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Preface & Acknowledgements

History of Medicine Days is an annual event which gathers medical students from across Canada to present brief papers on history of medicine at the University of Calgary. This year there were 38 papers on topics that covered three millennia, the surface of the globe, many disciplines of medicine and many historical themes. In their presentations the students shared their enthusiasm for history at social events, and communicated it to an audience of peers, faculty, and interested people in sessions running over two days. The invited lecture on *Pediatric Research - Canada 1978-1998* by Dr. Abbyann Lynch set a high standard and the students showed the abilities and intent that will make many of them leading physicians, teachers and administrators in the not too distant future.

The essays in this volume cannot capture the spirit of the event, the impression the students made with their presentations, or all of their passion about issues in the history of medicine, but they do convey the depth of their research, the range of their interest, and their skill at writing.

This volume owes its existence to the efforts of many people. Each of the students devoted many long hours, stolen from a very pressing medical school curriculum, to the research and writing of these papers, and to the preparation of their oral presentations or audio-visual material. Many of them were inspired or assisted by volunteer faculty members whose enthusiasm for the lessons to be learned from history can drag them too away from their day-to-day commitments. Dr. Keith Todd organized the events, which ran as smoothly as such events usually do only in textbooks of management. He had very effective help from students from the University of Calgary especially Daniel Heng, Tony Truong and Raymund Yong. Carolyn Taylor spent many hours and considerable effort of assembling the Proceedings itself.

The event and the publication of the Proceedings would not be possible without substantial financial support the Alberta Medical Foundation, the Hannah Institute, and the Faculty of Medicine at The University of Calgary to whom we are very grateful.

Dr. William A. Whitelaw
Chairman
History of Medicine Course
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Notes

ANCIENT EGYPTIAN OBSTETRICS & GYNECOLOGY

By

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ABSTRACT

The practice of obstetrics and gynecology, as we know it today, is carried out by a highly specialized practitioner who combines both medical and surgical skills to ensure the health of women during pregnancy and after. The approach to womens' health, however, in the ancient world, particularly Egypt, was somewhat different. Surgical intervention was never recommended, and the main treatment modalities provided by the "*swnw*" (pronounced *sounou*, physicians) that did exist would be deemed bizarre by today's standards. Gynecological disorders such as uterine prolapse were treated with medications rather than by manipulation. It was thought that if the patient stood over a burning fire of ingredients, her uterus would be magically forced back into its normal position. Excessive bleeding, or menorrhagia, was treated by remedies designed 'to draw out the blood of the woman' – the rationale being that if you were to draw the blood out, the bleeding would stop. Of particular concern to the Egyptians was the ability to predict whether or not a woman was capable of becoming pregnant. One method described that the likelihood of becoming pregnant was proportional to the number of times the woman vomited while sitting on a floor covered in beer mash. Another instructed the woman to place an onion bulb in her vagina overnight – if the odor of the onion could be smelled on the woman's breath by morning, then she was considered fertile. Once pregnant, numerous methods were then employed to predict the sex of the newborn.

The practice of obstetrics and gynecology, as we know it today, is carried out by a highly specialized practitioner who combines both medical and surgical skills with the ultimate goal being to ensure the health of women during both pregnancy and after. The approach to womens' health, however, in the ancient world, particularly Egypt, was somewhat different.

Obstetrician/Gynecologists in Ancient Egypt?

It is well known that certain *swnw* (pronounced *sounou*), the physicians who provided most of the medical care in ancient Egypt, had additional titles suggesting that they specialized in treating various parts of the body: Physician of the Eyes, Physician of the Belly, Shepherd of the Anus.[1]

Of the Egyptians, the Greek historian Herodotus wrote:

> "The practice of medicine they split into separate parts, each doctor being responsible for the treatment of only one disease. There are, in consequence, innumerable doctors, some specializing in diseases of the eye, others of the head, others of the stomach, and so on; while others, again, deal with the sort of troubles which cannot be exactly localized."[2]

This, however, does not seem to be the case for practitioners in the fields of obstetrics and gynecology in ancient Egypt, as there are no known words for midwife, obstetrician or gynecologist from this time period.[3]

Tests of Fertility and Pregnancy

Of particular interest to the Egyptians was whether or not a woman was capable of becoming, or was indeed, pregnant. One of the more famous tests, taken from the Berlin medical papyrus, is described as follows:

> "…test to see if a woman will bear a child or if she will not bear a child. Emmer and barley, the lady should moisten with her urine every day, like dates and like sand in two bags. If they all grow, she will bear a child. If the barley grows, it means a male. If the emmer grows, it means a female. If they do not grow, she will not bear a child."[3]

In a modern botany laboratory in Cairo, Ghalioungui and his colleagues carried out a trial[4] of this Egyptian test, which seems to be more of a test for pregnancy rather than fertility, and determined that non-pregnancy urines and roughly half of the pregnancy urines arrested germination. The researchers concluded that "…when growth occurs, the urine is presumably that of a pregnant woman, but the reverse is not necessarily true."[4] The ability of the test to predict the newborn's gender, however, was not so successful, with only 19 of 40 cases being correct, a result which one might expect to have occurred due to chance alone.[1]

One method described that the likelihood of becoming pregnant was proportional to the number of times the woman vomited while sitting on a floor covered in beer mash. That the early stages of pregnancy are often accompanied by nausea and vomiting might lend some degree of validity to this particular test.

Another method instructed the woman to place an onion bulb in her vagina overnight – if the odor of the onion could be smelled on the woman's breath by morning, then she was considered fertile.[5] Although the Egyptians were correct in thinking that obstruction of the uterus would make it impossible for a woman to bear a child, the latter test reveals the erroneous Egyptian view of anatomy at the time, that the cavity of the uterus was somehow connected to the digestive tract.

Obstetrics

Although there is little mention of treatment for problems that might arise at the time of delivery in the medical papyri of ancient Egypt, there is evidence to suggest that a group of remedies were used to "release a child from the belly of a woman," and "to cause a woman to

give to the earth"[3] – statements presumably meaning to begin contraction of the uterus and thereby hasten the birth process. The Ebers Papyrus suggests a number of remedies, including ground corn, celery ground in cow's milk, and hemp ground in honey, all of which were inserted into the vagina. Remedies that were taken orally included wine, date juice, and fresh salt of Lower Egypt.

The *swnw* did not in fact attend to women giving birth, rather there were typically two to three women who would assist during labour, particularly if the pregnant woman was of noble lineage. Delivery usually occurred with the woman squatting on two large bricks or on a chair from which the center had been removed – the hieroglyph for 'birth' aptly depicts the newborn's head emerging first with the woman seated in such fashion.[6]

Assessment of the neonate was, by today's standards, quite crude. The Ebers Papyrus[7] states:

> "…if, on the day the child is born, it says '*ny*' it will live and if it says '*mebi*' it will die.'

It was also thought that if the child moaned or turned its head downwards, it would also surely die.

The Ebers Papyrus also provides instructions on what to do should injury to the perineum occur during birth:

> "Instructions for a lady suffering in her pubic region, her vagina and the region of her vagina which is between her buttocks. You shall say concerning her: Very swollen due to giving birth. You should then prepare for her: oil to be soaked into her vagina."

In this particular situation, if the only concern was pain and swelling, then perhaps oil applied to the region may have had some therapeutic effect. But had there been any trauma, such as tearing, then surgery would have been the only effective treatment. As will be discussed below, surgery was not known to be employed by the *swnw* of ancient Egypt.

Contraception

As in our society today, in ancient Egypt there too was an occasional desire to prevent conception. The Kahun Gynecological Papyrus, the oldest surviving of the medical papyri, provides instructions for preparing numerous contraceptives to be inserted into the vagina. Pessaries made of sour milk, honey with a pinch of natron, and also of acacia gum were commonly used. Acacia gum has been shown to have a spermicidal effect in the presence of vaginal lactic acid.[5] A most peculiar practice involved the use of crocodile dung – contraception in this case would have undoubtedly occurred by way of deterrence of the man!

Gynecology

Although surgery plays a predominant role in contemporary gynecology, surgical intervention was not recommended in ancient Egypt, and the main treatment modalities provided by the *swnw* that did exist would be deemed bizarre by today's standards.

Gynecological disorders such as uterine prolapse were treated with medications rather than by manipulation. It was thought that if the patient stood over a burning fire of ingredients, her uterus would be magically forced back into its normal position. Alternative methods included drinking specially prepared remedies, and smearing oils and aromatic resins on the pubic region.[3]

Excessive bleeding, or menorrhagia, was treated by remedies designed "to draw out the blood of the woman"[7] – the rationale being that if you were to draw the blood out, the bleeding would stop.

The Kahun Gynecological Papyrus provides instructions for a victim of rape:

> "Instructions for a woman suffering in her vagina, and all her limbs likewise, having been beaten. You shall say concerning her: This has loosened her uterus. You should then prepare for her: oil to be eaten until she is well."[3]

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PHARMACOLOGICAL PRACTICES OF ANCIENT EGYPT

By

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ABSTRACT

Some of the most extensive reports on early medical practices are those from ancient Egypt. The physicians of this time period, known as the *swnw* (pronounced sounou), made enormous contributions to the field of medicine. The *swnw* were responsible for the production of the first known medical texts, the first reported observations of human anatomy, the first medical vocabulary, and the first prescribed drug therapies. The Egyptians employed a vast pharmacopoeia to treat a variety of recognized conditions ranging from hair loss to treating potentially fatal wounds.

Our knowledge of the therapeutic regimes of ancient Egypt comes from information contained in seven papyrus scrolls which were written around 1700 BC, but are believed to be copies of much older texts. These scrolls contain the names of hundreds of medicines used to treat a variety of pathological conditions. For the most part these treatment regimes contained multiple ingredients derived from animal, plant, and mineral origin, mixed with vehicles such as beer, milk and honey.

Egyptian drug therapy can be regarded as having evolved from a system rooted in magic to one of empiric observation applied within a central ideology of health and disease. That is to say that drugs used in specific therapies were first chosen based on perceived magical potential, and those that were continued were chosen based on empirical observation. Fewer than one third of the identified remedies for any given disorder contain an ingredient which can be perceived to have had activity towards the ailment being treated. However, of the therapies lacking a potentially "active ingredient" many did produce effects which in the context of the Egyptian model of health and disease were rationalized to be driving out the illness. This discussion will focus on providing a brief introduction to the pharmacological practices of ancient Egypt, with an emphasis on a few of the more intriguing treatments.

Pharmacopoeia of Ancient Egypt

Our knowledge of the treatment regimes of ancient Egypt comes from information contained in seven papyrus scrolls, all of which were written around 1700 BC, but are believed

to be copies of much older texts. These scrolls contain the names of hundreds of medicines and many pathological conditions. In particular, the Ebers Papyrus contains the most information on drug remedies and names over 900 specific drugs. Many of these drugs have been identified based on cross references with non-medical papyrus, drawings, analogy with function and in a few cases based on identification of remnants in labelled jars. However, the bulk of drugs of vegetable origin in particular remain to be identified. Further progress in these areas has been impeded by the inability to identify certain pathological conditions that these remaining unidentified drugs were used for treatment, and therefore correlation has been impossible.

Egyptian Model of Health and Disease

The physicians of ancient Egypt, the *swnw*, regarded air, water and nutrients as essential to life. They believed that these materials were transported together through a series of afferent ducts known as *metu* to the various organs and that this was essential for life. These *metu* were thought to extend throughout the entire body and anastomose with each other. The importance of the *metu* to Egyptians is indicated by greetings, where wishes of "may his *metu* be comfortable" and "may thy *metu* be sound" were frequent. The *swnw* believed that imbalances in air, water and blood within the *metu* were the cause of disease. The most important imbalance of *metu* was due to *whdw* (pronounced weedoo) – characterized as the "rotten stuff par excellence". *Whdw* was thought to originate in the faeces, due to undigested food, and in open wounds. If the *whdw* accumulated to dangerous levels it was possible for it to overflow into afferent *metu* and travel to the heart, the site of the soul. Egyptian therapies were therefore directed at expelling the *whdw* from the body, and this was achieved by administering medicines which would travel through the *metu*.

Administration of Drugs

There were five routes of drug administration; oral, rectal, vaginal, topical, and fumigation. While over 70% of Egyptian treatments were administered topically, a tenth of these were thought to exert their effects elsewhere. Here the Egyptian concept of *metu* can be observed through the practices of the *swnw*. Treatments administered to one area were envisioned to be transferred via these afferent ducts to their site of intended action. The greatest proportion of oral medications were prescribed for disorders of the gastrointestinal tract.

Treatment Regimes

The bulk of ancient Egyptian therapeutic regimes involved polypharmacy. In the Ebers Papyrus the average prescription contains 4.2 ingredients and, in one case of a treatment for impotence, more then 37. Identifying the active component in each treatment is often very difficult. The use of vehicles to transmit the treatment regime further compounds this difficulty.

Vehicles

Vehicles were commonly used in the administration of almost all medications. The most common vehicles were water, honey, milk, oil, fat, wine and beer. The vehicles would produce a pleasant effect on the concoction, sufficient to offset other disagreeable components.

Furthermore, the intoxication effects of wine and beer may have acted to ease the burden of suffering. However, based on their properties many vehicles can be considered drugs in and of themselves. Honey was the second most common ingredient (after water) found in Egyptian medicines, and was used for topical, rectal and oral applications. Honey was particularly effective in topical wound dressings. Though the Egyptians would not have known it, honey is an effective antibacterial agent due to its extremely hyper-tonic nature, and several antimicrobial agents contained within; hydrogen peroxide, gluconic acid, and proplis – which was used up until the mid 1900's as an antiseptic. Alcohol in the form of beer and wine were well known to the Egyptians. The alcohol content of wine and beer would have made it possible to extract active ingredients such as alkaloids from plants soaked overnight. The drugs were dispensed in a multitude of forms; infusions, liquid mixtures, pills, lozenges, inhalations, fumigations, plugs, suppositories, enemas, ointments and eye drops.

Dosing and Treatment Course

Most prescriptions did not specify total quantities, but rather were written indicating the fraction of each component in the final concoction. There were, however, exceptions to this rule which were almost exclusively observed with those medications taken orally. The Egyptians knew both the healing and deadly effects of some drugs, particularly the analgesics. They therefore weighed each component of many of the medicines to be taken orally, to ensure the beneficial effects and avoid the perils. The *swnw* even realized the importance of the size and age of the patient in therapeutic regimes. Rather than giving a child a full pill as they would an adult, they would often crush the pill and mix it with milk, giving the child only a portion. Finally, the duration of the treatment course was typically indicated by the papyrus for each therapeutic regime. Treatments were typically administered for four consecutive days. In rare instances, however, treatments were suggested to be used as frequently as required.

Drugs in the Ancient Egyptian Pharmacopoeia

The drugs in each of the medications were from animals, plants and even minerals. In a few instances, in addition to administering the medications, the *swnw* would have to use a magical spell for the treatment to work. It is not believed that these spells were performed based on the belief that the diseases were demonic in origin, but rather for their moral support value alone.

Drugs Derived from Animals

Components from animals appear in 42% of all prescriptions in the Ebers papyryus. Approximately 1/3 of these are fat or grease, both of which were likely used as vehicles. Fat and grease were often used in the formation of ointments for topical application. Approximately 1/3 of animal derived drugs were products of animal urine, eggs, faeces or milk. Finally, structural components of animal carcasses such as blood, bone, meat and skin were used in 1/3 of prescriptions. There is a wide range of animals from which animal constituents were obtained including cow, goose, ass, man, cat, pig, mouse, goat, sheep, bat, hippopotamus, antelope, dog, fish, insect, ostrich, pigeon, pelican, raven, frog, lizard, snake, tortoise and crocodile.

Animal products used in treatments were chosen because they were thought to possess the same traits by which the animal was characterized, and could thus impart these qualities to the patient. For example, crushed worms which are smooth and continuous were smeared on heads to keep them bald. The saliva from a stallion was given to a woman to stimulate her libido when her husband thought it necessary. The skin of an agile animal such as a deer was wrapped around a stiff foot in order to make the patient more nimble. Finally, disagreeable substances such as excrement and urine were used to repel evil spirits which were responsible for a patients disease. Despite the magical basis for the use of faeces, empirical observations of effective treatment were observed and this practice in particular continued, and will be discussed shortly. Finally, transference was used in the opposite direction, in which fish heads were used to treat migraines, and a hog's eye to cure blindness. In these situations it was believed that the evil spirits were transferred from the patient to the object. One must conclude that the value of the drugs derived from animals used in these remedies was more often based on magic and superstition than rational physiologic reasoning following the *metu* model.

Drugs Derived from Plant Matter

The ancient Egyptian *swnw* made extensive use of herbs and plants. In addition to the flora found in the lush native Egypt, they imported certain species from abroad. Unfortunately of the 160 plant products described in the medical Papyruses we have thus far been able to identify only 20%. Prescriptions specified particular parts of the plants to be used, including seeds, roots, leaves, flower petals, and crushed components suspended in wine. It thus appears that the *swnw* recognized that the active components are often found concentrated in specific parts of a plant.

The class of drugs in which Egyptologists are most interested remain the analgesics. There is some evidence that the ancient Egyptians were able to use morphine obtained from opiates. In particular, *shepen* (believed to be the opium poppy) was given to children to stop their crying. This practice has been continued through the ages and used as recently as the mid-nineteenth century in England. The Egyptians used cannabis as a drug and for making hemp ropes. Cannabis (*shemshemet*) was administered by mouth, rectum, vagina, topically, and fumigation, however, there is no evidence that the Egyptians were aware of its psychotropic effects. The mystical lotus flower (*seshen*), described in many papyris and depicted in many drawings is believed to be *Nymphaea spp*.. The lotus flower was frequently soaked in beer or wine and the extract drunk. This extract contains four powerful alcohol soluble alkaloids with significant psychotropic effects.

Drugs of Mineral Origin

A wide range of minerals were employed in the pharmacopoeia, and in fact most of these have been identified. The rationale behind the incorporation of these products into drugs is unknown, and empirical observation should have revealed that the bulk of these have no physiologic activity what so ever. Drugs such as sea salt (*hemat*), and natron (*hesmen*) would have possessed topical antibacterial activity on the basis that these hyper-tonic compounds have a powerful osmotic effect and would draw water out of the invading pathogen. However, many of the compounds such as granite and ferric iron are insoluble and would have had no activity.

Therapeutic Regimes for Specific Ailments

The following contains a few notable medical conditions, and the treatments the ancient Egyptian *swnw* used to manage them and promote healthy living.

Impotence

Many of the problems of today were also apparent in ancient Egypt. Erectile dysfunction is no exception and great efforts were made to overcome it. In one, the *swnw* would place small pieces of a baby crocodile's heart into hijabs designed to protect people from evil. These were mixed with nargin wood oil to create the correct concoction. The woman would then smear this medicine on her husband's penis to restore his potency. Another consisted of a concoction taken orally consisting of 37 different components. Of those which could be identified, the following are believed to have had active components; carob, juniper, hycoscyamus, oils, pine, salt and watermelon.

Aging

As today, people in ancient Egypt were concerned with regards to their outwards appearance. The ancient Egyptians were very conscious of the aging process, and accordingly several passages in the Ebers Papyrus are dedicated to stemming the ravages of age. Particularly these therapies focused on preventing the hair from turning grey and remedies to cause hair to re-grow to treat male and female baldness. In general the therapies directed at preventing greying of hair required the application of various parts of black animals to the grey hair. Baldness on the other hand was treated topically with the suspension of bristles of a hedgehog, fat of the hippopotamus, crocodile, cat, snake and ibex, the hoof of a donkey, and the leg of a hound suspended in castor oil. An alternate cure for baldness, which was supposedly used by the *swnw* of Cleopatra to re-grow the hair of her lover Julius Caesar, included the following; toasted domestic mouse, toasted vine, rag and toasted horses teeth, combined with equal proportions of bear's grease, deer's marrow and reed bark all pounded together mixed with honey and applied topically.

Sun Burn

In order to prevent sun burn on their long marches through the deserts following trade routes, the ancient Egyptians caravan drivers were told to chew the root of the plant ami-majos. This was reported to darken the skin, and therefore increase natural protection from the sun. Studies have recently shown that within the ami-majos bark is the compound 8-methoxysporate which acts to promote melanin pigment formation and therefore produce an artificial tan.

Infection

The pharmacopoeia of the *swnw* included many compounds which, unknown to them, contained antimicrobial properties. The *swnw* did, however, recognize the effect these compounds produced and therefore continued their use. While not understanding the basis of infection, the *swnw* did identify the symptoms associated with the infection of an open wound.

> "When you examine a man with an irregular wound … and that wound in inflamed … (there is) a concentration of heat; it pours out of the opening of that wound against your hand; the lips of the wound are reddened and that man is hot in consequence; then you must say: a man with an irregular wound … a sickness that I can treat. Then you must make a cooling substances for him to draw the heat out … leaves of the willow".

This information confirms that the ancient Egyptians recognize the cardinal signs of infection and inflammation, and also that the bark and leaves of willow trees tended to reduce infection. The antiseptic qualities of willow bark are well known to modern science.

Malachite (termed *wedju*), a green pigmented cupric carbonate/cupric hydroxide salt, was used by the ancient Egyptians both cosmetically and medicinally. Worn as an eye shadow, malachite would have protected against eye infections from organisms such as *Pseudomonas aeruginosa* and *Staphylococcus aureus*, for which it has potent bactericidal effects. Furthermore, it was probably the active ingredient in 39 drug mixtures described in the Ebers Papyrus, for infections of the eye and open wounds.

Bread was a common food stuff in ancient Egypt. The Egyptian *swnw* recognized that "bread in rotten condition" – mouldy bread - was regarded as one of the best treatments for intestinal ailments, diseases of the bladder and purulent wounds. Thus, it appeared that the *swnw* recognized the benefits of antibiotics produced by the contaminating bread moulds without understanding their mechanism of action.

Sewage pharmacology first began in ancient Egypt and was continued through the middle ages. The Ebers Papyrus contains more than 50 prescriptions in which faeces are believed to be active components, used for internal and external application. Furthermore, many of these prescriptions are very specific in their recommendations of excrement from different animals. The use of fecal matter in prescriptions was rationalized to repel the demons responsible for the disease and cause their exit, as these substances were seen as unfavourable. To explain the effect of these compounds by today's medical standards, we must recognize the importance of secondary metabolites of bacterial and fungal origin found in fecal matter. In fact, feces have been shown to be rich in antibiotic substances. Thus, the use of fecal matter was based on magical assumptions, but was supported by empirical observations. It is further known that every animal has different microflora, and correspondingly produces a different antibiotic complement in their waste – hence the use of fecal matter from a wide variety of organisms.

Gastrointestinal Ailments

About one quarter of all the prescriptions in the Ebers Papyrus were intended for ailments of the gastrointestinal system. Treatment of intestinal ailments were modeled following the Egyptian model of health and disease. For example, in order to expel the *whdw*, the toxin which arose in the bowels and could spill over into the *metu*, purgatives were used. Approaching Egyptian treatments from a modern medical standpoint it is difficult to comprehend how laxatives were used to treat cases of both constipation and diarrhoea alike. However, following the Egyptian *metu* model, the critical aspect in each case was a build up of *whdw*. By treating a patient suffering from diarrhoea with laxatives, the *swnw* could increase the expulsion of the

whdw and hence stop the disease process. So intent were the Egyptians on maintaining a balanced *metu*, that for three consecutive days every month the people would purge themselves with emetics and laxatives, to maintain a healthy status. A number of agents were used in this regard, including castor oil, figs, dates, carob, notched sycamore fig and cumin.

Conclusions

Our knowledge of the pharmacopoeia of ancient Egypt is clearly inadequate to support many sweeping generalizations about the effectiveness of the drug therapy regimens. Making actual conclusions on the efficacy of the pharmacological treatments of the *swnw* is difficult for a number of reasons, including the incomplete pharmacopoeia translations, difficulty in defining the conditions that treatments were suggested for and lack of information about how often a therapy was used. Further compounding this is the lack of first hand accounts of the clinical experiences and success of the *swnw*.

Egyptian drug therapy can be regarded as having evolved from a system rooted in magic, to one of empiric observation. That is to say that drugs used in the specific therapies were first chosen based on perceived magical potential, and those that were continued were chosen based on empirical observation. The *swnw* lacked the information regarding internal disorders and their causes that we posses today. Rather, their therapies were based on a misconstrued physiologic theory and empirical observation. While the bulk of Egyptian remedies can now be recognized as incapable of providing a cure, and in many circumstances even alleviation of symptoms, owing to their lack of active ingredients, it would be inappropriate to label all of these treatments as placebos. Of the 260 prescriptions in the Hearst Papyrus, 28 percent contain an ingredient which can be perceived to have had activity towards the condition being treated. Another third of these remedies supplied to any given disorder would produce a purgative effect on the gastrointestinal system, so as to imply to the *swnw* that the *whdw* was being driven out.

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SLEEP APNEA IN THE RAMAYANA

By

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ABSTRACT

The Ramayana, written by Sage Valmiki in approximately 800 B.C., is one of the two great epics of Hinduism. In Sanskrit, the Ramayana means "the journey of Rama". The Ramayana is a story of good versus evil. Goodness is represented by Lord Rama, one of the gods of Hinduism, and evil is represented by King Ravana. As the story goes, there is a war between good and evil. King Ravana feels his army is not as strong as that of Lord Rama and therefore, enlists the help of his brother Kumbhakarna.

In the story, Kumbhakarna is described as a giant with a huge appetite, who is cursed to sleep six months for every day that he is awake. When he sleeps, his breathing is quite turbulent, and his snoring is louder than an elephant. Waking him up is no easy task. When he is awakened from his long slumber, he is drowsy, and angry to have been interrupted from an incomplete sleep. He is what we would consider today a prime example of sleep apnea.

Sleep apnea is a very common disorder in which a person stops breathing for a few moments while he or she is sleeping. This phenomenon occurs many times during the night. The next day, the person feels that he or she has not gotten a good night's sleep and often feels sleepy during the day. Some people are more prone to sleep apnea than others, for example, those who are overweight, giants, or snore loudly. Kumbhakarna possesses all of these characteristics.

It is possible that characters in stories are based on observations of real people. If this was indeed the case in the Ramayana, then we can conclude that sleep apnea, a condition we first recognized in the 1960's, may have been present as far back as 800 B.C.

The Ramayana is one of the two great epic stories of Hinduism. It was written in India by Sage Valmiki in approximately 800 B.C. Ramayana is Sanskrit for "*the journey of Rama*" and the book tells the story of Lord Rama's life. Lord Rama is one of the incarnations or *avatars* of Lord Vishnu, the god responsible for sustaining life on earth. Whenever, evil begins to triumph over good, Lord Vishnu is born on earth to vanquish this evil and return the balance in favor of good over evil. The Ramayana tells us the story about the life of Rama as he fulfills his life's

purpose, to vanquish the evil present in the world in the form of the demon king of Lanka, Ravana.

The Ramayana is made up of seven *kandas* or books, and is written in the verse form called *shloka*. *Shlokas* are verses of two lines each of sixteen syllables written in a specific rhythm. Because the entire Ramayana is written in verse, approximately 24 000 verses in total, it was often recited orally and passed down orally from one generation to the next. In fact, the Ramayana itself, as written by Valmiki, is the story of Rama's life as recited to Rama by his own sons.

Rama was born the eldest of four sons of King Dasharatha of Ayodhya. Therefore, he was the crown prince, and the heir to the throne. However, his step-mother wanted her own son (Rama's younger half-brother) to become king, not Rama. Years before, King Dasharatha had promised to grant her two wishes, and she decided to invoke them now. One wish was that Rama be sent to the forest to live in exile for fourteen years, and the other was that her own son be crowned the next king of Ayodhya.

Rama, his wife Sita, and his youngest brother Lakshmana set out to spend fourteen years in the forest. They spent thirteen years living quietly in the forest as hermits. Unfortunately, it was during the last year of his exile that would prove the most difficult for Rama. The events that transpired during this year allowed Rama to fulfill the purpose for which he was born.

Rama, Sita and Lakshmana lived happily in the forest. They had built a comfortable home to live in and were quite content to live out fourteen years of exile there. However, one day King Ravana of Lanka happened to pass by and catch a glimpse of Rama's wife Sita. He thought her beautiful and could not take his mind off of her. He was determined to make her one of his wives. He approached her and told her that if she gave up the hermitage, and the hermit Rama, he would make her his bride and she would live out her days in luxury as queen of Lanka, wife to one of the most powerful demons in the world. Sita refused without giving the offer a second thought. This abrupt dismissal made Ravana very angry. He was accustomed to getting everything he wanted. He decided that since she would not agree to be his wife, he would take her by force. Disguised as a beggar, he approached the hermitage when Rama and Lakshmana were out, and kidnapped Sita.

When Rama learned what had happened, he proposed to King Ravana that if Ravana returned his wife to him, Rama would forgive him for what he had done. Ravana, not being one to surrender anything, refused. Therefore, Rama was left with no choice but to wage war on Lanka. Armed with their bows and arrows and the support of an army of monkeys and bears, Rama and Lakshmana made their way to Lanka.

The war went on for many days with the loss of innumerable lives. With each progressing day, King Ravana's army grew smaller and smaller. Still, he would not surrender. He held a meeting in his court knowing that the only way he could win was if he had some way of turning the balance of power to favour his army. He realized that he had just that key. He told his advisors that the only person who could help him now was his brother, Kumbhakarna. In order to get his help however, Ravana told his advisors that they had to undertake the difficult task of

waking him up. His advisors asked him why they had to wake Kumbhakarna up, and why he was sleeping in the first place. It was then that Ravana told them how his brother had been cursed with sleep.

Kumbhakarna had always been large for his age, even as a child. He used his size to bully others. As he grew older, he was the size of a giant. His size made him fearless and powerful, and so he would bully even the gods. He had been granted a *boon* or wish by the gods when he had done something good. The gods realized later that Kumbhakarna would use this wish to torment them even more. What Kumbhakarna wanted to wish for was to be able to take the place of Lord Indra, the ruler of heaven. As ruler of heaven, Kumbhakarna would be able to torment the gods as much as he wished, and they would be able to do nothing about it. The gods knew this, and went to the goddess Saraswati for help because she was the one who was going to grant Kumbhakarna's wish. She told the gods not to worry, and that she would take care of the situation. When the time came for Kumbhakarna to make his wish, instead of appearing in front of Kumbhakarna, goddess Saraswati appeared on his tongue. She knew that Kumbhakarna would make a slip of the tongue when making his wish because she was inside his mouth. Therefore, instead of asking for "*Indrason*" which means the place or seat of Indra (ruler of heaven), Kumbhakarna asked for "*Nindrason*", which means eternal sleep. His wish was immediately granted, and he fell into an uninterruptible sleep.

When Ravana, Kumbhakarna's elder brother, heard about what had happened, he became enraged. He went to Lord Brahma, the creator of the universe, and asked that the wish be undone. He said that Kumbhakarna had been tricked into making that wish, and to leave it that way was unfair. Lord Brahma told Ravana that once a wish had been granted, it could not be revoked, it could only be modified. He changed Kumbhakarna's wish so that Kumbhkarna would sleep for six months for every day that he was awake. That concludes the story of how Kumhbakarna was cursed with sleep.

When hearing about Kumbhakarna's size and prowess, Ravana's advisors exclaimed that he was just the secret weapon that Ravana's army needed. Ravana ordered them to wake up Kumbhakarna. This task was easier said than done. Kumbhakarna was very difficult to wake up. They brought food for him, but the scent would not wake him up. He was snoring loudly, and his breathing was violent (1). In fact, when he exhaled, he could blow away people like leaves in the wind (2). They blew trumpets and shouted, but the noise would not wake him up. They bit his ears, pulled his hair, and doused him with water, but still Kumbhakarna lay undisturbed in his slumber (3). They brought elephants to trample on his body, and finally he awoke to what seemed to him a gentle touch (1,2).

Still drowsy from his incomplete sleep, Kumbhkarna was angry at having been waked up (4). He noticed the food, and started eating quickly, quenching his anger as well as his hunger. Once he had finished eating, he was taken to see Ravana. Ravana told Kumbhakarna of his predicament and asked Kumbhakarna to fight on his behalf. Kumbhakarna was unimpressed by his older brother's foolish actions, but told him that he would support him nonetheless.

Kumbhakarna entered battle the next day. It did not take long for Rama to vanquish Kumbhkarna as Kumbhakarna's size was no match for Rama's skill. At this point, Ravana

realized he himself must fight. After ten days of war, Rama killed Ravana in battle, and was reunited with his wife Sita. In the war between good and evil, good had triumphed. By now, Rama had reached the end of his fourteen year exile. He returned with Sita and his brother, Lakshmana to Ayodhya, where his other brother gladly returned the throne to him. Rama became the King of Ayodhya and Sita, his queen. They ruled happily together for some time.

As is apparent from the story, the character likely to suffer from sleep apnea is Kumbhakarna, the brother of Ravana. Sleep apnea is a common disorder first recognized by medical professionals in the 1960's. It is characterized by frequent spells during the night in which a person stops breathing. Although apnea can be present in normal individuals, it occurs more frequently in people with the disorder. Some sufferers can have hundreds of apneic spells per night. At the end of each episode, the person wakes up in order to resume breathing. This awakening can be so subtle that the person may not even be aware that they have wakened. Because they have waked up so many times during the night, they may not have gotten very much sleep at all. Therefore, many patients suffer from daytime sleepiness (5).

Kumbhkarna possesses many of the features that are found in patients with sleep apnea. Kumbhakarna is male, and sleep apnea is eight times more common in men. Kumbhakarna is also a giant, and sleep apnea is commonly seen in giants. Obesity has been correlated with sleep apnea and Kumbhakarna was definitely overweight. Kumbhakarna snored loudly and persistently when he slept, slept more than was normal, breathed violently during sleep, felt drowsy when he was awake, and was known to have outbursts of anger. All of these characteristics are common to persons suffering from sleep apnea.

The intention of this manuscript has not been to prove that Kumbhakarna had sleep apnea, but simply to show that he may have had sleep apnea. Authors often base their characters on observations they make of actual people. If this was indeed the case with the Ramayana, then at the very least, we can see that sleep apnea, a condition that medical science did not recognize until the 1960's may have been present and observed as far back as 800 B.C.

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JESUS CHRIST, THE EXEMPLAR OF PATIENT CENTERED MEDICINE

By

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ABSTRACT

"*They ran throughout that whole region and carried the sick on mats to wherever they heard He was. And wherever He went - into villages, towns or countrysides - they placed the sick in the marketplaces...news about Him spread all the more, so that crowds of people came to hear Him and be healed of their sicknesses*." (Mark 6:55-56; Luke 5:15)

Patient centered medicine. What is it? Who does it? Is this clinical method new and unusual, ancient and time honoured, or on the rebound? The heart of what health professionals are calling 'patient centered medicine' today is that illness is more than biochemical, neurophysiological aberrations. There is a person from ancient times who knew this; one of history's most renowned, in fact, sometimes referred to as the Great Physician, who lived briefly in Israel two thousand years ago. According to Biblical records, Jesus Christ, touched the lives of countless individuals, focussing on the whole person: the physical, as well as the spiritual, emotional and relational being.

This presentation will explore the suggestion that Jesus Christ is the exemplar of patient centered healing as evidenced by his treatment of, relationships with, and love for the people who came to Him during His short time on earth.

What is the "patient centered"clinical method? A practice new and unusual, ancient and time honoured, or on the rebound? The heart of what health professionals are calling "patient centered medicine" today is that illness is more than biochemical, neurophysiological deviations. There is a person from ancient times who knew this; one of history's most renowned, in fact, sometimes referred to as the Great Physician, who lived briefly in Israel two thousand years ago. According to Biblical records, Jesus Christ touched the lives of countless individuals, focussing on the whole person: the physical, as well as the spiritual, emotional and relational being. This paper will explore the suggestion that Jesus Christ is the exemplar of patient centered healing as evidenced by His treatment of, relationships with and love for the people who came to Him during His short time on earth.

W. Wayne Weston and Judith Belle Brown, in their "Overview of the Patient Centered Clinical Method", contrast the patient centered approach with the conventional medical model of patient treatment which

> ...assumes disease to be fully accounted for by deviations from the norm of measurable biological (somatic) variables. It leaves no room within its framework for the social, psychological, and behavioural dimensions of illness. The biomedical model not only requires that disease be dealt with as an entity independent of social behaviour, it also demands that behavioural aberrations be explained on the basis of disordered somatic (biochemical or neurophysiological) processes. (Brown 1995, 22)

This could be called illness centered medicine. Conversely, patient centered medicine takes into account the "personal and social dimensions of a person's illness, in addition to biological aberrations" (Brown 1995, 22). A human being is more than a neatly synthesized jumble of synapses and reactions! Many health care professionals would agree with Weston and Brown when they say that "treatment of organic disease may be ineffective if the patient's context is dismissed" (Brown 1995, 22). "Context" may include external stressors like family strife, unemployment and cultural differences, or internal stressors like fear, assumptions and insecurities. Indeed, in his thoughtful book, "None of These Diseases", Dr. S. I. McMillen writes that "medical science recognizes that emotions such as fear, sorrow, envy, resentment and hatred are responsible for the majority of our sicknesses. Estimates vary from 60 percent to nearly 100 percent" (McMillen 1987, 5). Numerous other studies concur, Weston and Brown cite that:

> Blacklock (1977) found that in 50% of 109 patients who presented to their family physicians with chest pain, the etiology was unproven after 6-month follow-up. In Jerritt's (1981) study of 300 patients who complained of lethargy, fatigue or tiredness, no organic cause could be found in 62.3% of patients who were evaluated in a general practice during a three-year period. Wasson, Sox and Sox (1981), investigating 525 unselected male patients with abdominal pain who presented to an outpatient clinic, found no evidence for specific organic diagnosis in 79%. (Brown 1995, 33)

Clearly, there is more to health than the conventional model allows for. The physician who understands this will investigate the whole person, and find that he deepens his knowledge of his patient, and of the human condition, "especially the nature of suffering and the responses of persons to sickness" (Weston 1995, 28).

Jesus Christ was one such physician. Those who witnessed His activities say that when He ministered "The blind receive sight, the lame walk, those who have leprosy are cured and the deaf hear..." (Matthew 11:5, New International Version). The Gospel writer Luke, who is historically recognized as a medical doctor, writes that "people brought to Jesus all who had various kinds of sicknesses, and laying his hands on each one, He healed them" (Luke 4:40). In fact, Biblical writers specify a number of illnesses that Jesus dealt with, among them dropsy, fever, dumbness and other speech impediments, menorrhagia, lunacy, palsy and ulcers, as well as blindness, lameness, deafness and leprosy. Those familiar with the life of Jesus will recall that these healings are considered miraculous, and according to what is known about Him, His

methods cannot be duplicated by other physicians. My purpose in calling attention to them, however, is to point out that this person was actively concerned with the physical health of the people around Him. This is integral to the concept of His "whole person" approach to healing and its relation to today's patient centered clinical method.

Jesus cared for people in care's fullest sense. Dr. Margaret Cottle of Vancouver Hospital and Health Sciences Center points out that the very word "care" has a twofold application. One, it is an attitude or feeling about a person or circumstance, as in "I really care for Jody." Two, it is the activity of attending to something or someone simply because one possesses the skills required to do so, as in "This is the mechanic caring for my car" (Hui 1996, 224). Cottle maintains that medical and health related activities call on both contexts of "care", and she quotes Edmund Pellegrino who says,

> that the physician must have some understanding of what sickness means to another person, together with a readiness to help and to see the situation as the patient does. Compassion demands that the physician be so disposed that his every action and word be rooted in respect for the person he is serving. (Hui 1996, 224-25).

Competent medical care for and empathic relation to patients are sides of the same "whole healing" coin.

At least seven accounts of the healings Jesus effected begin with the statement, "...and He had compassion on them..." (Matt. 9:36, Mark 8:2). When He met a grieving mother, "His heart went out to her," records Luke, "and he said, "Don't cry" (Luke 7:13). His own tears flowed however, when he visited Mary, whose brother had died: an eye witness named John says that "When Jesus saw her weeping, and the Jews who had come along with her also weeping, He was deeply moved in spirit, and troubled" (John 11:33). He freely assumed people's pain as His own, communicating the depth of His commitment to them.

Personal contact with Jesus left virtually no one unmoved! Consider the contagious excitement in this scene: "They ran throughout that whole region and carried the sick on mats to wherever they heard He was. And wherever He went - into villages, towns and countrysides - they placed the sick in the marketplaces...news about Him spread all the more, so that crowds of people came to hear Him and be healed of their sicknesses" (Mark 6:55-56; Luke 5:15). Further, His magnetic servanthood was not limited to those who could afford it or whose prestige could bolster His public image. He unconditionally associated with those whom others refused to acknowledge: such social pariahs as dishonest tax collectors, beggars, prostitutes and adulterers, Samaritans (who were hated by the Jews of the day) and officers of the occupying Roman army. He once healed the serious wound of a soldier attempting to arrest Him. He tended the sick even when He was chastised for disregarding traditions that restricted days on which one was permitted to heal. He demonstrated what William P. Peabody called "one of the essential qualities of the clinician: interest in humanity, for the secret of the care of the patient is in caring for the patient" (Peabody 1927, 882).

Jesus made the effort to see beyond a person□s presenting problem to its root (John 4:16-18, story of the Samaritan woman), He urged patients to take control of wellness by abandoning negative lifestyles (John 8:10-11, story of adulterous woman), He engaged the individuals will and courage to take responsibility for health (John 5:7-9, story of a paralytic), and He treated people wherever they were, whenever they came (Luke 5:18-19, story of a paralytic).

Further testimony that relationship to the whole person was paramount to Jesus' personal mission is developed upon examining what was important to Him: He recognized that tragedies like murder, adultery, divorce and legal battles deeply wound, and gave practical instructions for avoiding them. He counselled against vengeance, anger, hatred, greed and worry, and encouraged forgiveness, humility, sharing, patience and mercy instead. There are upwards of seventy-five references that link peace to Jesus Christ, whether He taught about it, or offered it. Dr. S.I. McMillen wished that peace came in prescribable capsules, and grieved the destructive impact that spiritual and emotional suffering have on people's health; we might say that his concerns are very Christlike.

What motivation drove Jesus' commitment to healing people's bodies and souls? It was love. The Apostle Paul, who travelled in the Mediterranean telling the Roman world about Jesus, wrote of his hope that all people would "grasp how wide and long and high and deep is the love of Christ," and that they would "know this love that surpasses all understanding" (Ephesians 3:18-19). In a letter to citizens of Rome, Paul rhetorically queried, "Who shall separate us from the love of Christ? Shall trouble or hardship or persecution or famine or nakedness or danger or sword?...I am convinced," he writes, "that neither death nor life, neither angels nor demons, neither the present nor the future, nor any powers, neither height nor depth, nor anything else in all of creation, will be able to separate us from the love of God which is in Christ Jesus..." (Romans 8:35, 38-39). This sounds like an incredibly tenacious force! Jesus' love for humankind compelled Him to a life of humble service; "Let us not love with words or tongue, but in actions and in truth" (I John 3:18), wrote another, inspired to follow Jesus' example. Truly, love is most powerfully communicated by sacrificial service; service, says Margaret Cottle, that "pays attention to others with the desire to make them the center and to make their interests our own." "The simple experience," she asserts, "of being valuable and important to someone has tremendous recreative power" (Hui 1996, 234).

According to the Biblical account of His life, Jesus mission extended beyond physical and emotional restoration of humanity, to spiritual redemption. So committed was He to carrying this purpose to completion that He refused to be halted by hostile local rulers who considered Him a threat to their influence. This singleness of intent led to His execution. He was willing to make the ultimate sacrifice, life itself, to carry out His mandate of love. Every cured malady, every comforted sorrow, every word of encouragement and instruction, every tender touch confirmed this. He is the professional Lover, mastering competence, empathy, communication and sensitivity...and bearing the cost.

British palliative care physician Sheila Cassidy suggests that "the pattern of Jesus' loving provides a model for our own" (Cassidy 1991, 24). "Life is about sacrifice, about service, and the Love of God must be paid out in love of neighbour. Greater love hath no man than he who pours out his life for another. And life is not just blood, given once and for all, it is time and

energy, tears and laughter, poured out hourly, daily, over a lifetime" (Cassidy 1991, 52). Why? Because sometimes

No revolution will come in time
to alter this man's life
Except the one surprise of being loved.
He has no interest in Civil Rights
neo-marxism
psychiatry or any kind of sex.
He has only twelve more hours to live so never mind about
a cure for cancer, smoking, leprosy or osteoarthritis.
Over this dead loss to society
you pour your precious ointment,
call the bluff
and laugh at the
fat and clock-faced gravity
of our economy.
You wash the feet that
will not walk tomorrow.
Come levity of love,
Show him, show me
in this last step of time
Eternity, leaping and capering.
~ Sidney Carter (copied from Cassidy 1991, 25-26)

Patient centered medicine, past, present and future, is the one surprise of being Loved.

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EMPEROR MARCUS AURELIUS AND THE HISTORY OF OPIATE ADDICTION

By

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ABSTRACT

Opium is among a very short list of medications that can claim 3,500 years of therapeutic use. Accounts of the uses and abuses of this infamous drug are dispersed throughout history, from its application as a cure for colic in infants in Ancient Egypt, to a modern-day anaesthetic. Users of the drug include poppers and kings; sources of the drug have been both street-corner merchants, and the most highly acclaimed physicians. Thus, it is not uncommon to encounter new chronicles that implicate users of this mysterious plant extract.

However, it may be surprising to some that a man such as Marcus Aurelius, whose fame and accomplishments have been heralded for nearly two millennia, could have achieved such greatness while being plagued by the 'disease' that accompanies the frequent ingestion of opium. Accusations such as this are not to be taken lightly!

This presentation attempts to gather the circumstantial evidence surrounding the proposed vice of this famous Roman Caesar, and to verify it by comparison with known effects of this thoroughly studied narcotic. In support of this claim, I will call upon the writings of Galen (personal physician to Marcus Aurelius) and descriptions of the Emperor as recorded by several of his contemporaries.

It seems that *Papaver somniferum*, the opium poppy, has been present for the duration of man's existence. Likewise, the powerful drug that is extracted from it has a long and storied history. In fact, a person interested in discovering the identity of the first known user would have to trace history back over six thousand years. An equally difficult task might be to search for the first known addict, since endless tales of opium dependency have accompanied the use of the drug throughout the ages. Inaccuracies are likely to be encountered during this quest, since ancient records were generally kept only by the literate, and about the wealthy and important – both of these being very small segments of the population.

The focus of this paper, however, is the story of a man who meets these criteria. Marcus Annius Verus was born in 121 A.D. to a wealthy, important family during the golden age of Rome. He was well educated, and became a philosopher in the school of stoicism. Eventually, Marcus became Emperor Caesar Marcus Aelius Aurelius Antonius. During his reign as Roman

Emperor, he was known as a just and responsible ruler and a champion of the poor. He was successful in repelling invasions along the Northern and Eastern frontiers at several occasions, and he hoped to eventually expand the empire northward towards what is now Poland.

Beneath the surface, however, this prolific ruler was far from content. He warned the Roman people: "Beware, lest you too be made a Caesar"(Africa, 1961). Serving as the ruler of Rome was not a position that should be envied, according to Marcus. Part of his unhappiness was likely due to his ill health, and quite possibly to his dependency on his medications – which may have done him more harm than good. These medications were delivered on a daily basis by his personal physician, Galen, and to our benefit are described in detail in Galen's own records. The theriaca containing "poppy juice" was the only one that would satisfy him (Galen, 1985). Before we proceed, however, with accusations of dependency, it may be wise to explore the history of opium itself, so as to understand the state of knowledge about the drug at the time.

As previously mentioned, opium is derived from the unripe seedpod of the flower *Papaver somniferum.* Sumerian ideograms, dated to 4,000 B.C., show the poppy as a plant of joy – likely the first record of human opium consumption (Scott, 1969). In Egypt, around 1,500 B.C., the Therapeutic Papyrus of Thebes was written. Within this early medical document, opium was listed as a cure for colic in infants. In J.M. Scott's history of opium, he describes this effect as an example of the chief attraction of opium as a medicine. It is guaranteed to show results. Even if it does not cure the disease it removes the pain, which is all the unscientific patient worries about. It soothes both body and mind (Scott, 1969).

It is likely for this reason that it was used 'medicinally' by the Assyrians, who knew little of disease (Scott, 1969). Opium is cures practically all symptoms, and therefore has been heralded throughout its history as a cure for virtually any illness.

The popularity of opium faded somewhat in Greece in the era around 500 B.C. The drug was mostly reserved for use by the elite. In fact, during this time, the poppy met its first opposition. The drug was condemned by Diagoras of Melos, and indiscriminate use was discouraged by Hippocrates (Scott, 1969). A verse of today's Hippocratic oath reflects this belief: "To please no one will I prescribe a deadly drug, nor give any advice which will cause his death."

Galen (130-201 A.D.), however, restored the reputation of opium. It was his belief that opium:

> resists poison and venomous bites, cures chronic headache, vertigo, deafness, epilepsy, apoplexy, dimness of sight, loss of voice, asthma, coughs of all kinds, spitting of blood, tightness of breath, colic, the iliac poison, jaundice, hardness of the spleen, stone, urinary complaints, fevers, dropsies, leprosies, and the troubles to which women are subject, melancholy and all pestilences (Scott, 1969).

Galen was scientific in his approach to the use of opium, and carefully recorded his preparation and delivery of the drug in the case of Marcus Aurelius. In addition to being personal physician to Marcus Aurelius, Galen also attended to the Emperors Commodus and Severus.

Galen's records indicate that Commodus avoided theriaca, while Severus demanded the exact preparation given to Marcus Aurelius (Galen, 1985).

After the collapse of the Roman Empire, the Arabs were responsible for spreading the use of opium across Europe and the Orient. Unlike alcohol, opium is not forbidden by the Koran, and opium use by the masses was finally established around A.D. 1000 (Scott, 1969).

At this point, let us return to the evidence surrounding the case of Caesar Marcus Aurelius. The documentation of this Emperor's life and health comes from two important sources. First, are the writings of Galen himself, of which several sections are devoted to Marcus Aurelius and the preparation of his poppy juice theriaca. These descriptions convey some of the beliefs about the properties of opium in this time. Galen claims that a daily dose of theriaca conveys "complete immunity against venomous or noxious substances"(Galen, 1985) which was the initial reason for consumption by the emperor. He also noted some properties of the drug, including a weakened effect with age, and the acquisition of tolerance when taken daily (Galen, 1985). Prior to his role as Marcus' personal physician, Galen had previously been involved in the preparation of the "antidote" – another poppy juice containing concoction. It was his success with this responsibility that initially had him summoned to become the chief attending physician (Galen, 1985). This was around the time of a series of Germanic wars along the Danube river, and the emperor spent a great deal of his time near the battlefield. On one of his return visits to Rome, however, he had Galen show him the contents of the theriaca, and at the same time, Galen explained to Marcus the things about the potion that made him enjoy consuming it as well (Galen, 1985). The preparation could be taken with or without water, wine (making it similar to laudanum), honey or cinnamon. When a sample was combined with this last ingredient, the theriaca was so pleasing to the emperor that he requested a batch be immediately prepared and employed, without its usual 'fermentation' time (Galen, 1985). Normally, Galen allowed the concoction to sit and age for a period of time prior to use, which likely allowed some breakdown of the active ingredients to occur. The reason Marcus appreciated this cinnamon mixture may have actually been due to the increased potency of the fresh preparation, rather than to the added flavour as Galen suggested. Finally, Marcus began to show signs typical of chronic opium dependency when he attempted to have the poppy juice removed from the theriaca, and subsequently experienced insomnia until the product was replaced (Galen, 1985).

The life and behavior of Marcus Aurelius began to resemble that of other known opium addicts. The evidence supporting this claim lies in the second document recording the events of his life: his own "Meditations." This work is a collection of twelve volumes of his experiences and views of the world and human nature. In an attempt to determine the likelihood and the severity of opium dependency, it is convenient for us to compare statements within "Meditations" to pieces written by more recent addicts. From the late 1700s and on, several writings have described the opium-induced experiences of their authors. Others simply showed characteristics of bizarre reveries or altered perceptions of reality that are commonly associated with the drug.

In the early 1800s, Thomas De Quincey wrote *The Confessions of an English Opium Eater* in which he describes his experiments with the drug, and the state in which he was left:

For all this, however, I paid a heavy price in distance years, when the human face tyrannized over my dreams, and the perplexities of my steps in London came back and haunted my sleep, with the feeling of perplexities, moral and intellectual, that brought confusion to reason, that brought anguish and remorse to the conscience (Scott, 1969).

This is not altogether dissimilar from a picture of Marcus Aurelius, as painted in an essay by Thomas Africa: "Frail and sickly, Marcus lived with clenched fists, deeming life a desperate wrestling match or a daily death in the beast pit" (Africa, 1961). Lines from Aurelius' "Meditations" such as:

> "[time] is a raging river carrying all before it … into the abyss of the future" and "temporal and special dimensions were accelerated until Europe was but a speck and the present a point and men insects"(Africa, 1961)

show similarities to the distortion of time and space as also experienced by De Quincey:

> "space swelled, and was amplified to an extent of unutterable and self-repeating infinity" and "sometimes [I] had feelings representative of a duration far beyond the limits of any human experience" (Scott, 1985).

Marcus became habituated to having bizarre dreams, and his perception of reality was slowly altered: "though repelled by man and nature, the emperor came to see beauty in poison, thorns, and noxious things and even in the foam of a wild boar and the gaping jaws of beasts in the arena" (Africa, 1961). Another opium eater of the late 18th century was George Crabbe, a country parson in England. He also had bizarre dreams, although he was unable to alter his reality as Marcus Aurelius managed to do: "Awake, I had been with the high, and apparently happy: we were very pleasantly engaged, and my last thoughts were cheerful. Asleep, all was misery and degradation, not my own only, but of those who had been …" (Scott, 1985). These are rather uncharacteristic nightmares for an otherwise content vicar.

Eventually Marcus Aurelius came to prefer solitude, and "preferred the warm covers to meeting vicious vulgar people" (Africa, 1961). He claimed that it was better to "live as on a mountain. If they do not like it, let them kill you – it is better than living their life" (Africa, 1961). Once again, this is similar to De Quincey, who first used opium to explore the world, but later "naturally seeks solitude and silence, as indispensable conditions of these trances, or profound reveries" (Scott, 1969). A final comparison reveals another trait of opium that may have had some appeal with the philosopher Aurelius. De Quincey noted that "whereas wine disorders the mental faculties, opium, on the contrary (if taken in a proper manner), introduces amongst them the most exquisite order, legislation, and harmony" (Scott, 1969). Marcus Aurelius longed for the simple life of a philosopher (Africa, 1961), and perhaps this organizing trait of opium would have been pleasing to the rational, stoic thinker.

Although there is significant evidence in favour of the argument, it would be unfair to conclude that the great Marcus Aurelius was a slave to the "poppy juice" and completely incapacitated by the drug. He was able to produce the complete "Meditations" and although the volumes within may contain some opium-inspired concepts, he was still able to write. This

differs from the unfortunate case of Samuel Taylor Coleridge, a man with innate literary genius, who admits to losing his ability to write after years of laudanum consumption (Scott, 1969). Aurelius' writing exploits are but a small task when compared to his successful command of a vast empire for 19 years.

> The evidence leaves little doubt that Marcus Aurelius was consuming opium – frequently, if not daily. The dose, however, a "kyamos", is equivalent to about 0.033 gram of opium, which alone would not account for the said dependency. There is no sure way of knowing if this was in fact, the dose he was receiving, but the physical effects that have been described would tend to suggest otherwise (Africa, 1961).

To evaluate this anecdote fairly, one must employ all existing forms of evidence. Historical descriptions, personal accounts, and medical knowledge must all be called upon, and appropriately woven together in order to reach a justifiable conclusion. Through this process, some of the original claims about the emperor have been supported, while others remain hypotheses at best. As with all ancient history, the lack of reliable data, and the difficulty in verifying existing sources, ensures that the case of Marcus Aurelius will remain somewhat mysterious forever.

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PAUL OF AEGINA AND TRACHEOSTOMY

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ABSTRACT

The earliest written account of the operation of tracheostomy was provided by Paul of Aegina (625-690 A.D.), a surgeon and the last of the Greek compilers and epitomizers. Paul's greatest endeavor was to compose an *Epitome* of medicine in seven books, summarizing the best of Greek and Roman medicine to date. This work was so successful that it later formed a cornerstone of Arab medicine, and was eventually obtained by the Europeans of the pre-Renaissance period.

This presentation will explore Paul of Aegina's contributions to medicine using tracheostomy as a representative example from Paul's *Epitome*. A number of historical tracheostomies will be described, including the story of how the operation might have changed world history.

> *"I swear by Apollo Physician, by Asklepios, by Hygeia, and Panacea, and by all the gods and goddesses, making them my witnesses, that I will carry out, according to my ability and judgment, this oath and this indenture."*
> The Hippocratic Oath, from Wilder Penfield's *The Torch* (1960)

Western civilization was born in Ancient Greece, 2,500 years ago. The magnificent achievements of the ancient Greeks in government, science, philosophy, and the arts influence our lives every day. Indeed, the history of Greek medical thought and practice plays a central part in the general history of science, and Western medicine began, in fact, in ancient Greece. Furthermore, the ancient Greeks developed rational medicine, free from magical and religious elements and based upon natural causes. This rational attitude resulted in a new concept of disease, and causes and symptoms were now accounted for in natural terms.

This significant progress in medical thought was brought about by the endeavors of numerous Greek physicians, including Hippocrates and Galen. These names are familiar to many, but it is rarely questioned how their works came to rest in our hands, thousands of years later. Indeed, if it weren't for the foresight of one particular historical figure, Paul of Aegina, our current knowledge of Greek medicine would have been very limited.

Paul of Aegina was a surgeon who lived from 625-690 A.D (Garrison, 1929). He was the last of the Greek compilers and epitomizers, and wrote an *Epitome* of medicine in seven books that summarized all the medical knowledge extant at that time. His work was so successful that it later formed a cornerstone of Arab medicine. He therefore played an important role as a

preserver of Greek and Roman medicine. Moreover, his *Epitome*, which had been taken over by the Arab physicians, was eventually retranslated back into Greek and placed into the hands of the Europeans (Nuland, 1985).

Although virtually nothing is known about Paul's life history, it has been determined that he was born on the island of Aegina, and that he trained and worked in Alexandria (Nuland, 1985). In his lifetime, Paul became one of the most celebrated of the Byzantine physicians, and was a very capable surgeon. His *Epitome* provides original descriptions of procedures including lithotomy, trephining, herniotomy, paracentesis, amputation of the breast, and tracheostomy (Garrison, 1929). Paul also participated in other surgical procedures, including operations on the eye, removing polyps from the nose, extracting teeth, removing tonsils, and extracting stones from the bladder, to name a few. In removing the tonsils he describes in his compilation that the patient would be seated facing the sun, mouth held open and tongue depressed with a spatula. In a quick motion, a hook would be passed through one tonsil to pull it forwards, and a curved scalpel slid through its base so as to cut it. In like fashion, Paul would amputate the other tonsil, and the operation would be over. The patient, if still conscious, was then made to gargle with cold water (Graham, 1939).

Another contribution of Paul's was to identify that arrowheads and other weapons of war could most easily be removed from the body by placing the patient in exactly the same position as when he was shot. In this way, the foreign object would be found buried somewhere along a straight track from the point of entry, simplifying the removal process (Graham, 1939).

One of the best surgical descriptions by Paul is that of tracheostomy. It is a representative example of how our current knowledge stems from that of one of the oldest and most glorious of all civilizations. Accounts tracing back to antiquity reveal that relief of respiratory obstruction in the larynx and upper aspects of the trachea was achieved through tracheostomy, usually performed only as a last, lifesaving resort (Wangensteen and Wangensteen, 1978). There is some historical uncertainty as to who first performed the procedure, although Galen credited Asclepiades with having been the first to use it, in 100 B.C. (Stoller, 1999). Furthermore, Antyllus (who lived in the second century) was one of the first strong advocates of tracheostomy and attempted to describe the technique (Aegineta, 1985). About five hundred years later, Paul of Aegina also recommended the procedure and adapted the description of Antyllus in his *Epitome* (Meade, 1968). Indeed, none of the Greek authorities, other than Paul of Aegina, left a written description of this operation. In any case, it is evident that the procedure was developed in ancient times, and it is still in use today.

A tracheostomy entails making an opening into the trachea. The indications for performing the operation include: a mechanical obstruction of the upper airway; to remove an accumulation of secretions; or as a route for assisted mechanical ventilation. In any case, the patient with an obstruction is unable to breathe, and the procedure provides an alternative opening through which air can flow to the lungs (Wangensteen and Wangensteen, 1978).

The site of the tracheostomy is that part of the trachea between the cricoid cartilage and the suprasternal notch. A segment of the anterior tracheal wall, between the second and fourth tracheal rings, is usually removed to permit the introduction of the cannula (a tube inserted to

allow the passage of air). The final step is to stabilize the cannula (Goldin, 1981).

Turning to the historical aspects of tracheostomy, Paul of Aegina provides a detailed description of the operation in his *Epitome*. It is very similar to the modern procedure just described (Aegineta, 1985):

> "*[...] but in inflammations about the mouth and palate, and in cases of indurated tonsils which obstruct the mouth of the windpipe as the trachea is unaffected, it will be proper to have recourse to pharyngotomy, in order to avoid the risk of suffocation. When, therefore, we engage in the operation we slit open a part of the arteria aspera (for it is dangerous to divide the whole) below the top of the windpipe, about the third or fourth ring. For this is a convenient situation, as being free of flesh, and because the vessels are placed at a distance from the part which is divided. Wherefore, bending the patient's head backwards, so as to bring the windpipe better into view, we are to make a transverse incision between two of the rings, so as that it may not be the cartilage which is divided, but the membrane connecting the cartilages. If one be more timid in operating, one may first stretch the skin with a hook and divide it, and then, removing the vessels aside, if they come in the way, make the incision.*"

A number of historical examples of the procedure demonstrate the extent to which tracheostomy has been used in the past. For example, it was reputed that Alexander the Great, around 350 B.C., performed a tracheostomy upon a choking soldier, using only his sword; interestingly, this occurred long before the procedure was described in detail by Paul of Aegina (Stoller, 1999).

Albucasis (936-1013 A.D.), Islam's greatest medieval surgeon, showed that the trachea would heal following incision, when he was called to treat a slave girl who had attempted to commit suicide by slitting her throat with a knife. In the process, the girl had severed part of her trachea; however, Albucasis succeeded in sewing up the tracheal wound, leading to the girl's recovery (Wangensteen and Wangensteen, 1978).

The first account of a successful tracheostomy, however, was that published in 1546 by Antonio Brasavola, an Italian physician. Brasavola surgically opened the trachea of a patient suffering from respiratory obstruction caused by an abscess adjacent to the windpipe, effectively saving the patient's life. The patient recovered soon after the procedure was performed (Wangensteen and Wangensteen, 1978).

One final historical story pertaining to tracheostomy describes how it could have been used to save the life of George Washington. On December 14th, 1799, Washington became ill, suffering from a septic sore throat that was impeding his breathing and was steadily becoming worse. He was under the care of a family physician and two consultants who had tried numerous measures, including copious bleeding, laxatives, emetics, blisters, and poultices, all to no avail. The youngest member of the trio and a graduate of the new Medical School of Pennsylvania, Elisha Dick, proposed a bold alternative, that of tracheostomy. The suggestion was considered, but was ultimately vetoed by the other two elders. Hence, earlier remedies were continued, but

Washington died after fourteen hours of illness, from suffocation and depletion. Tracheostomy might well have been lifesaving for the president, but it was too radical a suggestion for 1799 and for so eminent a patient (Wangensteen and Wangensteen, 1978). Indeed, it wasn't until nearly a quarter century had passed that Dick's proposal would be justified. One wonders whether world history might have been different had Washington been saved that day.

To conclude, the tracheostomy is an important operation still in use today and initially described in great detail by the ancient Greeks. It is only one of many examples illustrating the observant and significant findings of this strong and impressive civilization, and it supports the idea that we owe much of our current knowledge, beliefs, and practices to the ancient Greeks.

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CUTTING FOR THE STONE: LITHOTOMY THROUGH THE AGES

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ABSTRACT

Urological disorders are among the oldest medical conditions known to man, afflicting humans since time immemorial. The discomfort, pain and other potential serious medical complications stemming from urinary stone formation have caused those afflicted and their appointed healers to search for any method, including surgical, by which to relieve the suffering.

Archaelogical findings, as well as early writings, indicate that our ancestors were plagued by the same kind of discomforts routinely encountered in modern urological practice. The importance of urinary stone disease and the dangers of treating bladder stones were fully recognized by Hippocrates. In fact, part of the Hippocratic oath clearly states that "I will not cut persons labouring under the stone, but will leave this to be done by men who are practitioners of this work". Unfortunately, as can be expected, the methods of stone removal were extremely crude and sepsis reigned, many times leading to the death of the patient after the procedure because of infection or hemorrhage.

These early techniques persisted almost unchanged down to the sixteenth century, when new and improved instrumentation and techniques for stone removal arose. Rennaisance gave rise to fresh curiosity in all areas of human knowledge, and newfound interest also arose in medical science and surgery. Sudden surgical improvements in lithotomy sparked further interest in surgical urinary stone removal and led to the invention of increasingly efficacious lithotriptor instruments and a more in-depth study of the anatomy of the urinary system, the forms and etio-pathogenesis of lithiasis, its treatments, operating techniques and prophylaxis.

This steady improvement has continued to the present day, and the dramatic technological and procedural boom that surgery experienced in the twentieth century has also been reflected in great advances in urological surgery and more specifically, in increasingly safe and efficient surgical solutions to urinary stone disease.

Urological maladies have always plagued man with considerable frequency, striking those young or old, healthy or ill. Among them, perhaps no condition was more prevalent and disabling than the formation of stones in the urinary system, most commonly expressing itself in

the bladder. One can even imagine a solitary prehistoric man at the dawn of our species, face grimacing and body contorted in pain, unable to void or walk, despairing for a quick end to the misery, one way or another.

The symptoms of stones in the bladder seem to have been common complaints since the beginning of recorded history. However, it was also one of the few conditions that healers of primitive civilizations could treat without condemning the patient to certain death. In fact, the extraction of bladder stones, or lithotomy as it came to be called in more modern times, was performed with surprising frequency by people in the ancient civilizations of Egypt, India, the Middle East, Greece and Rome. Along with trephination and circumcision, it was one of the triad of most ancient surgical operations. This paper will attempt to present a brief outline of the origins and development of the techniques of lithotomy from the earliest ages to just a century ago.

Stones were well known in ancient Egypt and, indeed, the earliest urolith ever recovered was retrieved from the nasal cavity of the mummified corpse of a young Egyptian boy. This great artifact was unfortunately later destroyed during the Nazi bombing campaign over Britain. References to stone disease have been found in several Egyptian writings, and treatments seem to have usually been medical in nature, consisting of specially-designed exercises and the administration of lotions, ointments, laxatives and special diets. Fly droppings, feces, gazelle dung, crocodile excrement, mud from burial grounds, and mouldy bread were all used! Surgical operations seem not to have been very common, but cutting for the stone sometimes took place in particularly severe cases.

Healers in ancient Hindu civilization seem to have frequently used a form of lithotomy, known as “cutting on the gripe”, to remove bladder stones. In fact, this same techniques seems to have made its way to the ancient Greeks and was the procedure that Hippocrates was referring to in his famous Oath when proscribing physicians from “cutting for the stone”. The manner in which the operation was performed will now be described.

The patient suffering from the stone was laid back on a table, with a stack of thick rugs providing some back support and preventing him from lying completely flat on the surface. His hips were flexed and the thighs pulled back, usually being tied to the neck or body to keep them in that position. The arms and hands were laid on top of the flexed thighs and also bound to them. Finally, the feet were pulled backward and outward and held tightly on each side by the cutter’s assistants, men of strong physical attributes. Often, assistants were also needed to hold the thighs. The resulting position of the patient offered an unobstructed access to the perineal area, the theater of operation for the lithotomist.

The cutter’s main assistant then pressed firmly with a closed fist on the left side of the abdomen so as to induce the stone to come within reach of the operator. The surgeon then introduced into the rectum the index and middle fingers of his left hand, which were well oiled and had their nails pared. The fingers were carried upward and attempted to feel for the stone within the bladder. Once contact had been made, the fingers attempted to bring the stone, along with the wall of the bladder along which it was situated, into the perineal area between the rectum and penis. Having reached this place, the stone could be more easily visualized as a

discernible bulge in the perineum. An incision was then made to the left of the raphe and carried inward through the prostate and into the membranous urethra and bladder neck. Attempts were then made to quickly remove the stone using the fingers of the hand or primitive forceps.

Post-operatively, the patient was made to sit in a cauldron full of warm water, in the hope that the accumulation of blood in the bladder could be prevented. If blood did accumulate, a concoction was injected using an urethral syringe.

This and other medical or surgical interventions were recorded in epic poems or stories known as *Vedas* or *Samhitas*. These writings represented an advanced knowledge of medicine and surgery. In the case of stone disease, they record a tremendous amount of information about stones and urinary obstruction. In fact, "lithologists" can be considered to have been the first specialists, and there existed rules for their behaviour and plans for their education. When considered ready, they were advised to try out their skill on three heretics: "If these all die, practice no more, for if you do and the man dies, it is murder", evidently a very sound piece of advice.

Epitomizing the advanced medical knowledge present in ancient Hindu culture was the greatest surgeon of the ancient world, Shusruta, believed to have lived sometimes between 1000-500 BC. His *Shusruta Samhita* was a monumental work and the first attempt at the systematic teaching of surgery. It was he who provided the first written surgical directives for removal of bladder stones. In recommending surgical lithotomy in those cases found not to be amenable to medical resolution, Shusruta warned the surgeon that although a last resort, this sort of operation was rarely successful and death often resulted.

References to the practice of lithotomy are later found in Greek documents, none more famous than that in the great Hippocratic Oath. In it, Hippocrates advises practicing physicians to "not cut persons labouring under the stone, but leave this to be done by men who are practitioners of this work", a clear indication that lithotomy was generally performed by people trained in this procedure but not belonging to the recognized medical occupation. These were more than likely itinerant, illiterate men who had acquired the technique of bladder stone extraction from older relatives or mentors. It is believed that Hippocrates advocated against this practice being performed by formally trained physicians because of the inherent riskiness of the procedure, the unsuccessful and fatal consequences of which could have diminished the reputation of Greek physicians. Another reason put forward is that Hippocrates felt physicians should restrict themselves to purely medical treatment, with surgery being too unscientific and beneath their professional dignity. This is perhaps the first recorded evidence of professional demarcation between physicians and surgeons and suggests that Hippocrates may not only have been the father of modern Western medicine, but also of the trade union movement!

Eventually however, formally recognized Greek physicians began practicing the surgical arts as well, and in the process made important contributions to the field of surgery, including the operation of lithotomy. Ammonius of Alexandria (3rd Century B.C.) improved the operation of lithotomy by cutting or breaking the calculus to make its extraction easier. After opening the bladder, he steadied the stone with a hook and then split or shattered it by striking it with a thin, blunt-ended instrument. He was given the nickname "*lithotomus*," which initially referred to the

splitting of the stone but eventually came to be applied to the entire operation of cutting for the stone.

The golden age of Greek surgery was the 1st century A.D., and an excellent account of surgical practice at that time is given by a comprehensive work by Celsus. After Hippocrates, Celsus was the most well-known ancient Greek physician, and made his residence in Rome. Bladder surgery had made considerable progress, and in his writings Celsus provided exact directions for removing and crushing stones.

Perineal surgery was well described by Celsus and closely resembled the technique first introduced by Shusruta, with the only minor modifications being that the incision specified by Celsus was transverse and across the line of the raphe, while that of Shusruta was lateral to the raphe and more vertical. Celsus' method was afterward denoted as the 'methodus Celsiana' and is of tremendous importance in the history of urology as it was practiced with little or no modification until the end of the eighteenth century and was the predominant lithotomical approach until the beginning of that century. The operation, however, was only really effective in children below the age of 14, as the presence of a large prostate made the operation more difficult in adults. More often than not, the extraction of a stone along the path of the incision caused severe trauma to the urethra, prostate and perineal bulb and its artery in the adult. A child was held in the lap of a strong assistant but an adult undergoing lithotomy was held in the characteristic position by three or four attendants. The incision was carried into the bladder trigone and the stone was removed, with fingers if small, with a specially designed hook if large. This operation was termed the 'Apparatus minor' and was the usual approach to lithotomy until 1520 when the operation was radicalized by the introduction of a large number of new and bulky instruments and re-named the 'Apparatus major'.

In women patients, Celsus advised the extraction of small stones by the urethra by means of a hook, aided by a finger in the vagina or, in the case of a virgin, in the rectum. For larger stones, an incision between the urethra and the pubic bone was recommended. The Greek and Roman authors and the Arabs merely repeated this advice.

After the conquest of Greece, the center of medical knowledge moved to Rome, the major capital of the Western world, a city to which a large number of Greek physicians were attracted. Not a great deal of novel progress was made in the area of lithotomy during the period of Roman imperialism, although it did produce Galen, whose prolific writings on the state of medical knowledge to that time had perhaps the greatest and most enduring impact on Western medicine well into the Renaissance period. Galen repeated Celsus' technique of lithotomy, stressing the importance of manipulating the stone down to the bladder neck and exposing it by a single incision.

After the fall of the Roman empire, the era of Greco-Roman medicine came to an end, with the notable exception of the last great Greek physician Paul of Aegina (625-690 A.D.), who wrote several works on surgery and made a few of his own modifications to lithotomy. Much of the medical knowledge of that era was passed down to and saved by the Arabian civilization over the period of 600-1200 A.D. The Arabs did not evolve a system of medicine of their own but

based their practice on the classical Greek writings, to which they added their own comments and the results of their experiences.

During this time, lithotomy seems to have fallen into disuse, although it was not completely discarded. While Rhazes and Avicenna were the most significant medical figures of this period, it was Abulcasis who made the greatest impact on lithotomy. He practiced surgery in Cordova and his writings are based on those of Roman and Greek authors, especially Paul of Aegina. His description of lithotomy differs little, with the exception that the instruments used were different and more complicated. Abulcasis used a scalpel "*nechil"* to make a transverse incision between the anus and testes. If the stone was a small impacted urethral calculi, a ligature was tied around the penis above the stone to prevent its slipping back into the bladder, and a triangular pointed blade fixed into a wooden handle and known as a "*michab"* was used to make contact with the stone. The michab was then rotated so as to drill it in several places. The surgeon squeezed the penis to break the stone and the fragments were washed out by the urine.

Very little is recorded with respect to the practice of lithotomy in the Dark and Middle Ages in Europe, although it appears, from the limited evidence available, that it continued to be carried out by itinerant trainees in the art. In France, the first College of Surgeons was founded in 1210 and included surgeons of the "long robe", the highest rung, and those of the "short robe", also known as barber-surgeons. Although surgeons were themselves still considered inferior in position to physicians, they themselves considered lithotomy, along with operations for hernia and cataract, as below their dignity. Instead, these were performed by uncertified travelling surgeons or barber-surgeons.

With the advent of the 1500s, although lithotomy continued to be considered an undignified operation, the barber-surgeons now included in their ranks some lithotomists of such skill that the College of surgeons was forced to accept them under a new statute and with a few conditions. Eventually, as the lithotomy technique was refined it began to be part of the regular domain of full-fledged surgeons, and when the Academy of Surgery was founded, the barbers were officially no longer allowed to perform any surgery.

The same pattern occurred in England, where formal surgeons and barber-surgeons first came into conflict, then united in a guild to wage their common conflict against physicians. As in France, the barber-surgeons were slowly precluded from performing surgical operations. During the eighteenth century, both in England and on mainland Europe, surgery became respectable and surgeons were no longer considered the social and professional inferiors of the physicians. Furthermore, it was no longer considered undignified to carry out operative surgery, including lithotomy. Lithotomy was at last accepted and began to take its place as one of the most important operations of surgery.

At the beginning of the sixteenth century, two different approaches to surgical bladder stone removal were known. The "apparatus minor", the more widely practiced method, was that advocated by Celsus. The operation was accomplished in short time, and practitioners often competed among themselves to demonstrate the facility by which they performed it, with bystanders timing the duration of the procedure. The knives were wrapped in linen at a predetermined depth, so the incisions would not penetrate too deeply. Nevertheless, the

operation as done at the time was a brutal manhandling of tissues with little or no regard for anatomy.

A new technique, which was to supersede that of Celsus, was developed by Giovanni di Romanis of Cremona. His technique is known due to the writings of one of his pupils, Marianus Sanctus de Barletta (1490-1550). In this operation, to overcome the difficulty of finding the bladder neck, especially in children, he introduced a sound into the bladder to act as a guide to the proximal urethra. A grooved staff was then introduced into the urethra and acted as a director for the blade to cut down upon, slightly to the left of the median raphe. This operation led the surgeon directly into the bladder and minimized accidental damage to neighbouring tissues. The number of instruments used was much greater, giving it its name, "Apparatus major". The prostatic urethra was entered and dilated or torn through the incision into the urethra. The stone was grasped and was pulled out forcefully, notwithstanding obstruction. Although minimizing accidental damage, this procedure, partly due to its location in the midline of the perineum, the size of the instruments used and the force of stone extraction, often caused a horrific amount of trauma, irreversibly tearing and shredding the membranous and prostatic urethra, the prostate itself, the perineal bulb and sometimes the rectum. Common complications included incontinenence, fistula formation and infection.

Marianus Sanctus also applied his technique to female patients. He passed his sound and made an incision between the urethra and pubis laterally and he then used his customary instruments.

Pierre Franco (1500-70) was an able barber-surgeon who practiced in Berne and Lausanne as well as in France. He occupies a prominent position in the history of the development of lithotomy, introducing several beneficial improvements to the procedure. First, he was the first to perform the suprapubic approach to stone removal, the approach that was to become the dominant *modus operandi* for bladder stone extraction after the arrival of anesthesia and antisepsis. He first tried this approach on a three year old child suffering from a large stone and with contraindications to the perineal approach. Although a far simpler operation than perineal lithotomy, this new method did not gain popularity until after the advent of anesthesia, when the struggles of the patient no longer threatened rupture of the diaphanous peritoneum, followed by extrusion of bowel into the wound, causing the usually fatal complications of bowel laceration, peritoneal inflammation and septicemia.

Second, Franco was the first to recommend a two stage operation. After making the initial incisions to the bladder neck and exploring for the stone, Franco advocated stopping and applying open-wound management and catheterization for urine flow for a few days if the patient became nearly unconscious, lost too much blood or several pieces of stone had to be removed. He felt that proceeding further under such circumstances posed undue risk to the patient, and advocated allowing the patient some rest to regain strength, and only then proceeding with the rest of the operation a few days later. This wise recommendation was found to significantly reduce mortality among patients operated on by surgeons courageous enough to challenge the status quo and try a new approach.

Finally, Franco once again went against the accepted practice of the day and recommended open-wound management. Against the long-held teachings of old masters advocating primary union of all wounds, Franco and others learned from their own experience that leaving deep wounds open, allowing them to close secondarily, was attended by a surprising decrease in mortality. Put into practice, this finding was a dominant factor in the success of perineal lithotomy prior to asepsis, by providing a free escape of urine and allowing the irrigation of the wound.

From the mid-sixteenth century well into the eighteenth century a brand of self-made stone cutters, "specialists" who acquired the art through apprenticeship, were the chief lithotomists. Chief among these was the family of Colot, who held something of a monopoly of lithotomy in France for several centuries and were held in high repute at the royal court, but who kept secret their method of lateral perineal lithotomy for eight succeeding generation before Francois Colot shed some light on the procedure in 1727. This sense of competitiveness, suspiciousness and jealousy had characterized the community of professional lithotomists since the inception of lithotomy as a recognized surgical procedure, a phenomenon driven by desire for clientele, profit and fame.

Toward the end of the seventeenth century, the Colots' pride of place among lithotomists was challenged by Francois Tolet, who wrote a well-known book on the operation in 1682. Tolet first used Celsus' method and later changed to the *grand appareil,* which in his hands reached the peak of its technique.

A major innovation to the practice of lithotomy was introduced to the world at the end of the seventeenth century by a travelling, non-certified lithotomist named Jacques de Beaulieu (1651-1714), usually known as Frere Jacques. Perhaps the most colourful character in the history of lithotomy, he was born impoverished and had a meager education, and may be the only lithotomist to be immortalized by a well-known nursery rhyme. Early in life, he was apprenticed to an Italian surgeon, from whom he learned the methods of the *petit appareil* and *grand appareil*. About 1690, he assumed a monkish habit, apparently of his own design and carried out many lithotomies as itinerant operator through southern France.

During this time, he developed his own technique which came to be known as the lateral approach of cutting for the stone. Initially, Frere Jacques introduced a sound without a groove and used a wide and rather long bistoury to make an incision on the left side of the perineum, medial to the ischial tuberosity, carried forward from the anus and down to the sound. The bladder was thus opened, and Frere Jacques inserted his finger into the bladder. He then introduced his '*dilateur-conducteur'* and then the forceps. He withdrew the conducteur and grasped the stone, then removed the sound, followed by the forceps with the calculus.

This operation was much more satisfactory in adults than the midline or Celsurian approach. It permitted better access to the bladder while producing much less trauma to tissues. The midline approach was generally fairly safe to use in young children and youth, but had always been very dangerous when used on adults.

Using this method, even with very little knowledge of anatomy, Frere Jacques achieved remarkable success on his travels, and his name became known to the medical luminaries of Paris, who decided to test his skill by observing his removal of a bladder stone in a cadaver. The test was a success, and Frere Jacques and his method came into vogue. He was introduced at court, and had a string of subsequent operating successes at Paris hospitals. Unfortunately, this success did not last, and after he lost several patients in a row, opinion changed and he was exiled from Paris.

Nevertheless, Frere Jacques continued to travel and perform lithotomies in the Netherlands, with considerable success. Once again, his exploits reached the Paris medical community and he was recalled to the great capital. There, a respected doctor saw great potential in Jacques' technique if only he could be taught to be more familiar with the local perineal anatomy. He was also convinced to use a grooved sound. The modified operation represented the greatest progress yet made in lithotomy, and Frere Jacques subsequently operated on thirty-eight patients at Versailles, none of whom died, a remarkable achievement. Eventually, the brutal *grand appareil* was replaced by this simpler and safer technique, and most other methods in use in the eighteenth century were modifications of this method.

In the eighteenth century, remarkable success was achieved by professional lithotomists implementing the method introduced by Frere Jacques. In fact, one of Jacques' contemporaries, Johann Rau, became a well-known lithotomist in Amsterdam. Unfortunately, his character left a lot to be desired, since after seeing Jacques' improvements and implementing them in his own practice, he became a virulent competitor and critic of him.

Another well-known lithotomist was Frere Come, who came from a family of surgeons. In 1729, he decided to take the order and dedicate his life to the medical treatment of the poor. He invented the *lithotome cache*, in which the cutting blade disappeared into a groove in the blunt segment of an instrument known a gorget. This instrument could be used to penetrate tissue and at the same time dilate and stretch the incision.

After Frere Jacques, lithotomy leadership passed to William Cheselden (1688-1752) of England, the foremost lithotomist of the eighteenth century and a major figure in the refinement of the perineal lithotomy. In his hands, lithotomy began to acquire the semblance of a scientific procedure. Unlike many of those previous travelling lithotomists, but like many of his contemporaries, Cheselden was well-trained in anatomy, and he made careful dissections before commencing his lithotomy practice.

Although he initally used the *grand appareil*, Cheselden went on to adopt the suprapubic route, also known as the *haute appareil*. However, he later dropped it when he realized that an unanesthetized patient's struggles and straining made a suprapubic operation dangerous, but actually aided the perineal approach by pushing bladder contents downwards. Cheselden then began using the perineal approach, making several modifications to it and causing it to become an even safer and more efficient procedure

Several other notable professional lithotomists should also be mentioned due to their high rate of success with lateral lithotomy and for making various improvements to the surgical

technique and instruments used in the operation. One of them, Pouteau of Lyons (b. 1725), employed Cheselden's method and is known to have had the lowest mortality rate among all lithotomists of the eighteenth century. For instance, in 120 perineal lithotomies, he lost only three patients. He preached patience and a slow calculated manner of operating, disapproving of the prevailing tendency of other lithotomists to stress the speed of completing the procedure so as to enhance their reputations. Instead, Pouteau took 5-6 minutes to extricate the stone, not the usual 1-2, believing that gradual dilatations resulted in making the procedure less painful. His writings emphasized cleanliness of the operator's hands, instruments and clothing and recognized the contagious nature of hospital gangrene. He also recommended disposable paper compresses for surface dressings of wounds. His work antedated antiseptic surgery by a century.

Another lithotomy luminary of that century was Le Cat of Rouen, a bitter and vocal critic and competitor of Frere Come. Although controversial, he also had a distinguished record for lithotomy, and invented several useful instruments to make incisions and stone removal more facile.

With regards to performing stone extraction on the female, until the eighteenth century, surgeons disagreed as to the best form of treatment. Franco preferred incision and described a double-bladed lithotome which was used for the next hundred years. Later, urethral dilatation was more in favour by Jonnot, Tollet and Covillard. Later still, Douglas and Le Dran employed gradual dilatation of the urethra by instruments, or by means of gentian root or tents. When the stone proved too large for this method, Le Dran used an oblique incision. The most common complication for these various approaches was incontinence.

All the methods used on the female involved the urethra, but occasionally incisions were also made into the bladder. Fabricius Hildanus observed stones passing spontaneously through the vesicovaginal wall, and he suggested opening the bladder by this route. Other surgeons during the seventeenth and eighteenth centuries used this method successfully, but the frequent development of fistula let to it being discarded about the middle of the nineteenth century. Finally, Frere Come described cases of suprapubic lithotomy in female patients resulting in cures without accompanying incontinence.

The professional lithotomists of the eighteenth century achieved success unequaled until the post-anesthetic and antiseptic era of surgery. During this time, however, a few practitioners began to experiment once again with the suprapubic approach, first introduced by Franco with that famous operation on a small child in 1556. Although several others, such as Rousset, Fabricius Hildanus and Nicholas Pietre wrote about the potential advantages of approaching the bladder suprapubically, the method was generally rejected as being too invasive and dangerous in a time when sepsis had not yet appeared and peritoneal inflammation would quickly prove fatal.

The credit for reinstating the suprapubic operation belongs to John Douglas, who performed his first planned lithotomy by this route in 1719. He noted the nature of the attachment of the peritoneum to the dome of the bladder in the cadaver and recognized that when the bladder was filled with fluid and the penis tied with a ligature, a midline suprapubic incision could be made without opening the peritoneum and causing the prolapse of the bowel.

Cheselden, as mentioned previously, also used this method for a time before abandoning it in order to try to refine the perineal approach.

Despite good results, the high operation fell into disuse while most surgeons, like Cheselden, devoted their attention to modifications of lateral lithotomy. Criticisms referred to the painful filling of the bladder and the risk of rectovesical fistula. It would remain up to Frere Come to make modifications to suprapubic cystotomy which led to its general acceptance. The key to his technique was the *sonde a dard*, a curved silver cannula which was introduced into the bladder through a perineal urethrotomy in men and the urethra in women. The cannula was like an open-ended catheter, carrying a sharp trocar which could be advanced well past the end of the tube. The anterior bladder wall was exposed through a short suprapubic incision. An assistant pushed the *sonde* against the exposed bladder wall, pierced this with the trocar and then pusthed the catheter through. The bladder opening was enlarged with a bistoury guided by the catheter, and the stone was removed.

Although suprapubic cystotomy became an accepted technique and was successfully used by famous surgeons such as Souberbielle, it was not widely practiced until Garson (1878) and Petersen (1880) demonstrated the safety and advantages of this approach. Suprapubic lithotomy replaced the perineal approach for removal of vesical calculi as prophylactic surgical antisepsis found acceptance. At the beginning of the twentieth century, lithotrity and lithopalaxy began to reduce the need for operative lithotomy. Today, perineal lithotomy, although useful in its time, has disapeared, to be replaced first by anesthetized suprapubic lithotomy and later by modified methods of lithotrity and lithopalaxy. Moreover, vesical stones, once frequent in most countries of Western culture, are rarely seen in these areas today. The reasons for this phenomenon have not been entirely understood and are beyond the scope of this paper. However, vesical calculi continue to be common in countries such as India, Vietnam, Thailand, Turkey, Syria, Bulgaria, Indonesia and many others.

An examination of the origins and development of lithotomy, also known as “cutting for the stone”, makes it clear that its progress has been intimately intertwined with that of surgery as a whole. For thousands of years, lithotomy was one of the most frequently performed and most invasive operations performed upon the human body. Tools invented for this procedure in turn spurred their use in other operations. Furthermore, the suprapubic cystotomy was among the few initial attempts at invasive abdominal surgery. There can be no doubt that lithotomy, the operation of cutting for stone of the bladder, with its long and diverse history, forms one of the most fascinating chapters in the annals of surgical and medical history.

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THE EVOLUTION OF NASAL RECONSTRUCTION: THE ORIGINS OF PLASTIC SURGERY

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ABSTRACT

The evolution of nasal reconstruction is the history of plastic surgery. The birthplace of plastic surgery is in ancient India. Sushruta documented the first description of the repair of an amputated nose in 800 BC. Nasal reconstruction arose in response to the custom of punishing prisoners of war, criminals and adulterers by cutting off their noses. A penal colony established in Egypt in 200 BC was known as Rhinocolora, the town of the truncated noses. The great Byzantine Emperor Justinian II, known later as Rhinomatos, had his nose cut off in a rebellion in 695 AD. The first nasal reconstruction in Europe was performed in Italy by the Branca family in the early fifteenth century. They closely guarded their technique of using a lateral arm flap, leaving no written record. Gaspare Tagliacozzi spread knowledge of the clandestine art when he published his famous book *De Chirugia Curtorum per Insitionem* [The Surgery of Deformities by Grafting] in 1597.

During the seventeenth and eighteenth centuries, embellished fables unjustly discredited nasal reconstruction. The dark age of plastic surgery ensued as nasal reconstruction fell into obscurity. History returned to India for the rebirth of plastic surgery. In 1794, a letter in the Gentleman's Magazine told the story of British soldiers who had their noses and hands cut off. A man remembered simply as the Artist of Poona reconstructed the noses using a forehead flap. The story was instrumental in the revival of plastic surgery in Europe. Joseph Carpue used a forehead flap for nasal reconstruction in 1814. Concurrently, in Germany, Graefe developed a modification of the Italian method, dividing the lateral arm flap earlier and drastically reducing the length of the procedure.

While nasal reconstruction has continued to evolve, the principles have remained the same. The development of nasal reconstruction laid the foundation from which all areas of plastic surgery emerged.

The evolution of nasal reconstruction is the history of plastic surgery. While the field of plastic surgery has emerged as one of the most innovative surgical subspecialties, few know the origins of this intriguing art. This paper examines the development of different techniques of reconstructing noses throughout history. In doing so, one gains a greater appreciation for the history of plastic surgery. By illustrating the indications which have served as the catalysts for

nasal reconstruction, the context in which plastic surgery evolved becomes clear. The path of nasal reconstruction goes through many roads from ancient India to renaissance Italy. The evolution of nasal reconstruction has not been without regressions. A dark age of plastic surery existed which saw embellished fables result in the decline of nasal reconstruction. Fortunately, a rebirth of plastic surgery occurred, preventing the loss of a great art.

Indications for the Development of Nasal Reconstruction

In examining the evolution of nasal reconstruction, it is important to begin with a solid understanding of the context from which the art of reconstructing noses developed. The nose has long been considered a structure of respect and reputation. This status is in large part due to the explicit and central location of the noses on one's face. Consequently, nasal mutilation or amputation has been used as a method of humiliation. The origin of nasal reconstruction owes its beginning to the custom of punishing thieves, deserters, and adulterers by cutting their noses off. The practice of nasal amputation, as a punitive measure, is seen in many ancient cultures. A penal colony established in Egypt in 200 BC was known as Rhinocolora or the town of truncated noses (Wallace 1982). The great Byzantine Emperor Justinian II (677-711 AD) had his nose involuntarily amputated during a rebellion in 695 AD (Remensynder 1979). To reign as emperor one invoked divine accession to the throne and consequently had to be free of any physical deformities. By cutting off the nose of Justinian II, the rebels hoped he would never rule again. In 1789, all the male inhabitants of a captured town in Nepal had their had their noses cut off and the epithet "Nascatapoor" applied. The town is still known to this day as "The City of Cut Noses"(Wallace 1982).

In Europe, the custom of amputating noses for punishment was not common. Hence, the art of remaking noses was not practised to the same extent as in other cultures. However, the incentive for nasal reconstruction was still present. Destruction of the nose was secondary to skin diseases such as lupus, syphilis, herpetic ulcers, and cancer (Patterson 1988).

In assessing the driving impetus for the development of nasal reconstruction, the role of societal values cannot be ignored. The connection between beauty and health is as old as society itself. To get a better perspective of the prevailng opinion in the early nineteenth century, we read from Zeis:

> When the nose is missing, even the most beautiful face becomes a caricature. It can be improved by reconstruction, even though this bears only a distant resemblance to a normal nose. The eye is so used to seeing a nose on a human face, that even an ugly one is preferable to one that is partly or completely missing; there are many natural noses that do not conform to the artist's idea of beauty. The sufferings of someone who has lost his nose, are made worse by the thought that he himself may be to blame. The layman makes no distinction, and even the innocent are subjected to insults, which make them go into hiding to avoid suspicion. Articifical noses of wood, silver, and other materials will disguise the deformity from a distance, but close to they make it worse – like a waxwork (Zeis 1838 in Patterson 1988).

In addition to what was perceived to be a hideous appearance, individuals without noses were seen as unfit for employment and social interaction (Patterson 1988). The association between misfortune and blame was a common theme in the early nineteenth century. To underscore the significance of not having a nose at the time, Zeis quotes Dieffenbach:

> Blindness is a great misfortune but it may be worse to have no nose…a blind man arouses pity, but a man without a nose, horror and loathing, and people are apt to regard the deformity as just punishment for his sins. This division of diseases, or even more their consequences, into blameworthy and blameless is strange. The victim who has lost his nose finds no pity, least of all from the hypocrites who are always ready to say that it is all his own fault. As if people with noses were always guiltless! No one ever asks whether the nose was lost because a beam fell on it, or whether it was destroyed by scrofula or syphilis (Dieffenbach 1834 in Patterson 1988).

Ancient India

The birthplace of plastic surgery is in ancient India. While the art of nasal reconstruction is believed to extend back to 3000 BC, the first detailed surgical description of the repair of an amputated nose is found in the writings of Sushrata from 800BC (English and Barton 1997). Sushrata developed the basic concepts of plastic surgery including the attached flap, skin grafting, and nasal reconstruction (Bhishagratna 1963). It has been said that necessity is the mother of invention. In ancient India, the mutilation of appendages including ears, nose, and genitals as a punishment for prisoners of war, thieves, and adulterers was common (Hauben and Sonneveld 1983). From Sushrata's writings we read:

> Now I shall describe the technique of putting on a missing nose. The careful surgeon takes a leaf of the size of the nose, cuts from the cheek the shape outlined (of the piece of leaf) so that it (by one part) is still attached, and quickly sets it in place after he has freshened (the margins), securing it with appropriate bandages, in which are carefully fixed two convenient little tubes, lifts it up and dusts it with red Sandal, licorice root, and antimony. He covers it with a soft cloth and sprinkles it frequently with Sesame oil. The patient should be given clarified butter (ghee) to drink, and when this has been digested he must be anointed with oil and treated with purgatives in the usual way. When the implanted nose is united, the remaining (bridge) is divided (Wallace 1982).

In Sushrata's work we can identify three important concepts. First, the nose was reconstructed from the cheek not the forehead. Nasal reconstruction using a forehead flap is an Indian innovation but was not originally part of the armentarium of Sushrata. Second, the inclusion of two tubes in the procedure shows that the ancient Indians reconstructed the nostrils. Third, the ancient Indians carried the pedicle over intact skin.

Unsubstantiated reports have always ascribed the art of nasal reconstrucion to the Koomas, a subcaste of Brahmin priests in the Hindu faith. It is known that nasal reconstructions using a

forehead flap have been performed near Delhi since 1000 AD. In particular, the Khanghaira family, who own a copy of Sushrata's text, performed the procedure from 1440 to 1937 (Almast 1967).

Spread to Europe

The precise chronology of the spread of nasal reconstruction to Europe is unclear. Plastic surgery is first mentioned in the West in the writings of Aulus Cornelius Celsus (25 BC – 50 AD), the great Roman physician. Celsus described the advancement of skin flaps from adjacent tissue to fill skin defects (Hauben 1983). He also considered the correction of ectropion, syndactyly, and partial reconstruction of the penis, lip, and nose (Hauben 1983). Although his work does not specifically refer to nasal reconstruction, he used parts of the technique. It has been theorized that Buddhist missionaries carried the knowledge from India to Greece (Nichter 1983).

The Byzantine civilization had knowledge of nasal reconstruction. After the Byzantine Emperor Justinian II (677-711 AD) had his nose cut off during a rebellion in 695 AD, surgeons reconstructed his nose. A marble bust of the emperor in Venice shows a scar on his forhead from a skin flap used to reconstruct his nose (Remensynder 1979).

Italian Reconstruction

The first substantiated nasal reconstruction in Europe was performed in Italy by the Branca family in the early fifteenth century (Wallace 1982). The father and son tandem included Branca the senior, a surgeon at Catania in Sicily, who developed the basis for the reconstruction, and his son Antonius, who invented the method of reconstructing the nose from an arm flap. Their technique was a closely guarded secret, customary at the time, and consequently they left no written record. The operation was described by Bartholommeo Fazio in 1457:

> [Branca] conceived how he might repair and replace noses that had been mutilated and cut off, and developed his ideas into a marvelous art. And the son Antonius added not a little to his father's wonderful discovery. For he conceived how mutilated lips and ears might be restored, as well as noses. Moreover, whereas his father had taken the flesh for repair from the mutilated man's face, Antonius took it from the muscles of his arm, so that no distortion of the face should be caused (Wallace 1982).

Traditionally, the brachial arm flap method of nasal reconstruction has been attributed to Gaspare Tagliacozzi (1545-1599) based on his writings in 1597 (English and Barton 1997). However, it is now known that the first documented report of the Italian method of nasal reconstruction can be attributed to Alessandro Benedetti. In 1502, Benedetti decribed nasal reconstruction by means of a skin flap taken from the arm in his work *Anatomice sive Historia Corporis Humani* [Anatomy, or the History of the Human Body] (Furlan and Mazzola 1995).

The Bojani family were the successors to the Brancas. Unfortunately, little is known of the Bojanis of Tropaea. They constituted a small number of surgeons in the western region of Calabria. There is little historical record; it appears as though they practised during the entire

sixteenth century. There is no evidence of any new developments made in the art of nasal reconstruction by this group. Their contribution to history is, however, notable for the role they served as a conduit of knowledge from the Brancas to the next great reconstructive surgeon, Tagliacozzi.

Gaspare Tagliacozzi (1545-1599) was a Professor of Anatomy and Medicine in Bologna. Initially credited as the innovator of nasal reconstruction, history would later establish evidence to the contrary. Tagliacozzi does, however, deserve his place in history of plastic surgery nevertheless. He spread knowledge of the clandestine art of nasal reconstruction when he published his famous book *De Chirugia Curtorum per Insitionem* [The Surgery of Deformities by Grafting] in 1597. Unlike his predecessors, Tagliacozzi always sought to instruct other surgeons and spread the word about the technique of nasal reconstruction.

The Decline of Nasal Reconstruction

Despite his best efforts to promote the technique of nasal reconstruction, few attempts were made after Tagliacozzi's time. During the seventeenth and eighteenth centuries, embellished fables unjustly discredited nasal reconstruction. Zeis has stated that patients were less inclined to undergo a tedious, painful, and troublesome procedure especially given that most surgeons were fearful of the procedure (Patterson 1977). In fact, many surgeons were unduely harsh of Tagliacozzi's method. Benedictus expressed fear that these noses were easily detached (Patterson 1977).

Tagliacozzi's work was not only disregarded, it was misread. His technique was dismissed by many, including Juncker, who felt he made his nose from the skin of other people (Patterson 1977). This ignorance was widespread and was spurred by many fables. These fables themselves lent support to the unpopular sentiment for nasal reconstruction at the time. A common myth stated that a piece of skin transplanted from one individual to another retained a vital connection with its former owner. It was widely held that this connection persisted so that when the donor become ill, the recipient felt pain and should the donor die, the reconstructed nose would subsequently fall off the recipient (Zeis 1838 in Patterson 1988). Tagliacozzi explicitly addressed this misconception. While he did not believe it was impossible for the skin of one person to be transplanted to another, he stressed that it would be extremely difficult to fasten two people together long enough for the skin to heal. He declared this transplantation technique to be impractical and consequently was unlikely to have performed it. Despite his admonitions, stories still persisted of this practice, some involving Tagliacozzi himself. A widely believed account by van Helmont stated that, "a man of Brussels had a nose made by Tagliacozzi from the arm of a porter; after thirteen months he noticed that his nose felt cold, and a few days later it became gangrenous. Enquiries were made, and it was found that the porter had died at the same time" (Zeis 1838 in Patterson 1988). Kirchner extended this fable by suggesting that two people who exchanged skin with the mutual intention of healing each other, would be able to communicate with each other telepathically (Zeis 1838 in Patterson 1988).

The scientific community was not immune to the influence of these myths and legends. The issue generated such interest that in 1742 a thesis *An curate nares ex brachio reficiendae?* [Whether mutilated noses can be restored from the arm?] was proposed and debated before the

Medical Faculty in Paris. It was concluded that a transplanted piece of skin must die when its former owner died (Zeis 1838 in Patterson 1988). With this decleration, plastic surgery almost vanished. The dark age of plastic surgery ensued as nasal reconstruction fell into obscurity.

The Rebirth of Plastic Surgery

History returned to India for the rebirth of plastic surgery. In 1794, a letter in the Gentleman's Magazine told the story of Cowasjee. The case centred around Cowasjee, a bullock driver in the British Army. He had been taken prisoner along with four soldiers in 1792. As a punishment and a warning to traitors, Sultan Tippoo had cut off their noses and hands. A man known simply as the Artist of Poona performed a nasal reconstruction using a forehead flap. This procedure, seen by Europeans for the first time, was witnessed by two British surgeons from Bombay, Thomas Cruso and James Findlay. The account of the procedure as stated in the letter:

> A pattern of the nose was made in wax, laid on the forehead, and a line drawn round it. The surgeon then dissected up this flap, leaving it attached only between the eyebrows. The stump of the nose was freshened, and an incision was made in the upper lip. The flap was turned on its pedicle, and laid with its edge in the incision on the nose. No sutures were used, and the flap was only held in place with dressings of terra japonica softened with water and spread on five or six slips of cloth. For the first four days no other dressing was used, but this was then replaced by cloth dipped in ghee (clarified of butter). The patient had to lie on his back for five or six days. On the tenth day pledgets of soft cloth were put into the nostrils to keep them open, and on the twenty-fifth day the pedicle was divided (Wallace 1982).

Revival in Europe

The letter in the Gentleman's Magazine rekindled interest in nasal reconstruction throughout Europe. Joseph Constantine Carpue (1764-1846) performed the first nose reconstruction using a forehead flap, the Indian method of nasal reconstruction, in Europe. The operation was performed in 1814 on an officer who lost his nose due to mercury poisoning (Wallace 1982). Carpue added to the technique of the Artist of Poona whose noses did not have a columella (septum) separating the nostrils.

Concurrently, in Germany, Carl Ferdinand von Graefe (1787-1840) performed a nose reconstruction in 1816 shortly after Carpue, but before he learned of Carpue's work. Graefe had used the Italian method to reconstruct the nose of a soldier who had lost his nose to a sabre cut (Zeis 1838 in Patterson 1988). Graefe developed what he called the German method of nasal reconstruction which was a modification of Tagliacozzi's technique (the Italian method) wherein the division of the flap and the attachment to the nose were completed in one stage (Zeis 1838 in Patterson 1988). An interesting side note, he is remembered for coining the term "plastik".

In 1845, Johan Friedrich Dieffenbach (1792-1847) recognized the importance of the lining in a new nose and described how local flaps could be turned into the nose with the skin-side inwards (Patterson 1988). Dieffenbach's teachings were often not adhered to until it was clearly pointed out that the main defect in noses distorted by syphilis and lupus is a shortage of lining

(Wallace 1982). After exploring different techniques, Dieffenbach decided the Indian method was superior to the other methods (Patterson 1988). Throughout the nineteenth century, French surgeons, under the leadership of Dieffenbach, used tissue from the cheek to reconstruct noses (English and Barton 1997).

Summary

While nasal reconstruction has continued to evolve, the essential principles have remained the same. The evolution of nasal reconstruction has followed three basic lines: the Indian method of a midline forehead flap; the Italian method of a brachial flap; and the French method of lateral cheek flaps. In 1925, Vilray Blair reviewed the various techniques available for nasal reconstruction and concluded that the forehead flap used in the Indian method worked the best for major defects (English and Barton 1997). He is credited with establishing the midline forehead flap as the foremost method for nasal reconstruction.

By the end of the nineteenth century, nasal reconstruction and with it plastic surgery had been revived never to be forgotten again. In the early days of modern plastic surgery, Zeis stated what is as true now as it was then, "[Plastic surgery] restores happiness, leaving its patients in a more perfect state than before, by reconstructing individual parts and restoring normal function" (Patterson 1988). In Tagliacozzi's writings, he describes what the reconstruction meant to the patient:

> The patient can smell again, and sometimes even hearing is improved. He can blow his nose like anybody else, and most important of all, he no longer has to hide himself away from people who would run at the sight of him. When his treatment is finished he leaves the surgeon with joy and gratitude for the courage and strenuous efforts which have restored him to the company of his fellows.

The story of nasal reconstruction is intertwined with the history of plastic surgery. The development of the art of restoring lost noses laid the foundation from which the field of plastic surgery emerged.

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THE MONSTROUS BIRTH: THE THEORY OF MATERNAL IMPRESSION AND CONGENITAL MALFORMATIONS

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Preceptor: none

ABSTRACT

Human malformations have been recognized for thousands of years. Images, statues and writings exist attesting to the interest shown in these rare occurrences. Some of the oldest are a 7500 year old marble figure of a two headed goddess from south Turkey and clay tablets listing malformations and their interpretations from 2000 B.C. Babylonia.

The birth of a child with anatomical deformities was greeted at different times and places with strong emotion: awe, terror or admiration. Early theories of teratology included the supernatural, celestial bodies, devils and witches, hybridization with animals and abnormal reproductive components. One of the theories with the most longevity however, was maternal impression. Even as recent as the early 20th century, it was felt that visual, auditory or tactile contact by the pregnant woman with various aspects of her environment could result in corresponding stigmata in her baby. The impressions could occur at conception or during gestation. Maternal impression was used both to promote the birth of handsome children, and explain the birth of ill-formed children. For instance, mothers in Greece were encouraged to look upon statues of Castor and Pollux to create strong and beautiful offspring. At the same time the women were encouraged to avoid situations where they may experience a fright, or view animals such as monkeys or rabbits, preventing resemblance in their babies.

The theory apparently originated independently in various geographic and cultural settings: Europe, Asia, Africa and South America. Maternal impression was gradually disproved as scientific understanding increased, however it does still exist as a superstition in many parts of the world.

Introduction

3-4% of infants born per year manifest a major birth defect. The public's view of malformations reflects religious, cultural, and scientific beliefs of the times. With advances or changes in these areas the public's interpretation and acceptance of birth defects also changes. Human malformations have been recognized and documented for thousands of years. These infants have always been greeted with strong emotions, varying from admiration to rejection and hostility.

Greeted as Goddess; Greeted as Portent

In some ancient civilizations, these infants were seen as products of the divine, and worshipped. One of the oldest known images of a human anomaly is a double-headed twin goddess discovered in southern Turkey. The figure has been dated to 6500 BC. Double-headed human figures have also been depicted in ancient South Pacific chalk drawings, pre-Columbian clay figures from Mexico, and in woodcuts from Middle Age Europe.

The arrival of a malformed infant was sometimes seen as a portent of things to come: either good or bad. The oldest written records of malformations are from Babylonia and date back to 2000 BC. These clay tablets catalogue both human and animal malformations and their putative meanings. From the 62 human malformations listed are two examples: when a woman gives birth to an infant that has no right hand the country will be convulsed by an earthquake; when a woman gives birth to an infant whose anus is closed, the country will suffer from want of nourishment.

Often the fate of such unfortunate infants was death at the hands of the parents or community members. There is some evidence that primitive peoples kept malformed children or conjoint twins and treated them well. However, most historical records show that these infants were exterminated. Infanticide was common among the early Greeks and Romans and widespread in the Middle Ages. During the Middle Ages, the danger was extended to the mother as well, as punishment for whatever she was presumed to have done to cause the malformation.

Early Theories

Malformations deviate from the expected order of nature, and humankind demands an explanation. Using imagination, reason, observation and experience, putative causes for these occurrences were invented.

Often, the supernatural world was called upon to supply explanations. Symbolism refers to the idea that malformed children are communications from the gods, as was discussed earlier with respect to the Babylonian clay tablets. It was believed that perhaps the malformation was a demonstration of the creativity of the gods, or perhaps created as a way to amuse themselves. They were sometimes seen to be warnings of dire events to come, or, admonitions for the actions of the mortals. The word monster is said to derive from the word *monstrare,* meaning to show, or *monere,* meaning to warn.

The concept of symbolism has also been linked to the Christian God. Luther in the 16th century wrote of signs from God through malformed infants, and indeed this concept still exists today in the minds of some.

Celestial bodies were also implicated. Astrologers felt that malformations were just another inevitable result of unfavorable positions of the stars.

Hybridization invokes the idea that animals were involved in the procreation of malformed infants. The cultures of ancient India and Egypt revered animals and children who were born with a resemblance to an animal were seen as sacred. However, in Christian and European cultures, these so-called hybrid children were a mortal sin. Both mother and child were in danger of death by burning.

During the 15th and 16th centuries, the idea of devils and witches causing malformations was in vogue. The children were viewed as offspring of the devil, and as described just previously, both child and mother, seen as the consort of the devil or a witch herself, were quickly put to death.

Aristotle and Hippocrates felt that uterine pressure and trauma could alter the fetus' development, resulting in the long-lived, and actually somewhat accurate, theory of mechanical forces. Cramped space in utero has been implicated in the development of clubfoot. However, the theory of mechanical forces was used broadly in the 19th century and corsets were blamed for many malformations.

Abnormal reproductive elements was another concept that gained some following. The idea was that semen contained all the 'forces' needed to create a child, and it was thought that problems developed if there was too old or too much or too little semen.

Ambroise Pare

The last few of these theories are nicely contained in Ambroise Pare's book of 1573: Les Monstres et Prodiges. He felt there were 13 causes of these so called 'monsters'.

The first is the glory of God.
The second, his wrath.
The third, too greatly a quantity of seed.
The fourth, too little a quantity.
The fifth, the imagination.
The sixth, the narrowness or smallness of the womb.
The seventh, the indecent posture of the mother.
The eighth, through a fall or blows struck against the womb.
The ninth, through hereditary or accidental illness.
The tenth, through rotten or corrupt seed.
The eleventh, through mixture or mingling of seed.
The twelfth, through the artifice of wicked spital beggars.
The thirteenth, through demons and devils.

Maternal Impression

I call your attention to the fifth on the list: the imagination. This refers to the ancient theory of maternal impression. It was thought that the formation of the child in utero could be influenced by maternal impressions such as thoughts, emotions, sights, or tactile contact of the mother with her environment.

The theory can be traced back as far as 400 BC, and is illustrated by this quote from Plato:

> Special watch should be kept over our pregnant women during their year of pregnancy to guard the expectant mother against the experiences of frequent and violent pleasures- or pains either – and insure her cultivation of a gracious, bright and serene spirit.

The theory of maternal impression in one form or another is ubiquitous, apparently originating independently in various geographical and cultural settings.

Belief in this theory of psychogenic factors influencing embryological development can take many forms, but two broad categories can be noted:

1. Impressions at conception or during pregnancy can have photographic effects, or
2. Strong emotions, positive or negative, can have non-specific effects on fetal development.

A classic example of the first can be found in the Bible. Genesis, chapter 30 relates the story of Jacob, who wanted speckled goats and sheep in his flock of solid coloured animals. He peeled the bark from tree branches in strips to make them striped and placed them in sight of the animals, in order to have the image transferred to the offspring as they were conceived.

Women in ancient Greece were counseled to look at statues and images of strong and beautiful people such as Castor and Pollux, to hopefully cultivate these same features in their children. A black child born to white parents was said to be due to the mother gazing upon a picture of a Moor. Ape-like children, for instance those born with anencephaly, were said to be the result of the mother looking at monkeys at the time of conception. There are references to this phenomenon in the Talmud, and the early Fathers of the Christian Church espoused these views as well.

The theory continued to be popular in the 17th and 18th century. A woman who viewed the torture and execution of a criminal on a wheel was greatly upset by the event, and later gave birth to a child with broken bones. It is easy to speculate now that the child had a form of osteogenesis imperfecta. Another woman who saw a criminal's hand chopped off, later gave birth to a child missing that same hand.

A rather unique example of alleged maternal impression took place in 19th century Scotland. A man named John Wood was accused of fathering the baby of an unmarried young woman. He denied this in court, saying the only way he would acknowledge the child as his own was if his name was written on the face of the baby. This statement apparently affected the young mother greatly, and when the baby was born, in its irises it said 'John Wood' on the right and 'born 1817' on the left. John Wood promptly left the city and was never heard from again.

By the 20th century, the theory of maternal impression was waning, as scientific understanding of embryogenesis and teratology grew. It was acknowledged that there was no nervous connection between mother and fetus.

However, there was still enough interest in maternal impression that some groups undertook scientific investigation as to whether psycho-emotional factors play a part in producing malformations. In one study, pregnant rats were subjected to 3 minutes of stress every hour by an agitator machine. The offspring were analyzed, and only in the stressed group were any malformations found; the control group had none. Hypertrophy of the suprarenal cortex and increased cortisone levels were noted in the stressed mothers.

A retrospective study of over 400 women who delivered malformed fetuses was undertaken, and a staggering ¾ of the women reported psychological trauma in the first trimester of pregnancy. Of course, in this era of evidence based medicine and randomized controlled trials, I make no conclusions from these rather poorly done trials!

What they do show is that there is some interest in that psycho-emotional factors, stress and excess cortisone levels may be harmful to the developing fetus. At the very least, these things may play a role in the multifactoral-polygenic etiology of congenital malformations.

The theory of maternal impression in one form or another is still present in the general population. A study done in the 70s in Australia looked at the prevalence of this superstition among pregnant women. The study concluded that 25% of the women believed that maternal impression was possible, and 10% believed in specific examples that they had heard of.

Conclusion

Maternal impression is a long lived, ubiquitous and colourful theory of the etiology of congenital malformations. It is not scientifically valid, but is still believed by some. The unfortunate corollary of this belief is that the mother had some avoidable role in the outcome of her pregnancy, perhaps causing her guilt and grief she need not have felt. Today, it is accepted that congenital malformations are caused by genetic defects, either via mendelian or multifactorial inheritance, or teratogenic factors such as environmental toxins, radiation, diet, drugs, infections or metabolic disorders.

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AVICENNA, A GREAT PERSIAN PHYSICIAN

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ABSTRACT

Ibn Sina, or Avicenna, as he is known in the West, was an influential Persian physician during the late 900s and early 1000s A.D. He made a number of significant contributions that have a bearing on the practice of medicine even today. One of his greatest achievements was the "Canon", written in five volumes. The Canon was virtually the first text to teach medicine as an integrated and connected subject. It included descriptions of symptoms and signs, diagnostics, treatments, and prognostics of many diseases. As well, surgical techniques, pathology, and pharmacology were discussed. In addition, one of the first descriptions of the scientific method was given in volume five. Avicenna applied this to the testing of new medications. Furthermore, Avicenna's descriptions of a number of disorders were extremely accurate and in many cases, have been little modified from his time. For example, he described cancer as a tumor that grew rapidly and had the ability to spread to other organs. He also proposed a number of guidelines for testing new medications. Interestingly, these form the fundamental basis of today's clinical drug trials. Therefore, this remarkable Persian physician not only translated and preserved many ancient Greek works but added information and interpretations to construct a logical and coherent text that became the major reference in medical schools of Europe and Asia for over 600 years.

Ibn Sina, known in the West as Avicenna, was one of the most famous physicians of his time, not to mention a great philosopher, encyclopedist, mathematician, and astronomer. He was born in 980 AD at Afshana near Bukhara, or what is now modern Iran. As a child, he showed exceptional intellectual prowess. By the age of ten, he was well versed in the Qur'an, the Islamic holy book, and proficient in other Persian and Arabic literature, as well as the basic sciences (1).

By the age of 18, Avicenna had a reputation as a physician and was summoned to attend to a Samani ruler. He was successful in treating his patient and in gratitude for Ibn Sina's services, the King allowed him the use of the royal library. Avicenna was thrilled and devoured the contents of the library. By 21 years of age, he was in a position to write his first medical book. He traveled extensively throughout modern day Iran and in Jurjan, met his famous contemporary Abu Raihan al-Biruni. In Hamadan, he wrote his famous book: Al-Quanun fi-al-Tibb or the "Canon" (2). At the same time, he treated one of the kings of the Daylami dynasty for severe colic (1).

Avicenna worked extremely hard and thus life was very strenuous for him. During the day, he attended to medical practices. At night, he lectured and dictated notes to students from his two great books: the Canon, a medical textbook, and Shafa, a book of philosophy. However, after these sessions, Avicenna attended parties in which he was well known as a drinker and a womanizer (1). Therefore, Avicenna, even though a great physician, was a human, like all the other people around him.

Friends told Avicenna to slow down and take life in moderation. However, he responded by saying: "I prefer a short life with width to a narrow one with length" (1). In other words, he wanted to fully experience each day and the things life has to offer, than to live a long but misadventurous life. This extensive mental exertion as well as political turmoil spoilt Avicenna's health and he died of "Colic" at the age of 57 (1037 AD) (2). He had tried to treat himself with celery seed enema and an opium mixture to prevent his colic seizures, but the treatments were unsuccessful. Some historians believe that Avicenna's death was perhaps due to an overdose of these treatments, given to him by his servants. However, this conclusion remains controversial (1).

Avicenna wrote about 100 famous books, all in Arabic except two in Persian. He wrote extensively about philosophy, mathematics, music, astronomy, medicine, theology, and poetry. However, his most famous book by far was the Canon. He wrote this book because he wanted a text that would teach medicine as an integrated and connected subject. Such a book had never existed before and thus the need for it was apparent. It took Avicenna about 8 years (1015-1023 AD) to write the Canon, but it was well worth the effort (3).

The Canon enjoyed being the major reference in medical schools for over 600 years in the near East and Europe. In the words of Dr. William Osler, a famous Canadian physician, the Canon has remained "a medical bible for a longer time than any other work" (1). The Canon was translated to Latin by Gerard of Cremona, a monk, between 1150-1187 AD, and went through 30 editions in Europe (3).

The Canon consists of five volumes or one million words. Volume one describes the nature of the human body, anatomy, physiology, the definition of health, illness, medical treatment, causes and symptoms of disease. Volume two consists of one of the first descriptions of the Scientific Method. Volume three describes the pathology of each organ/system, 21 in all, from head to toe. Volume four consists of fever, crisis, medical signs, symptoms, diagnostics, prognostics, and minor surgery. Finally, volume five is a manual for the preparation of compound medicine, i.e. pharmacy and pharmacology (1).

The Canon was an important step towards greater understanding of medicine and the importance of observation and experimentation. It combined Avicenna's findings with previous Greek and Arabic works and provided a logical and coherent way of organizing medical information. It also recognized the contagious nature of disease and the spread of disease by water, soil, and vectors, such as mosquitoes. In addition, the Canon pointed out the importance of dietetics, the climate and the environment on health (1). Furthermore, the surgical use of

anesthetics was described and 760 drugs were considered, including their methods of application and effectiveness (4).

In addition to his great medical text, Avicenna made a number of other significant contributions to the field of medicine (2). For example, his view of cancer was generally what we accept today. He described cancer as a swelling or tumour, accompanied by pain and rapid growth, and initially hidden. He described the process of tumor growth by stating that vessels form around it, a process today known as angiogenesis. He also mentioned that cancer most frequently occurs in hollow organs, such as the lungs, and has the ability to spread and affect other organs, what is today called metastasis. He stated that early cancer may be cured but not when it is advanced. In addition, small cancers may tolerate excision, but all blood vessels around them must also be removed to cut off the food and oxygen supply. Avicenna believed that there were two purposes for cancer medications: First, total arrest of cancer and prevention of progress, and second, prevention and treatment of the ulceration. He also mentioned that advanced cancer should be left untreated except for correction of the diet (5). Therefore, Avicenna was very knowledgeable and open-minded for his time, about 1000 years ago.

Avicenna also made advances in the fields of Anesthesia and Analgesia. For example, he proposed oropharyngeal intubation and tracheotomy as a means for overcoming respiratory distress. He also identified a great number of plants with pharmacological action, some of which are used today in herbal remedies. Some examples include Mandragora, Henbane, and opium (6).

Another significant contribution made by Avicenna was the proposal of a number of guidelines for testing new medications (1). He set out seven rules for testing the effectiveness of new drugs. His first rule states that experimentation must be done on the human body and not on other animals, to allow an accurate assessment of the actions and efficacy of the drug. His second rule is that drugs must be free from extraneous accidental quality, i.e. be pure. His third rule states that drugs must be used on a simple, not, composite, disease. In other words, do not test a drug on a patient with diabetes, heart disease and lung cancer for example, because it is then impossible to see what the exact mechanisms and effects of the drug really are. His fourth rule indicates that drugs must be tested on two contrary diseases to ensure its effectiveness. Rule five states that the strength of the drug must correspond to the strength of the disease, i.e. a very potent drug for a very severe disease and a less potent drug for a milder disease. Rule six mentions that the time of action must be observed. This is important for dosages and pharmacological action. Finally, his seventh rule states that the effect of the drug must be consistent (7). These rules form the fundamental basis of today's clinical drug trials. Again, Avicenna's innovation and open-mindedness are apparent.

In summary, Avicenna was one of the most influential physicians of his time. His greatest contribution to medicine was the Canon, compiled from previous Greek works and Avicenna's own findings. The Canon was used as a primary tool in many medical schools for over 600 years. Even today, as we enter the dawn of a new millenium, Avicenna's work is quoted in many medical books and the fundamentals of what he created still remain with us (8).

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IBN TUFAYL'S TREATISE ON ASTHMA LOST AND FOUND

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ABSTRACT

Ibn Tufayl was a well known 12th century Arab physician, who was born in Al-Andalus. Today the words Al-Andalus bring to mind the Spanish province of Andalucia, which lies in southern Spain, and contains the beautiful cities of Seville, Granada and Cordoba. In Ibn Tufayl's time however, Al-Andalus was much larger - in fact, the name implied all Spain under the dominion of the Arabs. To understand Arab medicine, that is to say, this flowering of philosophy, learning, questioning and studying that occurred between the 9th and 15th centuries, we must first understand the history of these extraordinary times.

A Brief History of the Arab Empire in Spain

The Arabs conquered Spain in 711 when Tariq Ibn Ziyad, the governor of Tangier, crossed the Straits of Gibraltar with approximately 7,000 men. He quickly defeated the Visigoth King Rodrigo at the battle of the River Barbate. (Lapidus, 1990). By 716, most of the Iberian peninsula was under the rule of the Arabs except for the kingdoms of Leon, Navarre, and Aragon. For the most part, the Arabs were welcomed by local Jewish and slave populations, who had been badly treated by the Visigoths.

Initially, Muslim Spain was a province of the Emirate of North Africa. North Africa itself was simply a province of the Islamic Caliphate of Damascus, the centre of the Muslim world. However in 756, Al-Andalus became an autonomous emirate under the Umayyad dynasty. (Lapidus, 1990) Cordoba became the capital city of the Umayyads and it was the biggest, and most dazzling city in Western Europe. (Jacquart and Micheau, 1990). For nearly four centuries after this, Al-Andalus was the most highly cultured society in medieval Europe. The Arab conquerors married into the local population, which for the most part, converted to Islam. Arabic became the main language. For the large part, the Arabs tolerated peoples of other faiths, notably Jews and Christians. (Simonis, 1999). These peoples were at liberty to practice their religion and to keep their customs. Jews and Christians were also a large part of the culture of Muslim Spain. (Jacquart and Micheau, 1990). Toledo for instance, was boastingly known as the city of three religions.

The princes and Caliphs of the ruling dynasties were patrons of physicians, philosophers, poets, architects and scribes. (Lapidus, 1990) Al-Andalus is remembered as a time of glory when works such as the Great Mosque of Cordoba, the Alhambra in Granada and the Alcàzar in

Seville were built. (Simonis, 1999). The Arab scholars of the time were prolific in medicine, poetry, philosophy, geometry, mathematics, astronomy, and architecture. (Jacquart and Micheau, 1990).

Why did this great flowering of learning occur in the Arab Empire?

Part of it may be explained by the attitude of the Qu'ran towards learning. The text of the Qu'ran is replete with verses inviting man to use his intellect, to ponder, to think and to know - for the ultimate goal in life is to discover truth.

- (http://www.islamnet.org/under/Islam_Knowledge_and_Science.htm)

Islamic traditions of the time tell us that "God has not inflicted sickness for which there is no cure." (Jacquart and Micheau, 1990). This idea is one that urges physicians to describe, and to do their utmost to treat disease, for nothing is beyond their reach.

Ibn Tufayl

Ibn Tufayl (Abu Bakr Mohammed Ibn 'Abd al-Malik) was a 12th century Arab physician, known to medieval scholars by the latinized name of Abubacer.

Little is known about Ibn Tufayl's life. He was born at Guadix, 60 km NE of Granada in 1116. His father was a scholar, and we know that Ibn Tufayl himself was something of a scholar, as he was a mathematician, astronomer, philosopher, physician and poet. (Conrad, 1996). We know that he practised medicine in Granada for some time before travelling to Marrakech, to take up a position under the Caliph Abd al-Mumin. He was apparently quite competent in his post, and was appointed confidential secretary to the governor of Ceuta and Tangier in 1154. (Conrad, 1996). During his service with the governor, Ibn Tufayl caught the eye of the Caliph Abu Ya'qub Yusuf, who appointed him to the post of personal physician and *vizier* (personal advisor). (Conrad, 1996).

It was during his court appointment that Ibn Tufayl met and taught Ibn Rushd, (Averroës) the famed Arab commentator on the works of Aristotle. It was Ibn Tufayl who recommended his younger colleague be given this prestigious task. In fact, later on, Ibn Tufayl resigned his court position in favour of Ibn Rushd.

Sources on the internet persist in saying that Ibn Tufayl poisoned the Caliph Abu Ya'qub Yusef, who died a year before his physician, in 1184. However, this has yet to be confirmed. (Conrad, 1996).

The Works of Ibn Tufayl

The work for which Ibn Tufayl is best known today is his philosophical novel, *Hayy Ibn Yaqzzan*, meaning "Alive Son of Awake." The work is thought to be the inspiration for Daniel DeFoe's *Robinson Crusoe*, and may have influenced thinkers such as Liebniz, and John Locke.

Hayy is a solitary hero who is raised on a desert island by a gazelle. When the gazelle dies, Hayy dissects her, in order to better understand death. (http://islam.org/Mosque/ihame/Ref4.htm) This incident is thought to represent a code for a possible human dissection Ibn Tufayl may have performed.

After the gazelle's death, Hayy lives on his solitary island and through contemplation and observation, he learns about the natural world, achieving the ultimate state of self realisation.(www.britannica.com/bcom/eb/article/9/ 0,5716,108139+32+105852,00 .html). It is a mystical and symbolic journey in which the reader is urged to renounce worldly pleasures, and to seek the divine outside the structure of revealed religion. Perhaps one of Ibn Tufayl's goals in writing Hayy Ibn Yaqzzan was to convince people that religion and philosophy did not oppose each other, as was popularly thought at the time in Al-Andalus and in North Africa. (Conrad, 1996).

Sources of the time say very little about Ibn Tufayl's role as a physician, other than he was highly regarded. We know that Ibn Tufayl wrote a "*Rajaz* poem on Medicine", *Rajaz* being a type of Arabic poetry style, with a specific rhyme and meter. This was not unusual as most works of the period were written in verse, no matter from what discipline they originated. The *Rajaz* work is supposedly one of great ambition, containing vast amounts of information about diagnoses, and therapeutics, in a head to foot arrangement. (Conrad, 1996). Whether it was original thought or simply a compilation of ideas of the day, is not known. A "copy of the *Rajaz* work survives in the Al-Qarawiyun Library in Fez," (Conrad, 1996) but no one had ever seen it before Dr. Jean Philippe Derenne was in Fez for a conference in 2000. Dr. Derenne was allowed to see this manuscript and translated that portion of the manuscript about asthma.

Asthma Today

In order to better understand the information conveyed to us by Ibn Tufayl's manuscript, we must first review what asthma is. Asthma is a chronic relapsing inflammatory disorder. It is characterised by hyperresponsive airways and episodic, reversible bronchoconstriction, in response to stimuli such as cold, viral infections, inhaled irritants, stress, exercise, dust, and pollen. (Cotran, 1999). During attacks of bronchoconstriction, asthmatics experience varying degrees of dyspnea, coughing, chest tightness and wheezing. Asthmatics often experience a nocturnal exacerbation of their symptoms. In between attacks however, patients may be virtually asymptomatic. Pathologically, the disease is characterised by areas of overdistention of the lungs, interspersed with patches of atelectasis or collapse. The airways become occluded by thick, mucous secretions. Microscopically, oedema of the airways, inflammatory infiltrates rich in eosinophils, thickening of the basement membrane, hyperplasia of sub mucosal glands, and hypertrophy of the bronchial smooth muscle cells can be seen. (Cotran, 1999).

Asthma in Ancient Times

The usage of the word asthma today however, is very different from its usage in ancient times. The Greek poet, Homer, is the first to use the word asthma in book 15 of his *Iliad*, when he described Hector lying on the field, spitting blood and out of breath. Homer tells us:

"*Hector was breathing with difficulty (asthmati). He was not yet fully conscious; and small wonder, for the man who had hit him was by no means the feeblest in the Achaean ranks."* (translation by EV Rieu, Penguin Edition).

For Homer, asthma is essentially dyspnea or a shortness of breath.

Hippocrates classifies asthma as a type of dyspnea, in book six, section four, of his *Epidemics*. Adults with asthma, Hippocrates tells us, experience alternating bouts of dyspnea and rheumatism. He also tells us that respiration in asthmatics becomes laboured and rapid. The main difficulty for asthmatics occurs during expiration, rather than in inspiration. (Peumery, 1984).

Celsus, in his work, "*De re medica*," tells us that the essential characteristic of asthma is an extreme difficulty in the work of breathing. Asthma is an extreme type of dyspnea, accompanied by wheezing, and an accumulation of humours. This causes the lungs to become distended. Celsius recommends phlebotomy, diuretics, emetics and purgatives to rid oneself of these accumulated humours. (Peumery, 1984).

Areateus of Cappadocia, a contemporary of Galen, recognises asthma as a dyspnea brought on by cold and exercise. These stimuli cause an accumulation of "viscous humours" in the lung. Areateus tells us that during the intensity of the crisis, coughing is violent and continuous, while respiration is laboured, especially during sleep. (Peumery, 1984).

Galen tells us that asthma is a type of dyspnea caused by abundant viscous humours which become trapped within the lung. It is because of this entrapment that asthmatics experience shortness of breath, and difficulty during expiration. (Peumery, 1984)

Paul of Aegina writes mostly about the use of herbal remedies for asthma, such as vinegar, myrrh, peppers, radishes, and arsenic. (Peumery, 1984).

To summarise, in ancient times, asthma was simply an extreme form of dyspnea. It was provoked by cold, and exercise. These stimuli caused viscous humours to become entrapped within the lung, giving to us a clinical picture of a patient with rapid, laboured breathing, difficulty in expiration and violent coughing.

Asthma in Arab Times

Ibn Sina, or Avicenna, is perhaps the best known of Arab physicians today. In his *Canon*, the "prince of physicians" restates the Galenic theory that asthma is the result of the entrapment of viscous humours within the lung. However, Ibn Sina writes that the acute paroxysms of asthma are due to acute spasms of the lung, similar to the acute paroxysms of epilepsy. Ibn Sina was the first to use the word asthma as not simply a form of dyspnea, but as an acute attack of lung spasms. (Peumery 1984). This distinction is significant; Peumery believes that Ibn Sina's theory must be recognised as the precursor to the modern theory of bronchospasm. (Peumery, 1984).

Maimonides was a Jewish physician and a contemporary of Ibn Tufayl. In his famous "*Treatise on Asthma*", Maimonides restates Ibn Sina's theory and tells us that asthmatics should avoid dusty, unclean or humid air. His main remedy for asthma attacks is chicken soup. (Rosner, 1981).

Ibn Tufayl's Treatise on Asthma (Derenne and Whitelaw, 2000)

What is it that Ibn Tufayl tells us about asthma? He says that:

> "Asthma occurs when it is hot, and on examination the lungs are distended, a pathognomonic sign."

Overdistended lungs is a pathologic feature of asthma that is well recognised today. Celsus was the first to describe overdistention, so this statement is not an original thought by Ibn Tufayl.

Ibn Tufayl next tells us that:

> *"*The differential diagnosis is that of dyspnea. Cancer or ulcerations can produce the same symptoms, but must reach a considerable size before there is dyspnea."

Ibn Tufayl's statement about cancers and ulcerations is indeed true. Both of these must reach a significant size before they are able to block or occlude the airways.

> "There is an obvious contrast between inspiration and expiration, a pair of opposites that correspond to contraction and relaxation of muscles."

Here, Ibn Tufayl tells us about muscles that function during inspiration and expiration. Presumably, he is referring to muscle groups such as the intercostals. The use of musculature during breathing is not a new idea, as this was recognised previously by Galen.

Ibn Tufayl's next statement is surprising:

> "Crisis occur mainly at night and are due to constrictions of the airways."

This is a very intriguing statement. Ibn Tufayl tells us that crisis occur mainly at night, which we know to be true today. Asthmatics typically experience exacerbations of their symptoms at night, and this is considered as a bad prognostic sign. Even today, we cannot clearly explain this phenomenon. When Ibn Tufayl speaks of "constrictions of the airways", does he mean bronchoconstriction? If so, it would mean that Ibn Tufayl is the first to recognise bronchoconstriction during an asthma attack. The symptoms that Ibn Tufayl describes may in fact be what we consider as asthma today.

Ibn Tufayl then speculates about the cause of asthma:

> "The cause of this malady is an increase in pressure, against which the patient struggles energetically."

Is Ibn Tufayl using the word pressure in the sense that we today use the word pressure? If so, he had a remarkable diagnostic ability. During forced expiration, positive pleural pressure is transmitted to intrathoracic airways, causing airway diameter to decrease. As pleural pressure increases, the airways collapse, trapping air within the lung. (Weinberger, 1998). During an asthma attack, bronchial smooth muscle cells constrict, and the subsequent bronchoconstriction causes an increase in airway resistance. Because of this increased resistance, the patient must generate increased pleural pressure in order to expel air from the lung. Is this the phenomenon that Ibn Tufayl is describing?

Ibn Tufayl tells us that the patient "struggles energetically" against this "increase in pressure." The manuscript uses the Arab word "khari" and the closest translation is "to struggle energetically." Presumably, Ibn Tufayl is describing the struggle of an asthmatic in respiratory distress.

Next, we have the following statement:

> "The air slips out like a sly thief. The nose flares."

With this observation, it should be apparent to the reader that this work was first written in verse. Ibn Tufayl is rather dramatic and descriptive. It is true that during an asthma attack, a patient will flare his nose, a sign of respiratory distress. However, Ibn Tufayl tells us that "the air slips out like a sly thief." It is unclear exactly what he means here. Asthmatics wheeze, reflecting airflow through narrowed bronchi. Wheezing is certainly not a very quiet sound, but rather noisy and musical in nature. A thief that wheezed would certainly be caught; a thief that was sly would work quietly, and certainly not be apprehended.

> "At the end of the crisis, expectoration brings relief. The main difficulty is to exhale. Expiration is noisy and stuttering."

Expectoration during an asthma attack certainly does bring relief, just as Ibn Tufayl tells us. If a patient is able to expectorate mucous which may be occluding his airways, he will most certainly relieve areas of blocked airflow.

Ibn Tufayl's next statement, "the main difficulty is to exhale" is, again, not an original thought. This was first recognised by Hippocrates. Ibn Tufayl then tells us that "expiration is noisy and stuttering." It is true that expiration during as asthma attack is noisy; many patients experiencing an asthma attack wheeze. However, the musical sound of wheezing is very different from the staccato sound of stuttering. What exactly is Ibn Tufayl describing here when he says that expiration is stuttering?

> "There is a problem in the airway as well as in the muscles which take part in this abnormal respiration."

In the above passage, it is likely that Ibn Tufayl is referring to intercostal muscles, or muscles which aid the actual process of respiration. It is extremely unlikely that Ibn Tufayl is referring to the constriction of bronchial smooth muscle cells.

> "If it is necessary, wash the bronchi with drugs but take care to avoid drying them. Ginger renders things more liquid ; it must be prepared with some acid substances."

Ibn Tufayl's text is replete with herbal remedies for asthma. As the names of these plants are in Arabic, and no English or French equivalent word is known, most of these plants remain unknown, as do their possible medicinal qualities. Ginger is an example of one of the few herbs which is known in this text. The fact that Ibn Tufayl suggests that ginger renders things more liquid, implies perhaps that he also prescribed to the balance of humours theory.

> "The other treatment is to bleed the patient from a vein in the axillary plexus. This will surely bring a remission of the crisis in cases where other treatments have failed, which occurs where there is a major inflammation."

How could phlebotomy possibly bring relief to an asthmatic patient? If the patient were suffering from pulmonary oedema, as a result of congestive heart failure, then phlebotomy would bring immediate relief. Patients in congestive heart failure and frank pulmonary oedema also wheeze, as a result of the presence of fluid within the conducting airways. Patients in pulmonary oedema also exhibit signs of respiratory distress, such as severe dyspnea, anxiety, and tachypnea. (Lilly, 1997). Because it may be difficult to differentiate pulmonary oedema from asthma, it is possible that what Ibn Tufayl is describing in the above statement is the treatment of a patient in congestive heart failure. Because the treatment may have had a dramatic success in these cases, Ibn Tufayl may have recommended it as a general treatment for asthma.

> "One must not resort to surgery unless all the indications are present. After the intervention it is necessary to give some sugar and a decoction of the plant hendeba in some large ripe fruit of good quality. Crush it and add some sugar and some anise."

Again, this statement has been included in the discussion to illustrate the point that Ibn Tufayl's text is replete with herbal remedies for asthma. Hendeba is the Arabic name for a plant. Because we do not know the equivalent English or French word, this plant remains unknown, as does any of its possible medicinal qualities.

Conclusion

What are Ibn Tufayl's contributions to the history of asthma?

There are certainly parts of Ibn Tufayl's manuscript which do not consist of original thought, but instead are taken from the writings of Celsus, Hippocrates and Galen. However, Ibn Tufayl may have been the first to recognise bronchoconstriction during an asthma attack. This makes him an important contributor to the definition of modern asthma. Thus, Ibn Tufayl's work speaks of asthma not only in ancient terms, but also in modern ones. Some of the symptoms that Ibn Tufayl describes are puzzling: expiration which is "stuttering" and air which "slips out like a sly thief." This is curious because these specific symptoms are not consistent with the modern clinical description of asthma. It is likely that Ibn Tufayl is describing several different illnesses in his manuscript.

The importance of Ibn Tufayl's *Rajaz works of Medicine* to the history of asthma is unquestionable. It is likely that this work may shed considerable light on other areas of medical history. Today, Ibn Tufayl may be recognised not simply as an influential philosopher, but also as an important physician.

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THE SCHOOL AT SALERNO: ORIGIN OF THE EUROPEAN MEDICAL UNIVERSITY

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ABSTRACT

Despite oppression of scientific learning through the Dark Ages, the medical school at Salerno emerged in the ninth century, reviving the tradition of the Ancient schools. How is it that a school founded by monks was able to flourish, promoting the development of future European Universities? Three important factors determined the success of the Salernitan School: first, medical education in Salerno began in the Benedictine monasteries, resulting in association between medical learning and hospitals of the Church. Connection with the monastery at Monte Casino and Benedictine traditions promoted intellectual development in a liberal atmosphere, which enabled students of all backgrounds, including women, to attend the school. The mild climate in Salerno was the second factor contributing to the development of the medical school. Salerno was considered a health resort, where travelers and nobility came to recuperate from various ailments. Aggregation of the sick at Salerno attracted Greek, Arabic and Jewish physicians. In addition, collections of literary material preserved in the monasteries drew students of medicine from all over Europe, Spain and Asia Minor. The third factor that promoted the success of the school was geographic location in Southern Italy. The school was located in the middle of an elevated valley, overlooking the town of Salerno, southeast of Naples. Proximity to surviving remnants of Greek culture promoted learning of Ancient Masters, such as Hippocrates and Aristotle. In addition, Islamic influence persisted despite conflict arising from the Crusades. Salerno was also a favorite stopping place for Crusaders on the way to and from Asia Minor. In fact, a famous work of the School, the *Regimen Sanitatis Salernitanum*, was written for the benefit of one such Crusader, Robert Duke of Normandy.

Introduction

The Medical School at Salerno emerged in the late middle ages near the end of the Crusades. Its formation began the revival of medical education in the tradition of the Ancient Schools of thought. Founded by monks, the school flourished and became a model for subsequent medical schools throughout Europe. Its success can be attributed to three main factors. First, the presence of Benedictine monasteries in and around the town of Salerno resulted

in the association of medical learning with the hospitals of the Church (the belief is that the care of the sick is an act that is pleasing to God[8]). Secondly, the climate around Salerno made it a favourite health resort due to it's mild temperature. Finally, the geographical location of the town in Southern Italy allowed for preservation of ancient Greek heritage.

The curriculum of the school was not very different from that of medical schools today, and like some schools that we all know and love, emphasized the practical nature of medicine. The curriculum and many traditions practiced in the School at Salerno are remarkably similar to some practiced today. The regulations governing medical education and practice are not so different from those found in modern society, which may indicate that they are either excellent legislations that will always be in place or that perhaps our governing bodies need to get out of the past.

Background

To begin our story, in the 9th century Arabic forces conquered Sicily and other Mediterranean islands, however, the Byzantines were able to recover some of the lost territory in the 10th century[4]. In 1071, Turkish forces, who had taken over the Arabs, defeated the Byzantines at the Battle of Manzikert (near Armenia), exposing the entire heartland of the Empire (Asia Minor); Turks ruled as far west as Nicaea (just across from Constantinople)[4]. Alexius Comnenus took over the Imperial Byzantine Crown and appealed to Pope Urban II in 1095 for assistance in the quest to recover Palestine, beginning the era of the Crusades[4].

Christianity & Medicine

Despite the fact that medicine as a science went nowhere fast during the middle ages, the Church built more hospitals and institutions perhaps in response to the diseases brought back by returning crusaders. Care of the sick was seen as a Christian duty and was promoted by the church as "pleasing to God"[8,21]. The association of the Church with both schools and hospitals facilitated medical learning in a practical setting. Medicine as a science flourished in the hospitals, providing opportunities to observe diseases and injuries of all kinds and facilities for learning and gaining experience[8]. As such, apprenticeship in monastic infirmaries and hospitals dominated medical education during the early Middle Ages. In addition, monastic libraries contained the writings of Greek, Latin and Arabian medicine transcribed by monks[7].

Throughout the era of the Crusades, the Church was active in modifying the system of teaching of the ancients, particularly Aristotle, in accordance with the Christian Dogma[8]. Medical teaching was based more on learning of the ancient philosophers and physicians than on sharing personal experience or observation[8]. For example, anatomy was learned from the writings of Galen, especially since he promoted the omnipotence and wisdom of God; dissection of human subjects was seen as a violation of dignity and even dissections of lower animals wasn't always possible[8]. In the middle ages, "deductive, rather than inductive, reasoning was the rule" whereby teaching was based on the works of the Ancients, such as Aristotle or Galen, modified to fit with Christian thought[10,23]. The modern European medical school in anything like its present form did not evolve until the establishment of the one at Salerno in southern Italy

between the 9th and 11th centuries[10]. The atmosphere at Salerno was seen as "early Renaissance", where Greek and Arabic influences were found in medical teaching[10].

The School at Salerno

The town of Salerno was situated in Magna Graecia (Greek colony in southern Italy). The school was located in the middle of an elevated valley that opened up on the mountain overlooking the town, just above the present city of Salerno (SE of Naples)[7,10]

The School at Salerno was founded in the 9th century out of Benedictine traditions, which promoted intellectual activities[10]. Salerno was considered a health resort and a favourite stopping place for returning Crusaders and attracted invalids from many parts of Europe, initially due to the mild climate and later for the opportunity to obtain medical advice from men of many different schools of thought[7,10]. The monastery at Monte Casino (founded in the 6th century near Naples) was initially responsible for medical teaching[7]. In Salerno, the monks of Monte Casino built monasteries and shrines believed to possess miraculous healing powers, (eg. St. Matthew, St. Archelaus, St. Thecla, St. Susanne) which attracted people suffering from chronic disease, followed by physicians seeking patients, leading ultimately to the organization of the medical school[7].

The first intellectual known to live in Salerno was Alphanus, a Benedictine monk, poet and physician who eventually became a Bishop and later promoted the development of the medical school[10]. In *Collectio Salernitana,* De Renzi states that four physicians founded the medical school, a Jewish Rabbi, Elinus, a Greek, Pontus, a Saracen, Adale, and a native of Salerno (no identity given, perhaps the Benedictine, Alphanus?)[10]. And so it arose, *Almum et Hippocraticum Medicorum Collegium (*the formal name of the school)[10]. Despite the religious origins of the school, Salernitan physicians were relatively free of clerical control. In fact, textbooks used, such as the *Antrorarium* and *Antidotarium* were described as being based in "the practical [with] disdain for the philosophical"[10].

Salernitan medicine began from Latin, Greek and Islamic civilizations, mainly due to location in the far south where it was in touch with the surviving remnants of Greek culture. Greek was the spoken language in most southern communities and Emperor Frederick II had his legal ordinances printed simultaneously in Latin and Greek, reflecting the atmosphere of tolerance in the area[7]. Greek travellers and sailors brought information from the Greeks of Asia Minor and the Grecian islands and the Crusades facilitated the spread of knowledge between the East and the West, despite the hostilities between the two sides[10]. Arabic medicine was equivalent to Greek medicine "modified by the dictates of religion, climate and racial characteristics with influences from Indian professors in the East"[1]. Initially, Arabic influence began in the south of Spain, particularly from Toledo and Cordova but spread through some parts of Western Europe[1]. In fact, regulations instituted by Roger of Sicily were thought to have basis in an Arabic system of licensing in place for nearly 3 centuries[1]. Aside from Latin translations of Arabic works by Constantinus Africanus, Islam wasn't popular due to frequent invasions during Saracen domination of Sicily from 829-1060AD[7]. During Norman rule of Sicily 1060-90AD, very little Arabic culture was absorbed into Salerno[7]. However from the 11th century Arabic

writings, such as Avicenna's *Canon* and the Arabic translations of the Ancients were studied at the school[10].

The Curriculum

Lectures consisted of "theoretical discourses on the medical writings of the ancients, in Arabian and Italian translations, with the professor adding technical explanations and remarks from his own practice"[8]. Teachers were expected to emphasize the Greek ideas of the four humors and their corresponding temperaments:

black bile – melancholic,
blood – sanguine,
phlegm – phlegmatic,
yellow bile – bilious[10].

The students learned the works of Hippocrates, Galen, Avicenna and Aristotle and if they passed their final examinations, they were awarded the title of Magister (the title of Doctor was used to indicate professorship)[7]. As in certain medical schools today, students also received instruction in medical conduct, history taking, characteristics of the physical examination with most emphasis on practical medicine[10]. Subjects taught in formal lectures included anatomy, fevers, blood-letting, dietetics, materia medica, special pathology and surgery[8]. In the gardens adjoining the monasteries medicinal plants were cultivated, but pharmacology was learned mainly from literature and from visits with apothecaries to learn to recognize drugs and prepare prescriptions[8]. Texts used at Salerno included translations of the works of Hippocrates, Galen and Avicenna, various compendiums of medical knowledge, surgical works of the Four Masters of Salerno (surgery was mainly Greek with little Arab influence) and the *Antidotarum of Mesue* and the *Regimen Sanitatis Salernitanum* – The Code of Health of the School of Salernum[10].

The *Regimen,* also known as *Schola Salernitana, Flos Medicinae* or *Medicina Salernitana* was a compilation of health advice from various professors on diet, air, exercise, and the like, written in rhymed verses[107]. It not written for the physician or for the student, but for popular information, although it was used as a textbook in medical schools for hundreds of years and copied into many languages[7]. Many versions exist but the manuscript of Arnold of Villanova, an instructor at Montpellier, is regarded as the most authentic as his translation was closest in time to the original writing[7]. Scholars believe that the *Regimen* was written for the benefit of Robert, Duke of Normandy (eldest son of William the Conqueror), who had wintered in Salerno in 1096 to receive the benediction from the monks at Monte Casino before leaving with the First Crusade[7]. While there Robert, befriended Duke Ruggerio (Roger) and later returned after the capture of Jerusalem to seek treatment of a poisoned wound in the arm[7]. The text was thought to have been composed in the late 11th century but its authorship is not known for sure[7]. Some historians state that it is a composite written by the Doctors of Salerno, while others claim that it was the work of John of Milan, who was head of the Faculty at the School at that time[7].

Famous Faces From the School of Salerno

Roger of Parma, a Salernitan graduate of the early 13th century, has been described as the founder of modern surgery[7]. Roger taught at Salerno, then became Chancellor of the medical school at Montpellier and wrote a text known as Chirurgia in 1180[7]. In this text, Roger advocated the application of wet dressings and ointments to wounds, and described techniques that involved re-breaking bones in order to correct poorly healed fractures, the treatment of scrofulous ulcers and broken down glands with tents made of sponge and the use of ligature if cautery or styptics failed to stop hemorrhage[7]. Roger was also known as the teacher of Roland of Parma, another famous surgeon from Salerno. Together, Roger and Roland were considered the surgeons of Salerno, as described in *Glossulae Quator Magistrorum Super Chirurgium Rogerii et Rolandii* a commentary on the surgical techniques of Roger & Roland written by four of the faculty at Salerno[7].

Constantinus Africanus (c. 1010-87) has been described as the most famous teacher of Salerno but eventually left the university to become physician to Duke Robert of Salerno[1,7,10]. He was responsible for invoking the spirit of Hippocrates and Galen in Salerno and maintaining continuity with the ancient world[7]. He travelled for four decades through Syria, India, Egypt and Ethiopia, collecting medical manuscripts before returning to Carthage[1,7]. He was accused of sorcery and subsequently fled to Salerno, where he was appointed secretary to Robert Guiscard, but eventually gave up the position to enter the monastery at Monte Casino to write medical books[1,7]. Because he knew Greek, Arabic and Latin, Constantinus could translate the medicine of the Eastern world. While he was at the monastery of Monte Casino[1,7] he became a key player in the Latin translations of ancient Greek medical texts from their Arabic versions, and of Arabic works, such as the *Liber Regalis* of Haly Abbas, the writings of Isaac Judaeus, Ibn el-Jazzar and Arabized versions of Hippocrates and Galen.

Medical Education and Legislation

In the early 12th century, Robert, King of the Two Sicilies passed regulations governing medical education[10]. Preliminary studies in University were required in preparation for medical studies, followed by four years in medicine, as the minimum requirement for the degree of doctor[10]. This certificate only allowed one to teach, not conferring licensure[10]. In 1224, Emperor Frederich II of the Hohenstauffen family and grandson of Roger II of Sicily "decreed that no one could practice medicine unless they were examined before the faculty of Salerno" (to be licensed)[7,10]. To be eligible to write the examination, the student had to provide proof of legitimacy, to have reached the age of 21 years and to have studied medicine for at least 7 years[7]. Subsequently, Frederich ruled that candidates were required to study at least three years in "logic", then five years in medicine prior to examination, followed by a year in clinical practice as an apprentice to a senior physician before they could practice on their own[7]. As Roger allowed earlier, the senior students were authorized to teach the writings of Hippocrates and Galen during their five years in medical training[7].

Frederich also outlined training required for surgeons, who had to study anatomy for a year at the School of Salerno or University of Naples prior to examination[7]. Additional regulations defined by Frederich included the management of infectious diseases, physician fees (medicine

was seen as a profession, therefore doctors should be paid accordingly), the sale of drugs and their purity with specific ordinances on the sale of poisons, love philtres and other charms[7,10]. It was also forbidden for physicians to accept fees or commissions from apothecaries or to have financial interest in apothecary shops[7]

Thesis Revisited

Despite the oppression of scientific learning through the dark ages, the School of Salerno emerges toward the end of the middle ages, beginning the revival of medical education in the tradition of the Ancient Schools of thought. A school founded by monks was able to flourish and promote the development of future European universities in the late Middle Ages because of:

1. its climate and geographical location – Salerno was a favorite health resort due to it's favourable climate and because of it's location in Southern Italy, was able to preserve some ancient Greek heritage
2. its association of medical learning with the hospitals of the Church (the belief is that the care of the sick is an act that is pleasing to God[8])
3. the presence of Benedictine monasteries in and around the town of Salerno

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REFORM WITHOUT CHANGE: WHAT ABOUT EFPO?

By

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ABSTRACT

The focus of the presentation is on the effects of the Educating Future Physicians for Ontario (EFPO) project on Canadian medical education through a review of its goals, conclusions and achievements. The context relates to the many twentieth-century reports on medical education that can be summarized in the catch-phrase of Samuel Bloom as "reform without change".

The lack of public support towards the Ontario physicians' strike of 1987 reflected the growing concerns of Ontario citizens towards their physicians and medical system. In response, the EFPO project was founded in 1990 to modify Ontario medical education to make it more responsive to the needs of Ontario society. Goals of EFPO included defining a set of roles and attributes for the physician to assume, enabling him to attend equally well to all aspects of health care. Implementing, instead of recommending, was the focus; frameworks were to be created that medical educators could use in applying the roles and attributes in the context of medical education.

Despite similar projects, institutions have intermittently modified their curricula, often to adapt to rapid developments in biomedical sciences, but little progress has been made in changing the fundamental organization of medical education. The presentation closes with asking whether a renewed EFPO project, at a national level, could help with making necessary, fundamental changes.

Introduction

North American medical education has been frequently adjusted throughout the twentieth century in efforts to respond to the growing number of recommendations for medical education reform. Over 25 major reports advocating for reform have been issued since 1910, many arguing the same issues, identifying the same problems and offering the same solutions. The resulting adjustments, though, have been characterized by sociologist Samuel W. Bloom as “reform without change”; institutions have intermittently modified their curricula, often to adapt to rapid developments in biomedical sciences, only to later retrench (Bloom, 1988). Little progress has been made in changing the fundamental organization of medical education.

As observed by authors such as Nicholas Christakis (1995), Cam Enarson and Frederic Burg (1992), the many reports advocating medical education reform share the same basic

structure and content. All articulate a similar purpose of medicine, identify similar objectives of reform and propose similar specific reforms. The basic purpose remains that medicine as a discipline and physicians as professionals exist to serve society. In order of the attention they are given, the primary or 'core' objectives are (i) to serve better the public interest, (ii) to address physician workforce needs, (iii) to cope with burgeoning medical knowledge, and (iv) to increase the generalist character of medical education. The 'secondary' objectives include (i) to apply new methods of teaching, (ii) to address the changing illness burden confronted by society, (iii) to address the changing nature of practice arrangements, and (iv) to increase the quality of education.

The specific reforms proposed to achieve the above objectives have consistently included (i) using problem-based learning and teaching lifelong and self-directed learning (addressing the manner of teaching), (ii) increasing concentration on generalist and ambulatory care (addressing the content of teaching), (iii) rewarding and improving teaching (addressing faculty development), and (iv) modifying admission requirements and centralizing control of curriculum (addressing organizational factors). The majority of reports have focused only on recommendation and have offered few strategies to implement the changes they claim are necessary.

What possible explanations could account for the vast similarities in reform papers written over a span of 90 years? And more importantly, why has fundamental change not yet occurred in North American medical education? Bloom argued that this history of "reform without change" is attributable to the fact that the humanistic mission of medical education is merely a screen for the research mission, the major concern of the institution (Bloom, 1988). Christakis comments that the similarities are attributable to the consistent values of the medical profession; the reports are built on identical foundations, and therefore are similar in nature. In general, many agree that the lack of change is widely due to medical educators' failure to address the underlying social, financial and organizational structure of medical education. (Christakis, 1995; Parsell, 1995; Ludmerer, 1999).

By the late 1980s, it was clear to many institutional, national and global health organizations that the issue of medical education reform could only be properly addressed through the creation of unique programs designed to investigate mechanisms of implementation for the previously suggested reforms. Two such programs, one within Canada and one within the United States, were initiated – the AAMC's Medical Schools Objective Project (MSOP) and Ontario's Educating Future Physicians for Ontario (EFPO) project. Both were aimed at determining society's expectations of their health system and their physicians, and at creating a framework that medical educators could use in reforming medical education to make it more responsive to society.

The intent of this paper is to look at the accomplishments of the Educating Future Physicians for Ontario project at the level of undergraduate medical education (the focus of the first phase of EFPO, EFPO I) and offer comments about whether or not EFPO can be classified as yet another attempt at reform without appreciable resulting change. Due to restrictions, the paper must omit details of other aspects of the program, namely EFPO II, which focused on

clinical education. It is worth noting though, as will be mentioned later, that EFPO II was not considered to be as successful as the first phase of the project.

Educating Future Physicians for Ontario – Phase I

In 1987, a strike was held by Ontario's physicians over the issue of "extra billing". The lack of public support towards the strike was seen to reflect the growing concerns of Ontario citizens towards their physicians and medical system. The apparent difference in the public's view of the health care profession and the profession's view of itself prompted action at several levels. The Ontario Ministry of Health published a series of health promotion/discussion papers that year. With the help of the five medical schools, Associated Medical Services (AMS), an Ontario based medical foundation, developed a proposal for a collaborative project to address these problems through medical education.

AMS first presented the resulting project Educating Future Physicians for Ontario (EFPO) at a conference in June 1989. As stated by the AMS Board of Directors, the overall goal of EFPO was "to modify the character of medical education in Ontario to make it more responsive to the evolving needs of Ontario society." The project was to focus less on short-term curriculum change, and more on the development of mechanisms to monitor the need for continuing change while creating a framework to implement those changes and make them sustainable. On January 1, 1990, EFPO was officially launched, funded by a consortium of the Ontario Ministry of Health, AMS and the five Ontario medical schools (Neufeld *et al*, 1993).

The first phase of EFPO (EFPO I) lasted from January 1990 to December 1994. Areas of interest of EFPO I included defining broader determinants of health, supporting faculty development, and redefining clinical competence by shifting evaluation systems to better address societal-responsiveness. The objectives were broad yet attainable; they included: (i) defining the health needs and expectations of the public as they relate to the training of physicians; (ii) preparing the educators of future physicians; (iii) assessing medical students' competencies; (iv) supporting related curricular innovations; and (v) developing ongoing leadership in medical education.

An implicit pupose of the project was to redress the constant tendancy of medical education toward "supply-side" rather than "demand-side" thinking, terms proposed by Kerr White in 1988. The preoccupation with supply side thinking, which focuses on keeping up with new knowledge and technology, has led to (i) crowded curricula with battles between departments for curriculum hours, (ii) little time devoted to independent thinking and learning, and (iii) excessive dependence on fact-oriented lectures as the predominant teaching method. The demand side approach, which responds to societal needs and expectations, instead focuses on addressing and questioning health-related issues, including (i) determining health status, (ii) health problems, (iii) the causes of these problems, (iv) which interventions are plausible, (v) what are distinctive roles for physicians in administering these interventions, and (vi) which interventions are better performed by other health care workers (White, 1988).

It was thus decided that for EFPO to address the demand / supply side conundrum, several tools would be necessary. These included (i) a listing of urgent health problems, (ii) educational

modules that promote the cost-effectiveness of interventions related to specific medical conditions, and (iii) the identification of roles and competencies that directly reflect societal needs and expectations (Neufeld *et al*, 1993). Continued community input into curriculum planning was also emphasized; mechanisms would have to be put in place to increase school-community communication and awareness.

Activities

While the list of projects initiated and completed by EFPO is lengthy, the main ones are described below. As will be shown, every principal objective set out at the beginning of the project was satisfied through the creation of unique tools and programs.

The most innovative tool, the identification of roles for the physician that reflected society's needs, satisfied EFPO's first objective: "to define the health needs and expectations of the public as they relate to the training of physicians". As the main objective of the Component 1 Task Force, identifiable public groups and professional health care workers were surveyed to determine what their expectations were of Ontario's physicians. The resulting large quantity of respondents' data was organized and discussed in a series of 19 working papers, many specific to the responses of a single public group. To have a lasting effect on educational planners and the general public, though, it was felt that their findings needed to be presented simply and in a format that could result in action.

From actual words and phrases of respondents were formed a list of "ideal" physician roles. In order of emphasis from the data, the first six identified roles were: (i) physician as medical expert – clinical decision-maker, (ii) physician as communicator, (iii) physician as collaborator, (iv) physician as gatekeeper – resource manager, (v) physician as learner, and (vi) physician as health advocate. From EFPO workshops, two further roles were identified, (vii) physician as scientist/scholar and (viii) physician as a person (Neufeld *et al*, 1998). A brochure published in May 1993, "Summary: What People of Ontario Need and Expect from Physicians", summarized the roles for general public distribution. This brochure also identified key issues emerging from the EFPO work related to medical education, including a re-emphasis on ethical matters, family issues, rural health care, and the medical school selection procedure.

The 'roles for the physician' has remained one of the most highly publicized projects of EFPO, as it enabled simple presentation of results to the public and helped focus the EFPO project. Much of the following work of EFPO task groups, fellows, and conference and workshop members was highly influenced by the identified roles. Questions began to be considered such as which roles were currently being well addressed in medical education, which ones were not, what competencies were needed to adequately assume each role, what methods existed to evaluate these competencies, and what framework existed to help faculty teach the competencies.

The most direct adoption of the roles for the physician occurred with the CanMEDS 2000 project. An initiative of the Health and Public Policy Committee of the Royal College of Physicians and Specialists of Canada, CanMEDS 2000 was commissioned to examine Canadian health care needs and to assess their implications for postgraduate specialty training programs.

Essentially a national version of EFPO, the CanMEDS 2000 Societal Needs Working Group (SNWG) identified key competencies required of Canada's specialists, grouped them by classification and assigned a role title. The work of EFPO was crucial in supplying the SNWG with a list of roles that could be adapted upon reexamination of the issues pertinent to Canadian specialists. Through CanMEDS 2000, methods for teaching, learning and evaluating were developed for postgraduate medical education, and strong recommendations for postgraduate curriculum reform were put forward (RCPSC, 1996).

The roles for the physician influenced numerous other groups. Among these, the roles formed the basis for (i) the development of physician attributes described in the AAMC's Medical School Objectives Project (MSOP), (ii) the Medical Council of Canada's revision of its learning objectives, (iii) discussions of the Canadian Medical Association's Future of Medicine Project, and (iv) the selection criteria for an award honouring outstanding Ontario physicians, established by the College of Physicians and Surgeons of Ontario. Ontario's medical school institutions have shaped much of their recent curricular reform around the roles, including the patient-centred curriculum developed at University of Western Ontario.

The second objective of the EFPO project, "preparing the educators of future physicians", was pursued by the development of a set of 71 teaching packages in medical and surgical specialties. The manuals were distributed to all Ontario medical faculties, and then made available to all North American medical faculties. To address the third objective, "assessing medical students' competencies", assessment capabilities were improved with the production of a number of faculty teaching tools, many aimed at improving OSCE examinations. EFPO also contributed to improved strategies for clinical assessments during ward rotations. The fourth EFPO objective of "supporting related curricular innovations" was pursued through direct and sustained collaboration with curriculum leaders from the five institutions. Deans from the schools were members of the Council of Ontario Faculties of Medicine (COFM), the body directly responsible for institutional curriculum change, to which EFPO members reported regularly. Annual conferences, collaborative activities, institution-specific workshops, and annual seminars for curriculum teams from the institutions facilitated close interaction and encouraged ongoing curriculum reform (Neufeld *et al,* 1998).

To implement EFPO's fifth objective, "to generate a mechanism and process for the development of leadership in medical education that will be able to sustain the changes initiated by the EFPO project", the Fellowship program was created. With an annual budget of $150,000, EFPO began in 1990 sponsoring select MD graduates with high interest in medical education, to develop leaders in the continued development of medical education in meeting future health care needs of Ontario society. A Junior Fellowship Program was created in 1992 to promote undergraduate student leadership in medical education; a grant was offered to one medical student a year at each of the five schools. A total of 19 fellowships had been awarded by the end of 1994. EFPO fellows played a substantial role in creating collaboration between institutions and in augmenting the importance of education within the medical faculties.

Consequences

An important outcome of EFPO is the greater collaboration now existing among the Ontario schools. Several projects currently exist that involve all five schools; most were developed to address issues related to the roles for the physician and to maintain societal-responsiveness. Examples include: (i) the Canadian Cancer Society / EFPO Communication Project, which focuses on improving the teaching of communication skills in clerkship and holds an annual conference; (ii) OMEN (the Ontario Medical Education Network), which sponsors monthly education grand rounds through videoconferencing and a biennial symposium on research in medical education; (iii) the project CREATE (Curriculum Renewal and Evaluation of Addiction Training and Education) which focuses on improving education about addictions; and (iv) the annual Education Conference for Ontario.

To enable the continuing community input deemed necessary for true societal-responsiveness, EFPO also acted as a catalyst toward the development of health intelligence units (HIU) at each Ontario medical institution. Already having been established at McMaster, the role of an HIU is to analyze, interpret and organize information and to present it in a practical form to educators and students (Neufeld *et al,* 1998). With such a body in place, maintaining societal-responsiveness in the curricula could be facilitated, and information would be readily available for active collaboration between institutions, health policy makers and community groups.

EFPO II - Problems

By the end of phase I (1994), it was agreed that many of the original goals of EFPO had been met. Extra focus was needed, though, in the clinical years, especially residency, with attention to further faculty development and further integration of the physician roles into curricula. The subsequent second phase of EFPO (EFPO II), which ran from 1994 to 1998, shared many of the same values and objectives as EFPO I with an emphasis on clinical education. The pre-identified roles and competencies were used as a guiding framework, and extra focus was given to the roles physician as communicator, collaborator, resource manager (gatekeeper) and health advocate. The fellowship program was expanded to the Fellowship and Leadership program, which focused on the development of leadership skills while still encouraging fellows to obtain graduate degrees in education (Maudsley *et al*, 2000).

Despite having implemented the majority of its objectives, EFPO II was viewed at its end as having been less successful than EFPO I. The clinical environment had not significantly changed; evaluation of residents with respect to the roles for the physician had not evolved substantially; and residency programs were still highly departmentally based. The continued support of EFPO fellows, though, was highly acclaimed and was viewed as possibly the project's strongest assets (Halparin, 1997). The possibility of EFPO being continued as a third phase, which would focus on continuing medical education (CME), was discouraged – continual work instead focused on following the mandate of EFPO I, that of influencing undergraduate medical education and fostering community involvement through community-based preceptors. The identified physician roles were to continue to be a foundation for curriculum change, and continued collaboration between the government and the schools was to be emphasized.

But there much of the story ends. With the halt of funding from the Ontario Ministry of Health in 1998, the AMS discontinued its funding as well at the end of the year. Thus most of the EFPO program ceased, though the AMS board committed a further $250,000 a year for an initial three years starting in 1999, in particular to maintain the fellowship program and to provide support for an annual conference on medical education for representatives from the five schools.

Accomplishments: Temporary or Lasting?

As shown, the Educating Future Physicians for Ontario project's objectives were each attained through the development of numerous programs, teaching tools and cooperative strategies. It is evident from its accomplishments that EFPO had a successful impact on Ontario medical education. But will this impact lead in the near future to the fundamental change deemed critical by dozens of authors and organizations? Although EFPO values continue to be sponsored through the leadership of EFPO fellows, will their commitment hold in upcoming decades? The roles for the physician have been incorporated into and have shaped the curricula of Ontario schools, but as of yet, few faculties outside of Ontario have been swayed to revolve their teaching practices around the roles. Until these values have been incorporated nation-wide, will EFPO have any appreciable effect in shifting the scale from supply side to demand side thinking in Canadian medical education?

It has been proposed that a similar project at a national level, Educating Future Physicians for Canada (EFPC), should be developed. Such a project could entail a re-evaluation of public conceptions, with review of the original roles for the physician for continuing validity. The mission of EFPO was to modify the character of Ontario medical education to make it more responsive to the *changing* needs of Ontario society. However, if the values held by EFPO founders and supporters are to continue to be held, continual updates are required of what the public needs and expects from its health care system.

Due to possible obstacles in developing such a project, a more practical approach to updating Canadian public views of health care to maintain relevance and societal-responsiveness could be to develop a curriculum reform project through the Association of Canadian Medical Colleges (ACMC) or the Canadian Association for Medical Education (CAME). Pre-formed medical organizations would perhaps have better access to resources than a newly formed organization. Nonetheless, it is clear that the issue of required medical education reform tackled by the EFPO project persists. Many excellent steps were taken through the creation of frameworks and tools to institute change, but continued funding is necessary from government and health care organizations to create the change deemed necessary. The idea though of developing an Educating Future Physicians for Canada project is tantalizing, and if the resources were available, the possible benefits to our future Canadian health care system through restructuring medical education are profound.

Summary

To return to Samuel Bloom's comment in 1988, twentieth-century North American medical education has been plagued by a history of "reform without change". His opinion that mere curriculum reform is not the solution is shared by many; Renee Fox adds that "nothing less than a deep transformation of the ethos, the social system, and the organization of the medical school is needed" (Fox, 1999, p. 1074). Optimistic authors such as Kenneth Ludmerer argue though that change is more attainable now than ever through strong leadership and a willingness to support principles and values that promote quality health care (Ludmerer, 1999). The Educating Future Physicians for Ontario project enforced these values, through unprecedented leadership, collaboration, an aim to implement rather than to merely recommend, and generous funding. Through continued attempts at reform stemming from such projects as EFPO, hopefully Canada can attain the change in medical education that has alluded North American medical institutions for the past ninety years.

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ANATOMY & ART IN THE RENAISSANCE

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ABSTRACT

Prior to the renaissance the anatomist was restricted to the cadavers of condemned criminals and the goal of dissection was essentially to learn ways to prolong suffering during execution. Over time the autopsy was utilized in public health to determine the cause of death and later developed a role in forensics by the 1300's. The earliest dissections took place in the homes of the wealthy and became quite common by the 1400's. However, dissections were still only performed on criminals of low birth and were regarded as a great humility. By the 15th century, some anatomists were employed directly as the executioner; some prisoners were said to prefer the opium of the physician to a public hanging. At the same time, interest developed in anatomy as an area of research and the artists of the period were also dissecting cadavers. Demand for cadavers grew to the point that individuals acquired them by any means possible. With the revival of antiquity, the artists tried to portray man as beautiful and in doing so wanted to understand the human form completely. The patron families, such as the Medici's, helped to bring the two groups together. Perhaps the key difference between the two was their goal in dissection; the artist to accurately produce beauty and the anatomist to gain scientific knowledge. In the end, the artist's goal for perfection took the art of anatomy to a higher level and in the end produced some of the most magnificent productions.

The art and artists of the Renaissance, more specifically the Italian Renaissance, played a role in the evolution of anatomy. The science of anatomy had evolved from its shadowed past as an executioners aid and began to play a major role in the medical schools of the time. The combined efforts of the artists and anatomists to accurately depict the human body elevated anatomy to a higher form. More specifically, the unique approach taken by the artists allowed anatomy to be viewed in a completely new way for the first time. This paper will briefly outline the history of anatomy up to the Renaissance and attempt to prove how the work of the artists made anatomy flourish.

In terms of how anatomy was portrayed in art prior to the renaissance, the naked human body was seen an evil and shameful. Christianity held the human form in such disgust that man was rarely represented in the nude. Therefore, there was little interest or incentive for the artists of the period to explore human anatomy. As for the anatomists of the time, there was hardly such a distinction. Anatomical dissections were restricted to the cadavers of condemned

criminals. The only function was to learn how to prolong suffering during execution. Thus, the 'anatomist' arguably acted as an arm of the state.

By the 1300's, the autopsy has become involved in public health with the purpose of finding the cause of death. It later developed into a forensic context. One condition which remained was that the contours of the body could not be destroyed by the postmortem. Some of the earliest dissections took place in the homes of the wealthy and became a somewhat popular practice. The general principle of the dissections at this point was to illustrate basic concepts but not to create any new theories. By the fourteenth century, these demonstrations became quite common. At the same time, attendance at a dissection became mandatory for the degree of medicine in Florence. However, in the medical school only one or two were held a year, more commonly in the winter months to preserve the body better.

Many false rumours regarding dissections have persisted over the years. For example, some stories told of individuals breaking into mortuaries to steal a corpse to work on in private with the fear of punishment if caught by the state or church. Dissections were generally accepted at the time, with some conditions. It may have been a false interpretation of the famous bull by Boniface VIII which created some of the misinterpretations. He condemned the distasteful funeral practice of dismembering the body and boiling off all the flesh to allow for easier transport. There were some conditions on who could be dissected; they must have been foreign criminals of low birth and could only be hanged during the winter months. Furthermore, there was a great deal of humility associated with this practice that would follow the accused into death, thus causing a great deal more shame and grief prior to their execution. The naked body was required to have a long exposure in the public eye before dissection. Also, the dissection compromised the identification of the body and took away any remaining honour in the ritual of the funeral.

Later in the fifteenth century, anatomists began to be employed as executioners. The Grand Duke of Tuscany even gave a prisoner to Falloppia to kill as he wished and dissect. It was written though, that the prisoners preferred the opium of the physician to a public hanging. These acts of torture and pain are depicted by the artist Berengario de Carpi who illustrated anatomical 'muscle men' wielding the executioners axe and the hangmans rope.

It is interesting to compare the goals of anatomy prior to and after the fourteenth century. Prior to this, the anatomist was not seeking to add to the existing body of knowledge but only to help students remember what they were learning in their texts. After the fourteenth century anatomy was seen as an area of research which resulted in a great interest. It was at this time that it was accepted for the artists to dissect. One of the great changes in thinking occurred around the same time when the Florentines revived the classical works of the Greeks. This included the ideas of revering the body for its beauty and strength, believing that man represented the gods, and that the body should be prized because it would not survive death. The treatise by Galen was discovered at the end of the fourteenth century and this resulted in a revived interest in naturalism. Physicians were taking on a more humanistic approach to their education and practice. After translating Plato, Ficino stated that 'love is the desire of beauty'. Since man is a loving creature, man cannot help loving beauty. This set the stage very nicely for a change in the way society looked at art and the naked body being represented in art was

accepted. Thus, the artists had a good reason to dissect, so they could accurately represent the naked form.

Dissections had begun to take on a larger audience. In 1405 there were only twenty students in attendance for every male cadaver and thirty for each female. By 1521, Jacopo Berengario da Caropi claimed 500 students and as many citizens were present during a dissection. Later in the sixteenth century permanent anatomy theatres were established. With this kind of popularity, cadavers came into high demand. Both the artists and anatomists wanted to work on cadavers privately and thus began to acquire them by new means. The dead from the hospitals and graves, essentially the poor, went missing quite often. Vesalius wrote with pride of his acts which included forging keys, rifling tombs, and nighttime escapades into ossuaries. It was rumoured that his pilgrimage was in penance for autopsying a still living Spanish noble. However, he did create one of the most amazing works when he released the Fabrica in 1543. He collaborated with the artist Jan Kalkar, a pupil of Titian, to produce a series of anatomical drawings considered to be the most accurate at the time. The patron families in Florence, such as the Medici, provided an environment for the scientists and artists to come together as they were great supporters of science and art. Two famous figures supported by this family were, Michelangelo and Antonio Benivieni. This allowed for exchange of ideas and possibly collaboration

Two artists who created some of the most famous works of art ever seen were also deeply involved in anatomical dissections. The first, Leonardo da Vinci emphasized that viewing his drawings were superior to witnessing a single dissection. Leonardo made over 1550 anatomical drawings in his lifetime and was the first to accurately depict a human embryo. It was proposed that Vesalius knew of him. The second person, Michelangelo had intended to write a treatise with anatomy as the central topic. He went beyond the basic knowledge gained through dissections by demonstrating his knowledge of surface anatomy. Furthermore, he created surface contours which could only be produced by active muscle which demonstrated a vast knowledge of the body.

Perhaps it was the artists who brought on an anatomical revolution. Artists approached the body with an unprejudiced eye and more often saw what was actually there. Antonio Pallaiuolo depicted the human body and it's muscles more accurately than any of the medical books of the century. This begs the question, where did the difference between artist and anatomist lie? Perhaps the only difference was the end goal of the two. The anatomist strove to understand the inner workings of the body, whether for public health, autopsy, or to prolong an execution. The artist desired to reproduce the most accurate, natural, and beautiful form by understanding what lay beneath and thus represent what was seen. In the end the artist may have been a major influence in the evolution of the art of anatomy.

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SHIFTING BONES

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ABSTRACT

Andreas Vesalius (1514-1564), a Flemish physician, is credited with the transformation of anatomy to a modern scientific subject. Prior to the Renaissance anatomical dissections were performed as infrequent demonstrations for medical students and the public. An anatomical text from which the lecturer read was central to these dissections rather than observation of the cadaver by the students. Similarly in anatomical works the point of focus was the rhetorical argument rather than pictorial representation. Diagrammatic illustrations were only employed as supplementary devices to complement this textual based thinking.

Vesalius' keynote work *De Fabrica* (1543) represented a shift to visual learning. He argued that medical students needed to be involved actively in anatomical dissection. He emphasized experiment and observation, and his works were rich in naturalistic representations of the human body. Through examination of these drawings, observers gleaned knowledge as if they were looking at the actual cadavers. Certain Vesalian drawings depict dissected figures in motion or involved in everyday (16th century) activities. When subsets of these drawings are selected and sequenced, they illusion three-dimensional anatomy in a pop-up-book style.

In short, Vesalius' naturalistic representations revolutionized textbook anatomy.

The Renaissance (1450-1600) was a time of intellectual rebirth—restoring the ways of thinking and acting in ancient Greece. During this time, anatomy was transformed into an experimental scientific subject. The man most often credited with this conversion is the Flemish physician and surgeon, Andreas Vesalius (1514-1564).

Prior to the Renaissance, anatomy was taught in the scholastic tradition. Reading and interpreting a text was central to an anatomical demonstration rather than dissecting and observing a cadaver. Mundinus (c1270-1326), a teacher and interpreter of Galenic medicine and a professor of medicine at the University of Bologna provided a model framework for anatomical dissection through his book *Anatoma*. In his book he compiled Galenic writings and Arabic medical sources, including the works of Avicenna. His pedagogical structure dominated the universities for the 14th and 15th centuries. (Cunningham, 1997, 42-56)

In a Mundinus-style dissection, the demonstration, performed on a recently executed criminal, was a public event spanning several days. It involved three main players—the lecturer, the ostensor, and the barber-surgeon. The lecturer oversaw the

Figure 1
Mundinus Style Dissection

proceedings from the high professorial chair. Providing interpretation and inserting comments, he read from a Latin text. The ostensor, a learned university man, who spoke and understood Latin, indicated the various parts of the cadaver in reference to the lecture. The barber-surgeon however was not of the university system. He was not versed in Latin or rhetoric, but he was responsible for the physical dissection. (Cunningham, 1997, 42-56)

Unfortunately, the anatomical texts, in particular *Anatoma*, contained much false information propagated through Galenic sources and poorly translated Arabic Compendiums. In addition, little communication existed between the lecturer, the ostensor, and the barber-surgeon. The surgeon did not understand Latin; the lecturer and ostensor were not versed in the physical anatomy or actual cutting of dissection. Lastly, the medical students focused on rhetorical debate about and on interpretation of the Latin text rather than observation of and experimentation on the cadaver. In essence, they dissected the text, not the corpse. (Cunningham, 1997, 42-56)

In contrast, Vesalius argued in his keynote work *De Fabrica Humani Corporis* (1543) that medical student participation in the dissection of cadavers and anatomically accurate textbooks would revolutionize the practice of medicine. The title page from *De Fabrica,* portrays a Vesalian dissection. (Cunningham, 1997, 88-142)

Figure 2
Vesalian Dissection Scene
Title Page De Fabrica

It is a tumultuous scene with Vesalius as the central actor, actually performing and engaging in the dismemberment of the corpse, not the three characters each with a disjoint role. The audience focuses on the corpse, not on Latin words from a book. In the foreground, three large figures, representing the ancients—Galen, Aristotle, and possibly Hippocrates—watch. They give reverence to Vesalius. The chosen cadaver is a female corpse with her abdomen dissected to demonstrate that the uterus does not have horns, contrary to what Galenic sources asserted. Lastly, a skeleton occupies the high position where the scholastic lecturer would have been—a definitive statement as to the role remaining in anatomy for Mundinius-style dissections (Cunningham, 1997, 124-130; Keelan, preprint, 14)

Part of Velasius' success relied upon the use of naturalist representations of the human body rather than diagrammatic illustrations in his published works. Diagrams are

Figure 3
Diagrammatic Anatomy

caricatures of a phenomenon. They employ special conventions to impart information without attempting direct representation. To a natural philosopher of the scholastic tradition, illustrations were supplementary—a debasement of the higher device of logical thought. Illustrations at best would complement the more important text based thinking. (Keelan, preprint, 1)

> In comparison, a naturalistic representation is a true imitation. Anyone can view this type of depiction of an object and glean knowledge as if they were studying the original object itself: "So as to virtually set a dissected body before the eyes of the students of the works of nature" (Vesalius, preface to De Fabrica, as quoted in Keelan, preprint, 8). Since Vesalian anatomy prioritizes experiment and observation, naturalistic portrayals permit the viewer to witness, to access, and to study a dissection. (Keelan, preprint, 8)

Figure 4
Naturalistic Anatomy
The Nervous System

Nevertheless, Vesalius did not 'photograph' dissections, but rather depicted imitations thereof. In mirroring reality, Vesalius's images are somewhat contrived. He minimizes

distracting details, removes the destruction of death to represent the living not the dead, and normalizes the representation of anatomy. (Keelan, preprint, 11) “It is desirable that the body employed for public dissection be as normal as possible to its sex and medium age so that you may compare other bodies to it….” (Vesalius, as quoted in Keelan, preprint, 8)

Figure 5
a. A photograph (Dr. Whitelaw), top
b. A diagrammatic caricature, left
c. A naturalistic rendering, right

In addition to regular natural anatomical depictions—a drawn piece on a bland background—Vesalius provided natural images situated in daily circumstances. Although ‘natural’ in the representation of the cadaver, a standing dissected corpse leaning on a farm tool in a mountainous area would be a most unnatural phenomenon. These portrayals of dissection in

Figure 6
Naturalistic skeleton in situ

the setting of an ordinary portrait suggest, however, that anatomy should be accepted and explored. Moreover, when many of these in situ representations are sequenced they create a three dimensionality—a layered effect of motion in the 16th century equivalent to a pop-up book. (Keelan, preprint, 17)

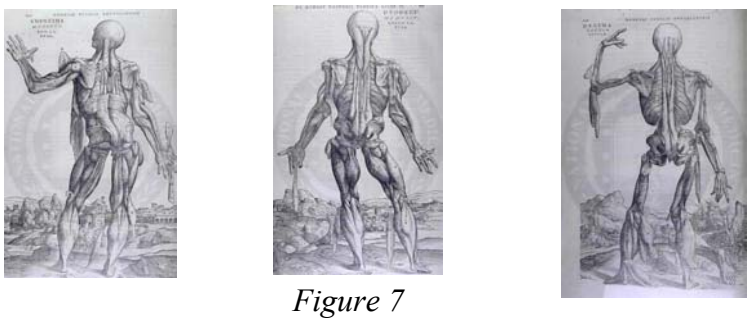

Figure 7
Vesalian Anatomy in motion

Vesalius however was not the only one to employ naturalistic representations. There were many other attempts including those by Berengario da Carpi and Leonhart Fuchs. In his 1522 work, *Isagoge brevis in anatomiae humani corporis,* the Bolognese anatomist and surgeon Berengario da Carpi endeavored to present realistic representations of dissected cadavers but "because of the ineptitude of the artists and the block cutter, provided extremely limited information." (Ackerman, 1985, 109)

In 1542, Fuchs published *De historia stirpium*, a herbal compendium which contained 512 illustrations. Fuchs realized the pedagogical advantage to naturalistic representations. He argued that visual learning superseded verbal learning:

> "Who in his right mind condemns [SIC] pictures which can communicate information much more clearly than the words of even the most eloquent men? … Those things that are presented to the eyes and depicted on panels of paper become fixed more firmly in the mind than those that are described in bare words." (Ackerman, 1985, 113-114)

Vesalius dwelt at the pinnacle of the anatomical revolution. The printing press had arrived almost a century before, and artistic techniques had recently been improved. Yet it required his inspiration to transform anatomical dissection and impel the study of anatomy forward out of scholasticism, into science.

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THE DOCTORS MAYO: ON THE "CUTTING EDGE" OF SURGERY

By

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ABSTRACT

Returning home to Minnesota in 1883, new medical school graduate William James Mayo was asked by a family friend if he was planning to move to such centers as St. Paul or Chicago. Twenty-two year old Will replied: "I expect to remain in Rochester and become the greatest surgeon in the world." So began the career of a young, enthusiastic, idealistic man who would go on to become one of the world's great surgeons. He was later joined in practice by his brother Charles, and together with their father they became known as the Doctors Mayo, whose achievements would eventually gain them widespread recognition and send doctors from all over the world flocking to the Minnesota countryside to witness their accomplishments.

From their childhood days on the Western frontier, the Mayo brothers were taught science and medicine by their parents, and were instilled with their father's beliefs in the novelity of their profession and the responsibility that accompanied their position. These are the ideals that formed the foundation of their practice of medicine. The legacy they left behind is the Mayo Clinic, today the world's largest private medical centre, specializing in nearly everything and serving almost 500,000 patients annually.

Introduction

They were only two brothers, inseparable friends growing up in an obscure town on the Minnesota frontier. Yet William James Mayo and Charles Horace Mayo achieved widespread recognition as surgeons and gave their name to what is today the world-renowned Mayo clinic, which treats nearly half a million patients each year[2].

The Foundation Laid

William Worrall Mayo was born in 1819 in the town of Salford, England. Like many of the young men of his generation, he boarded a boat headed to the New World where he slowly worked his way westward, gaining experience in a number of professions before settling in the frontier town of Rochester, Minnesota. During his travels, he earned a medical degree from Indiana Medical College in 1850. While most medical programs at the time were lax in their

standards, Dr. Mayo made the most of his education, also completing a three year apprenticeship before starting his own practice[1].

In 1851, William W. Mayo married Louise Wright, an intelligent and self-taught woman who worked as a milliner to supplement the family income in the early years of Dr. Mayo's practice. She also acted as medical assistant and was said by some to be as knowledgeable about medicine as the doctor himself[3].

There was a good variety of patient complaints to keep Dr. Mayo occupied, but more than anything else, he wanted to learn surgery. At the time, "female complaints" were common and severe enough that women could be completely bed-ridden with their illnesses. Feeling that his training in the treatment of these conditions was inadequate, Dr. Mayo decided to travel to New York and spend three months studying surgery and gynecology. Both these specialties were still in their early days and viewed somewhat skeptically, but Dr. Mayo gained enough confidence in his abilities that he returned to Rochester and performed his first ovariotomy in 1880. The operation was a success, and while Dr. Mayo mastered many skills in his lifetime, gynecology remained his major specialty[1].

Dr. Mayo strongly believed in the nobility of his profession. He believed that a doctor was obliged to attend every patient, regardless of whether or not they could pay for the services. He believed that those endowed with special skills were obliged to use those skills to the good of others, and these are the ideals that he built his practice on. They are also the ideals, coupled with a passion for medicine, that he passed on to his sons[1].

Childhood

The two boys, Will and Charlie, grew up with the benefit of both formal and informal schooling. Their mother had a strong interest in science, particularly in astronomy and botany, which she taught to them as opportunities arose[3]. From a young age, they were also required to help with their father's practice as they were able; this took the form of cleaning the office, driving the horse, or cutting sutures at first, and gradually, watching became assisting as the boys gained practical experience in surgery as well[1].

Medical School

Medical schools in this age had not improved much from the elder Dr. Mayo's time, and most were lax places where students learned little. However, in 1880 there was a revolution beginning in medical education and one of the schools leading the way was the University of Michigan, which boasted such novel ideas as entrance requirements, a three year graded program, a chemistry lab, and the first university hospital in the United States. It was here that Will Mayo was sent, and while the lifestyle could be intense (10% of his classmates died of various causes before graduation), he appears to have maintained good health and graduated in 1883, eager to put his education into practice[3].

It was decided by the family that Charlie Mayo should go to Chicago Medical College, in order to get a different viewpoint from Will. Students there were graded on a scale of 1 to 10,

and it is interesting to note that Charlie's lowest mark was a 7/10 in surgery, and yet he would go on to become one of the world's great surgeons. In addition, Listerian techniques were becoming widely accepted in the United States and Charlie would have learned these procedures while he was in medical school, which was no doubt an important skill that aided his success as a surgeon[3].

The Tornado of 1883

On August 21, 1883, a tornado swept through Rochester, damaging much of the north end of the town. The elder Dr. Mayo was put in charge of medical aid and soon realized that he was lacking nurses. The answer was found in the form of the Sisters of Saint Francis, a teaching order who were available because of the summer holidays. The arrangement worked so well that after the crisis had passed, Mother Alfred Moses suggested building a hospital in Rochester. The plan was first opposed by Dr. Mayo, who felt that the town was too small to support such a venture. However, the determination and perseverance of Mother Alfred eventually won, and Dr. Mayo agreed to run the hospital if funds could be obtained to build it. After much work, saving, and meagre living, St. Mary's Hospital was opened on October 1, 1889[1].

The hospital accomodated up to 45 patients and accepted sick people regardless of race, religion, or income, a novel concept during a time when people who could afford care were generally treated at home. The Mayos also hired Edith Graham, the first trained nurse in Rochester. Graham had been dismissed from her first case in Chicago, after being told by the doctor that she was far too beautiful to be a nurse. The Mayos, however, had no qualms about her beauty; she and Dr. Charlie were married in 1893. Graham's ability as a nurse was impressive as well[3]. She trained the nuns working at the hospital, and in one stretch of 400 patients, only 2 deaths were recorded[1]. Thus, much of the early success of St. Mary's Hospital can be attributed to the untiring commitment of the nursing staff.

The Doctors Mayo

Upon completion of their medical training, both boys returned to Rochester and joined their father's practice, which was already one of the biggest practices in the area. They, too, had an interest in surgery and took the initiative to gain and refine their surgical skills. Their father demanded that they spend at least an hour a day in study and reading, and because of this, they were able to keep abreast of new developments arising in surgery. Whenever they thought a technique could be beneficial, they would go to see the surgeon operate, learn the skill themselves, and use their own discretion to decide what would be adopted into their own practice. This pattern of learning was simple, but it was repeated over and over for a large number of different surgeries, and is, in a nutshell, the secret of the Mayos' success. With surgery being in its infant days and most physicians still shying away from its use, the Mayos were beginning to draw a clientele from a larger radius, as their reputation spread; this in turn allowed them to gain all the experience and expertise they could desire[1].

The Partnership

In the early 1890's, the Mayo brothers, in reporting their work, were beginning to gain widespread respect in medical circles. The sheer volume of their work was enough to amaze doctors in larger centres, and the eloquence and directness of their speeches were impressive in such young men. Surgeons from all over the country came to watch the Mayos at work, and none could deny the excellence of their skills and ideas. By 1903, their reputation had spread beyond the continent, and renowned surgeons from Europe were bypassing centres like New York and Boston in favour of visiting the little frontier town of Rochester, Minnesota[1].

Also in the early 1890's, the Mayos were beginning to realize that the volume of medical knowledge available was too great for one man to master. With this in mind, they began to take on partners in their practice, and structured it on the principle that two heads are better than one, and five are even better. Each doctor was able to develop a specialization but none could work independently of the others, and this concept of cooperative group practice was one of the Mayos' great achievements. They strove to limit competition, and encouraged the abilities of their partners by setting aside time for research, travel, and writing[1].

The Mayo Clinic

In 1914, the partnership moved into a new building, the old quarters having become too cramped. Designed by Dr. Henry Plummer, one of the partners, it housed all the necessary services under the same roof and featured such novel amenities as a conveyor belt to move files around the building and the first large intercommunicating telephone system. Up to this point, all the partners' names had been listed in the clinic's title. However, visiting physicians often spoke of going to the "Mayos' clinic" or the "Mayo brothers' clinic", names that were further popularized by the railroads and patients. Thus, with the opening of the 1914 building, the partners adopted the name "Mayo Clinic" as their official title[3].

The Mayo Foundation

When they joined their father's practice, the Mayo brothers became much more stringent than their father in collecting fees from those who could afford to pay. By the time the 1914 building was erected, they had amassed a large sum of money which they felt should be put back towards supporting patient care in the form of medical education and research. With this in mind, they developed an affiliation with the University of Minnesota in 1915, becoming the first official post-graduate training program in the United States. Then, in 1919, they dissolved their partnership and created what is today the Mayo Foundation. All staff became salaried, with any excess funds being directed towards research, education, and patient care[1].

Death of the Mayos

Dr. W.W. Mayo died in 1911 of complications from a previous farming injury. In 1928, Dr. Will spontaneously announced his last operation; he wanted to quit while in top form, and not wait until a time when he felt his work should be done by younger and more capable men.

Shortly after, Dr. Charlie suffered a retinal hemorrage and was forced to retire. Both brothers remained on as advisors until 1932, and died just two months apart, Dr. Charlie on May 26, 1939, and Dr. Will on July 28, 1939[3].

The Mayo Clinic Today

The legacy the Mayo brothers left behind is today the Mayo Clinic, the world's largest private medical centre, specializing in virtually all areas of medicine and remaining on the cutting edge of many exciting developments in medicine. It operates in three locations in the United States, serving nearly 500,000 patients each year[2].

"Yes, to be frank about, we have accomplished much, my brother and I. But we should have done great things; we were given the opportunity. We were born at the right time and to the right parents...We were not geniuses. We were only hard workers[1]." So go the wise words of Will Mayo. The success of the Mayo brothers was not due to miraculous abilities. They laboured long and hard with the resources available to them, upholding the values instilled in them by their father, and had the foresight to ensure that long after they were gone, their work would still continue on.

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SIR JAMES MACKENZIE (1853-1925): A PHYSICIAN OF TRUE HEART

By

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ABSTRACT

Why is Sir James Mackenzie's heart on display in a bottle in the Museum of St. Andrew's Medical School? The achievement of such an honor is explained by Mackenzie's invaluable contributions to the art and science of medical practice. He is ascribed as a master in the skill of clinical observation and as a physician who revolutionized cardiology to bring himself international acclaim and a knighthood.

James Mackenzie practiced as a general physician for 28 years in Burnley, England where he developed exemplary clinical skills. Described as having a discerning but kind personality, he became a figure known for his keen and methodical beside observations and outgoing sympathy for the sick.

While Mackenzie spent most of his professional life as a general practitioner in a modest provincial town, Mackenzie was drawn to the study of the heart. His observations of his heart disease patients, compounded by his curiosities to better understand their symptoms led him to become one of the great pioneers of clinical cardiology in the early 20th Century. James Mackenzie developed instruments to record waveforms of the venous and arterial pulses, enabling him to identify and describe cardiac rhythm irregularities. His interests in the heart provided the stimulus for the development of the British Military Heart Hospital during World War I. Supported by physicians Sir William Osler, Clifford Allbutt and Thomas Lewis, Mackenzie dealt with the large numbers of soldiers presenting with disorders of the heart.

Mackenzie spent his final years establishing an institute for clinical research at St. Andrew's University. Although his institute was not considered successful, Mackenzie was explained to be an ambitious man ahead of his time. Indeed, his invaluable contributions to medicine are now honored by the annual James Mackenzie Lecture for the Royal College of General Practitioners.

Throughout history it has been considered an honor following death, to have one's organs preserved for display. Indeed, the heart of the late physician Sir James Mackenzie survives him in a bottle at the Museum of St. Andrew's Medical School in Scotland. The achievement of such an honor for Mackenzie is explained by his invaluable contributions to the art and science of medical practice. It is not unremarkable that the organ of choice is his heart, and the reason for this choice is explained by considering the importance of the heart in humans.

The heart is viewed by some people as the most vital of all organs. Physiologically, the heart is the pump that provides nourishment for every other organ in the body. The heart, however, is so much more than the governor of the circulation; it is also the house of human emotion. The heart represents the source of sympathy, warmth, courage, and love. To illustrate the importance of the heart, author Harley Williams asserts that it is through the heart that "emotions are expressed in so many active and significant ways. Watch how the heart beats in fear, note how it slows down with determination, observe how it leaps with joy"(1). The heart beats infinitely day and night to keep both body and spirit alive. It thus comes as no surprise that heart disease makes up a large part of medicine.

Sir James Mackenzie was drawn to the study of this remarkable organ, and is credited as a man who elucidated much about the physiology of the heart. Mackenzie's accomplishments throughout his lifetime as a physician have led him to be considered by some as the Father of Cardiology, and by others to have been the first English speaking heart specialist (2). It is thus most appropriate that Mackenzie's heart is on display to carry on his legacy.

James Mackenzie was born in Scotland to a farming family in 1853 (3). He spent his youth working on his family's farm and at age eleven began his four years of study at Perth Grammar School. Mackenzie was an unremarkable student and withdrew from school to work as an apprentice with a local pharmacist. His five years as an apprentice led him to become a pharmacist's assistant for one year (2). Mackenzie's work in pharmacy exposed him to a variety of medications as well as to the practices of numerous physicians. Such exposure to health care ignited his interest to pursue the study of medicine at the University of Edinburgh. Here again, Mackenzie was an unremarkable student, making no particular impact as a scholar or as a researcher. He did, however, meet his future partner in the dissecting rooms in Edinburgh. He received his MD degree in 1882 and spent time working as the house physician in the Edinburgh Royal Infirmary.

James Mackenzie decided to enter general practice and joined colleagues in Burnley, England in 1880. Burnley was a busy cotton-manufacturing town at the height of the Industrial Revolution and offered Mackenzie the opportunity to build a practice. It was during his twenty-eight years of practicing medicine in Burnley that Mackenzie made truly remarkable accomplishments.

Mackenzie was a physician who worked hard to serve the needs of his patients. Practicing medicine in a small town required him to not only function as a general practitioner, but also as an obstetrican, an internist and a surgeon (4). The tall, ruminative Scotsman worked relentlessly to gain experience in medicine to better treat his patients. Mackenzie was well known for his caring and sympathetic nature and was truly a patient oriented physician. Sir Thomas Lewis, a student and colleague of Mackenzie, honors Mackenzie by explaining: "The patient was the lodestone of all his [Mackenzie's] work. He possessed remarkably the gift of stimulating others; to know him intimately was to imbibe his spirit; his was a rare eagerness to impart knowledge. [He was] a warm hearted man, oft touched by emotion, more often stirred by enthusiasm, cordial, a hard and tireless worker, a shrewd practitioner…."(5). Not only was Mackenzie a well respected physician concerned with his patients' symptoms and their comfort, he was also

dedicated to his family. As well, he found time to golf at least one afternoon each week throughout his time in Burnley.

Through his experience and diligence to his community, James Mackenzie thus created for himself an impressive practice. He is described as being a keen and methodical bedside observer when helping his patients (6). The combination of his curiosity, observational skills, and dedication led him to pursue clinical research alongside his practice. His desire to begin research was ignited as he soon discovered that many of his patients rarely fit the textbook description that he had learned at university. Mackenzie became frustrated looking for answers that he found did not exist, and he was intolerant of statements founded only on tradition. He was particularly taken when a woman under his care unexpectedly died during childbirth from a rhythm disturbance and congestive heart failure (4). This experience motivated Mackenzie to ask himself how to better understand afflictions of the heart.

Mackenzie worked as a self trained investigator relying on the presentations of his patients to guide his research. He was willing to find answers to new questions and to explore the nature of disease through the experiences and symptoms of his patients. In his search for what no medical eye had ever observed, he explained in 1884 that in clinical research a physician must "Find a person with a particular symptom and observe what becomes of him. Then [the physician] will understand what that symptom means" (1). He thus followed his patients with careful observation and well kept case reports. Mackenzie's rigorous and methodical clinical records enabled him to draw many accurate conclusions. Mackenzie's research made a particularly strong impact in three areas: the nature of referred pain, the distribution of *Herpes zoster*, and the workings of the heart. His research on the heart earned him the title as the first English speaking clinical cardiologist (8).

Through his experiences, Mackenzie believed that to fully understand the natural history of diseases, research must be carried out in the community general practice setting. He explains that: "One special function of a consultant is to foretell, what is going to happen to a patient if treated, or if left untreated. To obtain this knowledge it is necessary to see patients through the various stages of disease, and this can only be done by the individual who has the opportunity" (1). Mackenzie was dedicated to his belief to observe a disease as it is lived by the patient. He pioneered to carry out his endless hours of research alongside his busy practice. He was indeed a role model leading the way as a general practitioner who also functioned as an investigator. Mackenzie further justifies his desire to do research by explaining that: "… whole fields essential to the progress of medicine will remain unexplored, until the general practitioner takes his place as an investigator. The reason for this is that he has opportunities which no other worker possesses – opportunities which are necessary to the solution of problems essential to the advance of medicine" (1). This belief motivated Mackenzie's pursuit to establish the Institute for Clinical Research at St. Andrews University following World War I. He used this facility to provide research opportunities to young physicians promoting their investigative careers.

James Mackenzie's greatest interests lay in the study of the heart. Up until Mackenzie's work in the nineteenth century, the specialty of cardiology had not yet been born. Numerous important undertakings in the field of medicine set the stage for Mackenzie's accomplishments. Particularly in regards to research of the heart, William Harvey had described circulation in the

early seventeenth century. By 1706 the structure of the heart's chambers and the blood vessels had been elucidated by the French anatomist Raymond de Vieussens. Also French, Rene Laennec invented the stethoscope and auscultation in 1816, revolutionizing the ability for physicians to understand the origin of the pulse (7). It was during the nineteenth century, that the study of the arterial and venous pulses, cardiac failure and arrythmias truly began. Descriptions of the pulse and its irregularities in relation to the heart were the subject of much confusion. While many researchers at the time speculated to explain heart disease, James Hope is credited as the first to interpret the heart sounds and analyze heart disease (7). James Mackenzie followed Hope, and is credited as the physician who clarified much of the confusion and truly pioneered in deciphering normal and abnormal cardiac rhythms through analysis of the pulse (4).

Mackenzie's ability to accurately study afflictions of the heart was due not only to his polished clinical observation skills, but also to his development of instruments for recording the pulse. Mackenzie constructed an efficient model of an existing machine used to record the pulse. Mackenzie called his easily portable apparatus the "Clinical Polygraph." The polygraph soon became known around the world as "Mackenzie's Ink Polygraph" and it became an invaluable tool for not only Mackenzie, but for physicians in all countries (9). It was through the culmination of his clinical observations coupled with his many pulse tracings that Mackenzie was able to accurately describe various waveforms and cardiac arrythmias. Many of his observations were later proven with Willem Einthoven's development of the electrocardiograph (ECG). Indeed, Mackenzie has been described as having prepared the world of clinical cardiology for the era of the ECG (1).

Following Mackenzie's remarkable twenty-eight years in Burnley, he moved to London in 1907 and became a lecturer on cardiac research at the London Hospital. As a general practitioner coming form a small town, it was a challenge for him to find his place in London. He proved himself to be a talented clinical cardiologist and eventually established himself as head of the cardiac department of the leading teaching hospital in London. At this point, due to his numerous important accomplishments, Mackenzie was establishing himself as the Father of Cardiology. It was during this time that he was elected to the Association of Physicians of Great Britain and Ireland that was formed by William Osler in 1907, and Mackenzie was invited to open the discussion of the heart. With the onset of World War I and large numbers of soldiers presenting with disorders of the heart, Mackenzie's interests in the heart stimulated the development of the British Military Heart Hospital. Mackenzie worked at this initiative alongside William Osler, Clifford Allbutt and Thomas Lewis, other prominent physicians of the time. Mackenzie's accomplishments also earned him a knighthood in1915, which was a rare and extraordinary distinction for a physician (8).

As a pioneer in recording and analyzing pulse waveforms and describing cardiac rhythm disturbances, Mackenzie published numerous works describing his research. One of his most famous works that was used in many medical schools during the twentieth century is *Diseases of the Heart* published in 1908. Mackenzie also described numerous accounts of angina and myocardial infarction from patients seen in his practice that he documented in *Angina Pectoris* published in 1923 (2). In order to acknowledge Mackenzie and his many contributions to the art and science of medical practice, he is currently honored by the Annual James Mackenzie Lecture for the Royal College of General Practitioners.

Sir James Mackenzie, driven by his desire to better treat his patients, became one of the greatest pioneers of clinical cardiology. His development of the ink polygraph enabled him to be among the first to systematically use graphic methods for investigating the waveforms of the pulse. These investigations were used to identify common and life-threatening cardiac rhythm disturbances. He gained world acclaim for his insightful research and extensive publications on diseases of the heart. Alongside all of his extraordinary contributions to the study of the heart, Mackenzie remained a master in the art of clinical observation and in using his community as his laboratory. He was most respected for his caring and dedicated general practice, devoted the welfare and comfort of his patients. Sir James Mackenzie was indeed a physician of true heart.

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MILDRED VERA PETERS: A PIONEERING CANADIAN RADIOTHERAPIST

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ABSTRACT

Mildred Vera Peters (1911-1993), a Toronto-trained physician, challenged several key assumptions of cancer therapeutics. Her forward-thinking approach to medicine was distinctly evidence-based and patient-centered, even long before these concepts entered the mainstream. Through careful and exhaustive clinical studies, she demonstrated that Hodgkin's disease – previously thought to be uniformly fatal – was curable. Her findings were initially resisted in the medical community; however, she persevered, and nearly a decade later, her results were confirmed by others and completely validated. Later, she discovered that radical mastectomy for early breast cancer (the prior standard therapy) was no more effective than lumpectomy, followed by local radiation (a far less disfiguring procedure). Again, her findings challenged established notions in cancer therapy, and once again, were initially resisted although later verified. Peters' willingness to challenge established norms extended into her approach to the individual patient. Despite the prevailing attitude of medical paternalism, Peters argued that doctors and patients should engage in a therapeutic partnership founded upon equality. She believed firmly in the rights of patients to know about their disease, and most importantly, to exercise control over clinical decisions affecting them. Peters became famous for her interest in the emotional well-being of her patients and was among the first radiation oncologists to practice what is now called "psychosocial oncology." In her own lifetime, her contributions to medicine brought her international recognition, and numerous awards. A world-class researcher, a passionate clinician and a fundamentally kind human being, she will undoubtedly be remembered as a pioneering figure in radiation oncology.

Historically, the treatment of cancer has always been highly contentious. Its severe and progressive nature, combined with our often-limited understanding of its etiology and course, have resulted in much uncertainty about the disease. In this climate of uncertainty, numerous treatments were championed – even within the medical establishment – despite the fact that evidence of efficacy was lacking. By the 1950s, some notions about cancer and its treatment had become entrenched in a common wisdom, which was seldom challenged. Moreover, personal and emotional factors relevant to the individual patient were often overlooked, and paternalistic attitudes continued to prevail among many clinicians. Deeply cognizant of the impact of cancer and its therapy upon the psychosocial well being of patients, radiotherapist Vera Peters had little regard for dogma or medical paternalism. Backed by meticulous research, Peters challenged

several key assumptions of cancer therapeutics, and despite significant resistance, changed the practice of medicine. Her pioneering approach to the treatment of cancer, distinctly evidence-based and patient-centered, received international attention. Her contributions to the field of oncology continue to impact upon the practice of medicine today.

Born on 28 April 1911 in Rexdale (now part of metropolitan Toronto) Mildred Vera Peters was the daughter of Rebecca Mair, a teacher, and Charles Peters, a farmer (Shorter 1995). Completing her early education in the one room Highfield Public School, she entered the University of Toronto in 1929. Too young to enter medicine, she studied mathematics and physics but managed to transfer into medicine and graduated MD in 1934. After spending two years as a surgical resident at St. Johns Hospital, she met Dr. Gordon Richards who was treating her mother for breast cancer using a 'radium jacket' that he had designed. A renowned North American figure in radiation oncology and director of Radiology at the Toronto General Hospital (TGH), Richards had an enormous influence on Peters and is credited with stimulating her early interest in Hodgkin's disease and breast cancer for which she would later become famous.

As there was no formal certification at the time in radiotherapy, Peters began an apprenticeship with Richards in radiation oncology. Richards became her mentor and as Fitzpatrick (1993) writes in Peters' obituary, she, "credits this pioneer oncologist for stimulating her interest in clinical observation, the importance of accuracy and the subsequent review of the medical record." In her own words, it was Richards who inspired her, "to undertake laborious chart reviews in areas fraught with confusion, always attempting to assess the effectiveness of treatment methods and reasons for failure" (Peters 1979). By 1937 she was appointed junior assistant radiotherapist at TGH and in 1945, was granted Royal College certification in Radiation Therapy (on the basis of her prior apprenticeship). In 1958 she and the other members of the Ontario Cancer Institute moved to the Princess Margaret Hospital, where she remained until her retirement in 1976. During her academic career, she became Senior Radiotherapist and Associate Professor in the Faculty of Medicine.

In 1947, Peters' interest in Hodgkin's disease was "piqued" by a conversation with Richards. Peters referred to the "then prevailing medical mood of despair," a sentiment echoed by the renowned Radiotherapist Sir David Smithers who remarked that near the beginning of his career (in the 1930s and 40s), the disease was thought to be "invariably fatal; though remissions in its course were known, its progress was inexorable" (Smithers 1973). Peters wrote: "[Richards] had begun to sincerely doubt the incurability of the disease – some patients followed more than 10 years seemed to manifest cure," after, "aggressive palliation." Richards' protocol included "local radiation until the mass disappeared" or maximal tissue tolerance had been reached, as well as treatment of uninvolved lymphatic chains. This latter procedure was borrowed from radiotherapist René Gilbert of Geneva. (Peters (a)).

Although Gilbert was the first to report durable responses to radiation therapy in Hodgkin's disease, the protocol he used and his lower-powered apparatus (250 kV in contrast to Richards' 400 kV sources) were insufficient to effect cures. In 1950, the year of Richards' death from leukemia (likely radiation-induced), Peters published her classic paper describing the retrospective analysis of all 257 of Richards' Hodgkin's disease patients (an analysis which she later described as, "a monumental task"). Among these patients, treated from 1924-42, Peters

reported five- and ten- year survival rates of approximately 50% and 35% respectively, the highest rates ever reported. Significantly, she conclusively demonstrated, for the first time, that the disease could be cured. In her 1950 study, nearly 25% of patients with this supposedly fatal disease were cured (Peters 1950)

Peters' challenge to the well-entrenched attitude of pessimism was not immediately accepted. "It took them 10 years to believe that my survey was correct… that it [Hodgkin's disease] was curable with radiation alone," she once said (Toronto Star 1993). However, Peters braved the adversity of her colleagues, continuing to write and speak on the subject of Hodgkin's disease with "clarity and persistence," until, by degree, her work came to be accepted. Finally, in 1963, all doubts were cast aside by Eric Easson and Marion Russel (1963) of Manchester who confirmed a lasting cure in a subset of patients. Their figures suggested that a cure might be obtained in as many as 40% of those treated with radiation (Easson and Russel 1968).

Apart from the fact that she "alerted the rest of the world" to the fact the Hodgkin's disease could be successfully treated, Henry Kaplan, professor of Radiology at Stanford university and a respected specialist in the disease credits Peters with introducing the first meaningful staging system for the disease. She carefully documented her method of staging and treating the disease (treatment was dependent upon stage). Her staging system was soon adopted internationally, and remains the basis for the current system of staging, upon which clinical treatment decisions are made (Sutcliffe 1993). Kaplan remarked that by 1960 Peters was achieving the "best results in the world" in the treatment of Hodgkin's disease (Kaplan 1976). As Smithers (1973) concludes, Peters "proceeded with system and sense to develop a planned therapeutic attack on this disease process… She showed us the importance to prognosis both of the anatomical extent of the disease and of its constitutional symptoms."

Peters intense desire to improve the practice of medicine, and her willingness to systematically test entrenched dogma eventually led her to the highly controversial subject of the treatment of breast cancer. Peters' mother died of breast cancer, and Peters had a long-standing and early interest in the disease. Revealingly, in her personal notes, she writes, "of all ails in women – cancer of the breast [is] most feared." Peters' interest in breast cancer was broad in scope and spanned preoperative radiation therapy (Ash *et al* 1953; Peters 1953); the effects of pregnancy and lactation; and, the conservative management of the disease (Peters 1962, 1963). It was this latter interest which was to have far-reaching implications for the treatment of breast cancer.

When Peters arrived at TGH in 1935, most breast cancer patients were treated with radical mastectomies, as was the case around the world. In 1944, Peters published her first paper on the subject of breast cancer, examining radiation therapy in the treatment of the disease (Peters 1944). With her assistance, Richards (1948) published a paper which began to establish the roles of radiation and surgery, but did not question the need for radical surgery. However, over time, Peters and some of her colleagues began to suspect that radical mastectomy was not always needed. She was also acutely aware of the fear of disfigurement and resultant loss of self-esteem suffered by women who underwent radical mastectomy. As a supporter of conservative management, Peters was frequently referred patients who refused radical mastectomy. As her daughter Jenny Ingram later told historian Edward Shorter, "She acquired these patients without

a planned arrangement. The surgeons would know there was a female radiotherapist who would take these patients off them. Here's somebody who will understand your point of view, because she's female" (Shorter 1995). Such patients she usually treated with lumpectomy followed by local radiation, a highly controversial way to manage these patients.

Between 1935 and 1960 Peters was involved in the treatment of hundreds women with breast cancer. In her own words, she "observed over those years, the patients who refused to have a mastectomy and just had the lump removed." Convinced that these patients were doing well, she began an enormous retrospective study with age- and disease- matched controls, of all of her breast cancer patients to 1960. She compared those who underwent radical mastectomy with comparable patients who instead underwent lumpectomy and radiation therapy. She discovered that "these people [lumpectomy patients] survived 5, 10, 15 and 20 years or longer… The patients who did not want to have a mastectomy were doing equally as well as those who had it. Some people [with lumpectomy] survived the entire 30-year duration of the study" (Peters (c)).

Convinced of the validity of her findings, Peters once again did not hesitate to challenge established notions in cancer treatment. The day before she presented these results to the Royal College of Physicians and Surgeons of Canada, her colleague C. L. Ash (1975) mused: "Could it be, sir, that her presentation tomorrow on the highly controversial subject of breast cancer will find her again, a voice crying in the wilderness, as was the case in her initial publication on Hodgkin's disease?" As expected, her presentation of this research (Peters 1975) attracted considerable attention and initial skepticism. As Peters remarked, "surgery was cancer's catholicon for centuries; surgeons are loath to relinquish this role of mankind's savior! …a comment on the nature of human adherence to the comfort of established ways and attitudes." (Peters (d)). Nearly 30 years later, Fitzpatrick (1993) observed of her research that, "although heavily criticized at the time, it led to the conservative and now standard practice of minimal breast surgery with radiotherapy for the initial treatment of early breast cancer."

But although her fearless, rigorously scientific and evidence-based approach to medicine made her a world-renowned clinical cancer researcher, her approach to the individual patient was equally admirable and perhaps even more visionary. Peters was genuinely concerned for her patients. Her cognizance of the emotional impact of cancer on the individual is illustrated by her description of a new cancer patient as, "outraged at the frailty of their body, disgusted by the disease, and frightened by their lack of knowledge – with fear the dominant emotion" (Peters 1977). She notes that the, "first and most important responsibility [of physicians] is to acquire patients' trust by listening to patients and enquiring about: other possible problems (medical or social); family or occupational responsibilities; exposure to emotional strife; [and] major fears… [the] patient needs to feel that you are interested in her as a total person…" (Peters (b)). Undoubtedly, what is now termed "psychosocial oncology" was an inextricable part of her daily practice for over 40 years (Fitzpatrick 1993).

She believed firmly in the rights of patients to know about their disease and to understand its treatment. In an address to medical students and residents, Peters implored them to, "accept social responsibility [and]… discard this robe of ridiculous mystery." "We must recognize a patient's need and right to an honest answer. If you don't know, say so," she told them and,

"heed your patient – it's often the best advice you'll get…the alert communicative patient can teach much to the alert receptive physician" (Hollobon 1976). Widely appreciated by clinicians today, Peters recognized that, "the unhappiest patients are those that have been unable to extract information from attending doctors. Information, properly, simply presented, fully understood, can bear profoundly on the patients' psychological ability to cope well" (Peters (d)).

In the case of breast cancer, Peters noted that "the fear of the disease is so closely related to the fear of treatment, they cannot be separated." She accepted her patients' fears, patiently answered their questions, and above all, involved them in their own care. "Patients are always pleased that they have an important role in fighting their own disease," she said. She constantly emphasized these points in speeches to colleagues and lectures to training physicians. To patients she said: "if you cannot communicate or get satisfaction from your doctor, get another consultation. It is your life at stake – not the doctor's… If the operation has been booked, it can be cancelled or postponed" (Peters (a)).

It is important to realize that in her approach to the patient with cancer, Peters once again found herself a "lone voice." In a 1961 survey of 219 physicians, over 90% responded that they would not disclose a diagnosis of cancer to a patient. This prevailing climate of medical paternalism had persisted for decades, and it was only by 1979 that the figures would reverse themselves (Hebert 1996; Oken 1961). Despite the prevailing views, Peters argued that patients should not be rushed into major treatment; rather, that they should be given time to ask questions, to adequately reconcile themselves to the disease, and most importantly, to build trust with their doctor (Peters 1977).

Peters believed that physicians treating cancer (particularly breast cancer) need a system of guiding principles – a treatment philosophy (Peters 1979). This philosophy, she argued, ought to be based not only in the clinical and scientific progress being made in the treatment of the disease, but also in what is learned by the physician through his or her communication with the patient. Communication, in turn, includes not only expressed wishes, but also the subtle reactions of the patient observed by the empathic physician. Peters' regarded the doctor-patient relationship as a therapeutic partnership, formed between equal parties, "one no more important than the other." She urged doctors to reevaluate their relationship with patients, reminding them that "a patient is someone's child, someone's friend, wife or husband… perhaps a parent. A physician is also all these things." "We must put more into compassionate communication," she said, "and less into professional prestige" (Peters (d)).

Peters' concern for her patients and her interest in their emotional well-being became legendary, and was well appreciated. Reflecting some 20 years later on her diagnosis of Hodgkin's disease in 1973, one patient remarked: "Back then, people weren't comfortable talking about cancer, but Dr. Peters had a special way of making you feel calm and at ease and that you were the only one she was ever going to treat. I've been rediagnosed with Hodgkin's disease three times, and each time she was a positive influence in my life" (Toronto Star 1993).

From the detailed psychosocial histories taken of her breast cancer patients, Peters became interested in the importance of powerful psychological events upon the development of cancer. In a speech to the College of Family Physicians of Canada, Peters reported that several of her

patients had suffered emotional upheaval around the time that the cancer could have been predicted to have developed. She was one of the first to explore the role of stress upon the immune system and the subsequent development of cancer (Peters (e)).

Peters' contributions to medicine brought her wide recognition, locally and internationally. She was first author in the majority of the over 40 peer-reviewed publications listed on her CV, a number of which garnered attention in local newspapers. She delivered over 130 invitational lectures and training seminars during her career, including the prestigious 1968 Gordon Richards Memorial Lecture of the Canadian Association of Radiologists and the 1975 Royal College Lecture.

In 1975, she was made a member of the Order of Canada and in 1978 elevated to the rank of Officer. She received numerous other honors including an honorary Doctor of Laws from Queen's University in Kingston and an honorary D.Sc. from York University in Toronto. She was the first recipient of the RM Taylor medal of the National Cancer Institute of Canada and the Canadian Cancer Society and recipient of the Canadian Women's Breast Cancer Foundation's Professional Woman of Distinction Award. In 1979, Peters became the first North American and the first woman ever to win the medal of the Centre Antoine Béclère in Paris, the highest honor of the Royal Society of France. That year, she was also awarded the Gold Medal of the American Society of Therapeutic Radiologists, the highest honor possible for North American radiation oncologists. When Harold Johns (1980) and Bill Ryder (1986) were similarly honored, Toronto's Princess Margaret Hospital became the only institute ever to win three of these awards. Peters also served as consultant to the Illinois Cancer Control Program and member of the Medical Advisory Board of the Medical Post. (Peters (f); Shorter 1995).

Despite all of this success in her professional life, Peters was able to maintain a balanced personal life. In 1937 she married Ken Lobb whom she met during a summer job waiting tables on the Lake Ontario tourist ship, the SS Kingston. She loved to cottage in Sundridge, enjoyed traveling and was an avid bridge player (Fitzpatrick 1993). She and Lobb had two daughters, Sandy (later Sandy Clark) and Jenny (later Jenny Ingram). Ingram, also a physician, observed that as one of the first highly successful female-physicians, during the 1950s Peters was charting, "completely unwritten territory…integrating family life with professional life." "Mrs. Lobb," at home, Peters strove to play an integral role in raising her family while maintaining a full-time clinical practice – and an extensive research program – at a time when most women chose between family and career. Peters was mindful of the career and education gap between herself and her husband, a high school gym teacher and later vice-principal. Ingram says that her mother strove to be "feminine and supportive" at home while, "the Dr. Peters character happened when she got into her car and arrived at the doors of the hospital." In the eyes of her daughter, she was so successful in balancing her roles as mother and physician that when Ingram herself attended medical school, she brought her female student friends home to meet her mother. "Here was a regular family [that] had dinner…Here was a brilliant woman who was fun to be with…It's possible" (Shorter 1995).

Although she retired in 1976, Peters continued to consult in private practice for several years. She also continued to respond to the frequent requests for information and advice from colleagues around the world. After a battle with breast cancer, on 1 October 1993, Peters passed

away at the Princess Margaret Hospital in Toronto, the same hospital at which she had worked for most of her career. In her, Canada lost a world-class researcher, a passionate clinician and a fundamentally kind human being. Although she will undoubtedly be remembered as a pioneering figure in radiation oncology, the sentiments of her colleague, P.J. Fitzpatrick, will resonate with those whose lives were touched by her: "Vera was always very much a friend as well as a physician to her patients and a very special friend to her colleagues" (Fitzpatrick 1993).

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DR. MARY PERCY JACKSON: MEDICINE ON THE ALBERTA FRONTIER

By

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ABSTRACT

Dr. Mary Percy graduated from the Medical program at Birmingham University in 1927. Dr. Percy left her well-to-do Birmingham family in June 1929 to pursue an adventurous career in medicine in the Peace River Region of Northern Alberta. She was initially attracted to Alberta by an advertisement for "new women" who could ride horses and who had post-medical training in midwifery in the British Medical Journal in February 1929. Shortly after arriving Mary was assigned a ninehundred square kilometer district in the Battle River Prairie Region, where she lived alone in a one-room house.

I will talk about the challenges Dr. Mary Percy faced in her medical practice, which were many, but the distance that had to be covered was the most significant. There were no roads, and during the long winter months the trails were impassable to automobiles had they been available. Most of her travelling was done on horseback, but she often found herself in sleds, behind tractors and in boats. Trips of twenty to sixty miles were common, and in freezing conditions frostbite was a certainty. Dr. Mary's practice consisted mainly of midwifery, dentistry, many accident injuries, frostbite, and infectious diseases. She treated the settlers, many of whom were immigrants and spoke no English, as well as the Metis and Native people of the area. Tuberculosis was a significant problem among the Native population, and very high infant and maternal death rates (three times the British rate of the same time period) were alarming.

This amazing career of a pioneering physician did not go unnoticed in Alberta as Dr. Jackson received many awards over the course of her career. Her commitment to the people of Northern Alberta was a life-long one, and the many tales from her experiences are inspirational for anyone in the medical field.

Rural medicine today is facing many challenges in Alberta and across Canada. There is a shortage of physicians, an inability to attract physicians to rural areas, and many barriers to access and resources, but these are definitely not new problems. In fact it was these very issues that the Alberta government faced in the 1920's that led to the recruitment of foreign doctors to the Alberta frontier. Dr. Mary Percy Jackson was one such doctor who found herself dealing with the challenges in northern Alberta in 1929. Dr. Jackson's stories and adventures were

beautifully captured in letters written home to her family in England, and it is these letters that provided the inspiration for this topic.

In order to understand the magnitude of the challenges Dr. Jackson faced, we must first understand how she came to practice medicine in northern Alberta from her comfortable upbringing in Birmingham, England. Mary Percy was born in 1904 to a schoolteacher and the director of a woolen manufacturing company.[2] Her father was adament that his daughters receive the same level of education as his sons, so they were home-schooled by their mother. As a child Mary was bright and articulate and her father believed that a career in law would suit her spirit, but unfortunately law was still closed to women at that time. Medicine was not. Mary Percy decided at age ten that she wanted to be a doctor, and that is exactly what she did.

Dr. Jackson graduated from Medicine at Birmingham University in 1927. She was awarded the Queen's Prize for best all around student, to which she credits all those early mornings of studying while the men where hunting.[1] Upon finishing internships in Obstetrics, Anesthetics, and as House Surgeon, Dr. Jackson desired a posting at the Women's Hospital in Calcutta. India's infant and maternal mortality rates were extremely high as culture dictated that male physicians could not touch female patients. Dr. Jackson therefore felt that she could gain tremendous experience in Obstetrics in Calcutta. Unfortunately this posting was only made every three years, so Dr. Jackson required a position for the interim year. It was an ad in the British Medical Journal that brought her attention to the need for physicians in northern Alberta:

> "Strong energetic medical women with post-graduate experience in midwifery, wanted for country work in western Canada under the Provincial Government of Health."[1]

Dr. Jackson was informed that a physician was required who could handle emergencies without help, and that the ability to ride a horse would be an advantage. These requirements appealed to her adventurous side, while the high infant and maternal mortality rates on the frontier would give her the opportunity to gain the experience in obstetrics for which she was looking.

Conditions on the Alberta Frontier at that time were very difficult. There were alarmingly high infant and maternal mortality rates due to the lack of health care in the newly settled areas. This was a great concern to the Alberta government because they were relying on settlers to repopulate a post-war and post-flu nation.[2] This problem was compounded by the practice of "boosterism" by the Alberta government; propaganda with the intent to attract settlers. The government was promising free land, plentiful water, good transportation, and a temperate climate which was attracting even more settlers to an area that was incapable of servicing a larger population.[2] The Alberta Government had to find a way to recruit doctors to frontier areas, as their own would just not go. The government had had luck with British women doctors previously, so this prompted an ad in the British Medical Journal. The thought at the time was that foreign women doctors would work for less money than men, have the ability to cook and clean for themselves, and also do the work of nurses.[1] Dr. Jackson expressed this best when she said later in life:

> "Canadian men doctors of either sex would just not go. The only reasons Canadian men doctors are found in the wilds are drink, dope, or incompetence-with of course a few brilliant exceptions like Dr. Sutherland in Peace River. Hence the English women they sent for."[1]

Shortly after arriving in Alberta Dr. Jackson received word of a permanent posting for her year in Canada. She was to be responsible for Battle River Prairie. This was located approximately 450 kilometers northwest of Edmonton, and covered over 900 square kilometers. Dr. Jackson was to order whatever medical equipment and supplies she felt would be necessary. All in all she ordered 22 boxes of supplies, which were loaded with her personal belongings on a steamboat to make the 100-mile trip to Peace River. At Peace River they were again loaded on a horse-driven wagon for the final 30-mile trip to Battle River. It was during that final 30 miles that Dr. Jackson experienced her first real adventure. Shortly after beginning her journey the wagon got stuck on a hill. Dr. Jackson had to help unload the 29 boxes (weighing over 1000 pounds) and carry them up a tremendous hill, while wearing her sensible English frock and shoes. She describes that experience in her biography, "I can still feel the weight of that luggage. And it was 95 degrees in the shade. Besides there were mosquitoes by the millions."[1]

That thirty-mile trip took just over 11 hours, and upon arriving at her new home, she found it was nothing more than a sparsely furnished 280 square foot shack.[2] It was filthy and had gaps in the floorboards. This was all quite a shock to a woman who grew up without learning to cook or clean, because it was thought a career in medicine would always provide her with domestic help. Her first order of business was to have cupboards built for her supplies, and a bed that flipped down from the wall so she wouldn't have to examine patients on her own bed.[1]

Battle River Prairie, Dr. Jackson's district, had no roads, no railways, no telegraph and three rivers with no bridges. Her shack was on what was called the main roadway, but Dr. Jackson remarked that "if you had not known it was the main roadway, you might have missed it and walked straight across it without noticing".[1] She realized shortly after arriving that her biggest challenge was going to be covering the huge amount of territory for which she was responsible.

Practicing medicine on the Frontier was challenging at its best, and near impossible at its worst. The tremendous amount of territory was covered by any means possible, but more often than not it was covered by horseback. When a horse was not available, or her horse was too tired from days of riding, many other means were employed. She traveled by caboose (a small cabin mounted on runners, equipped with benches and a stove, driven by horse), by open sleigh, by automobile, and even behind a tractor. Each season presented it's own challenge. Spring was incredibly muddy and wet, winter was bitterly cold and snowy, while the summer could be very hot and dry. There are countless stories of Dr. Jackson getting lost, getting frostbite, being stuck, and even one account of a near drowning while crossing a river. During the winter Dr. Jackson learned to get up every four hours to stoke the fire or else everything in her shack would freeze, which was inevitable on nights she had to spend at patient's homes.[2]

The closest hospital was 160 kilometers away in Peace River, and its facilities were limited. There was no laboratory, and a wood-burning stove served as the furnace, the cook's

stove, and as the equipment sterilizer.[1] In one account Dr. Jackson transported a desperately ill man (heart failure) via open sleigh in the middle of winter to the hospital. After the long and cold trip they arrived only to find the hospital closed due to scarlet fever, one doctor away with severe burns from a gas explosion, and the other doctor in Edmonton with blood poisoning from a septic arm.[2] Doctor and patient then had to turn around and make the long cold trip home. Dr. Jackson said about that patient, "after over 200 miles in an open sleigh he should have died, but of course he didn't".[2] This was a testament to how strong the settlers were at that time.

Dr. Jackson encountered many different medical conditions in her practice, but she mainly dealt with midwifery, accidents, infectious disease, and an incredible amount of dentistry. Midwifery was a challenge because of the unsanitary conditions, but also because the Eastern European women were not used to calling on a doctor for childbirth. As a result Dr. Jackson was often summoned when the patient had been in labour for three or four days. The very large Native and Metis populations also had specific health challenges such as Tuberculosis. The native population regarded tuberculosis as inevitably fatal; therefore help was not sought out until someone was coughing up blood for weeks or months. Dr. Jackson felt that had she got to them earlier she could have helped many more patients.[2]

Dr. Jackson worked without the benefit of radiographs and antibiotics, but despite all this she felt that people were very healthy and strong. One great example of this is the case of a woman who had been gored by a cow. The cow's horn had penetrated under the woman's breast and lifted it from the chest wall. Dr. Jackson repaired the wound surgically while the woman was anaesthetized with chloroform. When the patient recovered from the anesthetic, she got up and insisted on serving the doctor tea and scones before she left for the journey home.[2]

Dr. Jackson was not told what she would be paid before coming to Canada, but found upon arriving that she was to charge her patients a fee established by the government. Because Dr. Jackson's territory was populated entirely by new settlers, there was precious little land to spare after crops and feed for the animals, so money and food were hard to come by. More often than not, the patient could not afford to pay Dr. Jackson and would offer food instead. This form of payment was accepted happily by the doctor, as she had no access to fresh food of any kind, and found cooking to be very challenging. When the patient had no food to spare, as was often the case, they could offer only their thanks.[1]

Dr. Jackson not only survived her year posting in Battle Prairie River, but she thrived in that environment. At one point she wrote home that had they offered her 1000 dollars she would not have gone back to England.[2] Near the end of her year posting, Dr Jackson met and married a man from even farther north in Keg River. She followed him north and took on the role of physician to the Keg River district, which was even more isolated with a much larger native population. As a married woman she was not expected to work, and the government took advantage of the fact that she was "stuck" in Keg River by refusing to pay her.[1] Her practice was paid for out of farm earnings, gifts, and inheritances. Dr. Jackson and her husband even built a small hospital in 1937 where she could see patients, as it was now inappropriate to see patients in the family home.[1] Is was in Keg River that Dr. Jackson spent the rest of her life, even after her husband passed away.

Dr. Jackson is remembered as a generous, tireless, and compassionate physician, who gave selflessly to her community and to the profession. Her work was exceptional despite the difficult conditions, and for this she was considered an exceptional diagnostician. She received many awards throughout her lifetime, but it was evident that the practice of medicine was her passion, with or without recognition or monetary success. Her adventurous and generous spirit remains with us through her stories and her legacy.

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AMPUTATIONS, ANESTHETICS, AND ARGUMENTS: MEDICINE IN THE AMERICAN CIVIL WAR

By

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ABSTRACT

Untrained surgeons with ulterior motives, nurses who refused to listen to authority, and soldiers lying wounded on the battlefield for days, all contributed to the chaos and horror of the American Civil War.

Infection was rife, pus still "laudable", and abdominal and chest wounds overwhelmingly fatal. Amputation was the main operation, and antisepsis was unheard of. Hundreds of thousands died, but only a third from battlefield injuries.

Controversy abounded as to whether anesthetics should be used and whether female nurses should be employed. Lessons learned in the Crimean War were all but ignored by both Union and Confederate armies.

Indeed, a Civil War soldier might have favored a quick death in battle to a surgeon's attention.

The American Civil War has been called "the first modern war". The soldiers were the first to fight under a unified command, the first to battle from trenches, and the first to use observation balloons, mines, submarines and iron clad ships. The weapons were very modern as well. Repeating arms which could fire several shots without reloading came in, and breech loading guns made an appearance. All of this contributed to the vast destruction. More than 600 000 men died in this war, which lasted from 1861-1865.

The Patient Experience

Evacuation

During the Crimean War, the French had developed very efficient ambulance services, but the armies of the American Civil War disregarded the lessons learned there. The large numbers of casualties sustained were unexpected, and initially, neither the Union Army nor the Confederates had organized methods of evacuating battlefields.

For example, during the second battle of Bull Run in August 1862 three thousand lay wounded for three days, and six hundred for more than a week. These soldiers often died not from their wounds, but from dehydration, or because they suffocated in their own vomit. It was

not until the Battle of Gettysburg in July of 1863 that the Union Army could remove the wounded from the battlefield at the end of each day.

A Harvard professor of medicine named Henry Bowditch was instrumental in the establishment of the Ambulance Corps Act of 1864. Bowditch's eldest son had died a pathetic death after lying on the battlefield for two days with an abdominal wound. When the horse drawn ambulance finally came, it carried with it no water, which was what most of the soldiers direly needed.

Sterility

Cross infection was not a concept that Civil War physicians were familiar with. A physical exam often consisted of probing the wound with dirty fingers, and bullets were pulled out with instruments that had not been sterilized or even washed. Water was at a premium, and there was usually a shortage of it for drinking, let alone washing wounds. Sponges were used to soak up blood, and the same sponge was used for several patients. The sponge only had to be wrung out before being applied to the next wound.

Stories abound about surgeons holding knives and other instruments in their mouths while they prepared patients. This kept the knife within easy reach, so that it could be used on a limb and placed back in the mouth while the physician finished tying off vessels and closing the skin. This way, the surgeon did not have to leave the patient's side to retrieve instruments.

Pus was considered "laudable", and wounds were often laid open for several days in an attempt to prevent infection. Apparently, no one cared about the sanitary reforms made by Florence Nightingale and others during the Crimean War on another continent.

Disease

Disease and infections were the greatest killers during the Civil War. On the Union Army side, for example, 110 100 soldiers were killed in action or mortally wounded. More than twice as many died of disease.

The most problematic infections were erysipelas, pyemia, hospital gangrene, and osteomyelitis. Tetanus, surprisingly, was not much of a problem. This can perhaps be attributed to the pristine battlefields that were very different from the manure-rich fields of the First World War.

Scurvy was a reality for both armies, but especially for the Confederates, particularly during the winter. A marching soldier's diet consisted of salted pork and hardened biscuits. Malaria was a problem, for obtaining sufficient quinine was difficult, although some controversy exists over whether the issue was truly supply or simply that the troops refused their daily dose. This problem was compounded in the South, where there was a longer warm season and a lot of water. While it was widely understood that smallpox could be prevented by vaccination and that spread of diarrhea could be reduced by careful handling of wastes, these diseases were not eliminated. In 1863, 995 of every 1000 Union soldiers contracted dysentery.

Procedures

A phenomenal number of amputations were performed. If a soldier was wounded in the head, abdomen or thorax, there was seldom anything that could be done. If, however, injuries were to a limb, it could be removed. Amputations were performed swiftly and efficiently, often with instruments that were little more than a carpenter's saw and a sharpened pen knife.

Lewis Stimson, a young medical recruit, reveals the story of Capain Graves, who was shot in the thigh at Gettysburg.

> He was taken to the field hospital, a [volunteer] surgeon came by, glanced at his wounds, and said 'Amputate!' While awaiting his turn, he saw a medical acquaintance passing and called to him, asking for at least an examination before condemnation. It proved to be simply a flesh wound and in a month he was back on duty.

The men were well aware of the likelihood of losing life or limb during the war.

An example of an evening's campfire musings follows:

> To amputate, or not to amputate? That is the question.
> Whether tis nobler in the mind to suffer the unsymmetry of one-armed men, and draw a pension
> Thereby, shuffling off a part of mortal coil.
> Or, trusting unhinged nature, take arms against a cruel surgeon's knife,
> And, by opposing rusty theories, risk a return to dust in the full shape of man.

Anesthesia

At the time of the American Civil War, the use of anesthetics was still very novel. A great deal of controversy existed over whether or not they should, in fact, be used during amputations and other surgical procedures. Samuel Gross, who wrote A Manual of Military Surgery in 1861 counseled surgeons against the use of anesthetics, claiming that they were unsafe and unnecessary. It was his opinion that patients experienced very little pain when having a limb amputated. Thankfully, others disagreed. Of 8900 recorded usages, there were only forty-three deaths. The relative safety was likely a product of the small dose required (amputations took very little time), and the fact that the agents used worked very quickly. The patient was given enough anesthetic to go limp and no more. Chloroform was preferred because ether, being extremely flammable, was dangerous.

Surgical Training

There were several botched procedures performed that did more harm than good during the war. This is not surprising given that most "surgeons" were completely untrained in surgery. They may have had nothing more to guide them than a hastily prepared manual.

Apparently many volunteer surgeons surfaced during the war. These were physicians looking to enhance their reputations and repertoires for when they returned to civil life. Some even refused to provide medical services other than amputations. Soldiers were quickly relieved of their limbs, whether they wanted to be or not.

Nursing

Before the war, the sick were usually cared for at home by female relatives. Doctors visited patients at their homes, as the hospitals were reserved for those who had no family members to care for them. During the Civil War, it was enlisted men, recovering from their own injuries and ailments who performed most nursing duties. Eventually, though, women's clubs and societies sprung up to provide over 2000 volunteer "hospital visitors".

Walter Atlee, a prominent Philadelphia physician admitted that Florence Nightingale had been a big help to the British army during the Crimean War. However, he had "serious objections" to the employment of female nurses for caring for soldiers in America. He thought that the women would faint at the sight of blood and gore, and also felt that young women should not be exposed to the naked male body.

Dorothea Dix, who pushed the Union to form the Official Women's Nursing Bureau, and was then in charge of hiring, rejected nurses who were too young or too attractive. Of the women who became Civil War nurses, many of them disdained military authority. One woman who was quite well known for her strong personality and distaste for doctors was Mary Bickerdyke. She would march into hospitals, pronounce them filthy, and start scrubbing everything – walls, beds, floors, and patients. She liked to give orders to anyone nearby, including the doctors. The nurses generally had the same complaints about the doctors they worked with: They were incompetent, indifferent, and in some cases, drunk.

After the war

The last surgical procedure of the war was performed in 1902, thirty-eight years after James Denn was struck in the hand by a minie ball. Over time, a cyst formed around the minie ball, and the ball could move freely within it. Denn used his hand to entertain visitors to the U.S. soldiers' home in Washington D.C.. He would shake his damaged hand near their ears, laughing at their amazement when it rattled. One day, however, he made the mistake of showing his hand to a radiologist who wanted it X-rayed immediately. The radiologist passed the X-ray on to a noted surgeon, who removed the minie ball later that same day.

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ANESTHESIA AND ACUTE RESPIRATORY DISTRESS SYNDROME IN MILITARY MEDICINE

By

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ABSTRACT

The provisions of medical and surgical support to campaigns of war has a rich and storied history. Its captivating tales of heroism offer intrigue to medical and non-medical people alike. The general appeal of medicine in the field has been proven through successes in literature, such as Hemmingway's *A Farewell to Arms*, television, in the popular series *MASH* and in motion pictures such as the screen adaptation of Ondaatje's *The English Patient.*

The subject holds special appeal for health care providers because of the depth of knowledge and practical skills developed during wars. As much as any other specialty, the roots of anesthesia are firmly planted in conflicts and wars of the past 150 years. During the post-treaty (June 15, 1846) resolution of the Mexican-American War, just months after Morton's successful public demonstration of ether anesthesia, it was attempted by surgeons on both sides of the conflict. Anesthesia developed rapidly, partly due to the desperate need for it in treating casualties of war.

Acute Respiratory Distress Syndrome (ARDS) represents a condition that has been almost exclusively characterized during war. One of the earliest detailed descriptions of this condition was published in 1915 by Sloggett, although he did not devise a formal name for the condition. Later, in the two Word Wars, the terms "shock lung" and "wet lung of trauma" were used to refer to the traumatic sequelae of wet, stiff, non-functioning lungs. In 1967, Ashbaugh and colleagues introduced the term ARDS to replace Da Nang Lung, the name that was popular during the Vietnam War. Great numbers of American soldiers died of ARDS in Vietnam as a complication of high-velocity missile injuries to the chest and resuscitation with crystalloid.

The provision of medical and surgical support to campaigns of war has a rich and storied history. Its captivating tales of heroism offer intrigue to medical and non-medical people alike. The general appeal of medicine in the field has been proven through successes in literature, such as Hemingway's *A Farewell to Arms*, television, in the popular series *MASH* and in motion pictures, such as the screen adaptation of Ondaatje's *The English Patient*.

This subject holds particular appeal for health care providers because of the depth of knowledge and practical skill developed during wars. As much as any other specialty, the roots of anesthesiology are firmly planted in conflicts and wars of the past 150 years. The earliest use of anesthesia in the field occurred just six brief months after William Morton's first successful demonstration of anesthesia, using diethyl ether, on October 16, 1846. As will become apparent later in this text, important advances in resuscitation and general trauma management, which also fall under the broad field of anesthesiology, have also been made during times of war. The developments made by military personnel that contributed to modern anesthesiology are among the few constructive outcomes of the tragic wars of the twentieth century and perhaps lend a degree of resolution to the otherwise pointless destruction, suffering and loss of life.

Unfortunately, prior developments do not always lead to successful implementation in the future. A prime example of this phenomenon is the disastrous experience with Acute Respiratory Distress Syndrome (ARDS) suffered by American soldiers in the Vietnam conflict. Despite a breadth of practical evidence garnered in the two world wars to support the use of colloid solutions for fluid resuscitation, the American military used large volumes of crystalloid solution (particularly Ringer's Lactate) to resuscitate casualties. This practice precipitated and exacerbated many cases of ARDS.

As it is a designation of considerable notoriety, controversy surrounds the first use of anesthesia under conditions of war. An American, Dr. John B. Porter, reported an administration to a soldier that required leg amputation following one of the border skirmishes that persisted following the termination of the Mexican-American War. (The war was terminated by a treaty on June 15, 1846, prior to Morton's first public use of anesthesia, but conflict at the front did not resolve immediately). Although the exact date of this trial was not documented, it was not reported until the summer of 1847. This would lend credence to the claim for Dr. Pedro Van der Linden, Chief Surgeon to the Mexican Army, as the first to practice anesthesia in the field. A daguerrotype taken at the battle of Cerro Gordo on April 18, 1847 shows him operating on a soldier who appears to be asleep. In subsequent wars of the nineteenth century, anesthesia continued to be used, although in a primitive manner that yielded, at best, equivocal results. Ether and chloroform, along with morphine, remained the principal agents at the anesthetists disposal until the First World War, when the use of nitrous oxide began to evolve. The Crimean War (1855-1857) saw the French achieve successful anesthesia in a reported 30,000 casualties using a mixture of ether and chloroform. The British, on the other hand, chose to use pure chloroform and experienced dismal results.

Between 1861 and 1865, the American Civil yielded enormous masses of casualties, with mortality exceeding 50% on both sides in some battles. As a result, anesthesia for those not so seriously wounded as to expire was practiced widely. The development of new vaporizing inhalers was a successful practice. Premedication with alcohol, however was not so helpful. It tended to cause regurgitation and aspiration once anesthesia was achieved. For Morton, the war offered an opportunity to witness his great discovery come to fruition. He personally attended to many of the wounded and was lauded for his contribution: "...he has done more for the soldier than anyone else, soldier or civilian, for he has taught you all to banish pain." (Grande)

Anecdotes regarding military use of anesthesia during its period of infancy abound. During the Zulu Wars (1878), Zulu warriors struck fear into the British with the *assegai*, a spear that could be thrown or stabbed into enemy soldiers. In one case a soldier whose profunda femoris was punctured by an *assegai* was anesthetized with chloroform. This allowed the wound to be opened and the artery to be located and tied off, preventing imminent exsanguination. In the 1885 uprising in the Sudan, a case was reported in which a camel bite became seriously infected. It ultimately required surgical debridement which was greatly facilitated by chloroform anesthesia. Finally, during the Boer War, physicians mounted horseback to reach the front and carried bottles of chloroform in their saddlebags.

Several developments were made in anesthesia during World War I to cope with the enormous numbers of casualties. Morphine remained the best choice for analgesia, although administration via the intramuscular route was found to be more effective than the sublingual route which was used before syringes became widely available. Fluid resuscitation improved dramatically during the First World War. Gum acacia (6% in saline) was used for its osmotic properties that tend to maintain fluid in the intravascular space rather than allowing it to escapes into the tissues. Moreover, owing to work done by Landsteiner on blood typing and Hustin on anticoagulation, blood transfusion was achievable for the first time. Finally, World War I heralded the use of balanced anesthesia using combinations of agents from different classes to maximize the benefits of each. An example of this approach would be the simultaneous use of morphine for generalized analgesia, nitrous oxide to induce loss of consciousness and a muscle relaxant to facilitate surgery on a particular area.

Between the world wars, advances in anesthesia equipped medical personnel with a new anesthetic arsenal. Barbiturates and trichloroethylene became popular, with the latter beginning to replace chloroform. A great deal of technical sophistication had also evolved, allowing anesthesia to be employed in previously impossible circumstances such as neurosurgery and cardiac surgery.

Henry Beecher was a significant contributor to military anesthesia during World War II. In his text *Resuscitation and Anesthesia for Wounded Men: The Management of traumatic Shock*, he rated ether, procaine hydrochloride and sodium pentothal as the most important agents for military anesthesia. In addition he recommended crystalloid solutions be used for dehydration only, not traumatic blood loss, and warned that "their use for blood volume replacement could be dangerous". (Grande) This admonition would prove tragically accurate in the Vietnam conflict.

The casualty load in Vietnam was among the most severe that had been seen to date. Medical personnel made liberal use of pentothal, succinylcholine, nitrous oxide and ether to anesthetize casualties before operating. In 1970, a new anesthestic drug, ketamine, was introduced. It was quite popular due to its effectiveness and intravenous administration but had one major drawback. Ketamine produces psychotic side effects which, coupled with the traumatic stress of war and the disturbing effects of malaria prophylaxis, were poorly tolerated by soldiers.

Casualties in Vietnam found themselves at particular risk for Acute Respiratory Distress Syndrome (ARDS). This condition is described as "acute hypoxemic respiratory failure due to

pulmonary edema" or more colloquially "thoroughly bruised, wet, stiff, nonfunctioning lungs". (Grande) Several conditions predisposed soldiers in Vietnam to develop this condition. ARDS is typically seen in the context of direct alveolar injury or airway contusion which could occur in penetrating missile wounds and blunt trauma respectively. In addition, toxic inhalation by napalm and other chemicals exacerbated the condition. Sepsis syndrome could also be implicated in the onset of ARDS and would have been present in many soldiers suffering from malaria and other tropical infections.

While all these conditions were more or less unavoidable in the context of war, a further factor magnified the problem of ARDS dramatically. Despite success in previous wars using colloid solutions such as gum acacia and dextran 70 for fluid resuscitation, American medical personnel used crystalloid solution (Ringer's Lactate) to replete blood lost to exsanguination. This decision was based on laboratory data generated by Shires who, ironically, refuted his own conclusions in 1990. The failure of the crystalloid solution to retain fluid in the intravascular space (as colloid solutions, by definition, achieve) resulted in large volumes of fluid accumulating in the lungs. This, according to Lyons, was the reason for the disastrous experience suffered by so many American soldiers in Vietnam.

In 1967, Ashbaugh and colleagues introduced the term ARDS to replace Da Nang Lung, the name that was popular during the Vietnam War. He was not, however, the first to recognize this clinical entity. In World War II, Brewer worked extensively to improve respiratory therapy for the condition that he called the "wet lung of trauma". An even earlier, detailed description of the condition was published in 1915 by Sloggett in a World War I military medical handbook. He did not, however, devise a formal name for the condition, referring to it merely as "shock lung". His description, nevertheless, was quite accurate, describing:

> "...edema of the lungs, with general asphyxia. Livid cyanosis with great dyspnea is the outstanding clinical feature... A yellow serous fluid fills the air passages in such quantities that it may drip from the mouth of the living patient when the stretcher is tilted head downwards. Death in this stage may occur at any time from the first to the fourth or fifth day." (Montgomery)

The development of anesthesia in military medicine began shortly after Morton's first public demonstration and continued throughout the wars of the twentieth century. World War II saw great advances in the field that were documented and analyzed by Beecher. Despite Beecher's recommendations regarding the use of crystalloid solutions, they were used in Vietnam for blood volume replacement and contributed to the loss of many casualties who succumbed to a peculiar, rapid failure of respiration.

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SMALLPOX IN THE AMERICAS: FROM IMPERIAL CONQUEST TO GERM WARFARE

By

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ABSTRACT

Epidemics have dismantled empires, defeated armies, and forever changed the way we live. Smallpox conquered the New World with such a force that the scars continue to linger on the face of Indian culture. Historians rate the invasion of the Americas as the greatest demographic disaster in the history of the world. The smallpox conquest eviscerated the New World in a manner that shattered cultures and humbled whole civilizations. Epidemics not only destroyed the Aztecs and the Incas but also forced Europeans to replace millions of dead Indians with millions of African slaves to keep the hemisphere's economy afloat.

The popular "Black Legend" of Spanish evil, based upon the butchering of Native Americans by over-zealous conquistadors, is inconsequential in comparison and largely records dramatic overkill. In fact, the rapid demise of the Amerindian population under Spanish rule panicked the newcomers who had expected to use native labor in their mines and plantations. There is evidence that Spaniards attempted to stem the tide of demographic collapse with public health laws requiring the presence of physicians and quarantine structures in each major settlement.

However, each European nation in America differed in their respective views of the Indians and the role that they were to assume in colonial society. Based upon a review of letters, journal entries, and charge logs, concrete evidence does exist that the practice of germ warfare by eighteenth century colonials was exercised against native peoples. In 1763, while Chief Pontiac and the Ottawa tribe lay siege to Fort Pitt, Lord Jeffrey Amherst, commanding general of British forces, Colonel Henry Bouquet, Captain Ecuyer, and Commander William Trent conspired to intentionally infect the tribe with smallpox via blankets, handkerchiefs, and linen. While the practical ramifications of this act are disputed, the historical significance of one of the first documented acts of directed biological warfare is staggering.

The Smallpox Virus

Smallpox has been labeled as "the most infectious human disease ever known" by scientists, physicians, and historians, all of who rejoiced when its worldwide eradication was proclaimed in 1977 (Smith 1987, 15). Medical research in the twentieth century demonstrated that the virus existed in two overall variants, variola major and variola minor. However, within this broad classification, ten variants of the virus have been identified which range from fulminating smallpox with 100 per cent mortality to non-eruptive smallpox with no mortality. The main sources of the viral infection were from a sufferer's respiratory tract, from the corpses of smallpox victims, from handling a sufferer's clothing or bedding, and by aerial spread. Once the virus had entered the body, the non-immune human host was infected and the incubation period had begun. The initial phase ranged from 10-14 days but was usually 12 days, during which the victim remained a passive (non-infectious) carrier. Thereafter, the patient was highly infectious and remained so until the final scab was removed or the corpse was destroyed (Smith 1987, 15).

Classically, the first signs of infection were a high temperature accompanied by a headache, general malaise, and occasional vomiting. A rash erupted a few days later starting with the face and spreading to the rest of the body. This in turn developed into pustules which, as they suppurated, gave off an offensive odour. The duration of the illness from the onset of fever until the last scab peeled off was about three weeks. Convalescence could be lengthy and facial disfigurement and scarring often severe, accompanied in a minority of cases by blindness in one or both eyes (Smith 1987, 16). Death from smallpox could be tranquil, resulting from sepsis, or traumatic, accompanied by massive hematemesis and/or hemoptysis.

Origins

Infectious diseases have ravaged humankind throughout our collective history. Early epidemics such as the plague of Athens in 430 B.C. and the plague of Galen in 164 A.D., contributed to the respective falls of the Athenian and Roman empires. The fall of Rome, perhaps one of the most studied events in history, was partially linked to the numerous plagues that struck during the final centuries of Roman dominance. The plague of Galen, named for the famous physician who not only ran from the disease but also described it, created the first holes in Roman defenses, allowing Germanic barbarians to invade northern Italy (Cartwright 1972, 13). Galen recorded the initial symptoms of high fever, inflammation of the mouth and throat, parching thirst, and diarrhea. Curiously, he described a skin eruption, appearing about the ninth day, sometimes dry and sometimes pustular. The disease originated among the troops of the co-emperor Lucius Verus on the eastern borders of the empire and was confined to the east from 164-166 A.D. It caused mass casualties among the legions under the command of Avidius Claudius, who had been dispatched to suppress revolts in Syria. The plague accompanied this army homewards, spreading throughout the countryside and reaching Rome in 166 A.D. It rapidly spread throughout the empire, causing so many deaths that 'loads of corpses were carried away from Rome and other cities in carts and wagons" (Cartwright 1972, 13). The pestilence, which raged until 180 A.D., not only claimed the Roman emperor, Marcus Aurelius, but also killed an estimated two thousand citizens of Rome each day.

There is little doubt that the origins of the plague of Galen were decidedly Asiatic. By her contacts with distant lands and peoples, Rome unknowingly opened her gates to infectious disease (Cartwright 1972, 15). Many historians have asserted that this plague represented the first smallpox epidemic in Western Europe. One theory hypothesizes that the western migration of the Huns started because of virulent smallpox in Mongolia. The disease accompanied them, was transmitted to the Germanic tribes with whom the Huns were battling and, subsequently, infected the Romans who were in contact with the Germans (Cartwright 1972, 16). Furthermore, the origins of smallpox have been traced to India and China. In India, the protection of the goddess Shitala had been invoked against smallpox from pre-Roman times and some Sanskrit medical texts describe early attempts at inoculation or variolation (Bollet 1987, 109). The spread of smallpox to Western Europe did not occur until large enough populations of susceptible individuals developed in armies, towns, and cities to sustain active infection by the virus. Smallpox was permanently established in the Arabian Peninsula among the followers of Mohammed and it spread with Islam across North Africa, into Spain, and across the Pyrenees. Epidemics of smallpox raged in Europe for the next thousand years, as the virus was reintroduced periodically from the Middle East by returning crusaders (Cartwright 1972, 18).

Imperial Conquest of the Americas

The invasion of the New World represents one of the most striking examples of the influence of disease upon history and rivals the significance of the plagues of Athens and Galen. The European conquest of the Americas was initially a "medical conquest" that paved the way for the more well-known and glorified military conquest and subsequent colonization (Cook 1998, 205). In the sixteenth century, Europeans, who learned of the fall of the Aztec and Inca empires to a mere few hundred Spaniards and a handful of Indian allies, offered two explanations. First, the 'Black Legend' of Spanish evil was afforded the dubious distinction of having cleaned out the Americas by killing, maiming, and exercising inhuman cruelty in a mission to destroy native peoples (Cook 1998, 1). By espousing this theory, rival European powers justified their own encroachment on Spanish territory and attacks levied against the Catholic Church. Second, religious theorists hypothesized that the Indians were doomed to extinction by providential decree. In the years that followed, English Puritans like John Winthrop observed that "God hath consumed the natives with such a great plague in these parts, so as there be few inhabitants left" (Cook 1998, 213). In retrospect, both of these theories fall short of explaining the depopulation of the New World. While Spanish cruelty is a documented, historical fact, mathematically there were too few Spaniards to have killed the millions who died during the first century of contact. The scientific understanding of infectious disease in subsequent centuries rapidly questioned the legitimacy of "providential decree."

The first smallpox epidemic in the Caribbean is documented in letters written by the Jeronymite friars Luis de Figueroa and Alonso de Santo Domingo to Charles V. The friars wrote from Hispaniola (Haiti/Dominican Republic) on January 10, 1519 and stated:

> It has pleased Our Lord to bestow a pestilence of smallpox among the said Indians, and it does not cease. From it have died and continue to die to the present almost a third of the said Indians. (Cook 1998, 61)

They estimated that if the epidemic were to continue at its present pace for two more months, it would be impossible to extract any gold from the island's mines in 1519, due to a loss of laborers. Other islands such as Puerto Rico and Taino were similarly affected, leading to a gradual extinction of native islanders.

The introduction of smallpox among the Aztecs coincided with Hernando Cortez's famous entry into the annals of history. The Spanish Conquistador sailed from Cuba to Mexico on November 18, 1518 with a force of 800 Spaniards and Indians (Cartwright 1972, 118). After landing on the coast, he promptly burned his ships to assure the absolute loyalty of his troops. After battling with the Tlasacalan Indians and establishing the city of Vera Cruz, Cortez reached Tenochtitlan (Mexico City) on November 8, 1519. The capital was home to some 300,000 inhabitants and represented the world's largest market place. Each morning, sixty thousand traders and consumers lined the streets to buy maize, polished stones, cotton garments, wild turkeys, garlic, raw fish, and gold (Nikiforuk 1996, 88). Cortez's early dealings with the Aztec emperor, Montezuma, yielded little progress and resulted in his eventual entrapment and imprisonment of the ruler. Cortez's reckless disregard prompted the Spanish governor of Cuba to send another Spanish expedition, under Panfilo de Narvaez, to restore Montezuma to power. Narvaez left Cuba in May 1520 and brought with him a number of Negro slaves. As documented by the Jeronymite friars, smallpox had been endemic in Cuba before Narvaez's fateful voyage. While traveling to Mexico, a number of the Negroes fell ill on the voyage and at least one was still sick when they landed (Cook 1998, 87). In a letter written by the judge of the Royal Audiencia of Santo Domingo, written to Charles V on August 30, 1520, licentiate Lucas Vazquez de Ayllon reported:

> Smallpox broke out almost immediately. Among the men of Narvaez, there was a Negro sick with the smallpox, and he infected the household in Cempoala where he was quartered; and it spread from one Indian to another, and they, being so numerous and eating and sleeping together, quickly infected the whole country (Cook 1998, 68).

Franciscan friar Ray Torbio Motolinfa observed the rapid advance of the virus:

> When the smallpox began to attack the Indians it became so great a pestilence among them throughout the land that in most provinces more than half the population died…They died in heaps, like bed bugs (Cook 1998, 67)

While the epidemic spread through the ranks of the Aztec armies and cities, Cortez was able to escape defeat at the hands of Montezuma's relative, Cuitalhuac, and his "obsidian-wielding Aztec army" which had previously killed three-quarters of Cortez's soldiers as they retreated from Tenochtitlan. The disease first struck down Cuitalhuac, and for seventy days it "burned among the capital city's inhabitants like a fire" (Nikiforuk 1996, 86)

Sores erupted on our faces, our breasts, our bellies; we were covered with agonizing sores from head to foot. The illness was so dreadful that no one could walk or move. The sick were so utterly helpless that they could only lie on their beds like corpses, unable to move their limbs

or even their heads. They could not lie face down or roll from one side to the other. If they did move their bodies they screamed with pains (Nikiforuk 1996, 87).

After the "big pox" infected the residents of Tenochtitlan, Cortez regrouped and returned to take the city. After eighty days of fighting, the Aztecs surrendered on August 13, 1521. The victorious Spaniards reported that "the streets were so filled with dead and sick people that our men walked over nothing but bodies" (Cook 1998, 68). Cortez himself estimated that nearly half of the inhabitants of the city had succumbed to the infection. Years later, Dominican Francisco de Aguilar, who had been with Cortez during the conquest, remarked "When the Christians were exhausted from war, God saw fit to send the Indians smallpox, and there was a great pestilence in the city" (Nikiforuk 1996, 86). Cortez himself, in a letter to Emperor Charles V dated May 15, 1522, linked the central Mexican epidemic and that of the Caribbean. He stated that many of the native leaders had died as a consequence of the "smallpox distemper which also enveloped those of these lands like those of the islands" (Cook 1998, 68).

Eleven years later, in 1531, a second epidemic devastated Mexico and was dubbed 'the small leprosy' by native Mexicans. Further outbreaks were recorded in 1545, 1564, and 1576 (Cartwright 1972, 120). After its conquest of Mexico, smallpox, joined by plague and influenza, visited populous Yucatan and Guatemala in the 1520s. It is estimated that nearly 400,000 Mayans in Yucatan succumbed in less than twenty years (Nikiforuk 1996, 88). Costa Rica, Panama, and Nicaragua were rapidly depopulated before the Inca Empire became infected. According to one Inca poet, the pestilence arrived in Quito in a box brought by a man dressed in black. Huayna Capac, the Incan emperor and "Child of the Sun," opened the box and beheld "a quantity of things like butterflies or bits of paper which spread abroad until they disappeared" (Nikiforuk 1996, 88). When his generals began dying, Huayna Capac hid in a stone house as his body slowly rotted from the newly introduced pestilence. His sudden death and the death of his heir, Ninan Cyoche, unraveled the authoritarian empire and started a brutal five-year civil war between two brothers, Huascar and Atahualpa (Nikiforuk 1996, 89). By the time Pizzaro arrived in 1532 with 170 men and 40 horses, the epidemic had shattered any possible hopes for resistance. While disease had decimated Inca royalty, the civil war had consumed the empire's best warriors (Nikiforuk 1996, 89).

In the Amazon, the smallpox conquest precipitated a similar tragedy. The rainforests resonated with the coughing, bleeding and death engendered by the horrifying disease. After losing faith in their gods, thousands of Amazonians converted to Christianity in the hopes that the new religion would offer them protection from suffering and death. One Jesuit settlement near Bahia converted 40,000 panicked Indians between 1559 and 1583, only to watch smallpox kill them all. By 1580 only 300 remained. The Jesuits recounted:

> Anyone who saw them in this distress, remembering the time past and how many of them there were then and how few now, and how previously they had enough to eat but they now die of hunger, and how previously they used to live in freedom but they now found themselves beyond misery, assaulted at every step and enslaved by force by Christians – anyone who considered and pondered this sudden change cannot fail to grieve and weep many tears of compassion (Nikiforuk 1996, 89)

The pattern of disease, disintegration of societal institutions and resultant famine was a familiar one by the mid 16th century and wreaked havoc throughout North America as well. The tribes of the Great Plains and the Indians of New England were equally devastated and the disease often rode in advance of white settlers. When Lewis and Clark traversed the continent in 1801, they encountered Natives with pockmark scars who had never seen white explorers in their territory before. While New Englanders rejoiced at the empty expanses of land available for colonization, Spaniards who had expected to use native slaves in their plantations and mines were dismayed. Viceroy Francisco de Toledo in the viceroyalty of Peru in the 1570s required that there be a physician in each large Indian town. The Spanish in the Andes also utilized quarantine in the late 1580s in an attempt to stem the progression of epidemics (Cook 1998, 112). These attempts were largely futile and precipitated the importation of millions of African slaves.

While early Puritans believed that Indian losses were brought on by God's desire to "make room for the following part of his army," the settlers did not mention that they took direct action to assist and speed up "Divine" intervention (Cook 1998, 213). The eighteenth century, however, provides concrete evidence of germ warfare waged by English colonials.

Smallpox and Biological Warfare

At the conclusion of the Seven Years War among the colonial powers (1756-1763), Lord Jeffrey Amherst was the acclaimed commanding general of British forces in North America. A colonial governor at the time stated that Amherst was "the most glamorous military hero in the New World" and his fame was immortalized as the town Amherst, Massachusetts, along with the adjacent university, Amherst College, were both named for him (Rand 1958, 15). During the summer of 1763, the British were engaged in a conflict with the Ottawa tribe known as Pontiac's Rebellion. Pontiac, an Ottawa chief, had sided with the French during the Seven Years War and led the uprising against the British after the French surrendered in Canada. The Indians were angered by Amherst's refusal to continue the French practice of providing supplies in exchange for Indian friendship and assistance. The general ill will that the British felt towards the Indians and their refusal to honor previous treaties and respect Indian land only added fuel to the fire. Additionally, Lord Amherst felt that the French had been engaged in "bribery" by granting provisions to the tribes allied with them. He favored a system of strict regulations and punishment, when necessary, as a means of adequately engaging the native tribes (Waldman 1985, 106)

As Pontiac attacked British forts at Detroit and Presqu'Isle, Amherst grew progressively enraged with the losses suffered by his forces. The elusive nature of Indian combatants was problematic as Pontiac's warriors did not stand in ordered ranks and fight on open battleground (Waldman 1985, 107). Amherst's frustrations and hatred for the Indians are well documented in a series of letters he wrote during the summer of 1763. His correspondence included letters written on routine matters such as officers who were sick or wanted to be relieved of duty. However, a common theme of hatred towards the native tribes colored his writings. In letters written to Sir William Johnson, Superintendent of the Northern Indian Department, Amherst conveyed his genocidal intentions as he supported "measures to be taken as would bring about the total extirpation of those Indian Nations" and to "put a most effectual stop to their very

being" (July 9, 1763, August 27, 1763). He later stated that "their total extirpation is scarce sufficient attonement" in a letter to George Croghan, Deputy Agent for Indian Affairs (August 7, 1763).

The means that Amherst pondered for "total extirpation" were explained in an earlier correspondence with Colonel Henry Bouquet. In the letter, Amherst declared, "Could it not be contrived to send the Small Pox among those disaffected tribes of Indians? We must on this occasion use every stratagem in our power to reduce them" (Parkman 1886, 39). As Pontiac's forces encircled Fort Pitt, Bouquet was informed by Captain Ecuyer, one of the officer's in command, that smallpox had infested the Fort. Thereafter, Bouquet suggested to the General that the virus be distributed via blankets to "inoculate the Indians." (July 13, 1763). Amherst, in a letter dated July 16, 1763, approved the plan and suggested, "to try every other method that can serve to extirpate this execrable race." Bouquet's own feelings towards native peoples were well established as he stated "I would rather chuse the liberty to kill any savage" and "that vermine have forfeited all claim to the rights of humanity."

Thus, the motive to deliberately infect the attacking tribe was clear, the means were present as the virus was localized within the Fort itself, and a premeditated plan had been proposed. Within the journal of William Trent, commander of the local militia of the townspeople of Pittsburgh during Pontiac's siege on the fort, it is clear that the plan was carried forth. In a journal entry, Trent wrote "…we gave them two Blankets and an Handkerchief out of the Small Pox Hospital. I hope it will have the desired effect" (Harpster, 1938). Furthermore, it is recorded in the logs of the firm Levy, Trent and Company that the Crown was charged in June 1763 for "sundries got to replace in kind those which were taken from the people in the Hospital to Convey the Small-pox to the Indians viz: 2 Blankets at 20/1 00,1 Silk Handkerchief LO/O and Linens do 3/6" (Cook 1, 218). These records are undisputed and prove that Amherst and Bouquet carried forth a deliberate plan to introduce disease amongst the enemy Ottawa tribe. The practical ramifications of the act are disputed. Historian Francis Parkman states that a year later, a man by the name of Gershom Hicks reported to Fort Pitt that he had been among Pontiac's tribes and that "the smallpox had been raging for some time among them" (Parkman, 1991, 85). Carl Waldman asserts that after "Captain Simeon Ecuyer had bought time by sending smallpox-infected blankets and handkerchiefs to the Indians surrounding the fort (an early example of biological warfare), an epidemic started among them" (Waldman 1985, 108). It is unclear whether or not the eventual collapse of Pontiac's Rebellion was due to Amherst and Bouquet's "biological warfare" or if the rebellion simply collapsed under the weight of direct warfare, disease, and resultant famine. Unfortunately, no direct evidence exists as to whether or not the transmission of smallpox via deliberate spread was effective.

Many other historical texts make reference to the strategy of deliberately disseminating the smallpox virus amongst the North American Indians. In Robert L. O'Connell's Of Arms and Men: A History of War, Weapons, and Aggression, the author states: "Marking a milestone of sorts, certain colonists during the French and Indian Wars resorted to trading smallpox-contaminated blankets to local tribes with immediate and devastating results. While infected carcasses had long been catapulted into besieged cities, this seems to be the first time a known weakness in the immunity structure of an adversary population was deliberately exploited with a weapons response (171). Purportedly, in the nineteenth century, the U.S. Army sent

contaminated blankets to Native Americans, especially Plains groups, to "control the Indian problem" (Stearn 1945, 148). While a wealth of information exists to support the germ warfare waged by Amherst and his cohorts, the evidence behind these other claims is not nearly as convincing.

Conclusion

The history of the smallpox virus is one that is characterized by paradox. As a disease that has been eliminated through the ingenuity and determination of mankind, smallpox offers the very hope that other devastating viral illnesses will also be contained and eradicated. Yet, the virus was also the key player in some of the most tragic and historically significant events in human history. From the misery it created in Europe and Asia to the stepwise extinction of many Native American peoples, smallpox exerted its will across the globe and over many centuries. As the agent of choice in one of the earliest examples of directed germ warfare, it holds the dubious distinction of representing the worst that humanity is capable of. While the virus depopulated the New World, it also made possible the creation of an entirely new economy that would shape global history for centuries to come. From the African slaves who were transported to replace dying natives to the Europeans who capitalized from religious and economic freedoms, smallpox determined the course that the imperial conquest of the Americas would take.

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SUMMER DIARRHOEA FROM 1850 TO 1950: AN ENDURING THREAT FOR MELBOURNE'S CHILDREN

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ABSTRACT

The tragedy of summer diarrhea tortured Melbourne's children for far too many years. Yet in the 21st century, the term summer diarrhea is no longer used in describing infectious diarrhea. What became of this, often fatal, category of gastrointestinal infection? Information to answer this question was uncovered within the archive collection at the Melbourne Hospital for Sick Children.

Between 1900 and 1940 the mortality due to summer diarrhea decreased at a steady, albeit, lethargic pace. The study of influences which instigated decreasing mortality is challenging. The reason is that criteria for which diseases were to be classified as summer diarrhea is not defined in any 20th century literature. Therefore an audit of the diagnoses of infectious gastrointestinal disease at the hospital were plotted over a calendar year to elucidate an acceptable definition of summer diarrhea. With that definition, mortality statistics from the hospital could be plotted over a forty-year period.

Results showed that summer diarrhea had a disturbing but predictable seasonal incidence. It was the predominating illness in Melbourne's children for the first half of the 20th century. Unfortunately, along with this high incidence was an associated mortality rate often greater than fifty percent.

How was summer diarrhea conquered? Investigations in the literature suggest that no one influence can be credited as the instigator for declines in summer diarrhea and its mortality. The community and physicians of the day approached this devastating problem from many angles. At the same time education, demography and values of society were changing. With so many factors altering the incidence of summer diarrhea, it is difficult to tease out one decisive influence which improved mortality. Identifying the most important influences from Melbourne would be valuable for applications today as infectious diarrhea still plagues children developing countries in the 21st century.

Introduction

Infants of Melbourne, and the wider state of Victoria, were at high risk of dying from summer diarrhoea since Australia was founded in the mid 1700's and for many centuries thereafter. Despite the establishment of the Melbourne Hospital for Sick Children in 1870, mortality as a result of this disease did not decrease. The effects of summer diarrhoea on infant mortality have thus been a central issue for those caring for the very young (3). By 1865, most local medical journals publishing articles on infant mortality were specifically interested in the issues of feeding and summer diarrhoea (3). Continuing into the mid-twentieth century, gastroenteritis was noted as the most important infectious disease in infancy because of its impact on infant mortality (6).

The history of summer diarrhoea at the Melbourne Hospital for Sick Children is well documented in the hospital archives at the current Royal Children's Hospital in Melbourne. (The hospital changed its name to the latter in the 1950's). Within the archives, materials used as sources for this manuscript were the typewritten Annual Reports by the hospital committee and the handwritten notes contained within the Superintendent's Report. When surveying historical literature, the colloquial term, summer diarrhoea, is used interchangeably with other medical diagnoses such as: gastroenteritis, entero-colitis, infantile colitis and dysentery (15). Thus it is very difficult to determine the definition of summer diarrhoea used in the hospital's early history. Disease definitions became more precise in the following years but confusion remained when making diagnoses of gastroenterological infections at least until the 1950s (6). The uncertainty in infectious gastrointestinal diagnosis made accurate review of historical material quite a challenge.

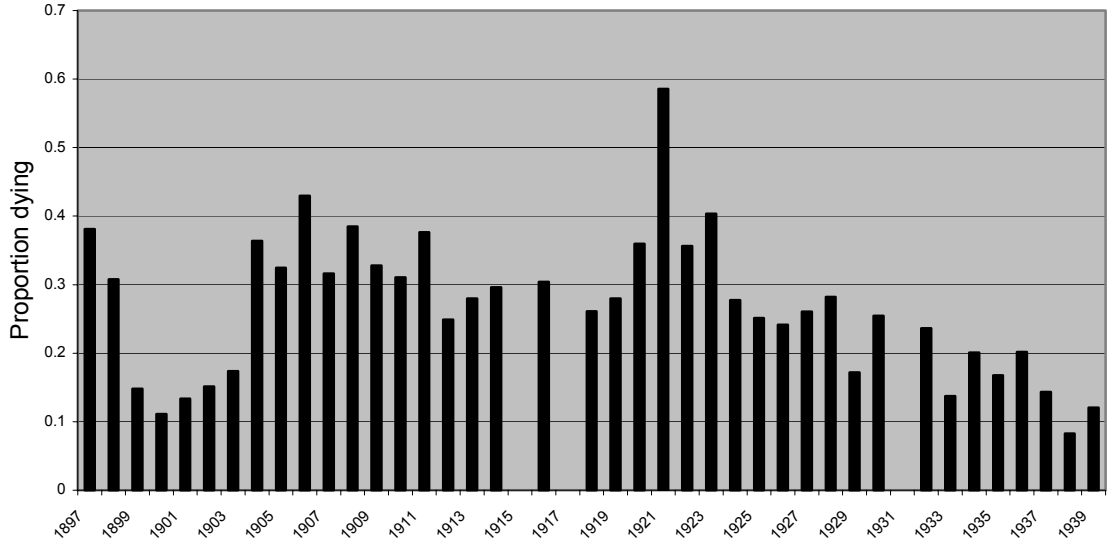
Available Data and Trends

Records of inpatient diseases at the Children's Hospital were not published until 1877 in the hospital's Eighth Annual Report. As for records regarding the deaths of children categorized by disease, these were not recorded until the Twenty-ninth Annual Report of 1898 and continued to be reported in such a manner only until the year 1939 (10).

As described earlier, diagnoses of summer diarrhoea, infantile diarrhoea, gastroenteritis, entero-colitis and dysentery were often confused or used interchangeably. Due to the lack of a definition for these diagnoses, they will be reviewed in this manuscript together as a single entity called 'infectious diarrhoea'. Typhoid is not included in this definition of infectious diarrhoea. Literature from the archives described typhoid to be a distinct entity that physicians could accurately diagnose. Therefore it was not included in the definition of infectious diarrhoea. Diseases such as debility, marasmus and teething are not included in the definition of infectious diarrhoea either, but some people suggest that they should be. Physicians described symptoms and signs of these diseases to be very similar to those of infectious diarrhoea. The problem is that the use of teething, debility and marasmus by physicians declined by the end of the 20th century. Physicians no longer identified these diagnoses as a cause of mortality. There was a realization that teething was coincidental and debility and marasmus were caused by, and not a

result, of the infectious diarrhoea (7,12). Due to the change in usage of these terms, they were not included in the description of infectious diarrhoea either.

Figure 1 shows a trend of increasing mortality due to infectious diarrhoea up to 1923 followed by a decline through to 1939. Although the data in figure 1 is not age stratified, statistics from the state of Victoria indicate that five of every six deaths from diarrhoea in the late 19th century were in children under the age of five years (8). Furthermore, additional data analysed from the Children's Hospital Registrar's Report in 1923 showed that of 146 children who died of infectious diarrhoea, all were less than two and a half years old. Therefore, it is reasonable to conservatively assume that the mortality due to infectious diarrhoea at the Melbourne Hospital for Sick Children mostly occurred in a young population under the age of five.



**1916, 1918 and 1932, data unavailable*
Figure 1: Proportion of Infectious diarrhoea Cases Not Surviving

There are countless factors that may have influenced the change in mortality due to infectious diarrhoea. Factors to be considered in this discussion include the role of: pathogens, changing hospital policy, research, treatment, prevention strategies, feeding practices, World Wars, infant welfare centres, changing values in society, standard of living, family size, education and literacy. Each section will discuss a different factor in brief. Keep in mind that each factor has been artificially segregated from the rest. More detail is surely warranted in each area as well as examination of their synergistic and antagonistic effects on each other. Such a complete analysis will be a considerable challenge to undertake in the future and is not attempted in this manuscript.

Pathogens

Pathogenic characteristics of bacteria evolve over time and those with appropriate characteristics are able to thrive in an appropriate human population. This evolutionary process is complicated by many factors including the physical and behavioural characteristics of the host, health practices in society, and medical treatment. Since the nature of all these factors were constantly changing over the time period in question, it is quite likely that pathogens causing the infectious diarrhoea were also evolving through time (3).

Although a pathology laboratory opened in the Children's Hospital in Melbourne in 1913, it was not until 1918 that stool samples were being examined routinely from patients with diarrhoea. After two more years, the pathology department was reporting successful isolation and identification of pathogens from those stool samples (10).

In the meantime, Dr. R. L. Forsyth began a study of summer diarrhoea in 1911 at the Children's Hospital. By 1913 he had results stating that stool samples from patients with the clinical diagnosis of summer diarrhoea had the following bacteriology: 33 per cent of stool cultures showed Shiga Flexner type organisms, 24 per cent showed Gaertner type, 26 per cent showed slow fermenter type, 7 per cent showed the Morgan type and the rest were identified as various liquefiers of gelatine. With these findings he could infer that these organisms caused the infectious diarrhoea but he could not prove it (15).

Pathogens cultured in subsequent decades in the pathology laboratory of the Melbourne Hospital for Sick Children showed varying numbers of cases of Bacillus dysenteriae (flexner and sonne types), Bacillus morgan No. 1, Bacillus faecalis alk, slow fermenters, non fermenters and lactose fermenters (10). As a result of advancing culturing techniques, it is difficult to compare the pathogens found in infectious diarrhoea patients over the years at the Children's Hospital. As well, a protocol for indicating which cases warranted bacteriological investigation was not documented. Without consistency in these areas it will be very difficult to enumerate the changing pathogens in the Melbourne community that caused infectious diarrhoea. As a result, the contribution by evolving pathogens to the mortality trends depicted in Figure 1 may never be known.

Hospital Policy

There was a long-standing policy at the Children's Hospital in Melbourne that physicians had the right to refuse patients who had little chance of surviving under their care. Two groups were most often denied hospital care: those under two years old and those with severe illnesses like summer diarrhoea or pneumonia. This meant that many children under age two were turned away to face death at home. Early in the twentieth century there was a falling birth rate in Melbourne. To maintain a stable or increasing population, it became crucial to reduce the incidence of infant mortality (3,13). To address this issue, in 1903 the Children's Hospital changed its policy with respect to admitting those under two years of age by opening a proper infants' ward. It was noted in the 1904 Annual Report:

> An interesting departure was made this year in the establishment of four baby cots for the reception of infants under two years. The results have been very encouraging, and the cots have proved of great service, both for the welfare of the little ones, and the completeness and general efficiency of the Hospital. (10)

The policy where patients were refused at the doctor's discretion stood despite the newly established infant's ward. Unfortunately, with few exceptions, children with summer diarrhoea were still turned away under the assumption that their chance for survival with treatment was far too low.

In 1921, a larger baby ward was opened and equipped with over eighty beds. Also, hospital policy changed to allow the admission of infants with infections like summer diarrhoea and pneumonia. As a result, the mortality figures at the hospital actually worsened the following year. Although many other patients in the hospital were being successfully treated, those under age two afflicted with the newly admittable diseases were still likely to die. Because of this change in hospital policy, deaths that previously occurred in the community were now being included in the hospital's statistical record (15). The evidence of increased mortality of 1921 is seen in Figure 1.

Research

In 1910, the Children's Hospital in Melbourne was able to secure £1000 for research into summer diarrhoea from charitable trust (15). It was hoped this initiative would lead to enlightenment on the nature, cause and cure of summer diarrhoea. Dr. R. L. Forsyth carried out the research over the next three years only to be frustrated by the difficulty of intestinal pathogen isolation. He could not properly tabulate and classify his results because the children's symptoms of infection were often obscured with chronic malnutrition, rickets and what he called 'severe specific infection' (3,15).

When he published his progress in 1913 he believed he had isolated the pathological organisms that cause summer diarrhoea but his investigations into treatments were less successful. Although he tried various vaccines and enteric washes, he was not able to alter the course of disease significantly. However, he was pleased to state that by knowing the pathogen which caused a patient's summer diarrhoea, he could predict the prognosis for the infant more accurately.

Changes in the trend for infant mortality due to infectious diarrhoeal disease are probably not immediately attributable to investment into research. Nevertheless, Dr. Forsyth's investigations contributed valuable information to the field of medical science. He built the groundwork necessary for others to progress with research into treatment and prevention of infectious diarrhoea.

Treatment

As stated, infants with summer diarrhoea were rarely admitted to hospital before 1921. Ultimately, there was little that could be done for effective treatment of summer diarrhoea.

Unfortunately, this was the case for almost all infectious diseases, whether they were intestinal, lung, skin or otherwise. Therapies in the nineteenth century could involve anything from cold compresses, to fresh air, to different varieties and doses of alcohol. Although there was some advancement in understanding disease pathology, the challenge persisted to find a logical treatment to replace the empirical regimes of the time (15). Even with the introduction of antibiotics, no major advances were made in the treatment of infectious diarrhoeal disease until well into the twentieth century.

Hirschhorn analysed advances in the treatment in infectious diarrhoea. The results he found are summarised here. In 1912 the paediatric medical community recognised that acidosis was a result of infectious diarrhoea in infants. This justified the use of intravenous saline and alkali, but reported mortality rates were over 80 percent with this treatment. In 1926 the implementation of fasting along with intermittent blood, glucose, saline and bicarbonate infusions were reported in studies to reduce mortality to 33 percent. Treatment that used lactate to resolve acidosis was tested but it actually increased the mortality of treated children. In the late 1940s, adding potassium to intravenous solutions as well as adding oral feeds was suggested; mortality rates improved. It was not until after 1950 that hypernatremia in infectious diarrhoea was recognised and targeted as therapy to reduce mortality (4). It is debated whether therapeutic developments in infectious diseases significantly altered infant mortality. It can be argued that during the twentieth century there was an overall decrease in infant mortality occurring already. The presence of doctors and medical therapeutics may have done little to accelerate this decline (3,12).

Prevention

With high rates of mortality and few options in treatment for summer diarrhoea, preventive medicine strategies were pursued. (7). Assuming some organism was to blame for infectious diarrhoea, there are several avenues for prevention: eliminate the reservoir of the bacteria, prevent the ingestion of the bacteria, prevent the growth of the bacteria and prevent the transfer of the bacteria.

At the end of the nineteenth century, it was deemed necessary to establish a sewage and water handling system in Melbourne to remove the reservoir for disease. This improved sanitation seems to correlate with decreased death and morbidity due to typhoid. Unfortunately, summer diarrhoea persisted or worsened despite improved sewage management. It is certain that many factors beyond sanitation needed modification to eliminate the disease reservoir. Proper sewage is a step towards preventing the spread of disease; however cleanliness in the home, proper disposal of waste and pest control are also vital.

To prevent the ingestion of bacteria, infant feeding issues were of upmost importance. Weaning was a crucial transition for an infant, never to be initiated in the summer months due to the risk of infectious diarrhoea (13). If weaning was necessary, options for fresh milk sources included the use of a wet nurse, boiling cow's milk or having your own cow on site (5,13). The maintenance of a clean milk supply was threatened by hot weather. Beginning in the 1860s in Australia, milk-desiccating technologies were introduced (7). Another option for mothers was to feed condensed milk to their children. Both of these substances could be kept more safely in

warm climates. Despite all of these feeding alternatives, infants continued to suffer. Other issues around feeding of infants will be examined more thoroughly in the next section entitled 'Feeding practices'.

Proper milk handling and storage could prevent growth of bacteria and milk spoilage. Consider how milk was handled before the introduction of the motorcar in the twentieth century. Milk vats were strapped to horses and brought on long journeys in the hot sun. Furthermore, the horse rider would then handle the milk, and he could possibly contaminate it. As horses were phased out, there were fewer stalls to clean, less manure accumulation and fewer associated flies and pests to act as infecting vectors (8). Additionally, with the introduction of motorcars, milk could be transported faster, and even on ice, thus protecting it from early spoilage.

Cooling milk by refrigeration would save milk from spoiling and prevent disease. This was implemented by the Children's Hospital in 1906 with the purchase of iceboxes. Unfortunately, buying refrigerators was not feasible for most people in Melbourne at the turn of the century, and even for some families in the 1950s. Arthur Jefferys Wood, a physician in Melbourne in the early 1900s, shared his thoughts on the critical need for clean and cooled milk to be available for infants in the community. Since most families had financial constraints and could not individually afford to have cooled milk, Wood helped establish the Lady Talbot Milk Depot. This was a place where families could obtain unadulterated and cooled milk (15). Refrigeration and other methods that prevented food and milk spoilage, therefore, were components that likely influenced infant mortality trends.

Prevention of transmission of bacteria was another avenue to reduce the incidence of summer diarrhoea. Physicians proposed that preventive measures could be implemented in the home. An English physician named Dr. Arthur Newsholme published an article entitled, 'Domestic infection in relation to epidemic diarrhoea' in the Journal of Hygiene. Here he encouraged attention to be focused on more than just the milk supply, but specifically on the home environment and the mother's activities to stop contamination. That included proper waste disposal, controlling flies and dust and having adequate sanitation practices both inside and outside the house (9).

In summary, prevention of infection was enabled through public health initiatives. First efforts focused on water and sewage handling in the late nineteenth century as well as emphasising not to wean infants in the summer months. Following this, initiatives were focused on improved storage and safety of the milk supply. Next, mothers were encouraged to improve the home environment for infants. Initiatives in public health take time to be accepted and implemented in society. Although the time course of their acceptance was uncertain, they most likely were a contributing factor to reducing infant mortality due to summer diarrhoea in infants.

Feeding Practices

Consistently, women were encouraged to breastfeed, but extenuating circumstances did not always allow the practice. This section will examine how breast-feeding was encouraged, what options were available for feeding infants when breast-feeding was not possible and how this may have influenced infant mortality trends.

It was well accepted by the 1800s that breast-feeding was best, and by the 1900's there was strong evidence to discourage women from weaning their children in the summer months. For children who were weaned or never breast-fed, there was much debate on what alternative food sources should be used.

The use of wet nurses waxed and waned in popularity as a substitute to mother's milk. In a pamphlet published by the Australian Health Society by C. D. Hunter, it was stated that of one hundred babies raised on breast milk, eighteen died in the first year of life. He warned that of one hundred babies raised by a wet-nurse, twenty-nine would die, and of one hundred raised by hand, eighty would die. Besides warning women of the risk to their child being given to a wet nurse he also noted that the wet-nurse's child was surely to be hand fed and put at an even greater risk of contracting fatal diarrhoea (5). By the 1900s, the hiring of wet-nurses was rare (7).

Desiccated milk and condensed milk were introduced in the 1860's to mothers as a safe food source for weaning. The problem with these products was that they needed to be diluted. Nutritionally inferior, these products promoted the malnourishment of infants (13).

It was common for weaning offspring to be given cow's milk, but this also caused concern. In 1869, Henri Nestle suggested that adding wheat flour to milk would make a formula more digestible and nutritious for children (13). In subsequent years, others suggested the cereal grains of arrowroot, sago, maizena and boiled graded flour as additives for infant and invalid food (13). Poor socio-economic classes were rationed more cereal grains than they were milk—and the milk received had already been watered down or otherwise adulterated. This resulted in them mixing low-quality, home-made formulas for their infants (7,13).

By 1883 there were over twenty-five brands of infant foods available but only a few were considered suitable for weaning offspring. The cheaper brands of formula were of poor quality due to low fat, vitamin A and vitamin D levels, and moreover were pre-diluted (7). As the practice of using these formulas gained popularity, the poor classes were forced to wean their infants onto a formula with a higher ratio of cereal grains to milk.

There were fewer objections to weaning infants onto goat's or ass's milk. These products were considered to be nutritionally superior to cow's milk, but unfortunately they were difficult to obtain (5,13). The reason for the preceding discussion on feeding practices is because good nutrition is an important factor in the resiliency of infants who contract infectious diarrhoea (7,8). Infants weaned on poor quality milks were not only be more likely to contract a diarrhoeal infection but their poor nutritional status may make them less likely to survive the illness.

World Wars

Figure one shows a decline in the mortality trend due to infectious diarrhoea at the time of World War I. Determining the significance of this decline has been difficult. Interestingly though, Philippa Mein Smith, an economic historian, notes:

> But the real spur to infant welfare services came with the First World War. The losses of the Great War provoked administrators to put their weight behind the baby health movement. Wartime economic and political priorities commanded: "The hope of Australia lies in healthy living babies, fewer dead babies, stronger children, and a fitter race… Population means power. The nation that has the babies has the future"'(12).

One initiative at the time of WW1 was the development of infant welfare centres to promote infant well-being and survival. A discussion of these centres is in the following section of this manuscript.

As for World War II, the 1942 Medical Superintendent's report at the Children's Hospital in Melbourne by Howard Williams explained that the death rate per thousand births due to gasrto-enteric infection fell from 29.66 in 1893 to 1.64 in the year 1940. He attributed this to "the result of preventive measures directed towards obtaining a clean wholesome milk supply and in instruction for people in hygienic methods of handling milk". He noted though in 1942 that the infant mortality rose by 80 percent. He believed that there was careless contamination of the public milk supply and warned of the danger of complacency when it came to securing the status of clean milk for the community in the future (10).

The Second World War caused changes in the incidence of infectious diarrhoea. During this war, families had parents engaged in work that took them outside the home. Therefore, children were being taken to medical attention too late when they were sick. Furthermore, the advances in the established milk supply were threatened with decreased availability of qualified labour and supervision. These human resources were diverted to war work initiatives (15).

Infant Welfare Centres

The role of these centres was to lend medical advice and educate mothers on the importance of breastfeeding and improving hygiene practices. Smith (1991) examined the infant mortality in the first half of the twentieth century and whether baby health centres were to be credited for the decline in infant mortality in Australia. She notes that the rapid decrease in infant mortality occurred before the introduction of the baby health centres in 1918 and furthermore, the baby health centres did not flourish until after 1918. She concludes first there is a temporal mismatch of the two events and that the health centres were a 'beneficiary rather than an instigator of the downward trend in the infant death rate'. Secondly, there is a spatial mismatch. States that introduced the initial health centres did not have a faster decline in infant mortality than those getting the centres later on.

Another problem with the usefulness of the baby health centres was that the advice they gave was only of maximum benefit for the well-to-do-families. Poor families in the first half of the twentieth century could not afford the recommend ice-chests and fly screens for milk protection (12).

A factor worth considering, but difficult to measure, is the changing behaviours of mothers. Mothers received many recommendations, but would not be able to implement them all. Their

personal beliefs on how a child should be properly tended were different and they may not have been able to afford the time or monetary investment to implement recommended changes for bringing up their infants, as suggested by the staff at the infant welfare centres (12).

Changing Values in Society

Society was more interested and aware of issues in public health. As well, with the depression in the 1890s, people accepted that poor groups in the community were not necessarily at fault for their hardships. Thus society was more compassionate for the poor.

Government passed legislative acts for heath, pure food and sanitation; all of which could have influenced child health. Governments also directed funds to support, clothe, and educate children from underprivileged situations (3). Legislation often follows after the changes of values and beliefs in society. Therefore, one must question whether government legislation acted to improve the survival of infants and the health of children, or whether it societal changes on their own made government merely reactive to positive changes?

Standard of Living and Poverty

Poverty is a determinant of health. In 1917 Dr. Newsholme, an English physician, examined the idea that excessive child mortality resulted from poverty. He declared poor people would tend to 'live in the most densely populated and the least sanitary parts of a district' where there was unsatisfactory housing, medical care, and milk supplies. He noted poverty was not necessarily a matter of low wages. He argued that secondary factors of low morals, including 'gambling, intemperance, and improvidence' were intertwined with poverty and prevented the increase in the standard of living even when wages were reasonable (9).

Until the late nineteenth century, the Children's Hospital catered almost exclusively to the children of the poor (15). These children and their families resided in the slums of Melbourne. Although the welfare and housing of Melbourne families gradually improved in the next several decades, many children were still classified as underprivileged and living in slum conditions (15). According to the Melbourne Royal Children's Hospital historian, Peter Yule:

> The slum areas of Melbourne had defective sanitation, gross overcrowding, poor and inadequate food, and no facilities for washing or personal hygiene. Most of the children would have had filthy, lice-infested clothing; their limbs and bodies covered with skin lesions, impetigo, scabies and insect bites, many of which were infected…In winter, bronchitis with recurrent cough and fever were common, often leading to pneumonia, while in summer, infantile diarrhoea was rampant (15).

One can infer that the opportunity for cross contamination among slum dwelling children was considerable. Improvement in these living conditions and communities would have contributed to the decreasing incidence of summer diarrhoea.

It is interesting to note the results from a study carried out in the 1950s by the Melbourne Children's Hospital on the contribution of poverty to infectious diarrhoea. The study reviewed

174 infants with infectious diarrhoea. It showed that many of these low-income family babies came from clean homes where personal hygiene was considered to be good by the research study's standards. Of these clean homes, some were adequate while other homes were substandard. They also found babies with infectious diarrhoea coming from middle class families. Socio-economic status, therefore, could not determine an infant's susceptibility risk to infectious diarrhoeal disease. What the investigator found to be a common problem in households with overall good hygiene was the practice of leaving soiled diapers in open receptacles in the laundry room. Cross contamination would be facilitated by flies, a widespread problem in homes, or the practice of washing laundry in non-boiling water. This study also looked at those who lived in community housing. One fifth of all cases had come from emergency housing centres. But according to the author, community living was not solely to blame for infectious diarrhoea in infants of Melbourne because no cases of infectious diarrhoea came from the city migrant hotels that also practiced community living (1).

Family size

Child labour was commonplace in the mid nineteenth century. Gradually, employment of children had dissipated by the early twentieth century and more children began to acquire formal education. This shift ultimately meant families needed to financially support their children longer since kids were not legally permitted to work and help pay for family expenses. As a result, it became advantageous to have fewer children per family (3).

At the beginning of the twentieth century the birth rate per thousand women of fertile age was decreasing (3). Dramatic changes are shown in these demographic statistics. Table 1 shows the state of Victoria's per cent population who were less than 15 years old at the time of census.

Table 1: Percentage of Victoria's Population Less than 15 Years Old

Year	1871	1901	1911	1921	1933
<15 years old	42%	34%	30%	30%	26%

(Data from Australians: historical statistics, ed by Vamplew, W. Broadway, NSW: Fairfax, Syme and Weldon, 1987, p32-36)

The birth rate per family was decreasing (3). In 1870 the average family had 6 children while in the 1930s this number was reduced to 2.4 (12). Small families were becoming possible because the probability of babies surviving to adulthood was on the increase and families could be confident when limiting their family size. Offspring of these families were more likely to survive to adulthood because there would be less division of the limited time and monetary resources of the family (3,9). For example, a mother with fewer children to look after may be more likely to have time and take her infant to a baby health centre for check-ups and health information. As well, if any of her children fell ill, it may be easier for her to get them to the doctor expediently. This proposal was supported in part by the correlation between the falling rates in fertility and falling rates of infant mortality in 20th century Australia (12). In essence, lower infant mortality may have led to smaller families and smaller families may have fostered lower infant mortality (12). Smaller families were more likely to have a higher standard of

living and apt to maximise the quality of their children and their environment. These changes would have contributed to the decreases in infant mortality.

Education and literacy

At the end of the nineteenth century, literacy among the population had increased in Australia allowing increased avenues for public education on hygiene and disease prevention in infant care. In Melbourne for example, a pamphlet entitled, 'What kills Our Babies' was distributed by the Australian Health Society (3). People also could read about their children's health and disease with popular books such as those by Phillip Muskett between 1890 and 1910. Various other laymen books were popular until the mid 1920s (3,7).

Education and literacy must have also played a major role in the effectiveness of public health campaigns (3). Changing social rules and solving hygienic ignorance was a difficult task, but an intelligent and receptive audience helps. Using the venue of children's schools, the Australian Health Society in Melbourne in 1875 started a poster campaign in schools and taught the children rhymes like 'The Sanitary Alphabet' (3).

It is quite possible that education, especially of women, confounds the seemingly evident relationship that the reduction of family size causes decreases in infant mortality. Caldwell has done extensive research on what causes reduction of infant mortality in developing countries. He found the single strongest correlate of current infant mortality to be the proportion of female children being schooled in the previous 20 years. To clarify, the educated children of 20 years ago are the mothers of the present infants in question. He suggests females who were formally educated are more likely to be practicing family planning and obtaining the health care that is available for their children. He named this phenomenon 'female autonomy'(2). Such a phenomenon could have applied to twentieth century Melbourne.

Conclusion

One would quickly assume that the reduction of infant mortality due to infectious diarrhoea was due to the establishment of proper water, milk and sewage handling by the cities in the late nineteenth century. Mathematically though, no true causation can be proved (3). Because the twentieth century brought a myriad of change, it is difficult to know which change was the most important for reducing mortality in infectious diarrhoeal disease in the time period discussed. It is not unlikely that many factors caused the ultimate decline of infant mortality due to infectious diarrhoea.

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JAKE LEG BLUES: A MODERN EPIDEMIC MIRRORED IN SONG

By

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ABSTRACT

It was the spring of 1930 and Prohibition in America was in its twilight years. While the economy was crumbling and the trade in illegal alcohol was exploding, a mysterious form of paralysis began affecting large numbers of people in the Southern and Midwestern United States. With surprising predictability, at any given town or hospital one could expect to see a poor, middle-aged man walking with a high-stepping and foot-slapping gait. It was so common and presented with such uniformity that locals coined the term "Jake Leg" or "Jake Walk" to describe the disease and associated neuropathy.

What caused this sudden form of paralysis and why were only poor men affected? Very early in the epidemic, a connection was made between this disease and the consumption of a beverage known as Jake or Ginger Jake, which is an abbreviation for Jamaica Ginger extract. Jake was a "medicinal" tonic that became a wildly popular source of alcohol among the underprivileged in the South. It had been consumed for years without incident. However, with the addition of a particular solvent in 1930, thousands of consumers were poisoned. Tragically, many were left with permanent disabilities.

Over and above its furtive arrival, this epidemic is exceptional because of the large number of blues songs it generated. From 1928 to 1934, a total of 13 songs were written and recorded about Jake Leg paralysis. Often, the artists described the physical manifestations and social stigma associated with the disease. These songs, therefore, provide additional information about the medical and social ramifications of the epidemic that may augment the material available to us in the form of traditional medical journals.

What is the Jake Leg?

Newspapers in February 1930 began describing a baffling paralytic illness in America's southern and midwestern states. By the spring, this "paralysis" had reached epidemic proportions. Indeed, 400 patients complaining of myalgia and quadriparesis had been admitted to the Cincinnati General Hospital in Ohio by August of 1930. In each case, the same symptoms were described: numbness in the legs, followed by weakness and eventual paralysis with "foot drop". Eventual "wrist-drop" was also common. Neurological manifestations included ataxia and neuropathy affecting large muscle groups. In severe cases, the neuropathy progressed to

symmetrical muscular paresis, spasticity, increased reflexes, and clonus, indicating damage to the pyramidal tracts. Although the illness was not fatal, recovery was very slow and often incomplete, leaving many patients with a permanent disability.

The paralysis was initially described as a peculiar polyneuritis. However, with time it became clear that the paralysis was due to a syndrome of the spinal cord similar to amyotrophic lateral sclerosis. The initial paresis and motor neuropathy largely resulted in an inability to dorsiflex the ankle and a high-stepping gait. The combination of the unique gait and foot slapping was termed the "jake leg" or "jake walk".

What makes this epidemic especially unique, in addition to its insidious onset, is the large number of blues songs that were composed about the condition. The compositions often described the physical manifestations of the disease. Willie Lofton, in his 1934 recording of Jake Leg Blues, sang:

> I say I know the jake leg, oh Lord, just as far as I can hear the poor boy walk….the jake limber is a present that keep 'em clumsy every day…
>
> (Decca Records 7076, copyright 1934)

Here, Lofton is describing the easily recognized gait resulting from the peripheral neuropathy. It is also thought the word "limber" is actually a reference to erectile dysfunction, a symptom not described in journal articles from that time period. The Ray Brothers, in their song Got The Jake Leg Too, sang:

> *I went to bed last night, feelin' mighty fine, two o'clock this morning, the jake leg went down my spine. I had the jake leg too.*
>
> *I woke up this morning, I couldn't get out of my bed. This stuff they call jake leg had me nearly dead. It was the jake leg too.*
>
> (Victor Records 23508, copyright 1930)

The Ray Brothers here make a distinct reference to the sudden onset of paralysis of the lower limbs. In addition, the feeling of being "nearly dead' could be due to the nausea and vomiting associated with Jake Leg paralysis.

What was the cause of Jake Leg paralysis?

Very early on in the epidemic, a connection was made between this sudden form of paralysis and the consumption of a beverage known as "Jake" or "Ginger Jake". Jake was an abbreviation of Jamaica ginger extract, a "medicinal" tonic with a very high alcohol content (70%). Why were people ingesting this tonic? By 1930, Prohibition, also known as the "noble experiment", had been the law in America for ten years. However, several methods for circumventing the ban on alcohol existed. For the wealthy, there were "speakeasies" (or illegal saloons) and bootleg spirits. The poor, however, could rarely afford such luxuries and consequently indulged in alcohol-containing medicinals. Jamaica ginger extract was one of the

more popular. For 50 cents, one could by a 2 oz bottle that was more potent than a drink of legal whisky sold over the bar before Prohibition.

Jamaica ginger extract had actually been in use since the 19th century as a multi-purpose medicine. It was said to be useful for headaches, as prophylaxis against upper respiratory tract infections, as a promoter of menstrual flow, and as a carminative. When Prohibition was implemented, the U.S. federal government, aware of the high alcohol content, examined Jake and classified it as non-potable and therefore legal to sell in drug stores. Essentially, the oleoresin of ginger had an extremely pungent taste and could only be tolerated in very small doses. One or two drops of the tonic were typically diluted in coffee or a soft drink.

Predictably, devious entrepreneurs developed ways to prepare Jake with much lower ginger contents, using adulterants such as molasses, glycerin, and castor oil. These adulterated mixtures, when tested by evaporating the alcohol, still contained the same dry weight as the government approved extract but tasted significantly better. Thus, in this new, easily-drinkable form, Jake became wildly popular among the lower class in the South. One could buy a bottle in a drug store, mix it at the soda fountain with one's choice of soft drink, and enjoy. Incidentally, it is unknown why adulterated Jake was not more closely monitored by the government. Although the adulterated concoctions easily passed chemical analysis, they were readily distinguishable by eye from true government approved extract – the watered-down versions were amber in colour while true Jake was nearly black and quite viscous.

In general, the effects of adulterated Jake consisted of nothing more than mere intoxication. In fact, there was initial confusion as to whether Jake was the cause of the paralysis epidemic, since it had been consumed with no complications for years. However, it was the addition of a particular adulterant, namely tri-ortho-cresyl phosphate (TOCP), that emerged as the cause of the devastating neuropathy. In 1930, the price of castor oil dramatically increased. Castor oil was one of the chief adulterants used in Jake. In an effort to maximize profits, a major producer of Jake turned to TOCP as an alternative. It was non-volatile, miscible in ginger oleoresin, and cheap, making it an ideal substitute. TOCP is a viscous organophosphate that retains its lubricating properties at very high temperatures. It was therefore commonly used in jet engine hydraulic fluid, brake lubricants, and glues. The supplier of the TOCP deemed it "presumably non-toxic" at the time, and from January to February of 1931, as many as 640,000 bottles of Jake containing TOCP were shipped to the southern U.S.

It is now known that TOCP causes direct neuronal toxicity. It is metabolized in neurons to an uncharacterized neurotoxic compound. This process causes axonal degeneration and secondary demyelination, affecting nerves of the long tracts and causing destruction of anterior horn cells. The end result is permanent damage to the neurological system.

Who did it affect?

The Southern and Midwestern states were most impacted by the Jake Leg epidemic. This included Tennessee, Kentucky, Mississippi, Missouri, Arkansas, Texas, Oklahoma, Kansas, and southern Ohio. Gallons of tainted Jake were shipped to many of these states, resulting in the paralysis of up to 50,000 people.

In epidemiologic studies, there was a remarkable uniformity of race, gender, age, and social status. Typically, it was the Caucasian, jobless, middle-aged man who was affected. The majority had a past history of abuse of moonshine. However, it is fairly certain that the number of African Americans affected is grossly underestimated due to inaccessibility of health care at the time. Such an observation may be confirmed by the number of blues songs that were composed by African American artists about Jake Leg paralysis.

Why is popular music, specifically the blues, important in understanding this particular disease?

In total there exist 13 blues songs about Jake Leg paralysis -- 8 by white artists and 5 by black artists. Recordings were made in the time period between 1928 and 1934. Southern folk artists at the time occasionally produced music reflecting current cultural and social issues. Therefore, these songs provide unique and valuable information about the epidemic that may augment the material available in medical journals.

First, the fact that more than a third of the songs were composed by black artists indicates a familiarity in the African American community despite medical reports of a mostly Caucasian problem. The artists obviously felt that their audience could identify with the tragedy. Since many of these songs were "hits" at the time, it is evident that the prevalence of Jake Leg in the black community was higher than presumed.

Furthermore, many of the songs by black artists stressed the importance of an additional symptom previously undescribed in medical reports -- erectile dysfunction. Three of the five pieces refer to "limber leg", regarded by ethnomusicologists as "impotence". While impotence (described either as erectile dysfunction or a "lack of power" in general) was a common theme in blues music, lesions of the spinal cord could in fact cause erectile dysfunction. In a follow-up study 47 years after the episode, one of four subjects admitted to erectile dysfunction and reported that others had experienced the same, although the literature from the 1930s does not mention this. It is thought that in the social climate of the 1930s, perhaps the appropriate questions were not asked or it was assumed that impotence occurred in conjunction with paraplegia.

Finally, not only do these songs provide additional information about the epidemiology and symptoms of the disease, but they also reflect the devastating social consequences of Jake Leg paralysis. To quote Willie Lofton's "Jake Leg Blues" once again,

> *Mama, mama, mama, mama, mama; Lord; children keep on cryin', wondering what in the world poor daddy gonna do.*
>
> (Decca Records 7076, copyright 1934)

Here, Lofton describes the effects of the disease on a victim's family when the primary wage earner becomes incapacitated. Like "Jake Leg Blues", many of the remaining 12 songs reflect the misery and hopelessness associated with Jake Leg paralysis. The question emerges as to why blues songs were composed and not ballads? The use of blues reflects the cynical,

accepting attitude towards a self-induced disease. Ballads, which are more narrative and sentimental, generally describe tragedies over which there was little control.

Conclusion

The Jake Leg paralysis epidemic was not only a medical disaster, but also symbolizes the hopelessness and struggle of a large sector of society during the Great Depression. The use of blues music here highlights the connection between health and society and is therefore invaluable in understanding the depths of this modern tragedy.

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DR. DENIS BURKITT: AN 'EYE' FOR TRAVEL AND MEDICINE

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ABSTRACT

"Any work that becomes a catalyst has more far-reaching results than has far more brilliant endeavor that remains an isolated discovery."

Most scientists have the dream of someday making a discovery that will change the way their respective disciplines regard something. Denis Parsons Burkitt was able to change the course of medical thinking twice in his career.[5] Interestingly, his two discoveries were in widely different fields of study. He was responsible for defining the origin of a tumor common in children in Africa. He also observed and explained that dietary fiber deficiency was related to many chronic diseases of the Western world.

Denis Burkitt was born February 28, 1911 in Enniskillen, Northern Ireland.[4,5] He had a 'normal' childhood until age eleven, when he and his younger brother Robin were involved in a school fight: a stone shattered Burkitt's eyeglasses, leaving him blind in one eye.[2] His right eye was removed and replaced with glass. Ironically, with only one 'seeing' eye, Burkitt was capable of making important observations for which he is now famous.

In secondary school, Denis showed no sign of inspiration and gave no clue to his ultimate direction.[2] Initially, Denis went into engineering to please his father, but eventually changed his mind. At school, Denis became very involved in a Christian youth club that provided him with new guidance. Instead of building roads and bridges, Denis now felt he should pursue a more soul-satisfying career; he decided to go into medicine.

From a very young age, Denis had a taste for travel. As part of his education, he underwent an apprenticeship as house surgeon in a succession of hospitals in Ireland and England.[2] After passing the required examination for the fellowship of the Royal College of Surgeons in 1938, Denis set out to explore the world; he took a job as ship's surgeon that travelled through such places as Manchuria, Singapore, Hong Kong, and Shanghai. He spent most of that trip reading and trying to discern god's plan for his future, and would later say that it was "god who guided him, not science."[2] By the end of the trip, he decided that he was to devote his life to being a surgeon but with a missionary avocation, in some part of the world that needed him in both capacities. Africa was an ideal destination.

Burkitt tried to join the African missionary services; however, he was always rejected on the basis of only having one eye.[2] Instead, he managed to join the army, during which time he met and married nurse-in-training Olive Rogers; they would later have three children: Judith,

Carolyn and Rachel. It was only in 1943, when Burkitt was finally sent overseas to Kenya where he learned some Swahili and fell in love with Africa and its people.[2] Three years later, he was appointed to a post in Uganda where he and his family would reside.

As a district medical officer in Uganda, Burkitt was responsible for the health of 250,000 people scattered over 7,000 square miles and made weekly excursions to visit dozens of hospitals and conduct clinics.[1,2] However, it was at Mulago Hospital in the late 1950s, where Burkitt came across the disease that was to inscribe his name in medical history.[5] A colleague, Dr. Hugh Trowell, asked Burkitt to look at one of his patients: a five-year old boy with symmetrical swellings on the sides of both jaws. Burkitt took a photograph of the young patient, but could do nothing to save him since surgery was not possible. A few weeks later, while on rounds at another hospital, Burkitt noticed a young girl in the hospital with a similar configuration of facial tumors. Soon after, she also past away.

The severity of the tumors and the inadequacy of available treatments led Burkitt to further examine the incidence and distribution of this tumor.[5] A search through other case histories and autopsies revealed that such jaw tumors were identical at all sites and were in many ways unlike other forms of cancer. For example, they were usually seen in children aged five to ten, and almost never found in infants under the age of two, unlike other forms of cancer.[2] Additionally, this cancer affected the jaw 90% of the time and often implicated the abdomen as well.[3]

Burkitt's records also suggested an uneven distribution of the tumor. Beginning with a grant of only twenty-five pounds, he used photographs of the child patients in a mail survey of African hospitals to determine the syndrome's geographical distribution.[5] He then plotted the results on map using pins to denote geographic incidence of the tumor. The results from his survey confirmed an uneven pattern of distribution. The distribution of incidence was coined the 'lymphoma belt,' an area stretching between ten degrees north and south of the equator and at elevations below 5000 feet[1]. This led Burkitt and two colleagues to conduct, what he would call, a 'geographical biopsy.'[1, 4] This was a ten-week, 10,000-mile safari through a dozen countries to examine the conditions in the boundaries between areas of prevalence and absence of the tumor. They recorded the incidence of the tumor seen in each area and made note of ecological factors. This was the first time that anyone had considered an ecological effect on the distribution of a cancer in humans.

With data obtained from the 'geographical biopsy,' Burkitt went to London where he spoke of the possible causes of the tumor that was in fact the most common cancer among African children.[1,2] Attending Burkitt's lecture was virologist Dr. Michael Anthony Epstein, who at the time, had been looking for a malignant tumor in humans that might be traceable to a virus. After listening to Burkitt talk about the potential effects of altitude, temperature and moisture, Epstein suspected a viral etiology of the cancer and asked that Burkitt send him tissue samples. Under the microscope, Epstein found a new virus in the cultures; this eventually led to the discovery of the Epstein-Barr virus. Several years later, when Epstein published a compilation of work dealing with the virus, he gave credit to his attendance at Burkitt's seminar as a turning point in its discovery.[1,2]

After the causal factor of the cancer was discovered, Burkitt was motivated to find an adequate treatment.[1-,3] At the time, there was a lack in x-ray treatment facilities in Africa. Chemotherapy was undergoing trials in the United States, but an obstacle remained in drug testing: the difficulty in finding cancer patients who had not been previously treated with radiation so that one could observe the effects of chemotherapy alone. Burkitt pointed out that Africa was an ideal place to test the drug treatment because none of the patients had any radiotherapy exposure[2]. This suggestion gave drug companies an effective way to perform clinical trials, while potentially saving the lives of children. The success of chemotherapy (e.g., methotrexate, cyclophosphamide and vincristine) was tremendous, with much lower doses being needed than had been reported for other types of tumors.[1,5]

In the late 1960s and early 1970s, Burkitt also played a major role in defining the concept of Western disease.[4] In 1966, Burkitt returned to England and, while working with the Medical Research Council, he met naval Surgeon Captain T. L. Cleave. Cleave described his hypothesis concerning refined carbohydrate as the cause of many of the chronic disease of the Western countries. In response, Burkitt pointed out that diseases in Africa differed from those of the Western world. For example, throughout his time working at African hospitals, Burkitt noted that Africans were free of appendicitis and cancer of the colon – all epidemic to the Western world.[2] He noticed these differences, was intrigued, and again sent out questionnaires and surveys. He gathered information from both Western and non-Western countries finding, for instance, that colorectal cancer in the United States was four times more prevalent than in Japan, South India and Uganda.[5]

It is interesting to note a common philosophy underlying both of Burkitt's endeavours.[5] In both instances, he sought the geographical distribution of disease in certain groups of people, and then analyzed various factors prevalent in high frequency areas and absent in how frequency areas. From his observations and collected data, Burkitt attributed the causal factor to be fiber in the diet, suggesting that diets low in fiber may underlie development of many characteristically Western diseases. He found that a lack of fiber in the diet played a role in diabetes, colon cancer, varicose veins, hiatus hernia, gallstones, and coronary heart disease.[2,5]

Burkitt wrote a book "Don't Forget Fibre in Your Diet", that described fiber's protective role against large-bowel diseases.[2,5] This helped launch the fiber era in the US in the early 1970s. Often quoted as saying, "If you have an enemy, give him your frying pan," Burkitt proposed that high fat diets, high salt intakes, diabetes and obesity were risk factors for heart disease and suggested that exercise and diets high in cereal fiber might be protective.[2,5]

In Uganda, Burkitt made the observation that Africans produce several times more feces than do Westernized people; their stool is soft and produced with negligible discomfort.[5] He often said that the stool size, and whether it floated or sank, could determine the health of a country's people. Known for starting his lectures by showing numerous slides of human feces taken on his early morning walks in the bush in Africa, Burkitt would stun physicians in the audience by asking them if they knew the size and texture of their wives' stools. Although comical, he demonstrated that an increased intake of fiber caused a higher stool weight and lower stool density, two variables epidemiologically linked with a lower incidence of several diseases.

After this finding, more research was conducted on dietary fiber. Much more is now known about fiber analysis, structure, and other beneficial substances in a high fiber diet; the discovery of these substances and properties owes itself somewhat to the fiber hypothesis.[5]

Denis Burkitt received many honours, honorary degrees and fellowships for his research.[4] One of these honours included the Prize for Achievement in Science, the most prestigious award in North America. However, Burkitt modestly described his discoveries as 'building blocks,' laying the framework for other scientists to build upon. He was once quoted as saying, "any work that becomes a catalyst has far more reaching results than has far more brilliant endeavor that remains an isolated discovery."[2]

Undoubtedly, Denis Burkitt was one of the great physicians of the 20th century. He had the ability to turn simple observations into major scientific discoveries.[5] He discovered, described, and successfully treated a deadly tumor, the first to be traced to a virus. He also played a major role in developing the concept of Western disease and the importance of dietary fiber. He dedicated himself to preventive medicine, noting that it was easier to prevent disease than to cure it. Described as a "launching pad from which others [could] fire their rockets," Dr. Denis Burkitt was a physician whose contribution to the field of medicine will never be forgotten.[2]

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THE TRANS-AFRICA HIGHWAY AS THE ORIGIN OF HIV AND THE EPICENTRE OF AN AIDS EPIDEMIC

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ABSTRACT

The origin of human immunodeficiency virus (HIV) has undergone much study in recent years. Many hypotheses concerning the emergence of HIV and its relationship to the simian immunodeficiency viruses (SIVs) have been published. While there remains tremendous controversy concerning the time in which HIV infected its first human host, there seems to be a consensus concerning the evolutionary divergence of HIV from SIV. If this pattern of divergence is correct, then the virus jumped from primates to humans in a fashion capable of producing disease. SIVs have been isolated solely from primates of African origin. Therefore, many believe the origin of HIV to be central Africa. One hypothesis equates the opening of the Trans-Africa Highway to the spread of HIV infection. This highway runs through the center of Africa, dividing the rainforest and connecting Kinshasa to Mombasa. Long sections of the highway were paved in the late seventies, and it has been suggested that the opening of this highway ended our most traditional defense against infectious diseases; isolation. Information concerning the history of the Trans-Africa highway, when it was paved, how its use has changed throughout time, and HIV prevalence data for towns situated alongside the highway will be discussed. This information will be put into context with the various documented hypotheses concerning the African origin of HIV. Presently it is estimated that four million adults and children living along the Trans-Africa highway are infected with HIV. As this number continues to rise, it becomes increasingly important to understand how man-made factors from one geographical area can influence transmission both within Africa and throughout the world.

In 1983, the virus responsible for AIDS was discovered. Since then, researchers have made tremendous progress in the understanding of the disease. Despite knowledge gained concerning diagnosis, treatment, and prevention of AIDS, the original source of human immunodeficiency virus (HIV) remains a mystery. Thus, the origin of HIV has been the subject of much study in recent years. Many hypotheses concerning the emergence of HIV have been documented. However, most agree that the virus has its roots in Africa. The African origin of HIV is a plausible theory at this time, due to genetic evidence that demonstrates a close relationship of HIV to simian immunodeficiency virus (SIV) isolated from African primates (Huet *et al*., 1990). If HIV truly did diverge from SIV, then the virus jumped from primates to humans in a fashion

capable of producing disease. This "human infective" form of SIV would therefore have been present initially in an African individual, before it spread throughout Africa and the world. The rapid, widespread distribution of HIV that began in the late 1970's and continues today is the topic of much debate. One hypothesis by Preston (1994) equates the spread of HIV infection to the paving of the trans-Africa (*syn*. Kinshasa or AIDS) highway. In his non-fiction book, The Hot Zone, Preston describes the highway as the route along which AIDS travelled during its "breakout from somewhere in the African rainforest to every place on earth". Preston further claims that "the paving of the highway affected every person on earth, and turned out to be one of the most important events of the twentieth century". The appraisal of Preston's theory is an important component of the AIDS puzzle. Understanding this "highway theory" may shed a new light on HIV transmission and may demonstrate the importance of man-made influences on disease. This analysis will include information regarding the highway, supporting evidence for the theory, and current trends in HIV transmission throughout Africa.

The Highway

The trans-Africa highway (Figure 1) is a stretch of pavement that runs from Pointe-Noir, Congo to Mombasa, Kenya connecting east to west across central Africa. The highway passes

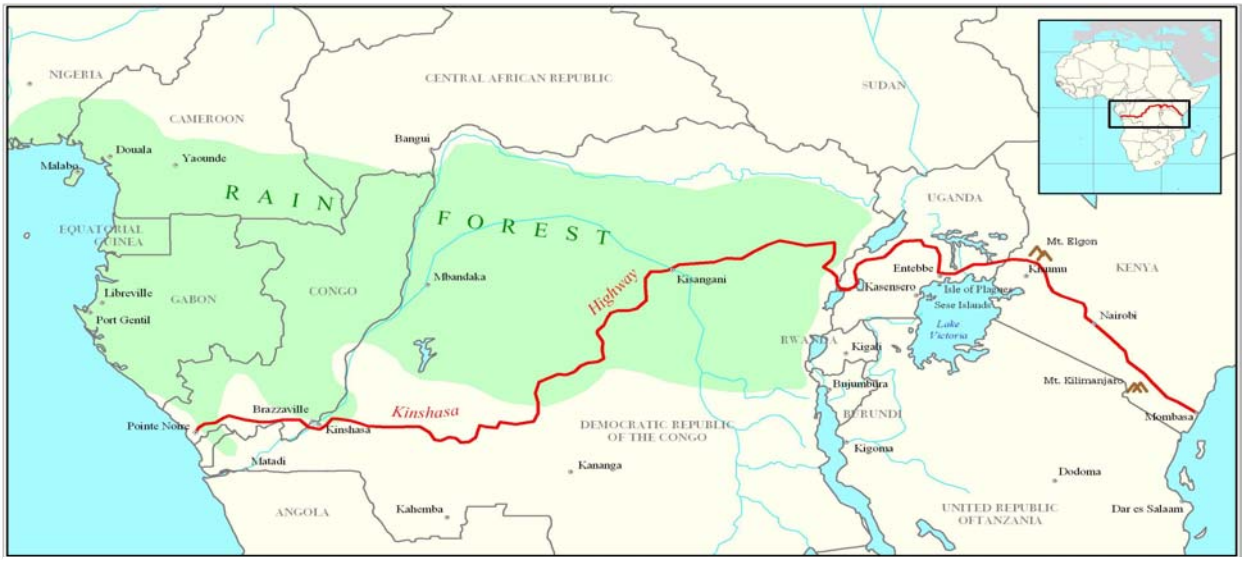

Figure 1. The trans-Africa or Kinshasa Highway represented in black as seen dividing Africa into North and South. The African rainforest is represented as the grey shaded area. (map courtesy of W. A. Hawkins)

through a large portion of the African rainforest, and transects both urban and rural settlements. Until the mid 1970's, the trans-Africa highway was a dirt track with few gravelled sections winding through rural Africa. Descriptions from the early 1970's describe the road as treacherous and impossible to traverse along its complete length (Conover, 1993). Today, the trans-Africa highway is government maintained and is a major trucking route for the continent.

The paving of the trans-Africa highway was a rural development project sponsored by the World Bank from 1973 to 1978 (Platt, 1995). Of the 63 World Bank loans given to Africa between 1970 to 1979, 40% were for infrastructure or transportation developments (Kapur *et al*.,

1997). These loans surpassed 1.7 billion US dollars. Other sectors also funded by World Bank loans during the 1970's included educational development, agriculture, water and sanitation, and industry including mining, oil and gas, telecommunications and electricity. World Bank roadwork projects initiated in Africa during the 1970's depended on local labour-based methods instead of mechanical-based methods (Stock and de Veen, 1996). The use of local labour forces was preferable to the use of machines because labour programs provided training, timely pay of labourers, numerous temporary employment opportunities for both men and women, and finally, labour forces were extremely cost-effective (Stock and de Veen, 1996). These projects were extremely advantageous for the African economy because they decreased regional unemployment and increased the number of skilled labourers.

Of the many African aid projects sponsored by the World Bank in the 1970's, transportation development was the largest. One could argue the merit of funding education and sanitation projects rather than road development. This issue therefore deserves clarification. Throughout the twentieth century, road related transport has and continues to be the dominant mode of transportation in the industrialised world. The automobile is dominant throughout developed economies and is the paradigm of success for developing economies. Road-related travel is economically advantageous as it makes the distribution and availability of goods wider and more accessible (Grbler and Nakicenovic, 1991). It is therefore feasible that the propensity towards road development in the 1970's would have suggested the greatest leap towards economic prosperity in Africa. The creation of jobs, availability of goods, and inclusion of previously isolated rural communities would not only result in an improved quality of life but economic advantage as well.

Supporting Evidence

When searching for a source, typically it can be found towards the centre of highest concentration. One would expect this "epicentre" phenomena to also occur with HIV infection. Therefore, if a location in Africa truly is the focal point or origin of HIV, infection rates in Africa should be high and they should decrease with increasing distance from the continent. Recent prevalence data for HIV and AIDS infection throughout the world demonstrates this principle (UNAIDS, 2000). Africa is undoubtedly the most severely affected, as 26 of the 36 million infected adults worldwide reside in Africa. Of the 26 million African individuals infected, current estimates indicate that 25.3 million are from Sub-Saharan Africa; the region of the trans-Africa highway (UNAIDS, 2000). The epicentre idea of HIV distribution can be similarly visualised when considering African HIV prevalence data through time. Although not as clear due to surveillance data bias and a late starting point (1984), Congo, Uganda, and Kenya stand out as countries with a history of higher than normal HIV prevalence (UNAIDS, 2000). As these values change with time, this distinction becomes less clear due to increased surveillance in wealthy, more urbanised countries (Southern Africa), higher prevalence rates in areas with the largest populations, and the overlap of both HIV strains.

When considering the origin of HIV, it is necessary to differentiate between strains of virus. At present, two strains of HIV exist; HIV-1 and HIV-2. Differentiation is absolutely necessary because one strain did not evolve from the other. Instead, it is thought that the two viruses diverged independently from unique strains of SIV (Barin *et al*., 1985). HIV-2 is less

pathogenic and transmissible than HIV-1. HIV-2 spreads less effectively than HIV-1, and is not the culprit in the current AIDS pandemic. HIV-2 is limited in distribution to Northwest Africa and a handful of cases in Portugal and France (Kanki and De Cock, 1994). Conversely, HIV-1 is easily transmitted, produces a severe immunodeficiency in a relatively short period of time, and is responsible for the bulk of worldwide infection seen today. For these reasons, it is thought that HIV-1 is the strain referred to by Preston (1994) and the strain that spread throughout Africa and the world following the paving of the trans-Africa highway.

The oldest confirmed case of HIV-1 infection in a human host was recently determined to be from a 1959 African plasma sample (Zhu *et al*., 1998). Up until this discovery, it was thought that the oldest case of HIV-1 was that of a Manchester sailor who died of an AIDS-like illness in 1959, although preserved specimens tested negative (Williams *et al*., 1983). The positive 1959 plasma sample was obtained from an adult male living in Kinshasa, Democratic Republic of Congo (formerly Leopoldville, Belgian Congo). The sequence amplified from this 1959 sample has extreme value in its potential to prove insight into the evolution of HIV-1. This value has in fact been demonstrated by Korber *et al*. (2000) who used the 1959 HIV-1 genetic sequence to help estimate the genetic age of HIV-1. Using the assumption that genetic changes are a linear function of time and a complex computer algorithm, Korber *et al*. (2000) predicted that the ancestral or main group of HIV-1 diverged from SIV in 1931. This data implies that the initial cross-species transmission of SIV from a primate host to HIV into a human host occurred in the early 1930's.

Many researchers have focused their efforts on collecting and genotyping strains of SIV isolated from various species of primates. Of the SIV strains analysed, HIV-1 is closest in genetic relation to the strain SIV_{cpz} isolated from the chimpanzee subspecies *Pan troglodytes troglodytes* (Hahn *et al*., 2000). Genetic evidence therefore suggests that HIV-1 descended from a chimpanzee strain of SIV or more simply stated, an SIV infected chimpanzee transmitted the virus to a human host. Pathogen movement between species is a common phenomenon and several simian viruses have been documented to cause human infection. These include monkey pox (Meyer *et al*., 1991), simian T cell leukemia virus (Voevodin *et al*., 1997), and simian foamy virus (Callahan *et al*., 1999). If an SIV crossover from a chimpanzee to a human host really did occur, then this jump would have occurred in the home range of *P. t. troglodytes*. This range corresponds largely to the area of the African rainforest in west equatorial Africa. Populations of *P. t. troglodytes* are highest in the large West African country, Democratic Republic of Congo, also the country of origin for the HIV-1 positive 1959 African plasma sample (Zhu *et al*., 1998). Viral crossover would have been dependent on close contact between humans and primates. This contact is substantiated through the hunting, butchering, and consumption of "bush meat" (often primates) which is commonplace for many African cultures (Fox, 2000). Through the aforementioned practices, it is therefore feasible that the blood of an infected chimpanzee could have transmitted SIV to a human host. This early form of HIV-1 would have festered in a small African community, being transmitted to others through sexual contact or exposure to blood.

Before the paving of the trans-Africa highway, rural communities in west-equatorial Africa were isolated from larger cities. This isolation was due to the lack of roads, rail, or any form of communication between urban and rural centres. Roads were scarce, and those that did exist were treacherous (Preston, 1994). Because of rural isolation, an HIV-1 infected community

would have been protected from other, perhaps larger populations. This would have severely limited the spread of HIV-1 in these early years. With the paving of the trans-Africa highway in the 1970's, a previously isolated community would have had access to urban centres and other rural communities, thereby enhancing the potential for transmission. Following the completion of the paved trans-Africa highway, the long distance hauling industry expanded to include central Africa (Conover, 1993).

Presently, HIV transmission along the trans-Africa highway is a major issue in the fight against AIDS. Studies have demonstrated that communities living on the trans-Africa trucking route are at considerably increased risk of contracting HIV when compared to the surrounding countryside with limited access to the highway (Serwadda *et al*., 1992). Factors affecting the increased risk of HIV include the rampant sex trade in truck-stop communities (Serwadda *et al*., 1992), the combination of multiple sexual partners with a lack of condom usage among all age groups (Nunn *et al*., 1996), and the complacent attitude towards contracting HIV of the local citizens (Witte *et al*., 1998). AIDS education and prevention efforts have targeted towns along the trans-Africa highway but unfortunately have reported little success. HIV-1 infection rates continue to increase throughout central Africa (UNAIDS, 2000).

Current trends in HIV transmission throughout Africa

HIV transmission in Africa is through heterosexual sexual contact in 90% of cases (World Bank, 1999). It is estimated that the African death toll from HIV will soon surpass 20 million - greater than the number of Europeans killed during the 14th century plague (Cohen, 2000). The only strategy to combat the spread of HIV in Africa is prevention, and it has been estimated that the cost to prevent each new HIV infection is between $8 and $12 US dollars (Cohen, 2000). Regardless of the knowledge concerning HIV transmission in Africa, the number of new infections continues to rise in all population sectors. A model to predict the effect of deaths due to HIV on the African population was constructed by UNAIDS (2000) and shows massive erosion of the middle-aged adult and infant age groups. This loss of productive adults and future generation will undoubtedly have negative consequences on the African economy including a loss of workforce, broken families, and millions of orphaned children (World Bank, 1999). Massive intervention efforts are currently underway in many African countries with the hopes of strengthening the fight against HIV transmission. UNAIDS, a partnership between the World Bank, World Health Organisation, and United Nations have supplied finances and manpower to support the following areas of intervention: surveillance of HIV and STDs, behaviour change communication and education, voluntary counselling and testing for all citizens, condom supply and logistics to improve condom usage, increased safety of blood products, reductions in mother to child transmission, HIV treatment, and care programs for AIDS orphans and vulnerable children (World Bank, 2000). The above interventions illustrate the importance placed on the fight against HIV. Presently, HIV prevention is at the centre of the World Bank's developmental agenda in Africa.

The exacerbation of current HIV infection rates in Africa due to transmission along the trans-Africa highway has been documented (Witte *et al*., 1998). The theory that HIV emerged from an isolated and localised rural African community only to spread to the rest of Africa and the world via the trans-Africa highway has much supporting evidence. This theory, however,

lacks definitive proof. What is unique regarding Preston's theory (1994) is that he attributes the initial widespread dissemination of HIV to be due to the same factor that is responsible for much of the spread today - the trans-Africa highway. Use of the trans-Africa highway has remained the same since it's completion in 1978. It is a major trucking route for central Africa. It is widely used and what seems obvious, is that it has extreme importance for the African economy. The role of the highway in the initial spread of HIV cannot be predicted. However the highway and transmission most certainly seem connected. Research regarding the origin of HIV continues at a rampant pace. Understanding the origin of the current pandemic has important implications in understanding the potential for future zoonotic virus transmission. Finally, by being aware of how the trans-Africa highway may have affected HIV infection throughout the world, the importance of man-made factors in disease dissemination becomes increasingly important. Perhaps in understanding how HIV has managed to spread to every corner of the world, we can prevent future outbreaks of unknown and misunderstood viruses.

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THE ORIGIN OF HIV/AIDS: MONKEYING AROUND?

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ABSTRACT

Though theories abound as to the origin of HIV/AIDS, it is generally accepted today that HIV likely originated in Africa, transferred to humans through monkeys. While there are many variations on this "natural transfer/isolated tribe" theory, ranging from a hunter cutting themselves while skinning monkeys, to kinky African tribal sexual practices, these variations all generally revolve around this "natural progression from monkey to man", or just a twist of fate.

However, there are still those who disagree with this theory, pushing various theories of their own instead. Ranging from the paranoid and unsubstantiated to the plausible and well researched, one of the more interesting alternate theories involves the possibility that HIV might have been accidentally introduced into humans by scientists involved in polio vaccine research.

In the race to develop the oral polio vaccine, it was common practice for the researchers to inactivate the live poliovirus in monkey kidney cell culture, and while details are sketchy as to which species of monkey was used specifically, there is evidence that chimpanzees, African green monkey, and rhesus monkeys were all used at one time or another, species in which simian immunodeficiency viruses (SIV's) have since been found. As well, there are strong correlations between the African areas in which the vaccines were tested and current prevalence statistics.

Though HIV/AIDS is not a new phenomenon, there is disagreement as to exactly when and wher it came from. The first known case to have occurred dates back to 1959, when David Carr, a British naval conscript, died of then unrecognized AIDS-like symptoms. Because the primary cause of death was *Pneumocystis carinii* pneumonia (PCP), and was suspicious at the time, doctors made a note of it, and saved tissue blocks from David's body. Only later in the 1980's when HIV and AIDS came to the forefront, did people go back to check the tissue blocks for evidence of HIV, which they were indeed positive for. Those findings have since been confirmed with PCR techniques.

It is generally accepted today that the origin from HIV is from somewhere deep in Africa, where an ape or monkey with a strain of simian immunodeficiency virus (SIV) similar to HIV crossed the species barrier and infected a human. Theories abound as to exactly how this could have happened, varying from hunters being bitten while looking for food, to improperly cooking their meat, or cutting themselves while skinning the monkey carcass. There have also been

many refinements to the core of this theory, with critics wondering why HIV suddenly appeared in the 70's and 80's when African hunters have been trapping and eating monkeys for a lot longer than that. Some common refinements to this theory is the "isolated tribe" hypothesis, as well as changing morals and increased geographic mobility with air travel. However this theory has not always been so widely accepted, with many other competing theories abounding just 20-30 years ago.

While these competing theories range from the absurd to the unprovable, they generally break down into four major categories. First, there are those that believe HIV was "from the heavens", essentially an act of God, or an extra-terrestrial phenomenon such as an alien experiment. These theories are generally difficult to prove and have little basis other than just fundamental belief, and as such we will discuss them no further.

The next set of theories are the conspiracy theories. These are the people that believe HIV was a result of the "evil man". Proposed theories under this category are the suspected government cover-ups of chemical/biological warfare research, with HIV either being the end result or an accidental by-product. Critics of course argue that HIV is a slow an inefficient means to kill the enemy due to the long incubation periods.

The third group of theories involve the "bungling man", or the accidental theories. Examples of such unfortunate happenstance include the contaminated vaccine theories, the varied African sexual practices, cult practices, and nuclear testing. The vaccine theories maintain that during the course of vaccine research, contaminated monkey or ape cells might have been used, with some HIV surviving to be injected into humans. The African sexual practices refer to some tribes who believe monkey blood to be aphrodisiac, and inject blood into themselves before engaging in intercourse. Cult practices follow along the same line, with fingers being pointed at bloodletting and drinking animal blood. Finally the nuclear testing theory maintains that low level radiation may have a dual effect, by both increasing the mutation rate of retroviruses and immunosuppressing individuals in the vicinity.

Finally, there is a school of thought that does not believe HIV/AIDS exists at all. They maintain AIDS may simply be a conglomeration of symptoms from various other diseases. Others say that AIDS is a multifactorial disease, implying that infection with HIV does not automatically lead to AIDS, but depends on other factors. Worthy of mention in this category is Dr. Peter Duesberg, a hero in some HIV circles because even into the early 90's, he maintained that HIV does NOT directly lead to AIDS, and even offered various times to inject himself with HIV to prove it. However, he has become somewhat more quiet in recent years, and has since withdrawn that offer.

The theory that will be the focus of this presentation is the Oral Polio Vaccine (OPV), and how for a period of time through the 80's and 90's many believed that HIV may have been unwittingly introduced into humans by researchers involved in a race to be the first to perfect a vaccine to eradicate poliomyelitis. This theory was first proposed by several fairly obscure scientists, who then brought the theory to the attention of an investigative journalist, Tom Curtis, who published an article in Rolling Stone. The cause has then since been taken up by Edward Hooper, who remains one of the major proponents of this theory. In addition, he has written a

substantial book on the topic, which was in fact the primary reference for this presentation (Hooper, 1999).

But first, a little background. Poliomyelitis was one of the most feared diseases in the post World War II era. Part of why the world was so eager to eradicate this disease was because of the horrible images that it evoked at the time, such as little children in iron lung devices, unable to breathe for themselves. Another reason for the widespread fear was the terrible effects of the disease, with the most feared being invasion of the spinal cord and paralysis. This was especially difficult to deal with because polio attacked not only sick individuals, but indiscriminately, including normally healthy people. By the early 1950's polio epidemics were an annual occurrence.

Early vaccine research began in the 1930's, but all of these were scrapped because the vaccine would tend to revert to its virulent form. Finally in 1954, Jonas Salk began trials of his Inactivated Polio Vaccine (IPV) (an injectable), but still encountered periodic problems with reversion and mild paralysis. However, with continued work and modifications between 1955-62, most of the bugs were worked out, and Salk's IPV became the accepted vaccine to in the fight against polio. It should be noted though, that Salk's vaccine was not without controversy. Soon after its implementation, doubts as to its effectiveness were raised, as field testing showed that immunity was only conferred about 60-70% of the time. Also, immunity dwindled with time, requiring booster shots.

Though work on Oral Polio Vaccines (OPV) had begun in the 40's, it was about this time that they started becoming a viable alternative to Salk's vaccine. The race began in earnest in 1955 when three competing groups of researchers headed by Albert Sabin, Hilary Koprowski, and Harald Cox respectively obtained backing from various sources to perfect their OPVs. OPVs in contrast to IPV, is a "live attenuated vaccine", meaning the virus is never completely killed, but rather rendered less virulent through multiple passages through cell culture. The benefits of OPV were many. It could be delivered orally, either by squirting it into the mouth, put into capsule form, or just dripped onto sugar cubes for children to swallow. Furthermore, the immunity conferred was more consistent and permanent than with IPV.

As this "race" continued, the researchers settled on various species of monkey kidneys as the favored substrate in which to passage the virus after trying other cell lines like chick embryo or rabbit. In 1958, mass trials of the vaccines began, with Sabin experimenting in Russia, and Koprowski in Poland and Africa. Of particular interest was the CHAT vaccine of Koprowski's , which we will revisit shortly. Cox's vaccines quickly fell out of the running at this point due to reversions to virulence, a common problem at the time. An interesting side note about these trials: consent was usually not an issue with these tests, as subjects were often "feeble-minded children" in homes, or in the case of Russia, were "volunteered" by the state. These trials continued into 1959, and by this point, Sabin's vaccines had emerged as the safer of the two, and provided broader coverage. In 1960, Sabin's vaccines had been approved for use, and by 1961 were being used worldwide to stamp out polio. But what of Koprowski and his vaccines? Though not the winner of the race, his CHAT vaccines come back to play a central role in Hooper's theory.

The theory starts with OPV itself. Being a live attenuated vaccine, the polio virus is never completely killed. The argument is that if it can survive the inactivation process, other viruses may well be able to do the same. Vaccine contamination was not a new phenomenon, with many accidents having occurred in the past, such as the incidents in 1906 of cholera vaccine contaminated with plague bacilli, and yellow fever vaccine being contaminated with Hep B in 1942 to name a few (Hooper, 1999). Additionally, you can only test for viruses that you are aware of, and of course at the time, no one even knew HIV or SIVs existed. Many researchers at the time admitted their best precaution against unknown viruses was to "exclude sick looking monkeys". However a proponent of the OPV/HIV theory, Louis Pascal, was quick to point out that "Thus was a system set up for the selective transfer of slow and difficult to detect diseases from other species into the human race", of which HIV is a perfect example.

To further illustrate this point, in 1960, simian virus forty (SV40) was discovered in the same monkeys used to make OPV. Till that point, 39 simian viruses had been identified and tested for in batches of vaccine, and excluded. Of more concern was the ability of this virus to immortalize cells in test mice, sending a wave of panic through the scientific establishment, fearing that they had inadvertently introduced a cancer-causing agent into the human population. Though initial tests in the 60's and 70's showed no conclusive link between SV40 and cancer in humans, later in 1993, an Italian scientist by the name of Michele Carbone discovered SV40 in the lungs of people with mesothelioma. As well, links to osteosarcomas and brain tumors were found in 1996, illustrating the possibility of vaccines introducing a simian virus capable of harm into humans.

Another piece of the argument comes from the people who point out that the sites of the trial feedings in Africa (Burundi, Congo, and Rwanda) correlate closely with the countries with the highest prevalence of HIV and AIDS in the world. Looking at a more detailed c map of the Congo, the earliest deaths from AIDS-like symptoms also correspond to the towns and villages where the CHAT vaccine was given (Hooper, 1999)

More evidence supporting this theory comes from the CHAT vaccine itself. When Koprowski was questioned about the type of monkey/ape used for the passage of the vaccine, he was unable to produce records indicating a specific species, and changed his minds several times as to what species they used and when. This uncertainty, coupled with the lack of paper records, prevents the use of the defence "We never used any monkeys with SIVs in them". This argument points to Camp Lindi, a chimpanzee research facility headed by Koprowski just outside of Stanleyville, Congo. Proponents of the OPV/AIDS theory point out that despite the large number of chimps housed at this facility there was very little documentation to come out of it. Of the 400 or so chimps to pass through this facility, only about 150 were accounted for on paper. While most of the research going on at this facility was safety and challenge tests on the chimps, with researchers injecting the chimps with the vaccine to test for safety and efficacy, upon digging Hooper discovered that many chimps died while housed at Camp Lindi. Keepers of the animals stated that chimps did not handle being in cages all that well, and often would refuse to eat to the point of starvation.

This raises the point of what happened to all the chimps when they died? The head researchers involved have all since passed away, and Koprowski denies that chimp kidneys were

ever used to grow vaccine, either at Camp Lindi or back in the United States. He also stated that all the dead chimps were "disposed of", and kidneys were at no point sent back to the States. However, many of the lower ranking staff disagreed, saying that organs and tissue were often removed from chimps that died suddenly, to be "sacrificed for research." Evidence was also obtained by shipping records that many of these samples were sent to Philadelphia, home of the Wistar Institute, Koprowski's home research institute, though never was there any evidence that these chimp kidneys were ever used to grow OPV. The point that Hooper and others bring up was, given that there was no reason to NOT use this tissue to grow vaccine and that there was often a shortage of other monkey species, how could Koprowski be so sure it was never used?

This issue is important because chimps possess the closest known SIV to the human form of HIV (Ewald, 1996). Despite the lack of evidence showing that chimp kidneys were ever used to grow OPV, Hooper maintains that there is also no evidence stating that they were NEVER used, making this a possible point of entry of a SIV into humans, mutating into the HIV-1 that we know today.

Moving away from Africa, the question of how the virus may have spread from Africa to North America is often raised, and here Hooper provides a very plausible answer. Through the early 1960's, the Congolese government was in a state of upheaval having recently gained independence. This meant their Belgian colonial masters were leaving for home en masse, leaving a dearth of knowledge and expertise in the professional and technical sectors. Seeking replacements, the Congo turned to Haiti in Central America, a good fit because they were an independent, black French speaking country. Additionally, Haitians were more than willing to leave given the unstable and oppressive political situation at home. UN records showed that in excess of 1000 Haitians moved to the Congo to work, to return home in the 70's and 80's about the time to the AIDS outbreak in the States and Haiti. Coincidentally, one of the first groups that HIV was first discovered in were Haitian Americans and gay men in the States. This all pieces together nicely when you take into account that Haiti was a very popular stop for gay cruises from the US, evidenced by numerous glowing recommendations from the Spartacus International Gay Guide.

Proponents of the OPV/HIV theory were not always on the attack though. Quite often they were forced to defend their theory, as the scientific establishment never really did accept their theory as plausible. One common question asked was why an outbreak did not occur in Poland at the same time as Africa, given that CHAT was also administered there. The explanation: Different batches were largely used in the different locations, and it was possible that only one batch was contaminated.

Another common attack was that HIV does not survive swallowing in humans. The defence: While strictly this is true, OPV was given to all age groups, and all that was needed for entry was a lesion in the mouth, or even more simply, teething children.

A third counter-argument held that HIV could not does not grow in kidney cells. The defence: Again, while this is true, early vaccine production methods were crude at best, and contaminating macrophages and lymphocytes would inevitably be present, and HIV did grow in those.

Finally, critics point out that there were AIDS deaths before the implementation of the OPV trials, reasoning that if AIDS existed prior to the OPV trials, they could not possibly have been the source. While there were numerous AIDS-like deaths, none had tissues sample saved except for one, David Carr the British sailor. This meant that PCR confirmation was never done on all of these suspected AIDS cases. One such key case was Robert R., a 16 year old black male living in the United States. While he did die of PCP, and other AIDS-like symptoms, Hooper discovered that Robert lived about 1 block away from a US army chemical warfare test site, which had commonly tested cadmium compounds. Upon consultation with various medical experts, it was agreed that chronic exposure to a heavy metal such as cadmium may have immunosuppressed Robert R., rendering him susceptible to unusual pathogens such as PCP.

Hooper proceeds to do the same with all the other key cases of pre-OPV AIDS, taking GREAT pains to establish possible immunodeficiency in each of the victims before their eventual demise from AIDS-like symptoms. Explanations ranged from background radiation from secret US nuclear tests, a gentleman working in a fluorescent light bulb factory (chronic beryllium exposure), and workers from uranium mines. If nothing else, it was fascinating to see the amount of legwork done by Hooper, the evidence he amassed, and the efforts he went to in an attempt to waterproof the OPV/AIDS theory.

Despite all this, the question of David Carr still lingers, the dead sailor whose tissue samples tested positive for HIV by PCR. Further complicating matters, he had never been given CHAT vaccine and had never ventured into Africa, only ever getting as close a Gibraltar in his naval travels. This remained the biggest hole in theory, and the only defences ever used against this criticism was that the tissue blocks may have been contaminated with HIV during handling. As for his death, they argue that David Carr was immunocompromised before, possibly from the series of vaccinations required as a military conscript, coupled with the exertion and stress of the job.

While this entire debate was going on, with Hooper fighting with the scientific community, an option that was raised by Hooper was to go back into Koprowski's freezers at the Wistar institute to dig up some old sample of the vaccine and test it through PCR for SIV or HIV contamination. Upon looking in the freezers, no samples of the vaccine batch were found, but they did turn up some of the seed stocks used in the manufacture of the vaccine. In spite of reluctance to do it at first, PCR tests have now been done on these seed stocks, and have turned up completely negative. Critics of the OPV/AIDS theory say that this effectively quashes the entire theory, while Hooper and his supporters remain adamant that contamination could still have occurred in the additional passages of the vaccine between the seed stocks and the final products, so the debate rages on, though a little more quietly nowadays.

The final thought I will leave to Tom Curtis, the reporter who first published the theory in Rolling Stone.

> "If the Congo vaccine turns out not to be the way AIDS got started in people, it will be because medicine was lucky, not because it was infallible."

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THE HISTORY OF PMS AS A REFLECTION OF CHANGING HISTORICAL CONCEPTS OF HEALTH, ILLNESS, AND DISEASE

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ABSTRACT

In 1931, Robert T. Frank presented a paper to the New York Academy of Medicine bringing attention to the intense suffering women experienced preceding the onset of menstruation. He called this suffering "premenstrual tension". In the same year Karen Horney, a psychoanalyst, published a paper linking these symptoms to rejected fantasies of motherhood. In 1953, Greene and Dalton argued that there were many components to this condition and they proposed that it should be referred to as "premenstrual syndrome", or PMS, a term still in use today. Physicians and the general public have only acknowledged the idea that certain characteristic symptoms are associated with the premenstrual phase of the menstruation cycle for slightly more than 60 years. References to these symptoms however, can be found as far back as the late Renaissance. Over the centuries explanations regarding the etiology, pathophysiology, and nature of the condition have been modified, transformed, or rejected. To this day there is a lack of understanding of many concepts of PMS. This is exemplified by the vague definition and intensely debated etiology and nature of PMS. As such, explanations surrounding PMS continue to change. This paper will explore how many of the historical and modern day concepts of premenstrual symptoms were, and continue to be, a reflection of the era specific approaches to health, illness, and disease.

Medicine has offered numerous theories as to the nature and meaning of health, illness, and disease. Theories have evolved throughout the centuries from the ancient spiritualistic accounts of nature and an imbalance of humours to the careful bedside descriptions of illness and the laboratory expertise of modern day (Duffin, 1999). Just as theories of disease have been reconfigured and transformed over the centuries so too have theories of menstruation and premenstrual suffering. Although only acknowledged as a syndrome in the last half of the 20th century PMS has been described as a complaint by physicians and women from at least the late Renaissance (Stolberg, 2000). This paper will explore how many of the historical and modern day concepts of premenstrual symptoms were, and continue to be, a reflection of the era specific approaches to health, illness, and disease.

The Renaissance was an era of "rebirth" from the 14th to 16th centuries in which artistic, social, scientific, and political thought moved out of the stagnation of the Middle Ages and turned in new directions. New discoveries about the physical world were being made and

applied to medicine. There was a revival of physiological medicine and as a result spiritualistic explanations of the world lost credibility. Disease was seen as the product of physical processes, not of spirit possession or sorcery as was believed in previous eras (Porter, 1996). Philippus Aureolus Paracelsus, a Swiss-born physician and philosopher, studied disease and held that the functions of the body were chemical in nature. It was during this time that physicians saw menstruation primarily as cathartic, a purifying process of accumulated chemical matter. It was believed that women accumulated crude, peccant or disease inducing humours in their bodies that served as a substrate for semen, but when no conception occurred, the uterus got rid of it via menstruation (Stolberg, 2000). According to Jacques Dubois, at the approach of menstruation many women developed a "strangulation from the uterus" due to the accumulation of peccant matter and excretory work of the uterus, thus accounting for premenstrual symptoms (Stolberg, 2000, p. 304).

In the seventeenth century the medical traditions of the Ancients were challenged by the Scientific Revolution. Philosophers, such as Rene Descartes and Thomas Hobbes, argued that nature was made up of particles of inert matter and that motions of the planets and objects were explained by the laws of mechanics, not explained in terms of "desires", thus denounced Aristotle for falsely endowing nature with vitality, will, consciousness, and purpose. This was the time of mechanical science. The concept of humours was scorned and thanks to the dissection techniques of anatomist Andreas Vesalius, the operation of the body could be interpreted by analogy with levers, springs, and pulleys. Nature was viewed as a machine; so too was health and disease. Well-being was compared to a well-tuned machine, while sickness was seen as a mechanical breakdown (Porter, 1996). Ideas surrounding menstruation also changed with the Scientific Revolution. By 1650 the idea that menstruation purified the female body was increasingly challenged. It was believed that instead of accumulating peccant matter, a healthy woman accumulated pure, unspoiled blood every month in order to nourish the fetus during pregnancy and that it was redirected to the breasts post-partum, thus explaining the amenorrhea that followed pregnancy (Stolberg, 2000). The menstruation that occurred when no conception took place was explained in terms of mechanical science. The sheer volume of the accumulated blood dilated the blood vessels of the body and the uterus in particular due to its vascular supply and low position. When the blood vessels could no longer resist the pressure they gave way and burst. Thus plethora, the accumulation of excess blood, was prevented.

The era of mechanical science changed the significance of premenstrual complaints. Most academics considered premenstrual complaints as the norm rather than the exception. They viewed the headaches, abdomen and lower back pain, restlessness, and palpitations as physiological manifestations of the local and generalized plethora and vascular distention, all of which were relieved with menstruation. Girolamo Mercuriale stated, "almost all women, during the time when their monthlies are about to flow, are more troubled for no other reason than the impetus of the blood which runs out in great quantity" (Stolberg, 2000 p. 306). Every premenstrual symptoms was explained by the accumulation of blood and dilation of vessels; headaches were due to the ascending vapours, heat around the spine and loins was due to the expansion of the blood vessels, breast and whole body swelling was due to the increased blood volume and filling of the veins, hip pain was due to the uterus being pulled downward, nausea and vomiting was due to the vascular distention and stagnation in the stomach, palpitations and feelings of suffocation were due to the overloading of the heart and lungs, and tinnitus, insomnia,

and bad dreams were due to the increased pressure, especially on soft tissues (Stolberg, 2000). Thus reductionism prevailed in medicine; the whole was explained in terms of its parts, the complex in terms of the simple, and the biological in terms of the physical.

The physiologists of mechanical science also noticed that chemistry could mimic phenomena such as fermentation, combustion, and decomposition. Bodily processes were described in similar terms and iatrochemistry became a subset of physiology (Duffin, 1999). In the late seventeenth and eighteenth century, iatrochemical theories were used to explain menstruation. Menstrual bleeding was believed to be the result of fermentation or effervescence of the blood in the uterus and in the whole body. As a result of its rapid movement, the fluid dilated the vessels to the point of overcoming the resistance in the uterine vessels and menstruation set in. The fermentation was said to be due to the accumulation of peccant, fermentable matter. The old notion of cathartic menstruation was reframed to present a "purifying" view of menstruation (Stolberg, 2000). The explanations for premenstrual symptoms were similar to those given in the plethora model but the fermentation explanation was preferred in explaining the abrupt onset of symptoms since the symptoms of plethora should have increased gradually over the month. Violent premenstrual symptoms were explained by fermenting matter that was more impure or by delayed evacuation.

Throughout the eighteenth century both the iatrochemical and mechanical notions were being replaced. German physiologist George Stahl, who began as a mechanist, began to think that "in emphasizing the physical sciences, the iatromechanists had fostered a trend away from life itself…and refuted the existence of an underlying life force…" (Duffin, 1999, p. 50). The body was no longer compared to inanimate matter. Attention was directed toward the vital properties and active processes and functions of individual organs (Stolberg, 2000). Thus menstruation was also seen as an active, rather than passive process, used to rid the body of plethora. It was considered the specific, vital function of the uterus to attract blood for excretion or to undergo active glandular secretion.

In the early nineteenth century the idea that organs possessed vital functions was challenged. French physician Francois Magendie and Charles Bell of England conducted experiments on motor and sensory nerve fibers. Their functions were suggested to be the properties of life. In 1828 Friedrich Wohler synthesized urea, a substance previously thought to be a product of living processes. Since vital functions could be reproduced in the laboratory, it was said that vitalism was dead (Duffin, 1999). There was shift to understand events by the structural and functional properties of those events. This led to a change in ideas about menstruation and premenstrual symptoms. In the late nineteenth century E. F. W. Pfluger's explanation dominated. The role of the ovaries was being connected to menstruation and he stated that follicular expansion irritated the ovaries, which irritated the uterus, and triggered menstruation through a nervous reflex. The "irritable uterus" in turn influenced the nervous system to overstimulate the vascular system and produce many of the premenstrual symptoms. During this time period the brain was deemed most sensitive to nervous overstimulation and emotional and mental disturbances became its most characteristic effects (Stolberg, 2000). During the premenstrual period women were said to suffer from nervous overexcitement, sensory disturbances, and mood changes. They experienced decreased intellect, sadness and depression, anxiety, and weeping fits. More frequently women were described as "irritable",

"difficult to live with", and ready to "jump out of their skins" at the slightest provocation. These mental states were said to subside with the onset of menstruation.

The belief among physicians that an irritated uterus led to behavioural changes was so strong that on July 19, 1865 the irritable uterus theory helped acquit Mary Harris, who murdered Adoniram J. Burroughs, a man who promised to marry her, but then married someone else (Spiegel, 1988). Mary Harris was said to have had her menstrual period around the time of the murder. Many physicians testified in the trial that Mary Harris experienced "paroxysmal insanity" at the time of the shooting. Dr. Fitch testified that Harris suffered from severe congestive dysmenorrhea due to irritability of the uterus and that such uterine irritation always affects the nervous system. He stated, "In some instances it develops insanity…uterine irritability is one of the most frequent causes of insanity." He also stated that the uterine irritation combined with her disappointment in love produced a greater effect (Clephane, 1865, p. 51-52). Dr. May testified that he had no hesitation in saying that Mary Harris "laboured under a deranged intellect, paroxysmally deranged, produced by moral causes, and assisted or increased by a physical cause, derangement of the uterus" (Clephane, 1865, p.106). In his concluding testimony defense attorney Joseph Bradley said she was "insane from moral causes aggravated by disease of the body" (Clephane, 1865, p.17). And so it was, the belief that an irritable uterus could produce nervous overstimulation and emotional and mental disturbances was so strong as to link temporary insanity and premenstrual symptoms.

In the early twentieth century hormones were isolated and identified as enzymes of living processes. They offered "an interesting bridge between vitalistic and mechanistic views… They were recognized as the chemical translation of the life force" (Duffin, 1999, p. 58). The isolation of sex hormones in the 1920s supported an endocrinological explanation of menstruation. In 1931, Robert T. Frank presented a paper to the New York Academy of Medicine attributing the raised levels of sex hormones observed premenstrually to the intense suffering women experienced preceding the onset of menstruation. The suffering some women experienced, which exceeded the mild discomfort experienced by most women, included irritability, depression, and various somatic complaints such as headache, backache, breast fullness and discomfort, weight gain, fatigability and nausea (Frank, 1931). He called it "premenstrual tension". The discovery of cyclic changes of the sex hormones in relation to the menstrual cycle provided a credible explanation for the symptoms experienced throughout the body and the varying degrees of severity experienced by many women.

That same year, in an era when Freud's psychoanalysis was popular, psychoanalyst Karen Horney published a paper on "premenstrual mood swings" and linked them to a repressed wish for a child and to frustrated libidinal energy, which she claimed was released by the normal physiological processes that prepared women for pregnancy (Horney, 1931). Attention was drawn to the psychological aspects of premenstrual suffering because of the growing number of women in the workforce and the potential negative impact menstruation could have on the physical and mental work performance. There was also a growing understanding of the "psychological" aspects of life that did not require a somatic cause such as "vapours" (Stolberg, 2000). This was the start of extensive biomedical research into the relationship between women's menstrual cycles and the occurrence of physical, emotional, and behavioural changes. In 1953, Greene and Dalton argued that there were many components to this condition and they

proposed that it should be referred to as "premenstrual syndrome", or PMS, a term still in use today (Greene and Dalton, 1953).

Despite much research that has gone into understanding PMS, its etiology, pathophysiology, and nature are still unknown. This is exemplified by the vague definition that has changed relatively little since the term was first coined. PMS is currently defined as "the cyclic recurrence of a constellation of nonspecific somatic, psychological, or behavioural symptoms that are entrained with the luteal and premenstrual phases of the menstrual cycle and are of sufficient severity to result in deterioration of interpersonal relationships, interference with normal activities, or both" (Ransom, 2000). Although there is still a lack of understanding of many of its concepts, the study and understanding of PMS has benefited from the shift in modern medicine which has moved away from strictly looking at disease and illness from an anatomical and physiological perspective to taking a biopsychosocial approach.

The biopsychosocial model proposes up to four levels of functioning that may contribute to PMS. These include: (1) menstrual cycle changes, which most women consider normal, (2) pathology, which includes psychiatric, gynecological, and other medical conditions that may contribute to symptoms, (3) social contexts and cultural influences framing women's premenstrual experiences, such as unhappy personal and work situations and the abundance of information on PMS found in popular literature, and (4) the individual's interpretation of the combined influences of physiology, possible pathology, and social situation which may depend on the individual's personality factors, coping style, and learning (Vanselow, 1998). This approach is not meant to negate the real and distressing premenstrual experiences of women, nor is it meant to negate the influence of biology. Rather it seeks to bring together the interrelated biological, psychological, and social factors (Gurevich, 1995). The recent application of the biopsychosocial model to PMS can be observed in a comparison of standard obstetrics and gynecology textbooks. The 1971 Benson Handbook of Obstetrics and Gynecology has one page devoted to the topic. It briefly gives a definition, possible etiologies, clinical findings, and treatment options. The Ransom 2000 Practical Strategies in Obstetrics and Gynecology devotes a ten page chapter to PMS. It covers the definition of PMS, its prevalence, theories about its etiology and pathogenesis, a biopsychosocial approach to the topic, how to carry out an appropriate history and physical exam, diagnostic considerations, differential diagnosis, and treatment options. Therapeutic interventions for premenstrual syndromes have also taken a biopsychosocial approach by ranging from conservative treatment (lifestyle and stress management) to treatment with psychotropic medications and hormonal therapy or surgical procedures to eliminate ovulation or ovarian function for more extreme cases (Steiner, 1997). The fact that no one intervention has proven effective for all women who experience PMS indicates that PMS is indeed multifaceted and should be approached as such. Thus, the modern day biopsychosocial approach to disease has been appropriately applied to assist in the study, understanding, and treatment of PMS.

Premenstrual syndrome is a relatively new term but references to premenstrual suffering can be found as far back as the late renaissance. Although the descriptions given by physicians and women fall within modern day definitions of PMS the explanations regarding the etiology, pathophysiology, and nature of the condition have changed throughout the centuries. The explanations were shaped by the era specific theories of health, illness, and disease. Therefore,

understanding the contemporary physiological notions is important to understanding the history of PMS specifically, and other conditions in general. Recently, there has also been a move to distinguish true PMS from the normal, milder physiological premenstrual symptoms. Although the latter can be influenced by many factors, it does not necessarily signal a diseased state. The normal menstrual changes "constitute a part of women's being, and are not pathological. Women do not have times of normality and times of illness...the menstrual cycle forms a continuum of change, physical, mental, and social" (Laws, 1983, p. 30). Only when the symptoms are severe enough to lead to a disruption of normal functioning is the condition called PMS. Recognition of this fact is one of the most important advances made in understanding menstrual experiences.

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HOMOSEXUALITY AND THE DSM: DOCTORING THE SOCIALLY MARGINALIZED

By

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ABSTRACT

On December 15th, 1973, the board of trustees of the American Psychiatric Association (APA) voted to remove homosexuality from the Diagnostic and Statistical Manual (DSM). In doing so, they abandoned the position on homosexuality that had been deeply entrenched in psychiatric theory for almost a century. Alfred Freedman, the president of the APA during this period, noted that the classification of homosexuality as a sexual deviation had been the subject of a fiery debate, "fanned by the organized homosexual community, which has vigorously protested the prejudice that derives from classifying their condition as a mental illness". For four months after the nosological change, controversy consumed the APA membership until a referendum was held. With an approximate 60-40 split, the results were a clear, though muted, expression of support for the new nomenclature.

The debate among psychiatrists at the time focused almost exclusively on the social and ethical impact such a change in classification would have on the lives of homosexuals. This entire process seemed to violate the most basic expectations about how questions of science should be resolved. Instead of being engaged in a sober consideration of data, psychiatrists were swept up in political and moral argument.

It has become a matter of conventional wisdom to note that psychiatry is affected by the cultural milieu within which it is embedded, tending to reflect the dominant values of the time. Disease labels applied to, or withdrawn from, modes of deviant behaviour can be as much a result of changing social norms or political expediency as they are an outcome of psychiatric theory or clinical practice. The struggle over the classification of homosexuality provides an extraordinary opportunity to examine the reciprocal relationship between psychiatry and social constructions of normalcy.

Introduction

It has become a matter of conventional wisdom to note that psychiatry is affected by the cultural milieu within which it is embedded, tending to reflect the dominant values of the time. Disease labels applied to, or withdrawn from, modes of deviant behaviour can be as much a result of changing social norms or political expediency as they are an outcome of psychiatric theory or clinical practice. The struggle over the classification of homosexuality provides an opportunity to examine the reciprocal relationship between psychiatry and social constructions of normalcy.

The history of medicine abounds with examples of the influence of cultural values on the classification of both physical and mental conditions (Reznek, 1987). However, cultural norms are not universal and eternal truths; on the contrary, they vary with geography and alter across time (Bootzin and Acocella, 1980). Compared with other cultures, Western culture has been relatively sexually repressive in its attitude towards homosexuality. In fact, the cultural taboo of homosexuality is by no means universal. According to one cross-cultural survey, two-thirds of the societies studied regarded homosexuality as normal and acceptable, at least for some people or for some age groups (Ford and Beach, 1951). Whether or not adherence to norms is even an appropriate criterion for defining mental health, it might be considered an oppressive criterion. Not only does this standard enthrone conformity as the ideal pattern of behaviour, it also stigmatizes the nonconformist and devalues diversity (Bootzin and Acocella, 1980).

Confusion on the status of homosexuality within the classification system of mental disorders stems largely from the misattribution of health as normalcy and illness as deviance, as well as varying concepts of normalcy. The term "normal" can refer to statistical frequency or to a notion of normative correctness - a value concept. An act can be considered normal in one of these senses and abnormal in the other. Regardless of its "normality" or "deviance", it is a conceptual mistake to consider homosexuality a disease. To see that this view is plausible, one need only observe that not all disapproved patterns of behaviour nor all statistically deviant conditions are diseases (Macklin, 1982).

Dominant Views on Homosexuality and the DSM-I

Although homosexual behaviour has existed throughout human existence and across cultures, the term "homosexuality" was coined in 1869 by a Hungarian physician, K. Benkert. He wrote: "In addition to the normal sexual urge in man and woman, Nature in her sovereign mood had endowed at birth certain male and female individuals with the homosexual urge, thus placing them in a sexual bondage which renders them physically and psychically incapable - even with the best intention - of normal erection" (Hirschfield, 1936).

When the American Psychiatric Association (APA) issued its first official listing of mental disorders in 1952, the *Diagnostic and Statistical Manual* (*DSM*), voices of dissent on the issue of homosexuality were just beginning to be heard, but they had little political force (Bayer, 1987). In the nomenclature of the *DSM-I*, homosexuality and the "other sexual deviations" were included among the sociopathic personality disturbances. These disorders were characterized by the absence of subjectively experienced distress or anxiety despite the presence of profound

pathology. However, the *DSM-I* acknowledged that homosexuality was considered a disease largely because of cultural values when it asserted that homosexuals were "ill primarily in terms of society and conformity with the prevailing cultural milieu" (*DSM-I*, 1952).

The primary evidence for the position that homosexuality is pathological and should be included in the psychiatric nosology, came from a study of 106 male homosexuals who were already undergoing psychiatric treatment for various disorders (Bieber et al, 1962). Bieber and his colleagues reported the frequent occurrence of "smother mother" syndrome among the study population. According to the authors, the fundamental cause of this syndrome was a disturbed relationship between the parents. The mother would then transfer her love from her husband to her son and become very overprotective of him. At the same time, the father would become withdrawn, resentful and distant from the son. Of course, this study never held up to scientific scrutiny since its sample was far from representative of the homosexual community and was biased in the direction of having significant pathology by virtue of the recruitment method used. It is not surprising that a high level of psychopathology would be found among homosexuals who were currently undergoing psychiatric treatment for various disorders. It is, however, noteworthy that there had been very little research done using random samples of homosexuals in the community.

Challenges to the Pathological View of Homosexuality

Statistical Normalcy

Homosexual rights activists have asserted that the Alfred Kinsey Report, published in 1948, was instrumental in beginning to change dominant public attitudes toward homosexuality and creating a social climate conducive to the emergence of an open gay rights movement in the United States. Based on interviews with 5,300 American males, the Report stated that 37% of the male population interviewed had experienced physical contact to the point of orgasm with other men at some time between adolescence and old age, 18% of males revealed as much homosexual as heterosexual experience, and another 13% of men experienced but did not act upon homosexual impulses (Kinsey et al, 1948). Kinsey's data on women indicated a much lower incidence of homosexual experience of only 13%, but even this was considered startling when first published. Kinsey believed that sexual preferences were no different from those involving food or clothing and that it was society's intolerance of certain sexual practices that brought them to public attention (Kinsey et al, 1953).

Anti-Psychiatry

In the mid-1950s, Dr. Thomas Szasz, a psychiatrist, created a revolution in thought when he began a movement that became known as "anti-psychiatry". He produced a series of essays that accused psychiatry of masquerading as a medical discipline and of assuming the function of social censure previously performed by religious institutions. According to Szasz, psychiatry sought to redefine deviations from ethical, political and legal norms by the invention and then by the expansion of the concept of mental illness. Szasz believed that psychiatric diagnoses were merely labels applied to deviant or unacceptable behaviours and served only to degrade the people to whom they were attached. According to Szasz, applying a psychiatric diagnosis was the first step in the psychiatric control of discordant behaviour. Szasz believed that such

diagnoses served the interests of those with power instead of serving the interests of those who are "sick" (Szasz, 1974).

Thomas Szasz expressed his disgust at the aversive therapy used in the treatment of patients labelled homosexual to "convert" them to heterosexuality. "Psychiatric preoccupation with the disease concept of homosexuality - as with the disease concept of all so-called mental illnesses...conceals the fact that homosexuals are a group of medically stigmatized and socially persecuted individuals… It is a heartless hypocrisy to pretend that physicians, psychiatrists or normal laymen for that matter really care about the welfare of them mentally ill in general, or the homosexual in particular. If they did, they would stop torturing him while claiming to help him" (Szasz, 1970).

DSM-II

In the *DSM-II*, issued in 1968, homosexuality was removed from the category of sociopathic personality disturbances and listed together with the other sexual deviations - fetishism, pedophilia, transvestitism, exhibitionism, voyeurism, sadism and masochism - among the "other non-psychotic mental disorders". The *DSM-II* provided a definition of normal sexual behaviour that was quite narrow in its scope. Any "sexual interests directed primarily toward objects other than people of the opposite sex or toward sexual acts not usually associated with coitus" (*DSM-II*, 1968) was considered to be a sexual disorder. However, evidence began to accumulate indicating that homosexuality may be inappropriately classified as a mental illness. Several studies were published that reported that homosexuals were no more prone to psychopathology than matched groups of heterosexuals (Hooker, 1957; Saghir and Robins, 1969; Saghir, Robins, and Walbran, 1969). Also, according to the research, there was no evidence for a "typical" homosexual personality (Hooker, 1957).

Taking the new evidence into consideration, in 1972, Judd Marmor *published Homosexuality - Mental Disease - or Moral Dilemma?* in which he asserted that the fundamental issue raised by the nosological status of homosexuality was neither medical nor semantic, but moral. Marmor argued that since homosexuals were capable of making successful adaptations to society, there was no more justification for classifying homosexuality as a disease than for so designating heterosexuality.

There was much at stake in the medical debate. If homosexuals were ill, then the medical profession was justified in subjecting them to various medical treatments. Two psychiatrists described their treatment: "A photograph of a male, attractive to the patient, is presented to him and the patient is able to continue to look at this, or remove it as he wishes. If he has not removed it within 8 seconds he receives an electric shock at an intensity previously determined as very unpleasant for him, until he does remove the photograph. The moment he does so the shock ceases. The male stimulus is a signal that something unpleasant is about to happen. Anxiety is evoked by this, and is reduced by avoiding the shock" (Feldman and MacCullouch, 1971). Other psychiatrists who were against the idea of using this method to attempt to "convert" homosexuals claimed that it was prone to produce impotent homosexuals rather than healthy heterosexuals. The mere existence of treatment served as a tacit endorsement of society's

condemnation of homosexuality and a tacit encouragement of homosexuals to regard themselves as "sick" (Bootzin and Acocella, 1980).

The Gay Rights Movement

While homosexuals have been present at all times in Western history, their presence in public discourse and political debate has never been so prominent as in the past century. During this time, a number of social changes and focal events have spurred first the social, then the political organization of gays, followed by the radicalization of the gay rights movement.

The urbanization of Western civilization in the late 19th century was an important factor contributing to the early organization of gay and lesbian groups, as it allowed previously isolated gays to meet and form social networks and communities (Adam, 1995). At first, these individuals developed ways of meeting one another and institutions to foster a sense of identity. For the most part hidden from view because of social hostility, an urban gay subculture had come into existence by the 1930s (Foner and Garraty, 1991).

World War II served as a critical divide in the social history of homosexuality. Large numbers of young people left families, small towns, and closely knit ethnic neighborhoods to enter a sex-segregated military or to migrate to larger cities for wartime employment. After the War, many gays and lesbians elected to remain in urban areas to adopt their gay identities and foster social connections and the gay subculture through gay bars and friendship networks. Although bars were central to gay socialization for several hundred years, many smaller North American cities saw their first gay bars in the 1940s (Ibid.).

This new visibility provoked latent cultural prejudices. Blatant discrimination, including firings from government jobs and purges from the military intensified in the 1950s. In 1953, President Dwight D. Eisenhower issued an executive order barring gay men and lesbians from all federal jobs; many state and local governments and private corporations followed suit (Ibid.).

The 1950s also saw the beginning of a FBI surveillance program against homosexuals. Local police forces increasingly harassed gay citizens, regularly raiding gay bars, sometimes arresting dozens of men and women on a single night. At the time, the presence of three or more homosexuals at the same venue constituted unlawful assembly under common law in many states and cities. Under these dangerously oppressive conditions, some gays began to organize politically. In November 1950, a small group of homosexual men in Los Angeles met to form what would become the Mattachine Society. Initially secretive and almost exclusively male in membership, it was joined in 1955 by a lesbian organization in San Francisco, the Daughters of Bilitis (Ibid.; Bayer, 1987). In the 1950s these organizations remained small, but they established chapters in several cities and published magazines that provided for many readers a comforting social network and an inspiring example of resistance (Foner and Garraty, 1991). Although these and other small organizations exercised extreme caution, moving slowly in organizing and outreach, their progress was significant considering the hostile political milieu of McCarthyism in which they existed (Bayer, 1987).

Prominent among early issues addressed by the Mattachine Society and similar organizations were questions about the causes of homosexuality, its status as a pathological condition, and the appropriateness of "curative therapy" for homosexuals (Ibid.). Dramatically conflicting views were put forth, with some homosexuals welcoming a psychiatric definition of homosexuality over a criminal definition, and others critiquing psychiatric orthodoxy by asserting that homosexuality is "fully compatible with subjective well-being and objective efficiency" (Mattachine Review, 1958). However, alongside these published partisan submissions, the editors of the Mattachine Review claimed agnosticism on these issues and deferred to psychiatric professionals and social scientists to resolve these complex issues (Bayer, 1987).

Political organization around the rights of homosexuals was substantially inspired by other human rights groups of the 1960s – the Black civil rights movement, the second wave of the feminist movement, and the student protests against the Vietnam War. Gays and lesbians added homophobia and discrimination on the basis of sexual orientation to the list of social injustices that demanded political and social protest and heterosexuals with similar politics joined in the effort to promote social change. The "homophile movement", as the participants dubbed it, became more visible, picketing government agencies in Washington to protest discriminatory employment policies and protesting police harassment. By 1969, perhaps fifty homophile organizations existed in the United States, with memberships of a few thousand individuals (Sloan, 1997; Foner and Garraty, 1991).

By all accounts, the 1969 Stonewall riots were a focal point in the gay rights movement that was observed throughout the Western world. In 1969, it was illegal to operate any business catering to homosexuals in New York City -- as it still is today in many places in the United States and eleswhere. Typically, the New York City police would raid such establishments on a semi-regular basis, arrest a few of the most obvious targets (such as Hispanics and drag-queens whose double-minority status made them likely victims), and fine the owners prior to letting business continue as usual by the next evening. On Friday evening, June 27, 1969, the New York City police raided an illicit gay bar, the Stonewall Inn on Christopher Street in Greenwich Village. In contrast with many previous raids on gay bars, this one was met with substantial resistance, not only on the part of patrons, but also residents of this predominantly left-wing neighborhood. Hundreds of protesters demonstrated their opposition to the oppression of homosexuals, and for three nights, defiant crowds took to the streets proclaiming "Gay Power!" Overnight, a radicalized, grassroots gay rights movement was born, championed by militant groups such as the Gay Liberation Front and the Gay Activist Alliance (Stonewall, 2001; Sloan, 1997; Foner and Garraty, 1991).

In 1970, 5,000 gay men and lesbians marched in New York City to commemorate the first anniversary of the Stonewall Riots, and by 1973, there were almost eight hundred gay and lesbian organizations in the United States (Foner and Garraty, 1991). Gay activists were increasingly united in their "gay pride" and their conscious rejection of the social stigma attached to their sexuality. These groups demanded the decriminalization of homosexual behavior, the end of police harassment, the elimination of the ban on the employment of homosexuals in federal jobs, and the inclusion of sexual orientation in civil rights statutes (Ibid.; Sloan, 1997). Their protests became more broadly and more disruptively directed against all institutions that

propagated the pattern of discrimination against homosexuals, including the psychiatric profession (Bayer, 1987). The lesbian and gay world was no longer an underground subculture but a well-organized community, especially in larger cities (Foner and Garraty, 1991).

Psychiatric Politics 1970-1973

At the APA conference in San Francisco in 1970, gay rights activists organized picketing and disruptions of all panels and discussions about transsexualism, homosexuality, and aversive therapy for sexual deviations. At any such events during the conference, shouting matches ensued and demands for a panel on homosexuality that included homosexual individuals at the next APA convention in Washington, DC were expressed. This demand was met by the APA's administration and a more balanced panel on the topic of homosexuality which included representatives of gay rights groups was incorporated into the schedule of the 1971 APA conference (Bayer, 1987). The gay rights movement presence at the 1971 conference was far more muted than it had been the year before when pandemonium had ensued. At the 1970 convention, many conference participants demanded refunds on their airfare and at least one physician asked that police shoot the protesters (Kirk and Kutchins, 1992).

At the 1972 APA convention in Dallas, gay rights groups were allowed to have a display in the scientific exhibition area entitled "Gay, Proud and Healthy". They handed out flyers at the booth in an attempt to gain support from psychiatrists for the removal of homosexuality from the *DSM-II*. The fliers stated, "We are trying to open dialogue with the psychiatric profession...In the past years it has been necessary, on occasion, to resort to strong measures against a resisting profession in order to achieve such discussion of our problems with us instead of merely about us. We sincerely hope that resolution, constructive discussion and dialogue followed by meaningful reform of psychiatry will soon proceed...Psychiatry in the past - and continuingly - has been the major single obstacle in our society to the advancement of homosexuals and to the achievement of our full rights, our full happiness and our basic human dignity. Psychiatry can become our major ally."

The panel discussion on homosexuality at the APA convention in 1972 was a major turning point in the relationship between the gay community and psychiatry. The panel included representatives from gay rights groups, two psychiatrists who were sympathetic to the gay rights movement, and a gay psychiatrist who was masked and cloaked and introduced simply as Dr. Anonymous. Dr. Anonymous' speech had a profound impact on many of his colleagues sitting in the audience. For some of these psychiatrists, it was their first exposure to a professional colleague who admitted to being a homosexual. Many psychiatrists in the audience were surprised when he told them that there were more than 200 members on the Gay Psychiatric Association which met socially but secretly during the annual APA meetings (Kirk and Kutchins, 1992). Dr. Anonymous' speech began, "I am a homosexual. I am a psychiatrist. As psychiatrists who are homosexual, we must know our place and what we must do to be successful. If our goal is high academic achievement, a level of earning capacity equal to our fellows, or admission to a psychoanalytic institute, we must make sure that we behave ourselves and that no one in a position of power is aware of our sexual preference and/or gender identity. Much like a black man with white skin who chooses to live as a white man, we can't be seen with our real friends, our real homosexual family, lest our secret be known and our doom sealed...

Those who are willing to speak out openly will do so only if they have little to lose, and if you have little to lose, you won't be listened to." Dr. Anonymous ended his speech with an appeal to both homosexual psychiatrists and their nonhomosexual colleagues. From the former, he called for the courage to struggle for change, while from the latter, he called for acceptance.

On October 9, 1972, the New York Gay Activist Alliance organized a protest of the Association for the Advancement of Behavior Therapy, calling for an end to aversive therapy as a treatment for homosexuality. This was the first time that Robert Spitzer, a member of the APA's Committee on Nomenclature & Statistics, came into contact with homosexuals demanding a revision of psychiatry's attitude toward homosexuality. He agreed to arrange for a formal presentation of their views before a full meeting of his committee and to sponsor a panel at the APA's 1973 convention in Honolulu on the question of whether homosexuality should be included in the *DSM*.

On February 8, 1973, Robert Spitzer came through on his promise for a full Committee on Nomenclature & Statistics meeting. Perhaps the most moving moment during this meeting came when a gay rights activist spoke about the way in which psychiatry and society in general had pathologized homosexual love. "We are told from the time that we first recognize our homosexual feeling, that our love for other human beings is sick, childish and subject to 'cure'. We are told that we are emotional cripples forever condemned to an emotional status below that of the 'whole' people who run the world. The result of this in many cases is to contribute to a self-image that often lower the sights we set for ourselves in life, and many of us ask ourselves, 'How could anybody love me?' or 'How can I love somebody who must be just as sick as I am?'"

After the Committee on Nomenclature & Statistics Meeting, most members of the APA felt that it was very likely that the Committee would decide that homosexuality should be deleted from the *DSM-II*. In responses to this perceived threat, the Ad Hoc Committee Against the Deletion of Homosexuality from the *DSM-II* was formed under the leadership of Irving Bieber and Charles Socarides to focus the forces of resistance to this nosological change. They felt that a positive response to gay demands would constitute an unjustified political accommodation (Kirk and Kutchins, 1992). Psychoanalytic societies were also outspoken in their opposition to change. The question of the nosological status of homosexuality aroused deep concern for these groups for several reasons. Firstly, any change in the diagnostic status of homosexuality would impact on psychiatric thinking and practice with regard to sexuality and secondly, any change would also affect the status of psychoanalytic theory in the organization of the nosology of mental disorders.

Despite the opposition being voiced by the Ad Hoc Committee Against the Deletion of Homosexuality from the DSM-II, in March 1973, the Northern New England District Branch was the first APA affiliate to take a stand for the deletion of homosexuality from the *DSM* by endorsing a resolution enacted by the APA's Social Issues Committee. This resolution called for the deletion of homosexuality from the *DSM-II* and replacement with the broader category of "sexual dysfunction" which would include frigidity, impotence, and homosexuality in instances when "in the opinion of the physician this is a problem area for the patient." The resolution also called for a repeal of all sodomy legislation affecting consenting adults. Soon afterward, the

resolution was endorsed by the APA's Area Council I, which included all of New England in addition to Quebec and Ontario.

In an effort to satisfy both those who saw homosexuality as a psychopathology and those who saw it as a normal variant of sexuality, Robert Spitzer put forth his own proposal entitled, "Homosexuality as an irregular form of sexual development and sexual orientation disturbance as a psychiatric disorder". Included in his proposal, Spitzer also provided a definition of mental disorders. For a behaviour to be considered a psychiatric disorder, it had to be regularly accompanied by subjective distress and/or "some generalized impairment in social effectiveness or functioning". With the exception of homosexuality and some of the other sexual deviations listed in the *DSM-II*, all of the disorders in the nomenclature conformed to this definition of disorder. The inclusion of homosexuality in the diagnostic system that Spitzer proposed would have required the expansion of the concept of psychiatric disorder to include all "suboptimal" conditions (Bayer, 1987). Spitzer warned that if a broader concept of mental disorder was accepted, the classification system would become a vast array of "odd" behaviours including celibacy (failure to achieve optimal sexual functioning), religious fanaticism (dogmatic and rigid adherence to religious doctrine), racism (irrational hatred of certain groups), vegetarianism (unnatural avoidance of carnivorous behaviour), and male chauvinism (irrational belief in the inferiority of women).

Spitzer did not advocate for the complete removal of any reference to homosexuality in the *DSM-II*. He recommended a new classification of "sexual orientation disturbance" be substituted for homosexuality in the *DSM-II*. He described this category as being applicable to those "individuals whose sexual interests are directed primarily toward people of the same sex and who are either bothered by, in conflict with or wish to change their sexual orientation. This diagnostic category is distinguished from homosexuality, which by itself does not necessarily constitute a psychiatric disorder. Homosexuality per se is a form of irregular sexual development and like other forms of irregular sexual development, which are not by themselves psychiatric disorders, is not listed in this nomenclature of mental disorders" (Ibid.).

When the Committee on Nomenclature & Statistics could not agree on whether or not to support Spitzer's suggestions, a formal survey of a stratified sample of APA members was recommended by Henry Brill, the head of the Nomenclature Committee, to elicit responses to the nomenclature proposal. However, the APA rejected Brill's recommendation because they felt that to do otherwise would imply a willingness to subject scientific questions to the democratic process.

The APA's Council on Research and Development approved Spitzer's proposal stating that they felt they should not override the recommendation of a committee they had appointed to evaluate a scientific issue. The logic of this decision, however, is questionable, since Spitzer's proposal was not officially supported by any of the members of the Committee on Nomenclature & Statistics. (Kirk and Kutchins, 1992). The board of trustees of the APA agreed to the deletion of homosexuality from the *DSM-II* on December 15th, 1973. A press conference was held thereafter and the media portrayed the decision of the board as an indication that psychiatry now viewed homosexuality as normal even though Spitzer and other psychiatrists attempted to make their position clear that homosexuality was not "normal" nor was it as desirable as

heterosexuality. (Ibid.) Despite this, on December 16, 1973, the headlines of major American newspapers read, "Doctors Rule Homosexuals Not Abnormal" (Washington Post) and "Psychiatrists in a Shift Declare Homosexuality No Mental Illness" (The New York Times).

While gay rights groups celebrated the APA's decision to delete homosexuality from the DSM-II, Thomas Szasz declared that their decision should not be a cause for jubilation. He wrote in a popular gay newspaper at the time, "Celebrating the APA's abolition of homosexuality as a psychiatric diagnosis tacitly acknowledges that they have the knowledge and the right to decide what is and what is not a mental illness. I think the homosexual community is making a big mistake by hailing the APA's new stance as a real forward step in civil liberties. It's nothing of the sort. It's just another case of co-optation"@ (The Advocate, 1977).

On a conceptual level, opponents of the board's decision found it astounding that subjective distress could provide a standard by which to determine the presence or absence of psychopathology. They believed that it was the absence of such discomfort that often revealed the depths of pathology. On a clinical level, concern was greatest over the implication of the APA's decision for the psychotherapeutic effort to assist adolescents experiencing conflict over their sexual identities. Some psychiatrists felt that the removal of homosexuality from the DSM would signal to these confused young people that it mattered little whether they chose a homosexual or heterosexual orientation.

After the board of trustees' decision was announced, the Ad Hoc Committee circulated a petition demanding a referendum of the APA's membership. It was remarkable to some observers of this conflict that the same individuals who had charged the APA's board with unscientific capitulation to political pressure now justified the use of a political device, the referendum procedure, to reverse the decision of the board. The debate among psychiatrists at the time focussed almost exclusively on the social and ethical impact a change in classification would have on the lives of homosexuals. This entire process seemed to violate the most basic expectations about how questions of science should be resolved. Instead of being engaged in a sober consideration of data, psychiatrists were swept up in political and moral argument. Proponents on both sides of this conflict claimed that they were being scientific and their opponents were not (Kirk and Kutchins, 1992). John Spiegel, the APA's president-elect at the time stated publicly that he felt a vote on this issue would make a popularity contest out of what had been a soberly considered decision. Nevertheless, in April 1974, a vote was held and with an approximate 60-40 split, the results were a clear, though muted, expression of support for the new nomenclature.

The controversy regarding the nosological status of homosexuality that consumed the APA from 1970 through 1974 highlighted the confusion among psychiatrists about what constituted a mental disorder. At the time, no consensus existed on what defined a disorder nor was there any agreement on the etiology of many disorders. With no workable definition of mental disorder and no established theory of pathology, some psychiatrists believed that the evidence for the validity of many diagnostic categories in the DSM was meagre. Some have argued that the debates about homosexuality could have been about many other diagnoses, had there been strong differences of opinions and hungry media (Kirk and Kutchins, 1992).

The DSM-III and -IIIR

In part because of the leadership role he had undertaken in the classification of homosexuality in the *DSM-II*, Robert Spitzer was appointed chair of the APA's Task Force on Nomenclature when intraprofessional dissatisfaction demanded a thorough revision and the drafting of the *DSM-III* (Bayer, 1987). Recognizing, as his opponents had, that the absence of subjective distress was a typical feature of some psychiatric disorders, especially the sexual deviations, Spitzer amended his 1973 definition of psychiatric disorder to encompass forms of behaviour deemed to be of "inherent disadvantage" (Spitzer, 1976). He argued that homosexuality did not belong in the nomenclature because, unlike other behaviours classified as sexual deviations, homosexuality does not preclude the possibility of an affectionate relationship between adult human partners. Although this did not address the argument that there is inherent disadvantage in the failure to develop an affectionate sexual relationship between adult human partners of the opposite sex, proponents of this view recognized the futility of reenacting the bitter debate over the pathology of homosexuality (Bayer, 1987).

Instead, another intense conflict emerged over the inclusion of a special category for homosexuals distressed by their sexual orientation, for which Spitzer coined the term "dyshomophilia" (Ibid.). Spitzer insisted that the *DSM-III* clearly stated that homosexuality per se is not a mental disorder and praised the concept of dyshomophilia as a "middle position" defensible due to scientific ignorance and justifiably resistant to political pressure (Spitzer, 1977). However, the reformers who had attained victory in 1973 were now deeply split, with one group casting Spitzer as a conservative defender of psychiatric orthodoxy and others supporting Spitzer's development of the term "dyshomophilia" (Bayer, 1987).

Judd Marmor, a psychiatrist who was opposed to Spitzer's new term "dyshomophilia" argued that "If a homosexual is distressed about his orientation, the appropriate diagnosis should be the underlying psychological disorder, e.g. anxiety reaction… [or] depressive reaction," and he warned against the theoretical error of designating a disorder in terms of the specific source of the anxiety or depression (Marmor, 1977). John Money of Johns Hopkins University and Paul Gebhard of Indiana University's Institute of Sex Research concurred with Marmor, warning that "to single out homosexuality from all the numerous possible causes of distress, suggests there is something pathogenic about it" (Bayer, 1987; Gebhard, 1977). Their greatest fear was that the inclusion of "dyshomophilia" would lead to the surreptitious readmission of homosexuality into the psychiatric nosology (Bayer, 1987).

Arrested by the lack of consensus among the Task Force on Nomenclature, Spitzer developed a new category, "ego-dystonic homosexuality", which was defined as "A desire to acquire or increase heterosexual arousal so that heterosexual relations can be initiated and maintained, and a sustained pattern of overt homosexual arousal that the individual explicitly complains is unwanted and a source of distress" (Bayer, 1987; *DSM-III* draft, 1977). The *DSM* was to acknowledge that "The factors that predispose to ego-dystonic homosexuality are those negative societal attitudes towards homosexuality that have been internalized. In addition features associated with heterosexuality such as having children and socially sanctioned family life, may be viewed as desirable, and incompatible with a homosexual arousal pattern" (Ibid.).

With these revisions, Spitzer gained the support of some of his most adamant critics and a majority of the Task Force on Nomenclature (Bayer, 1987).

Surprisingly, the conflict over the status of homosexuality in the *DSM-III* remained an intraprofessional matter throughout, without involvement of the gay community. This may be explained by gay activists' perceptions that the controversy was a technical problem of narrow symbolic importance, with the possible marginal gains from an organized protest dwarfed by the high risk of provoking a reconsideration of the original deletion decision of 1973 (Ibid.).

Perhaps inevitably, the appointment of a Working Group to Revise *DSM-III*, again chaired by Robert Spitzer, and the flare-up of controversy over diagnostic categories deemed offensive by feminist groups (such as Premenstrual Dysphoric Disorder, Self-Defeating Personality Disorder and Paraphyllic Rapism), led to the re-emergence of the conflict surrounding "ego-dystonic homosexuality". This debate saw the reiteration of arguments that the inclusion of a specific category for dysphoria due to homosexuality was a value-laden refusal to view homosexuality as a normal variant. New challenges suggested that labeling homosexuals as having the disorder "ego-dystonic homosexuality" produced an iatrogenic disorder, by failing to recognize that homosexuals' distress in the face of social denigration is a normal phase in coming to terms with their gay identities. Finally, a compromise was achieved: "ego-dystonic homosexuality" would be deleted and replaced with an entry for "persistent distress or confusion about one's sexual orientation" under the residual category "Sexual Disorders Not Otherwise Specified." Remarkably, the decision to eliminate the vestiges of homosexuality from psychiatric nosology was ultimately unopposed, perhaps because opponents of the decision ultimately believed diagnostic labels to be of secondary importance in clinical practice. After all, in the period during which "ego-dystonic homosexuality" was included in the *DSM*, it was rarely used in research or in practice (Ibid.).

Conclusions

The barrage of challenges to traditional social values in the 1960s and 1970s and the ensuing confusion and controversy within the psychiatric profession has forced the profession to confront the intimate connections between social constructions of deviant behaviour and medical constructions of deviant states (i.e. illness). Since its inception, psychiatry has identified social adjustment and observance of cultural norms as criteria in the definition of mental health, providing anti-psychiatrists with ammunition with which to attack the "scientific pretensions" of a profession that performs the function of social censorship by enforcing behavioural norms (Ibid.). More recently, mental health professionals have had to acknowledge that their understanding of health is influenced by their own subjective valuations, in turn the product of "cultural norms, society's expectations and values, professional biases, individual differences, and the political climate of the times" (Offer, 1974). Whereas uniformly shared values within a culture exert a masked influence, seeming to be representative of a natural order, public dissent and social changes make the subjective nature of these values obvious.

The unmasking of subjective values prompts an investigation of their impact on the scientific method. This may explain why a pervasive aspect of the controversy over the classification of homosexuality was the abandonment of scientific methodology in favour of

politicking and moral concerns, in order to resolve what should have been an intellectual and academic dispute.

Since the controversy has subsided, APA leaders have acknowledged that their decision to delete homosexuality from the DSM was strongly influenced by changing social attitudes and by political pressure from gay rights organizations. It is clear that shifting power dynamics between social groups bears significant influence upon psychiatric nosology. Moreover, the emphasis that gay rights activists placed on changing psychiatric orthodoxy highlights their recognition of the impact of medical and psychiatric conceptions of illness and deviance on cultural values and civil rights. The struggle over the classification of homosexuality is thus an example of the reciprocal relationship between psychiatry and social constructions of deviance.

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THE DEVIL'S GRIN: REVEALING OUR RELATIONSHIP WITH THE IMPERFECT BODY THROUGH THE ART OF JOEL-PETER WITKIN

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ABSTRACT

By combining elements of art history iconography with medical pathology, the photographs of Joel-Peter Witkin invoke the deformity and deviances present in the documentary images of early medical photography. Like the first medical photographs, his portraits are less of the individual person, than of their physical condition. In his images, Witkin's subjects idealize their imperfect bodies, and provide what can be considered as a representation of their identity.

From the early days of photography, physicians used the camera to deconstruct and document deviations of the body from its normal appearance. For the first time, photography provided the ability to present the undeniable truth about the condition of the pathological body. Building on this tradition, Witkin presents images that while at times shocking, allow us to examine the many possible dimensions of our existence. His attempts to find beauty in unusual places challenges the ideas of early philosophers who believed that the beauty of medicine was found in the cure, and that good health was the only condition worthy of admiration.

Witkin's art confronts our reaction to the damaged body. In viewing his images, we are forced to struggle with out own view of humanity, and to expand our understanding of the human condition.

"Ugliness is a devil's grin behind beauty."
The Man Who Laughs
Victor Hugo

A friend recently underwent orthoscopic surgery on his knee. The operation required a general anaesthetic. When he was discharged his surgeon gave him a videotape of the procedure. "One minute you are just watching. Then suddenly you realize you are looking inside yourself. Everything changes." [1]

Joel-Peter Witkin takes photographic portraits not of people, but of conditions of being. His images are representations (and in many ways an affirmation) of the alternative physical and

sociological modes of existence that are always present in the reality of the human condition. Beautifully composed, Witkin's portraits take the viewer through a chorus of art history iconography from paintings by Botticelli, Vala'zquez, Goya and Caravaggio. Yet despite Witkin's adherence to these models of artistic convention, the bodies, people and acts which are at the centre of his photos shock and repulse. Amputees, transsexuals, dwarves, severed heads and feet, and sado-masochists are principal characters in a theatre of the macabre that finds its inspiration not only in art history, but also in the brutal murders of crime photography, the practices of the sexually deviant, and the deformity and freakery of early medical photography and circus side-shows. For what Witkin calls portraits, one could also consider antiportraits.

The subjects' faces are rarely visible. Their masks, banded eyes and scratched-out faces conceal not only their identity, but also their place in time, and in doing so, they become representative figures in Witkin's stage of symbols. Their bodies provide their sole identity, as well as their sole purpose in representing universal truth and in illustrating the possibilities of our own destiny. It is the intent of this paper to explore what Witkin's art says about our relation to these imperfect, damaged bodies, and how his struggle to find beauty in imperfection can lead us to a greater understanding of the human condition.

Frederick Schlegel wrote, "Nur Gesundheit ist liebenswürdig." [2] Only health is lovable. Witkin expresses this with images of deformed bodies and unsightly acts that illuminate our personal fear of illness and reveal the deviances that we hide within. By showing on the outside the dark side of our spirits which is normally concealed internally, Witkin introduces us to the possibility of personal identification. In turning away in disgust and in refusing to contemplate these photographs, our aversion not only refuses to acknowledge our own personal fears and darknesses, but also refuses to confront the realities of what it means to be alive. The photographer John Coplans, who photographs his own naked, *imperfect* and aging body, says of his work, "I'm not dealing with the perfect body, I'm dealing with another kind of truth, that is how the body really is and why don't we accept it, because that's our norm."[3] The power of Witkin's photos also lies in the fact that they reflect a norm; however, Witkin's norm is the normal range of human experience that most of us refuse to validate.

"Our world is a kindergarden of violence and pathology," says Witkin.[4] By showing us things we wouldn't normally see or experience, or things we wouldn't normally wish to see or experience, his work challenges us to consider a darker side of life, and perhaps to acknowledge a darker side of our own spirits. As Charles Baudelaire wrote: "Lord give me strength to behold/my body and my heart without disgust!"[5] Witkin's images are the visual metaphor for that which we are all capable, and like the man watching his own surgery, everything changes when we realize we are looking into ourselves.

Photography contemplates the body

Since its creation, photography has had an intimate relationship with the body, predominantly as an art of identity. The sole requirement of photography was to produce, as closely as possible, a mirror image; but over time, people became dissatisfied with simply having a record or their true likeness, and desired a more idealized view of themselves. As photographic portraits became affordable, and copies of the image became numerous, people wanted to look as

attractive as possible, because these photographs might now be seen by people who had never met them. People's encounters with the camera became infused with concerns about what to wear and how to pose, and the good photographer was one who was a master in highlighting and enhancing the body's formality.[6]

This concentration on the body's formality, led to the desire of many photographers to use the camera as a means of deconstructing and documenting the deviations of the body from its formal appearance. One of the most notable groups to do this was physicians. In 1896, Drs. George Gould and Walter Pyle published a volume, which rivals in content the voluminous medical texts published today, entitled Anomalies and Curiosities of Medicine. In their introduction of this book, Gould and Pyle give a poetic rendition of their purpose: "to catch forbidden sight of the secret work-room of Nature, and drag out into the light the evidences of her clumsiness, and proofs of her lapses of skill...upon the mysterious garment of corporeality."[7] Perhaps the most important aspect of this view is the acknowledgement that the anomalous body is a product of nature, rather than an unnatural distortion. Photography was able, for the first time, to present the undeniable truth about the appearance of the pathological or *imperfect* body. This determined the role of photography throughout medicine. Gould and Pyle's book, which is still printed today, is filled with photographic proof of the strange bodies that in many cases, continue to baffle scientists. Witkin's inspiration from these medical photographs is undeniable, and Witkin's purpose is in some ways similar to that of the early medical photographers: "to catch forbidden sight" of nature. Witkin's use of photography and his choice of photographic style have made him one of the most highly collected photographers living today, but have also brought him under fire by many who consider him sensationalist and exploitative. It is interesting to note that the work of Diane Arbus, who also photographed people considered to be on the margins of society, tends not to elicit the same visceral reaction as that of Witkin, even though both photographers, as was said of Arbus, make images that say: "'This is how it is.' [And] in doing so, they act as an assault on all polite, habitual blindness to what's really there."[8] Although the world portrayed in the photographs of Diane Arbus is a stranger place than the one we may perceive, her documentarian and unobtrusive style does not offend the viewer. The viewer does not turn away with the feeling that she has exploited her subjects.

Exploitation is a word that one might imagine hearing often in relation to Witkin's'work. It is possible however, to turn that criticism back onto those who attack Witkin for being exploitative. "It may be that their refusal to appreciate the relationship between the artist and his subjects is pre-determined by a refusal to see such subjects in any way other than a pre-packaged, stereotypically 'positive' image--which itself might constitute a patronising condescension--or even an unconscious desire not to see such subjects at all."[9] When asked about whether they felt exploited, Witkin's subjects said that his images made them feel visible, dignified and human in a society that made them feel invisible, unimportant and less than human.[10]

Controversy

Witkin is not alone in exploring alternate visions of the body. Contemporary photographers such as Andres Serrano, who has photographed corpses as well as statues submerged in bodily fluids such as blood and urine, and Robert Mapplethorpe, who found much

of his inspiration in sado-masochism, have also earned notoriety for their controversial images, and have come under political, moral and even legal scrutiny in doing so.

In the United States in the late 1980s, a movement by conservative politicians and religious fundamentalists to control expression in American culture "exploited scarcely acknowledged but clearly identifiable social fears, particularly regarding sexuality and the body."[11] Although Witkin's work narrowly escaped political and public attention for obscenity,[12] Mapplethorpe's work was at the forefront of a lengthy debate over funding from the National Endowment for the Arts, and Serrano's *Piss Christ*, a picture of a crucifix immersed in urine, was torn up on the floor of the American Senate.[13] Cancellation of Mapplethorpe's shows became a matter of fierce debate, and fuelled a generalized upheaval in moral sensibility. "Mapplethorpe said that there is no difference to speak of between photographing a cock and anything else, which is true and at the same time a kind of self-deception."[14] While the self-deception induces debate and controversy, the truth makes artists like Mapplethorpe and Witkin both powerful and vital.

Curiously, these artists who so threatened conservatives are themselves rather conservative: Witkin, Serrano and Mapplethorpe all work in the traditions of classical art, still life, and the aesthetics of nineteenth century photography.[11] It is, however, the dissonance between the content and the form that causes these photographs to have such a great impact. The form represents our ideals of conventional beauty, while the content asks us to contemplate the unthinkable. As Roland Barthes writes in Camera Lucida,

> With regard to the heterogeneity of "good photographs", all we can say is that the object speaks, it induces us, vaguely, to think. And further: even this risks being perceived as dangerous. At the limit, no meaning at all is safer: the editors of *Life* rejected [André] Kertesz's photographs... because, they said, his images "spoke too much"; they make us reflect, suggested a meaning--a different meaning from the literal one. Ultimately, Photography is subversive not when it frightens, repels, or even stigmatizes, but when it is pensive, when it thinks.[15]

Witkin's photography may be viewed as subversive because it asks us to consider eliminating the boundary between beauty and horror.

Beauty of the awful

"What is important is that our optical awareness rids itself of classical notions of beauty and opens itself more and more to the beauty of the instant and of those surprising points of view...those are what make photography an art."[16] By representing the many dimensions of our existence, Witkin presents those surprising points of view that find beauty in unusual places. In doing this he blurs the line between fiction and reality, sexuality and innocence, and beauty and ugliness. Witkin says, "I want to live in an age which sees similar beauty in a flower and in the severed limb of a human-being."[17]

Once, while in the morgue of a hospital in Mexico City, Witkin was with a doctor who opened the wrong drawer by mistake. Inside were severed arms, legs, ears and parts of babies. Witkin found the sight so unsettling that he had to turn away, but at the same time he was very

excited, because he recognized the challenge. Witkin knew that he had the ability to find beauty in the most vile things. Returning to the hospital the next day, Witkin created *Feast of Fools*, [18] in which he uses for inspiration the still lifes of the seventeenth century, but instead of arrangements of flowers and fruit, Witkin arranged a dead baby and severed limbs. The arrangement is so skillful that on first glance the distinction between flowers and death may be overlooked. If we look again however, we are overwhelmed by a feeling more powerful than if we had been present when the doctor opened the wrong drawer.

We see evidence of Witkin's relation to the flower in another of his photographs: *John Herring P.W.A., Posed as Flora with Lover and Mother*. The P.W.A. stands for Person With AIDS, and so Witkin poses his friend who is suffering from this fatal disease as Flora, the goddess of flowers. Witkin's portrait, which is one of his only photographs where you can see the subject's eyes, is filled with the anxiety of a contagious and fatal disease which may be present without outward symptoms. At the same time the image celebrates the beauty of both the subject's life and his imminent death.

The desire to find beauty in the things many people find repulsive is not exclusive to Witkin's work, particularly in comparison to the flower. Jean Genet, the French writer, thief and prostitute, wrote in his book, Journal du Voleur: "…there is a close relationship between flowers and convicts. The fragility and delicacy of the former are of the same nature as the brutal insensitivity of the latter."[19] And the title of Charles Baudelaire's book of poetry introduces his search for the beauty of the awful: Les fleurs du Mal. The Flowers of Evil. In one of his poems, *Une Charocne*, Baudelaire describes a decaying animal corpse then says:

> Yet you will come to this offense,
> this horrible decay,
> you, the light of my life, the sun
> and moon and stars of my love![20]

In another poem, *Hymne à la Beauté*, Baudelaire again contemplates the duality of beauty:

> Do you come from on high or out of the abyss,
> O Beauty? Godless yet divine, your gaze
> indifferently showers favor and shame.[21]

Beauty of medicine

The seventeenth century philosopher Blaise Pascal wrote that we talk of the beauty of poetry rather than the beauty of geometry or medicine, because the beauty of poetry lies in its charm, while the beauty of medicine lies in the cure.[22] This again is reminiscent of Schlegel's *Only health is lovable*, and defines a certain role for both physicians and the field of medicine in general. Is the function of medicine to define a common denominator? If medicine defines what is normal and healthy, does it also become responsible for maintaining that normality? In Rosemarie Garland Thompson's book entitled Freakery: Cultural spectacles of the extraordinary

body, she examines how we have translocated deviant bodies from their place in the curiosity cabinets of the renaissance to their exploitation on the stages on carnival freak-shows to their consignment within the realm of science.

> Domesticated within the laboratory and the textbook, what was once the prodigious monster, the fanciful freak, the strange and subtle curiosity of nature, has become today the abnormal, the intolerable. The exceptional body thus becomes...an "especially vicious normative violation," demanding genetic reconstruction, surgical normalization, therapeutic elimination, or relegation to pathological specimen.[23]

This suggests not only a generalized intolerance for anyone who is physically different, but also a shift in the domain of the *freak* from circus side-shows to medical spectacle. Perhaps one of the greatest examples of this is conjoined twins. Witkin's *Siamese Twins*, which shows two adult women joined at the head, draws on both the imagery of the circus side show and early medical photography. The birth of conjoined twins today generates as much, if not a greater amount of attention from the general public as it does from the medical community. In the early 1990s, when conjoined twins were separated in Toronto, the whole world was watching. They were not only watching the wonders of modern medicine, but also the wonders of nature.

Witkin often turns to medicine to provide him with his subjects. His corpses and severed limbs, such as the autopsied body of *Glassman* and the kissing severed heads of *The Kiss (Le Baiser)*, remind us that until the 19th century, anatomy theatres were not only teaching events, but public spectacles as well. These public displays of anatomical dissections demonstrated the uniformity of the body, and reinforced the idea that any deviances were due to pathology. The events became such spectacles, in fact, that they were often held in conjunction with the Carnival in Italy.[24] Even Witkin's hermaphrodites are modern medical reconstructions of an antique curiosity. In Witkin's photos, hermaphrodites become pre-op transsexuals, whom he reveres simply as alternative ways of being. These *hermaphrodites* overturn our definitions of gender and sexual desire by redefining the classical ideal of Venus and the Graces. Witkin's presentation is respectful and non-judgemental, perhaps even more so compared to other methods of presenting people who undergo gender reassignment surgery. On January 28, 1999, a 49-year-old man named "Julie" became the first person to undergo a sex-change operation live on the internet.[25] This event in particular, represents the conversion, rather than the disappearance, of the circus side-show. Instead of being naturally occurring deviations, modern *freaks* become medical constructions.

Children born in the early 1960s with defects, such as shortened limbs, due to the drug Thalidomide, may also be considered as medical creations since their condition was inflicted by the actions of a pharmacological agent. Witkin's *Un Santo Oscuro* is the portrait of a thalidomide victim, who had been born without arms, legs or hair. Witkin wanted to portray him as martyr of life by portraying him as martyrs would have been in 17th and 18th century Spain. In this photo a man with a prosthetic limb holds an arrow, which penetrates his chest demonstrating pain and suffering at the hands of others. This rings true if we think that much of the suffering endured by thalidomide victims as children was the result of other's inner sense of the grotesque, rather than from any pain related to the child's physical condition. A child doesn't

know what it means to be uncomfortable with his or her own body, this is something that society creates. When asked, almost all mothers with thalidomide babies said that their child looked less normal with a prosthesis than without, but all the mothers urged their children to wear the devices nonetheless,[26] perhaps to protect society from being uncomfortable.

So Witkin may question: Does medical intervention become a way to increase a person's standard of living or does it become a process in normalization? In *Portrait of a Dwarf*, Witkin again borrows heavily from images of the circus and early medicine. Today, medicine aims to *cure* the anomaly of dwarfism through hormone therapy, possibly to provide the person with a *normal* existence. Some studies have shown, however, that it is unclear whether the social anxiety experienced by growth hormone deficient patients is "secondary to growth hormone deficiency or to the aversive social consequences of being short in a society that values tallness."[27] A similar situation fuels the debate over cochlear implants for the deaf. Deaf people have been demonstrating at provincial legislatures across Canada to try to influence governments to stop funding cochlear implants. They believe that deafness is not a disability, nor does it require medical intervention. What's more, many deaf people believe that deafness comes complete with a culture of language, traditions, values, and art.[28] Janice Springford, who has been deaf since age eight says, "From my perspective, my life was normal. I was normal."[29]

Unmasking the offensive

When does it become appropriate for medicine to intervene? I don't think it is Witkin's intention to answer that question. I also believe that given the choice, he would favour a text-book form of health for all his subjects. I do believe, however, that it is his intention to make us question our reactions to the way people are. Why do we stare? Why do we feel disgust? Why do we feel pity? Thalidomide victims, for instance, revealed that their lives turned out to be, "from their own point of view, at least, neither notably nonproductive, nor especially miserable. None of them, at any rate, were willing to confess that they would have wished themselves dead."[30] Witkin might say, "There are many ways to live life, and I don't think any one is better than the other." The *unbearable lightness of being* described by Milan Kundera in the book of the same name, is that we only have one life to live, and no matter what happens, no matter what decisions we make, we can never know what another life would have brought us.

Perhaps this is one of the reasons we feel uncomfortable or repulsed by images of illness, deformity and death. We know at any moment, despite our efforts or attempts to control, our lives could take us down any one of those paths. This is why only the person completely devoid of sympathy, could look at the photographs of Joel-Peter Witkin and feel nothing. His photographs make us think of the lives of his subjects, and makes us think about how our lives would be if we became like one of the people in his pictures.

In her introduction to a series of murder photographs taken around the turn of the 20th century Eugenia Parry Lewis writes: "Through the pictures we enter a realm of unfathomable strangeness, an experience as old as humanity itself, but one essential to integrating the incomprehensibility of what links death to our own humanity."[31] The same can be said of the photographs of Joel-Peter Witkin. Their ability to integrate death and humanity should make us contemplate them rather than turn in disgust. Kierkegaard writes that "it is of course stupidity or

cowardly obduracy to wish to be unaware that poverty and sickness exist because for one's own part one is in good health;...anyone who has thought two healthy thoughts about existence knows that the next instant he may be in this case."[32] Only by being aware that at any moment we might fall terribly ill or die, can we truly appreciate life. Perhaps more importantly, only by contemplating damage can we possibly understand the powers of healing. Witkin believes that his photographs will bring us closer to understanding and appreciating life.

In Waiting for Godot Samuel Beckett writes:

> What are we doing here, that is the question. And we are blessed in this, that we happen to know the answer. Yes, in this immense confusion one thing alone is clear. We are waiting for Godot to come...Or for night to fall.[33]

Elsewhere in the play Beckett writes:

> ...one day he went dumb, one day I went blind, one day we'll go deaf, one day we were born, one day we shall die, the same day, the same second, is that not enough for you? They give birth astride of a grave, the light gleams an instant, then it's night once more.[34]

We live. We die. And Beckett says the absurdity is that no matter how hard we struggle, we can never possibly understand the process we endure in between. But Witkin is not an existentialist. He believes that there is some higher power to give meaning to the time between birth and death that we call life. His work is strongly spiritual. Born of a Jewish father and a Catholic mother, we see repeated evidence of his religious up-bringing throughout his work, particularly in the *Journies of the Mask* series, in which a black eye mask adorned with a white model of the crucified Christ is worn by people involved in sexually deviant practices. Witkin's subjects are given a religious quality, because they have experienced pain and redemption through life's suffering. Pascal says that suffering is the natural state of the Christian, just as health is that of the *natural* man.[22] In this sense Witkin's subjects bridge religious and medical suffering. Medical suffering comes from without. Religious suffering comes from within. The result is that the pain of the physical suffering experienced by Witkin's subjects is treated by medicine as pathology, while at the same time, the mental anguish they endure as a result of their physical condition elevates them to the level of religious hero. In this way, Witkin is able to identify with his subjects. By photographing them, by being a part of their suffering, he finds personal salvation. "If your life and work are about despair, there's no resolution, no redemption."[35] And Witkin attempts to share this redemption with all of us. His work implies that no matter who we are, we can only hope to understand our lives if we discover the distress and ugliness within them. "Beauty is an unattainable, unsustainable myth--an illusory quick fix."[36]

Witkin's final prayer

The distress we experience as viewers of Joel-Peter Witkin's work lies in the recognition that his atrocities are at the heart of our personal identities. This gives his photographs the ability to reconcile our humanity with everything we consider inhumane. Our aversion to this

reconciliation is demonstrated in the aversion of our eyes; we refuse to look, to examine, to contemplate, and as a result, we hope that by ejecting these monsters from our vision, we are also ejecting them from our souls. But Witkin's work asserts that despite our efforts, it is impossible to refute our common mortality. His subjects figure the breadth of human existence, not only because they represent the possible paths each of us might face, but because they embody the part of us that we fear others will learn exists. Our fears only partly stem from our reticence to become them. It is our greatest fear that we are them. "What I make are my prayers,"[37] says Witkin of his work. And in projecting his search for redemption, Witkin attempts to eliminate our fears and bring us to a closer understanding of who we are and why we are here.

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THE HISTORY OF PLACEBO SURGERY

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ABSTRACT

In the era when evidence based medicine reigns supreme, surgical research is faced with the problem of conducting randomized control trials without being able to create a true placebo group. Most people would argue that conducting a true placebo surgery, wherein the person is operated on involving incisions and anaesthetics, without a corrective procedure being performed, would simply be unethical. However, there are examples of such placebo surgeries in the historical literature, and more importantly there is a resurgent push for placebo surgery today.

The goals of this article/presentation are to define placebo, and the placebo effect, to give some historical and modern day examples of placebo surgeries, and to hypothesize what the role of placebo and placebo surgery will be into the near future.

As the new millennium begins there is one simple question that is being asked of medicine more today than ever before. Is medicine really helping people? Out of this enlightening question has arisen the mighty push for what is called evidence based medicine. The fundamental principle fuelling the push for evidence based medicine is that physicians should only be performing treatments on people if there is reason to believe these treatments will improve their health. The medical community has responded with the development of reportedly fool proof, systematic experimental methods that evaluate treatments. The solution is proudly called the randomized control trial. What this means for physicians and researchers is that in order to justify new and old treatments, there must be statistical evidence that a given intervention produces positive outcomes more often than no intervention. In an effort to fulfill this protocol, the process required to approve new therapies has become an extensive multimillion-dollar endeavour. But amazingly, in a time when medical interventions are being rigorously assessed and analysed, surgical treatments have somehow escaped this scrutiny. The reason for this is the problem of the placebo. One of the cornerstones of the modern day randomised-control-trial is the creation of a placebo group within the study, to provide a baseline against which the therapy of interest can be compared. Surely, if the entire premise of evidence based medicine is that one shall only provide a medical intervention if it will help the patient, then, by the same reasoning, it should be impossible to subject patients to a potentially dangerous placebo surgery. This is the dilemma of placebo surgery. This paper will try to explore this dilemma by defining 'placebo' and the 'placebo effect', giving a brief historical account of placebo surgery, and addressing the potential role of placebo surgery for today and tomorrow.

What do 'Placebo' and 'Placebo Effect' Mean?

Hornung defined placebo as "an empty preparation or intervention that imitates an effective therapy (Hornung 1994)." This definition best summarises how placebo is thought of in the minds of most people. It has within it, sentiments that placebo is an artificial, fake treatment that carries with it no intention of healing. It is this definition of placebo that is thought of when one hears of sugar pills being administered in large studies, in place of a "real" drug. More difficult for to understand is the term 'placebo effect.' The most useful definition of the placebo effect is that provided by Gotzsche. The placebo effect is the difference in outcome between a placebo treated group and an untreated control group in an unbiased experiment (Gotzsche 1994). It is this definition of the placebo effect that gives the randomised control trial its strength, because one can then clearly assess what portion of a patient's outcome is attributable to the intervention we are interested in, and what portion is due to the placebo effect. This definition of placebo effect points out another important principle. For many treatments there will be some form of positive (or negative) placebo effect simply because the physician has done something. When evaluating modern medical practices one must clearly differentiate between a placebo therapy and the placebo effect.

The History of Placebo

The term 'placebo' in Latin means I shall please, and it was first used in the 14th century. It referred to people who were hired by the family of the deceased at funerals to wail and sob, to give the impression of importance to the dead person (Shapiro 1964). Interestingly, from its beginnings, the term placebo has been associated with images of substitution, depreciation or cheapness, all of which are still connected to the term. In the next few hundred years the term had become a medical one. By 1785, the New Medical Dictionary had described placebo as "a commonplace method or medicine (Motherby 1785)." The use of placebo had become one of the foundations of medical therapy up until the middle of the twentieth century. In 1807, Thomas Jefferson stated "One of the most successful physicians I have ever known has assured me that he used more bread pills, drops of coloured water, and powders of hickory ashes, than all other medicines put together (Jefferson 1898)." Clearly the understanding of the placebo effect is not new. In fact, out of suspicion of the placebo effect was born perhaps the first example of a placebo-controlled trial in 1801 by a physician named Haygarth. A common remedy for many ailments at the time was to apply metallic rods, known as Perkins tractors, to the body. These rods were supposed to relieve symptoms through the electromagnetic influence of the metal. Haygarth treated five patients with imitation tractors made of wood and found that four gained relief. The next day he treated the same five patients with the metal rods and obtained the same results. He wrote "the experiment clearly proved what wonderful effects the passions of hope and faith, excited by mere imagination, can produce on disease (Haygarth 1801)." It would seem from his writings then, that Haygarth was more interested in the potential benefits of the placebo effect, than the ineffectiveness of a placebo treatment. Almost 140 years later, the first example of a randomised placebo controlled trial was reported. In 1938, in testing the efficacy of a cold vaccination, a group of medical students were randomly allocated to receive either the true vaccine, or a lactose-filled placebo vaccine. Both groups reported lower cold rates, but the most interesting result was that the students who received the placebo vaccine had lower cold rates

than the true vaccine (Diehl *et al*. 1938). And so the value of the randomised placebo controlled trial was born. What makes this result humorous is that fifteen years later in 1953 Handfield-Jones wrote that the value of the placebo was inversely related to the intelligence of the patient (Handfield-Jones 1953). That doesn't say much for the medical students.

The History of Placebo Surgery

By the middle of the 1950's there were many successful reports of internal mammary artery ligation in the treatment and alleviation of angina pectoris. Support for the operation derived from the belief that coronary blood flow could be enhanced by the formation of collateral blood vessels if the internal mammary was ligated, and as a result the patient's chest pain would subside. Despite the reported results, there were sceptics of the procedure. It was these sceptics who devised what would become the first recorded placebo controlled surgical trial, to evaluate the effectiveness of internal mammary artery ligation. In two separate small trials a group of patients were assigned to either the traditional internal mammary artery ligation procedure, or to the placebo "sham" surgery. The placebo surgery involved making two skin incisions in an effort to mask the ligation surgery, without performing any further operation (Cobb *et al*. 1959, Dimond *et al.* 1960). Both trials showed similar results. Both surgeries were subjectively considered more successful than no intervention at all and 10/18 total patients reported significant relief of chest pain. Electrocardiogram results were however the same in both groups before and after surgery, and three months later the majority of both groups reported loss of symptom relief, generally indicating that in both treatment arms rates of improvement were the same. Despite the fact that neither trial was large enough to have statistical power, the results were compelling enough that the surgery was rapidly abandoned. What is truly amazing about this trial is that along with the abandonment of internal mammary artery ligation went the placebo controlled surgical trial.

Almost 40 years passed before the rebirth of the placebo controlled surgical trial in 1993. After giving fully informed consent, including knowledge of the possibility of receiving a placebo surgery, 10 men with osteoarthritis of the knee, were randomised, and blindly assigned to one of three arthroscopic surgical treatments. Two men received a standardised debridement treatment, three received an arthroscopic lavage, and five received a placebo arthroscopic surgery (Mosley Jr. *et al*. 1996). A summary of the three treatments is listed in Table 1.

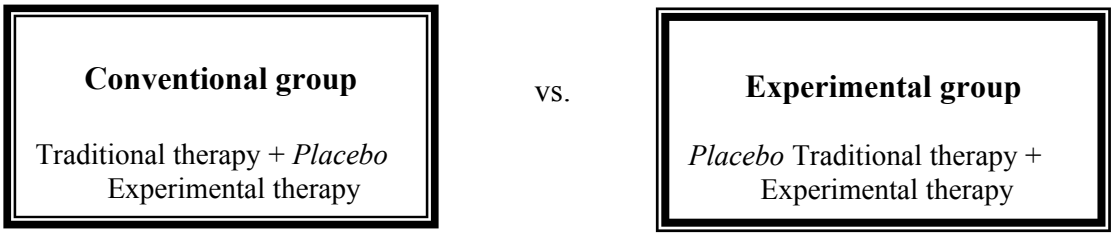
Debridement Procedure	**Arthroscopic Lavage**	**Placebo Arthroscopy**
• **General Anaesthetic** • **3 incisions** • **Scopes inserted** • **Cartilage removal** • **Correction of soft tissue problems** • **10 liters of saline lavaged through the knee**	• **General Anaesthetic** • **3 incisions** • **Scopes inserted** • **10 liters of saline lavage**	• **IV tranquilizer, opiods and local freezing** • **3 incisions** • **No instruments into knee** • **Simulated surgery**

Table 1. A summary of the three treatment arms in the placebo controlled trial of arthroscopic knee surgery for osteoarthritis (Mosley Jr. *et al*. 1993).

Six months following the surgeries, all three groups reported similar results. Pain improvement, the 50-foot walk time, and the physical exams were the same. Not surprisingly, during interviews, all three groups reported that they would recommend the surgery to family and friends afflicted with osteoarthritis. The small study sizes prevented statistical analysis of the results, but nonetheless, these studies emphasised the role of the placebo effect in arthroscopic knee surgery for osteoarthritis. As of today, arthroscopic knee surgery for the treatment of osteoarthritis is commonplace in hospitals around North America, but studies like the one reported bring into question the need for such a surgery. Perhaps a lot of time, money and risk could be saved if patients simply received a number of incisions in their knees, rather than the formal arthroscopic surgery.

What is the Role of Placebo Surgery Today?

In order to answer this question one must first consider the more fundamental questions that are at stake. Firstly, why is it important to evaluate surgical treatments? Arguments in this paper, and common sense lead one to conclude that it is important to evaluate surgeries for the simple reason that they put patient's lives at risk. Furthermore surgery is frightening, painful, and it consumes scarce health care resources. We should know then, whether the main effect of an operation is attributable to the placebo effect, or if it's the result of the procedure. The next logical question then is, can surgical trials be improved with a placebo group? The historical examples cited in this paper provide support for the utility of a placebo group in a surgical trial. In the only two examples of placebo controlled surgical trials there are, the results between the sham operation group, and the traditional surgical group were indistinguishable. The simple answer is yes; we can better evaluate a surgery with a comparison to a placebo group. However things are not that simple. The problem with assigning a patient to a placebo treatment is that it forces physicians to withhold treatment. In an effort to avoid not treating patients at all, the final question that we need to answer then is, can we do good surgical research with a placebo group without having to withhold treatment? The answer again is yes. By allocating patients to one of the two treatment arms outlined below, we can provide treatment for all patients, and yet still evaluate the efficacy of a new intervention.



Such a study design allows all patients to receive treatment, while also allowing the evaluation of the new and old treatment methods. Of course such a design carries with it the problems of conducting placebo surgeries. Probably the greatest difficulty in creating such an experiment would be receiving ethical approval. However by using local versus general

anaesthetic whenever possible, and by making shallow skin incisions for example, the risks of a placebo surgery could be reduced to near zero levels, hopefully eliminating most of the ethical problems. All patients would still be receiving treatment, which is more than most randomized placebo trials can claim. Other difficulties could include the dilemma of accurately imitating a surgery, as well as the need for treating each patient in the study twice. These are both issues that could be addressed with proper planning and financial backing. It is these same potential drawbacks though which demonstrate the true value of the placebo surgical trial. It would seem much more ethical to accurately evaluate many of the surgeries patients are subjected to, to determine if they are truly providing benefit, than to simply assume they are helping. Perhaps it is the untested surgery that is the unethical one.

Conclusions

Over the course of nearly 250 years, the use of the term 'placebo' in medicine has changed very little. It is still used today to describe an artificial treatment, given as an illusion to the unknowing patient, without any intention of improving the disease process taking place. The utility of the placebo in medicine on the other hand has changed considerably over that same time. Whereas it was used in the 1700's as a mainstay of medical therapy to enhance the patient's perceptions of healing, it is used in the year 2001 as a mainstay of medical research. In fact the need for the placebo in medicine is as great today as it has ever been, for in the era of evidence based medicine the placebo provides researchers with the accurate baseline against which therapies can be compared. There must be recognition that alongside the push for evidence in medicine there must also be a push for evidence in surgery. This evidence must come in the form of randomised placebo controlled surgical trials. Without a more rigorous investigation of the many thousands of surgeries that exist today we shall never know how many people are unnecessarily being subjected to life threatening, invasive operations. There is absolutely no question that people's lives are saved everyday because of the skills of highly trained surgeons, but in the era of high tech, evidence based medicine, we cannot accept that ignorance should be a guiding principle. There is a way to safely evaluate surgeries, to ensure that we learn which procedures do and don't save lives. Whether the medical community will embrace this method of surgical research remains to be seen.

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EVIDENCE-BASED NEUROSURGERY? A HISTORICAL COMPARISON OF LOBOTOMIES OF YESTERDAY WITH NEURAL ABLATION TECHNIQUES OF TODAY

By

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ABSTRACT

Trephination, or opening the skull, began centuries before it was ever recorded. The oldest evidence of prehistoric trephination was found in a North African skull that dates back to 10,000 BC.(1) The practice which continued into the nineteenth century without anaesthetic or antibiotic, arouses incredulity, even horror in the minds of many people, as does the twentieth-century history of lobotomy.

This paper looks, very briefly, at the complicated story of lobotomy (from c. 1935 to c. 1960) and, for example, at what many see as the undue influence of leaders in the field, who helped to promote such a procedure. It will highlight the possibility that a new phase in the lobotomy story-neural ablation procedures for behavioural problems and for ailments such as Parkinson's disease-may also be promoted, and unwittingly shaped, by social factors. The presentation will close with a series of questions relating to the need to avoid undue influence of social factors in current practices.

There is no evidence that trephination led to surgery on the brain, although the twelfth-century surgeon Roger (Frugardi) of Salerno said that "for mania and melancholy the skin at the top of the head should be incised in a cruciate fashion and the skull perforated to allow matter to escape."(1) However, alterations of lobes of the brain itself were not well documented until around 1888 by Gottlieb Burckhardt. In removing about 1.5 grams of tissue from the temporal lobes of about seven patients with schizophrenia, he noted that they were improved, calmer, and no longer needed to be isolated.

Lobotomies did not become "popular" until the 1930's, when Antonio de Egas Moniz pioneered or at least popularized the operation, especially in Europe.(2) The seed was sown by the research of the influential John Fulton in America. He demonstrated that chimpanzees showed changes in behavior following lobectomies. The stature of these two men contributed to lobotomy quickly becoming a popular treatment that made its way to the United States, when, in 1936, neurologist Walter Freeman along with colleague James W. Watts performed a lobotomy procedure in their office for a patient. Later, Freeman modified the procedure by using an "ice pick"-like device instead of a leucotome, which Moniz used. Eventually, this gory procedure even upset his colleague, Watts, who quickly tried to disassociate with Freeman.

The peak of lobotomies was between 1949-1952 when it approached 5000 per year. Such was the interest that Moniz was awarded the Nobel Prize for Medicine and Physiology in 1949. Although there were individuals who opposed lobotomies, their voices were lost amid "overwhelmingly positive" reports in the medical and popular press and relatively little published opposition.

The issue of why the "notorious" practice evolved has received constant scrutiny. Most studies on lobotomy have been highly critical of the practice. In part, this seems to reflect "pride" in medicine's "great strides," and to think that practices that have not stood the test of time were due to incompetence, ignorance or both. The studies suggest that among the reasons to explain why the professional community did not reject lobotomies was the strength and power of opinion leaders in the field of neurosurgery, on little published research on lobotomies prior to 1960 and on results that were often hard to solidify.(3) As critics of the lobotomy episode make clear, there is little doubt that much subjective interpretation of results occurred. For instance, the amount of tissue removed varied greatly from patient to patient, such that comparisons between cases was difficult. In fact most information was published in case study format rather then as a clinical trial, and there seemed to be little effort to tie clinical results to physiological theory. It seems that many neurosurgeons were more reliant on "word of mouth" from their "distinguished" colleagues rather than evidence published in journals.

In contrast to such accounts, Jack Pressman, in his book, *Last Resort: Psychosurgery and the Limits of Medicine* (1998), "brilliantly and convincingly tells a very different story." Here I am quoting from Joel T. Braslow's comments on Pressman's work. He adds:

> "Instead of portraying lobotomy as a kind of cautionary tale of medicine at the periphery run amok, he turns the conventional interpretive tables around and asks: 'How could a therapy so highly valued at one point in time later be considered wholly useless?' He makes evident the scientific, professional, and cultural context that once made lobotomy a viable and efficacious therapy. By so doing, he raises profoundly troubling questions about the nature of scientific medicine and its ability to rescue us from the 'human tragedy' of illness and suffering. We can no longer reassure ourselves with the comforting tale that psychosurgery was simply the product of overly zealous researchers and gullible (and, at times, sadistic) practitioners."(4)

As Pressman argues, it is precisely the opposite: "the use of and support for psychosurgery was intimately interwoven into the fabric of 'normal' psychiatric science and clinical care."

Pressman, then, argues that lobotomies were considered reasonable at the time given the context of scientific, medical and social knowledge. He makes clear that, while the criticisms of lobotomy made in earlier studies are relevant, that the reasons for general acceptance were much more complex such that it was difficult for the lobotomists to recognize the many social factors shaping their commitment to the practice of lobotomies.

Pressman's work offers a challenge to look at the very recent and current trend to restore lobotomy-like procedures, a challenge to examine social factors and the standards of evaluation.

First, it must be noted that the 1960's saw a dramatic drop in the number of lobotomies performed-only about 350-550. This owed much to the shift from surgery to pharmaceutical treatments, especially with the introduction of the tranquillizer, thorazine. Psychiatry entered a period of confidence in drug therapy.

However, by the 1970's, there was an increased and renewed interest in psychosurgical lobotomies possibly due to increasing questions, complications, and tolerances with drug therapies.(1) The arrival of a new instrument known as a stereotactic device and an increased understanding of neuroanatomy allowed for more accurate and localized ablation techniques in psychoneurosurgery. Currently, the new technology is used for the treatment of pain and obsessive- compulsive disorder by removing tissue in the cingulate gyrus (cingulotomy). However, most of the literature on this procedure involves a variety of clinical situations and small sample sizes. I was only able to find one journal entry that reviews that literature, which is limited, on cingulotomy.(5)

Additionally, the use of fetal tissue and neural ablation techniques in neural diseases with psychiatric involvement, like Parkinson's disease and possibly some day Alzheimer's disease, has grown in interest over the last decade.(6) However, patients who have gone through this treatment have currently been few and far between. I do not have a good sense at the moment of the strength of animal studies-e.g., using MPTP to induce Parkinson's disease with subsequent removal of their globus pallidus and monitoring Parkinson's symptoms. A suspicion exists that the evidence is no greater than the animal model research of Fulton, which led to Moniz performing his lobotomies.

Although the new phase of lobotomy has grown up in a new era of peer-reviewed clinical trials, evidence-based medicine, ethics review boards and a keener awareness of conflicts of interest, it would be wrong to believe that social factors considered by Pressman are not still shaping current practices.

What I wish to do in closing is to ask a series of questions.

1. Can we get a better understanding of the influence of social factors by studying the history of the past? Here I wish to respond by saying "yes." I suggest that Jack Pressman's book or others like it should be mandatory reading for all neurosurgeons. I believe that the insights gained will develop a critical appraisal of personal attitudes and how these are subtly influenced by social factors.

2. To minimise, as far as possible, the influence of social biases and poor science, and to develop evidence-based neurosurgery, I ask, Do we need an international review organization that would

    a) gather, compile, and analyse all data published and unpublished;

b) respond quickly to a neurosurgeon seeking advice on the management of a particular patient;
c) develop and utilize evidence-based medicine assessments along the lines of the Cochrane International Program;

My own view would be to institute such an international program, but equally important, as a lesson from the lobotomy story, for our medical education to encourage effective educated autonomy.

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WILDER PENFIELD AND THE MONTREAL NEUROLOGICAL INSTITUTE

By

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ABSTRACT

Today the Montreal Neurological Institute (MNI) is a world class center for both neurosurgery and neuroscience research. The conception and construction of the MNI is an important part of Canadian history and of the history of neuroscience in general. In the midst of the Great Depression, Wilder Graves Penfield and his partner, William Cone, managed to build the MNI with financing from the Rockefeller Foundation, McGill University and the Quebec government. Penfield's idea, which was near-unique at the time, was to combine clinical practice with research in one institute in the hopes of pursuing his dream to decipher the workings of the human brain. Through his research at the MNI, Wilder Penfield made many contributions to basic neuroscience including a topographical map of the motor and sensory areas of the cerebral cortex called the Homunculus. In addition, he pioneered the "Montreal Procedure" for the treatment of epilepsy. To this date, the MNI performs more epilepsy surgeries than any other center in the world.

As a young doctor, it was Wilder Graves Penfield's dream to establish an institute for the study and treatment of neurological disorders. He and his partner, Dr. William Cone, were eventually able to make this dream a reality when they obtained funding from the Rockefeller Foundation. The Montreal Neurological Institute (MNI) opened in 1934 as a 50 bed hospital for neurological disorders combined with research laboratories dedicated to the study of neuroscience. Over the ensuing years many discoveries and innovations at the MNI have contributed to our current knowledge of brain function. Dr. Penfield became the world's leading authority on the surgical treatment of epilepsy. He also contributed much to our knowledge of the physiology of the brain; Penfield's Homunculus can still be found in neuroscience textbooks today.

Wilder Graves Penfield: early life and education

Wilder Graves Penfield was born in Spokane Washington in 1891. His father and grandfather had both been physicians. Wilder Penfield's father was not financially successful in his practice during Wilder's childhood and this actually deterred Wilder from becoming a physician. So although his father had been a physician, his mother seemed to be the dominant influence in his life and it was her who later supported and encouraged him throughout his medical studies. As a result of the financial difficulties, when Wilder was eight years old Mrs.

Jean Jefferson Penfield separated from her husband and brought her children to her parent's place in Hudson, Wisconsin. From an early age Mrs. Penfield instilled in Wilder a strong sense of value for education. She suggested to Wilder, who was 13 years old at the time, that he should aspire to become a Rhodes Scholar. With encouragement and support from his mother, Wilder Penfield set out to do just that. Wilder took his Bachelor's Degree at Princeton and was an all-round scholar, a leader, and athlete. He was a member of both the football and wrestling teams.

Upon his graduation from Princeton in June 1913, Penfield applied for the Rhodes Scholarship. He was eventually successful and studied medicine at Merton College, Oxford University, England. In 1916, Penfield graduated from Oxford University with a Bachelor of Arts degree from the Honours School of Physiology. During his studies Penfield met two men who became his lifetime heroes: Sir William Osler and Sir Charles Sherrington.

At the time, the Canadian, Sir William Osler was a Regius Professor of Medicine. Penfield later wrote that he was "a doctor who contributed more than anyone, in his time, to the art and practice of medicine"[1] (p 36). Penfield became friends with the Osler family. In fact, he convalesced at the Osler home in Oxford after being among the wounded on a ship struck by a German torpedo. This occurred in 1916 when Penfield was crossing the English Channel on the *S. S. Sussex* to reach a Red Cross hospital in France.

Sir Charles Sherrington was one of the world's foremost neurophysiologists. He later received the Order of Merit and the Nobel Prize in 1926 and 1932, respectively. Penfield attended Sherrington's lectures and observed his research in the laboratory. In particular, Sherrington studied the mechanisms of reflex actions in the brain and spinal cord and how these mechanisms were integrated.

Penfield then completed two years of medical schooling at the Johns Hopkins Medical School. It was during this time he married Helen Katherine Kermott (June 6, 1917).

Dr. Wilder Penfield

After studying at Johns Hopkins, Dr. Penfield became a surgical intern at Brent Brigham Hospital in Boston from 1918 to1919. The famous pioneer neurosurgeon, Harvey Cushing, was the chief surgeon at this time. Penfield later described Cushing's technique as a "sort of classic" and "constantly referred to the general principles which he laid down in neurosurgical operating" (Penfield, 1969).

Penfield then returned to Oxford in 1920 for a final year. He worked at the National Hospital at Queen's Square, London as a Beit Memorial Research Fellow.

In the spring of 1921, Penfield accepted a position as a neurosurgeon and Assistant Professor of Surgery at the Presbyterian Hospital at Columbia University in New York City. Dr. Penfield worked under the supervision of Dr. Allen Whipple who became a friend and supporter of Penfield's educational endeavors.

In 1924, Penfield became acquainted with a person who would later become integral to his life: Dr. William Vernon Cone. Penfield later wrote that between him and Cone grew a "deep affection, respect and companionship" (p 117). Cone and Penfield later became the cofounders of the MNI. When Dr. Cone arrived in New York he had just completed his undergraduate and medical training at the University of Iowa. He was a neurosurgeon with a strong interest in neuropathology and originally came to work at the New York Neurological Institute. Unlike the New York Neurological Institute, the Presbyterian Hospital had a pathological laboratory devoted to the study of the brain. Since there was an opportunity to conduct research Dr. Cone decided to transfer his National Research Council fellowship to the Presbyterian Hospital. Cone became Penfield's assistant in both the clinic and the laboratory and "acquired the art of neurosurgery and patient care as if by instinct" (p 118). Together Cone and Penfield studied the cells of the brain and how they responded to injury.

During the New York years, Penfield had two exciting opportunities to study abroad. First he traveled to Madrid, Spain to spend six months in the laboratory of Pio del Río-Hortega who was a former student of Ramón y Cajal. Previously, Penfield was only able to observe neurons and neuroglia (astrocytes) under the microscope. With the new staining techniques he learnt from Hortega, Penfield was able to see oligodendricytes and microglia. This enabled him to learn about their role in neuropathology. The second time Penfield left New York he went to Breslau, Germany to learn from the neurosurgeon, Dr. Otfrib Foerster. Penfield learned to surgically remove brain scars as treatment for certain cases of epilepsy. In addition, he was taught the methods of electrical stimulation of the brain which he would later use to construct the Homunculus. These two ventures abroad to Madrid and Breslau taught Penfield valuable skills that he would later use and build upon in his surgical practice and research activities at the MNI.

Dr. Penfield and Dr. Cone move to Montreal

Edward Archibald, a professor of surgery at McGill, invited Penfield to come to Montreal as a faculty member at McGill University and a neurosurgeon at the Royal Victoria and Montreal General Hospitals. Penfield accepted the offer on the condition that Cone would also be added to the surgical team in Montreal. In 1928, both Penfield and Cone settled with their respective families in Montreal.

Just a few months after Penfield set up his surgical practice and research laboratory in Montreal a crisis occurred. His sister, Ruth had for some time been experiencing headaches, vomiting and convulsions. Ruth and Penfield's mother arrived in Montreal for a consultation and Ruth was examined and tested at the Royal Victoria Hospital. She was diagnosed with a brain tumour. The tumour was felt to be growing quickly and there was concern that Ruth would loose her vision. After a discussion of her case by Penfield, Cone and Edward Archibald it was decided that Penfield would attempt brain surgery to remove the tumour.

When Penfield operated on Ruth's brain he found that the tumour was much larger than expected. He removed a larger section of brain tissue than he ever had before and performed a more radical surgery than any other surgeon would have ventured to. Unfortunately the tumour was too large and could not be completely removed. Although Ruth's symptoms were alleviated and her eyesight was saved, the tumour eventually killed her three years later at the age of 46.

Ruth's surgery was a turning point for Penfield. He wrote: "the resentment I felt because of my inability to save my sister spurred me to make my first bid for an endowed neurological institute" (p 221).

The Montreal Neurological Institute

For many years Penfield's dream was to build "an institute where the neurologists could work with neurosurgeons and where basic scientists would join the common cause, bringing new approaches" (p 218). After several unsuccessful attempts Penfield managed to secure funding from the Rockefeller Foundation for the amount of 1 232 000$ which was awarded in April, 1932. Additional funds were provided by the government and private sector.

The MNI opened in 1934 as a 50 bed hospital and research institute. It was built a half a block north of Pine Avenue on University Street beside the McGill University Pathology Building and across the street from the Royal Victoria Hospital. Cone became the chief neurosurgeon and Penfield acted as the Director. Penfield retained his post as the Director until 1960.

During Penfield's years at the MNI, the institute gained a world-wide reputation for the diagnosis and surgical treatment of epilepsy. Penfield's research contributed to our current knowledge of how the brain learns movement and language, receives sensations and forms memory. Penfield's Homunculus, a topographical map of the somatosensory cortex, is still found in Neuroscience textbooks today.

As chief neurosurgeon, Dr. Cone continued to be technically innovative although much of his work went unrecorded since he did not enjoy writing. He was described as a "tireless surgeon, an inspired, and intensely compassionate doctor". He continued to work at the MNI until his death in 1959.

Among other famous neurosurgeons who worked at the MNI in the early years were Arthur Elvidge, Herbert Jasper, Theodore Rasmussen and William Feindel. The former two neurosurgeons were also, in turn, directors of the MNI.

The MNI became a model for other centers in North America for its near-unique concept of combing basic science research with clinical practice in the same building. The concept of the "Neuro" was also propagated through the many neurosurgeons and neurologists who trained at the MNI and then went on to head departments in the United States.

Today the MNI continues to be internationally recognized for work in epilepsy. More surgeries for the treatment of epilepsy are performed at the MNI than at any other center in the world. The MNI is also a know for its research and treatment of brain tumours, stroke, muscle disorders, neurodegenerative diseases and diseases of the spinal chord. Wilder Penfield is remembered as one of the great neurosurgeons of his time. During his life he published 10 books (both fiction and nonfiction) and more than 300 scientific publications. In the words of the British neurologist and Nobel Laureate, Edgar Douglas Adrian, Penfield was a "skilled neurosurgeon, a distinguished scientist and a clear and engaging writer".

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THE HISTORY OF SPACE MEDICINE: A NORTH AMERICAN PERSPECTIVE

By

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ABSTRACT

Space medicine emerged as a field distinct from its parent discipline, aviation medicine, to support human exploration of outer space. Space medicine refers to medical care delivered beyond the Earth's atmosphere. It includes the screening and preparation of candidates for space travel, investigating the effects of microgravity on the human body, and the development of medical requirements for flight technology.

From Yuri Gagarin's first human orbital flight in 1961 to the permanent human presence aboard the International Space Station today, we have learned that humans can tolerate exposure to space with no permanent physiological change. The journey towards this discovery has been both motivated and hindered by the fear that humans would morph into functionless creatures in space. In addition to this fear of the unknown, there were other obstacles to overcome: engineers, politicians and even astronauts have all resisted the space medicine movement.

Human survival in space has been hailed as one of the most important medical discoveries of the 20th century. This paper details the history of space medicine and its struggle to determine human viability in space.

On October 30th, 2000, a permanent human presence was established in space. The Russian Soyuz vehicle delivered the Expedition 1 crew to the International Space Station (ISS). The ISS would serve as the space living quarters for its first 3 inhabitants and the rest of humanity.

Unfortunately, this historic event received little attention. Some of you may remember it as a two-minute flash on the news. Others may recall the Canadian hype surrounding Marc Garneau's visit to the ISS in later weeks. Compare this to the excitement when Apollo 11 landed on the Moon in 1969. Space has become boring because we are confident that humans can survive there. However, to space medicine pioneers 50 years ago, microgravity posed a threat to every physiological system.

Space Medicine

It was clear that German V2 rockets were capable of crossing the barrier between Earth's atmosphere and space towards the end of World War 2. The threat of medical disaster increased as flight vehicles reached greater heights. Hence, aviation and aerospace medicine evolved in parallel with flight technology. The 'Aeromedical Problems of Space Travel' meeting hosted by the United States Air Force in 1948 is where space medicine branched from aviation medicine. Here, Hubertus Strughold, who later acquired the reputation as 'the father of space medicine', proposed that the space-atmosphere boundary be defined in terms of the flyer's perception and not physical phenomena. "What we call upper atmosphere in the physical sense," said Strughold, "must be considered - in terms of biology - as space in its total form."
Orbital flight at an altitude of 100 miles was referred to as space flight and the delivery of care above this altitude, 'space medicine.'

Space medicine is still lumped with aviation medicine today. Dr. Patrick McGinnis, a flight surgeon at the Johnson Space Center, argues that 'just as pediatrics is not adult medicine practiced on small people, space medicine is not aviation medicine practiced at greater altitudes."

So what is space medicine? Again, it refers to medical care delivered beyond the Earth's atmosphere. It is important to understand space medicine's beginnings in basic science to understand how it is practiced today. Initially, space medicine's goals were simple: to determine if humans could survive in space, and, if so, for how long. Today, space medicine involves selecting and preparing candidates for space travel, investigating the effects of microgravity, and finally, developing medical requirements for flight technology.

Project Mercury

In October of 1957, the Soviet Union launched the world's first satellite into orbit. Laika, the dog, was launched one month later. President Eisenhower was informed by US Intelligence that the Russians were preparing to orbit a man in space. This prompted him to support Langley Center's Project Mercury, whose purpose was to orbit a human around the Earth.

Although the challenges of space flight were unknown, NASA thought that it was an environment fit for the fittest. NASA's original astronaut announcement called for young, fit and danger-seeking males. However, fearing applications from psychotic individuals, President Eisenhower narrowed the selection to military test pilots who had a degree in physics or engineering, were less than 40 years in age and 5'11 in height, and most importantly, 'physically and psychologically suited for flight.' 32 candidates underwent medical screening at the Lovelace Clinic in Albequerque and later, at the Wright Patterson Air Force Base in Ohio. They were subjected to air pressure, temperature, sensory deprivation, and vibration chambers. The goal of this testing was to reveal underlying medical problems.

Once selected, the seven Mercury astronauts underwent further vestibular, psychological and exercise testing. It was at this time that astronauts began to regard the medical profession as a nuisance. Physicians subjected astronauts to barbaric testing only to use the results to ground them.

Meanwhile, forty chimpanzees were also being tortured. The scientists of the National Research Council Committee on Bioastronautics mandated animal flights, warning that microgravity was incompatible with life. At a meeting in 1958, they identified potential problems such as euphoria, hallucinations, sleepiness, sleeplessness, disorientation, an inability to swallow food and urinary retention. Consequently, a monkey was the first American in space.

A Russian, Yuri Gagarin, performed the first manned orbit of Earth in April of 1962. This was followed by Alan Shepard's suborbital flight a month later, and John Glenn's orbital flight in February of 1962. The main medical finding of the Mercury Project's six manned flights was minor cardiovascular deconditioning. Overall, humans could survive in space.

Project Gemini

Project Gemini extended the medical and engineering objectives of Project Mercury. The engineering goals were to use the two-man vehicle to practice docking and re-entry techniques. However, Gemini's main objective was medical: to determine whether humans could survive the anticipated length of a lunar mission i.e., fourteen days. Dr. Charles Berry, then Director of Life Sciences at NASA, describes how he devised an incremental flight plan to sell to NASA officials. Blood pooling and post-flight hypotension during the Mercury program had alarmed Dr. Berry. He planned to evaluate the crew's biological functions over missions lasting 4, 8 and 14 days. His plan was implemented but he recalls receiving 'phone-calls from well-meaning physicians and physiologists warning that we were sending men to their deaths in 4 days in space…'

Dr. Berry was also frustrated by having to satisfy the wishes of both politicians and astronauts. Unconvinced that humans could perform safely in space, the US Congress demanded medical proof. However, astronauts viewed medical testing as a nuisance and refused to be treated like lab beasts.

To his satisfaction, on December 4th, 1965, Gemini 7 was launched. Astronauts Frank Borman and Jim Lovell returned safely fourteen days later. The ten manned Gemini missions proved that man could live in space long enough to complete a lunar mission. Medically, the moon was in reach.

Apollo

On May 25th, 1961, President John F. Kennedy announced to the American public that a man would land on the Moon and return to Earth before the end of the decade. This announcement made operational space medicine a reality.

During the Apollo program, research was secondary to treatment and prevention. If an astronaut became ill during an orbital Mercury or Gemini mission, he could be evacuated to Earth to receive treatment. But lunar travel time made this impossible. Instead, in flight illness had to be prevented, and in flight treatment plans had to be prepared.

Contamination was another medical concern. Apollo scientists were concerned about introducing a moon plague on Earth and feared that organisms from Earth would contaminate the Moon. To prevent this, astronauts were quarantined pre and post flight in a Lunar Receiving Laboratory in Houston. Fortunately, no organisms were ever discovered in the lunar rocks brought back to Earth. We never returned to the Moon following Apollo 17's flight in 1972.

Skylab and Sickness

The American space program lost momentum and direction following Apollo. The Skylab program was launched to recapture public interest and investigate the long-term effects of microgravity on the body. Skylab, as its name implies, was an orbiting laboratory. Space motion sickness was studied at length during the three Skylab missions, the longest lasting 84 days. Vestibular studies indicated that space motion sickness was distinct from motion sickness on the ground; one could be sick on Earth and comfortable in space or the opposite. Other Skylab medical observations included intravascular fluid loss, orthostatic intolerance, bone demineralization and muscle atrophy. None of these effects were deemed life-threatening.

Shuttle, International Space Station and Beyond

Twenty years of experiments aboard the American Space Shuttle have only confirmed Skylab's medical findings. Conversely, astronaut selection and training has evolved and is more humane than it used to be. Any American citizen is now eligible to apply. The best predictors of being selected include undergraduate GPA, graduate GPA, and aviation experience. Following selection, training is less physical and more cerebral; astronauts attend seminars and participate in simulations of space scenarios.

The frequency of human flights has created the need for sophisticated treatment strategies. This issue of the delivery of treatment in space is a debated topic. Less than 10% of astronauts are physicians and there is no requirement for a physician to be a member of a Shuttle or ISS crew. When a physician is not part of a crew, a Crew Medical Officer provides medical care. He or she receives 70 hours of medical training two months to two years before flight. Most NASA flight surgeons would like a physician to be a member of every crew but it is difficult to determine whether they have their own interests or the crew's at heart since many of them aspire to be astronauts themselves. There is resistance to this movement, especially within the field of engineering. Take Robert Zubrin, NASA engineer, President of the Mars Society: "the idea of having a dedicated top–notch doctor on board who spends his or her time reading medical texts and honing skills by practicing surgery with virtual reality gear…is cumbersome and unnecessary."

With or without a physician on board, all crews are supported by a flight surgeon at Mission Control. Besides providing in flight support, flight surgeons treat astronauts and their families, develop flight treatment protocols and propose requirements for medical hardware. It is evident that the flight surgeon's role is now more functional and not limited to basic scientific research.

Space medicine's role within the space exploration effort has also evolved. In the past, the engineering and political achievements of space travel have shadowed the medical ones. However, fulfilling the medical objectives of the Mercury, Gemini, Apollo and Shuttle programs was as important as meeting the engineering ones. Our engineering and political colleagues now view space medicine as an integral part of the space exploration effort. This is largely because they recognize that one medical catastrophe would devastate the entire space program.

In contrast, space medicine research has decreased the public's interest in human space flight. Space is dull because it doesn't seem dangerous any more. By establishing itself and its theories, space medicine finds itself limiting the space exploration effort. We have overcome our fear of the effects of space only to be grounded by the finding that space travel is not disabling. The next challenge is to convince the public that despite the safety of space travel, exploration is still worthwhile.

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THE SIXTH SENSE IN SPACE MEDICINE

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ABSTRACT

The vestibular system is the under-appreciated, compact inertial guidance system of the inner ear responsible for normal spatial orientation and posture. Composed of the rotation-sensing semicircular canals and the otolith organs which sense linear acceleration and gravity, it works with the visual and proprioceptive systems to provide the powerful precision mechanism by which we can tolerate the demands of normal dynamic postural control.

With the advent of aviation and the revelation that humans were not naturally "designed" by evolution to fly, the physiological significance of vestibular function has come to the forefront. In our normal environment on Earth, vestibular deficiencies can be debilitating. In space, zero gravity and prolonged rotations during space flight extend the vestibular system beyond its natural capabilities. The central nervous system (CNS) must therefore "learn" to reinterpret any informational discrepancy between vestibular and other allied sensory-motor systems. The abnormal space environment drives normal vestibular function to adapt. In fact, the vestibular system has proven itself to be an exquisite model for the investigation of adaptive plasticity in the CNS.

The challenge of space flight has fueled both basic vestibular research and the search for ways to circumvent the costly, often incapacitating, effects of vestibular malfunction in Space and on return to Earth. These effects include Space Motion Sickness, postural illusions and disorientation. By tracing historical experiments, it will be shown how real life experiences, basic science and clinical medicine combine to increase our understanding of vestibular physiology and engender further research.

Historically, space medical research has led to better comprehension of basic vestibular function and improved methods of clinical vestibular rehabilitation. Currently, it is stimulating research into adaptive mechanisms in the CNS. Thus, to a significant extent through the impact of space-medical problems, the vestibular system has established itself as one of our primary sensory systems, the Sixth Sense.

Introduction

In his book, The Analysis of Sensations, Ernst Mach asks all natural scientists and philosophers "...to reflect that everything that we can know about the world is necessarily expressed in the sensations..." (1886). With this simple statement, Mach has captured the fundamental role of the senses in the perception of the surrounding environment. When asked to name the primary sensory systems, five senses naturally come to mind: sight, hearing, smell, taste and touch. However, the fundamental senses of balance and spatial orientation have been neglected despite their critical role in enabling interaction with the environment. Moreover, the remarkable system responsible for these senses, the vestibular system, has in the past been relegated to the background and virtually ignored; perhaps because it is physically hidden from view and its sensory signals are normally perceptually covert.

However, with progressively more sophisticated advances in technology, new and diverse challenges have surfaced which have serious, often fatal consequences if they are not overcome successfully. The survival of the first man in space and the resulting "Space Race" between the Union of Soviet Socialist Republics (USSR) and United States of America (USA) transformed the possibility of space flight into reality. Aerospace medicine and the National Aeronautics and Space Administration (NASA) became major players. In early space flights, the main objective was to prove repeatedly that humans could survive in space. Cosmonauts and astronauts were restricted in their movements and the actual time spent in space was minor. With increasingly longer missions in space and the development of larger space vehicles (Apollo, Space Shuttle, Space Stations), movement within the vehicles became possible (Nicogossian *et al*., 1994). In conjunction with this freedom of movement, however, a potentially incapacitating entity emerged, space motion sickness. Space motion sickness is a continuum of symptoms that can range from increased stomach awareness to actual nausea, vomiting and prostration. Other complaints include disorientation, postural illusions, vertigo, pallor and cold sweats as well as a severe sense of lassitude and fatigue (Gillingham and Previc, 1996). All of these problems can be traced to inappropriate action of the vestibular system.

The Vestibular System

The vestibular system is embedded in the rock-like petrous portion of the temporal bone in our skull and is considered a part of the inner ear. It consists of semicircular canals and otolith organs (utricle and saccule). On each side, there are three semicircular canals oriented roughly at ninety degrees to one another, which makes it possible to sense all rotations of the head in three-dimensional space. The otolith organs are also bilateral and recognize linear acceleration and gravity, and thereby provide the translational information in three dimensions. The ampullae and cupulae of the canals and the maculae and stratoconia of the otoliths contain sensory hair cells, the cilia of which can be transiently bent by movement of the endolymph fluid contained within these compartments. Deflection of these hair cell cilia produces generator potentials in the cell body, which in turn cause nerve cells in the cristae to fire and send action potentials to the central nervous system (CNS) via the eighth cranial nerve (Wilson and Melvill Jones, 1979).

One of Mach's legacies is the characterization of the vestibular system's physical properties (Mach, 1886). The precise orientation of the components of the vestibular system

makes it possible to sense any movement of the head in three linear planes and three rotational planes. In addition, the relative inertia (tendency to be left behind) of the endolymph in the canals and the stratoconia crystals of the otolith organs are the major determinants of the hair cell deflection. Thus, the vestibular system can be considered an inertial guidance system with six degrees of freedom that is capable of measuring any changes in velocity (acceleration) of head movement. Together with the visual system and proprioceptive (somatosensory) system, the vestibular system plays an integral role in spatial orientation, posture and balance.

Vestibulo-Ocular Reflex (VOR)

Gaze stabilization is the main outcome of the interaction between the vestibular system and the visual system through the vestibulo-ocular reflex. In its shortest pathway, this reflex involves a three neuron pathway and is one of the fastest reflexes in the body. Neurons from the vestibular system arc with excitatory and inhibitory neurons in the vestibular nucleus of the brainstem. These neurons then project from the vestibular nucleus to the motor nuclei (III, IV, VI) of the oculo-motor system of the brainstem. Finally, excitatory neurons from these ocular-motor nuclei synapse onto the three muscle pairs controlling movement of the eye. Consequently, when the head rotates in one direction, the VOR enables the eyes to move in the opposite direction so that the eyes remain fixed on a particular stationary object (Wilson and Melvill Jones, 1979).

The efficiency and vulnerability of the VOR can be demonstrated by several simple demonstrations. (1) Normal situation. Hold a hand steady in front of the head and fix the eyes on the hand. Slowly begin to oscillate the head through very small angles with a gradually increasing frequency. Oscillations of the head can reach a frequency of approximately ten Hertz with maintenance of a clear image of the hand. In fact, during locomotion such as running, the head is oscillating anywhere from three to five Hertz and the runner is still able to see clearly. (2) Removal of the vestibular contribution to the VOR by fixing the position of the head. A hand is held in front of the still head, the gaze is fixed on the hand, then the hand slowly begins to wave back and forth through small angles, gradually increasing the frequency of oscillation. Above a frequency of only one Hertz, the image of the hand will become blurry because purely visual tracking (via the optokinetic reflex) is too slow. This emphasizes the importance of the vestibular contribution. (3) Misleading the Vestibular System. If an individual sits blindfolded in a chair which begins to turn (acceleration), the head turns in one direction, the endolymph is left behind in the opposite direction and the vestibular cupula is deflected leading to the sensation of rotation. If the chair then continues to turn for a prolonged length of time at a constant velocity so that it is no longer accelerating, the elastic properties of the cupula cause it to revert back to its original position so that the vestibular system is misled into believing that it is no longer turning. Then, if the chair is suddenly stopped, the cupula deflects in the opposite direction and the vestibular system “thinks” it is turning in the opposite direction even though there is no actual rotation. Subsequently, the VOR generates “compensatory” ocular nystagmus with the slow phase compensating for the illusionary rotation even though the head is stationary, thus compromising clear vision and even generating a compelling visual illusion of rotation (somatogyral illusion).

Aviation Medicine: Laying the Groundwork

Space flight has a very strong heritage in aviation and owes much of the current knowledge to pioneering studies in aviation medicine. Many of the early studies suggested that humans were not meant to fly and this idea was further substantiated by numerous fatal airplane crashes. In flight, for example, the prolonged time it takes for an aircraft to complete a turn or arc at a constant velocity allows the vestibular system to be misled in a manner similar to demonstration number three described above. As a consequence, ocular nystagmus develops and vision becomes misleading. A pilot who cannot see while flying and who relies on the misleading information provided by his vestibular system is a disastrous combination and an accident waiting to happen (Melvill Jones, 1958).

One individual in particular, Ashton Graybiel, played a prominent role by establishing the Naval Aerospace Medicine Laboratories in Pensacola, Florida, to study vestibular function in anticipation of space flight through aviation. Graybiel was responsible for characterizing some of the psycho-physical illusions experienced by pilots (Graybiel, 1952). For example, a sudden acceleration of the aircraft results in a gravity vector (linear acceleration) that is tilted back at an angle to vertical. Since the pilot perceives the direction of the gravity vector as "down", he experiences the illusion that the nose of the aircraft is tilted up (somatogravic illusion). If the pilot then compensates by pointing the nose of the aircraft down, he ends up crashing into the ground. Another type of illusion includes somatogyral illusions which are false senses of rotation or absence of rotation (due to an inability to correctly register a prolonged rotation such as those experienced in flight). Additional research by Graybiel and colleagues (Fred Guedry, James Lackner) employed the rotating Barany chair to study vestibular canal physiology both on the ground and in space (Skylab), and the human centrifuge to study illusions due to otolith stimulation. The human centrifuge could experimentally change not only the magnitude of apparent gravity ("*g*"), but also the perceived direction of the gravity vector which led to the understanding of ocular-gravito illusions.

Clinical Vestibular Deficits

An understanding of the vestibular system is essential and can have ramifications both on space flight and in clinical scenarios. Clinical correlations arise in instances of unilateral or bilateral vestibular deficiencies and pathology of the vestibular system itself. Unilateral deficiencies can be induced by infection, trauma, ischemia and progression of Meniere's disease. Tumours (Schwannomas) of the vestibular nerve can also lead to vestibular deficiencies. In these patients, there is a mismatch in the information coming from each side since one side is absent. Ultimately, these patients will exhibit some degree of vestibular compensation. In contrast, patients with bilateral vestibular deficiencies, e.g. from aminoglycoside antibiotics which irreversibly damage the hair cells, suffer permanent blurring of their vision when walking due to the absence of a functional VOR (Daroff and Carlson, 2001).

The Challenge of Space

In space, the apparent loss of the gravity vector (zero gravity) makes the information generated by the otolith organs incorrect and invalid. Thus, there is a conflict within the

vestibular system between the information provided by the semicircular canals which function normally and the information provided by the otolith organs. In addition, conflict arises between the different sensory systems such as the vestibular system and the visual system because the information generated by each system does not match the other. These ideas are collectively known as the "sensory conflict/neural mismatch theory". Regardless of the source of the conflict or mismatch, motion sickness occurs only with vestibular involvement. Thus, if we consider Earth as the normal environment, then clinical problems on Earth derive from an abnormal vestibular system malfunctioning in a normal environment. In contrast, space motion sickness and associated problems involve a normal vestibular system malfunctioning because of an abnormal environment.

Aerospace Medicine and Research

NASA has approached the study of vestibular function through several routes. Using a modified Boeing 707, NASA created the KC-135 or "Vomit Comet" as it is "affectionately" known. This aircraft flies a series of parabolic flight paths so that for about thirty seconds at the top of each parabola, zero gravity is simulated. Short zero gravity experiments can be conducted on board. All personnel find the parabolic flight profile to be quite nauseating. Some get sick simply at the sight of the plane on the runway! Another approach involved the space station Skylab which allowed missions of up to three months duration to be undertaken in 1973 and 1974. It was discovered that predictors of motion sickness and nausea susceptibility in normal gravity may not be valid in zero gravity environments. For example, Graybiel's rotating Barany chair is an extremely provocative stimulus of nausea on Earth if the rotation is combined with lateral head movement (sensory mismatch) during rotation. However, in space, this effect could not be duplicated. In fact, upon return to Earth, this effect was initially absent and only returned after some time had passed. In short, some form of adaptation had taken place to permit the astronaut to be resilient to the nauseating stimulus of the rotating chair. Finally, the development of the re-usable space shuttle and the Spacelab module (which fits snugly within the cargo bay) increased the number of opportunities for space flight and experiments.

Once astronauts are in a zero gravity environment during space flight, approximately half of them will experience space motion sickness (Nicogossian and Gaiser, 1996). An interesting observed phenomenon is that regardless of whether any treatment has been initiated, space motion sickness is self-limited and astronauts will undergo a phase of adaptation within two to seven days. Veteran astronauts may adapt more rapidly on subsequent trips, but a period of adaptation is still required. During this time, the symptoms will begin to subside and once gone, will remain absent for the remainder of the time in space. Since space flight is very expensive, each moment that an astronaut is not working at peak efficiency or is incapacitated translates into a tremendous financial cost. The current treatment of choice for the symptoms is Promethazine given intra-muscularly. However, Promethazine works best when given prophylactically and it is difficult to estimate when launch will actually occur and when the symptoms of space motion sickness will appear. Furthermore, one of the side effects is drowsiness and Promethazine may actually increase the period of adaptation.

Post-flight, upon return to Earth's one *g* environment, astronauts who have become accustomed to zero gravity after prolonged exposure must now undergo a phase of re-adaptation

to normal gravity. It is a little known fact that astronauts are posturally relatively unstable post-flight when compared to pre-flight. Some of the changes observed immediately post-flight include a wider gait, reluctance to move their head and the renewal of nausea and vomiting. New research has shown that visual acuity during locomotion is also diminished post-flight. For two to three weeks after their return, astronauts usually experience severe balance and postural disturbances (Reschke *et al*., 1998).

Adaptive Plasticity of the CNS

The observed adaptation to zero gravity and re-adaptation to normal gravity demonstrates a phenomenon known as adaptive plasticity of the CNS. The plasticity refers to the fact that the adaptation is permanent and can only be induced to change again if there is some impetus to drive the change. In other words, it will not spontaneously revert back to its original state.

Adaptive plasticity has been clearly demonstrated in normal gravity utilizing other experimental driving forces for change. In the same Naval Aerospace Medicine Laboratories as Graybiel, a scientist by the name of Guedrey studied volunteers who lived in a slow-rotating room for prolonged periods of time. As these volunteers were adapting to their new living conditions, nausea and disequilibrium were constant companions which suggested involvement of the vestibular system. During this time, these volunteers were exposed to acceleratory forces along the periphery of the room. At the end of the study, they were blindfolded, taken out of the room and asked to walk in a straight line. Unknowingly, these volunteers would actually walk around in a circle because they had adapted. If they remained blindfolded, the circular walk would continue because the visual system could not provide any feedback telling them that they were not walking in a straight line. There would be no driving force for change.

Similarly, studies by Melvill Jones and colleagues at the McGill University Aerospace Medicine Research Unit used reversing prisms to put visual information in direct conflict with vestibular input (Melvill Jones, 1985). For up to four weeks, volunteers would continuously wear reversing prism goggles that reversed everything they saw by one hundred eighty degrees. In other words, objects that appeared to be on the right side would actually be on the left and vice versa. In normal individuals, a dark-tested VOR involved picking an object to look at, closing the eyes and while still "looking" at the object, rotating the head to the left or right. When the eyes were opened again, they would still be looking at the object because of the VOR. In the volunteers with goggles, this dark-tested VOR was attenuated during the first week and was accompanied by severe nausea. In the second week, the eyes actually moved in the opposite direction. Therefore, an inborn reflex had been reversed! This reversal was permanent as long as the goggles were worn. Furthermore, the larger the gap that existed between abnormal and normal, the bigger the drive for adaptation. This increased drive culminated in a faster rate of adaptation and a resulting increased severity of concomitant sickness.

The vestibular system thus provides a model for the investigation of the adaptive plasticity of the CNS. Recent work by D. Marr, M. Ito, F. Miles and S. Lisberger have mapped out the actual neural pathways involved and elucidated a role for the cerebellum in adaptive plasticity (reviewed by Melvill Jones, 2000). Any disease in the brainstem or cerebellum diminishes the adaptive capacity of the CNS (Daroff and Carlson, 2001).

History in the Making and a Glimpse of Destiny

The function of the vestibular system continues to be an area of intense research. Some of the research being conducted at the NASA Johnson Space Center includes studying dynamic visual acuity (ability to read while walking both pre-flight and post-flight), using a virtual reality DOME (display-oriented motion environment) to help train astronauts for zero gravity, using a short-arm human centrifuges to simulate gravity, balance tests which specifically test vestibular function (pre-flight and post-flight) and exploring the possible use of strobe lights to prevent motion sickness (Reschke *et al*., 1998).

The ultimate goal is to develop countermeasures and create a training regimen that will enable astronauts to become more proficient at adaptation and achieve a state of adaptive generalization. Not only is it hoped that astronauts will adapt more rapidly, but also that they will remain under the threshold of eliciting nausea and sickness in the process. Thus, regardless of whether astronauts simply go into orbit around the Earth, explore Mars, go back to the moon, visit Jupiter's moon Europa or return home to Earth, they will be able to adapt appropriately without the penalty of nausea. One idea currently being developed is an omni-directional treadmill combined with virtual reality technology to continually expose astronauts to different vestibular challenges. The major advantage of this concept is the incorporation of the existing treadmill currently used to maintain muscle mass and bone composition.

Many questions remain unanswered such as how does a vestibular problem or sensory mismatch translate into a gastrointestinal manifestation such as nausea, vomiting and ultimately lead to incapacitation. One thought is that this incapacitation may be a protective measure. In other words, there is something that is so fundamentally wrong that the body has to shut itself down so that it can identify and evaluate the problem and decide how to adapt to it.

With the recent installation of the US Destiny Laboratory module on the International Space Station, more research opportunities of longer duration and increased thoroughness will soon be available. It will definitely be a chance to quantify post-flight and in-flight changes. With respect to the future, Peter Pan sums it up best, "Second star to the right and then straight on 'til morning!" (Barrie, 1904). Anything is possible and the possibilities are endless. The only limit will be the imagination.

Conclusion

After consideration of all of the evidence presented herein, there can be no doubt that the vestibular system deserves recognition as an important sensory system. The vestibular system has lurked in the background and quietly accomplished what it was designed to do for a long time. It is only when the vestibular system malfunctions and is compromised, regardless of whether the compromise is a consequence of pathology or a drastically altered environment (zero gravity) to function within, that its importance is revealed. If Mach's assertion that "...everything that we can know about the world is necessarily expressed in the sensations..." (1886) should be considered true, then the vestibular system deserves its rightful place as the sixth sense.

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NORTH AMERICAN HERBOLOGY: TRADITIONALLY USED MEDICINAL PLANTS

By

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ABSTRACT

Living in this area hundreds of years ago, before the coming of Europeans and today's modern society with all its conveniences, were people who depended on the land for all of their needs. It provided food for them to eat, clothing and shelter to keep them warm, and medicine to heal their sicknesses. Their pharmacy was their own backyard, and its shelves were filled with medicines no fewer in number or in application than those that fill today's drugstores. Nearly 3000 different species have been recorded as being used for medicinal purposes by the native people of North America.

How did they learn about the properties of these plants? Their knowledge was obtained through generations of experience: people with an acute awareness of their environment using plants that were on hand, recognizing the effects of these plants in terms of healing, and passing this knowledge on to their successors. While this method may not correspond to modern medicine's standards of randomized control trials, it has great value in its own right. Who are we to ignore the wisdom of countless generations of perceptive, intelligent people? Traditional native medicine deserves at least a closer look…

> *For Native Americans, the universe was home. Father Sky covered them from above and Mother Earth supported them from below. And between, brothers and sisters shared in the plenty. The largest bear was no more important in this great home than the smallest insect, humans no more important than rocks or mice. In this world, everything depended on something else, and living and nonliving environments flowed together in a giant circle supported and connected by spirits.* (Wolfson 1993)

This description gives us a basic understanding of the traditional Native American way of life, and depicts a culture very different from that which dominates North America today. Whereas Native Americans recognized and respected the interdependence of all living things with the earth, modern culture sees human beings as superior, with animals and natural resources being put here for our use. While Native people lived close to the land, and in harmony with it, people today live in large cities, and spend most of their days inside closed buildings. Similarly, in dealing with illness we rely on modern medicine and technological advances to provide

treatments. Native Americans however, because of their philosophy of interdependence, turned to the land and the plants growing on it to provide cures for their ailments.

There are over thirty thousand different species of plants growing in North America, and nearly three thousand of these have been recorded as being used by Native people for medicinal purposes. This represents a vast amount of knowledge; knowledge not only about which plants possess medicinal properties, but also about how they should be prepared and used. We will look at how this knowledge was obtained, who in Native society it was employed by, and what relevance it has to the practice of medicine today, focusing on specific examples of plants used by Native people who lived in the area that is now Alberta.

Native Americans were a people of legends, and much information was passed down from one generation to the next in the form of stories. Each tribe had its own legends explaining how various things came to be, and included with these were tales of how the healing properties of plants were first discovered. The Apache legend, for instance, went as follows:

> When the Creator began his work upon the Earth, he decided each person should have their own piece of land to live on. The Apache people, however, were not happy with the land the Creator chose for them. They asked for his permission to move and it was granted. Soon after they settled on their new land, several tribe members became very ill. The Apache people felt helpless and were very worried about their tribal brothers. They knew neither the illness [n]or how to cure it. The medicine man placed four men in four directions. They all prayed to the Creator for his help. The Creator sent the message to them that all they needed to heal the illness was available on their new land. They needed only to care for and harvest it. (Null 1998)

The Cherokee had a different version of this story, which told that long ago

> …plants, animals, and rocks shared a common language and a need to survive. Then humans suddenly began to multiply and act unfriendly toward others. To obtain food and clothing, hunters developed weapons and began to shoot arrows at their defenseless animal brothers. Many died, and others ran into the forest to hide.
>
> Eventually, the bears held a council meeting in the forest. Old White Bear said, "We must come out of hiding and defend ourselves. Let us make bows and arrows of our own and fight back." They did, but they could not shoot them because their claws got in the way. "Look, I cut off my claws," said a bear. "Now I can shoot arrows."
>
> Old White Bear shook his head. "Without claws you cannot dig roots, climb trees, or hunt. It is a bad solution." So herds of deer gathered to discuss the problem. They decided that hunters who killed them without first asking

> permission in the proper way would be punished. Hunters would suffer from pains in their joints for the rest of their lives.
>
> When birds, insects, and reptiles heard what the deer had decided, they also held a meeting. Fish Hawk spoke first. "We will not be so generous to our human brothers and sisters. We will make them very sick. Pain will remind them they are no more important than any other creature."
>
> Plants listened to the angry animals. "Humans are definitely out of harmony with the universe," said Rose Bush, "but should they suffer so much illness? Should they die?" The rest of the plants agreed that illness and possibly death was a harsh solution. Finally Rose Bush spoke again. "Let us try to make up for the anger of our brothers and sisters. Let the plants – the shrubs, grasses, water lilies, and trees of the earth – create cures for illnesses." Thus, plants and animals worked out an agreement with humans: people could hunt if they asked permission first and gave thanks to the spirit of the giver. But if they forgot and angered the animal spirits into making them ill, then plants would help them recover. (Wolfson 1993)

Legends such as these were told to explain observations and phenomena that were not fully understood. Native Americans may not have known how or why plants could heal some illnesses, but they clearly recognized that these curative properties existed. The fact that different tribes had different legends to explain this observation suggests that it was observed independently many times. Tribes living all across North America made the same basic discovery, and developed their own stories to explain it.

How did Native Americans determine which plants were useful? It seems likely that both chance and keen observational and reasoning skills played a part here. For example, let us say that a young child with a badly blistered foot was found the next day to be nearly healed. The child's parents might have remembered that their little one had spent most of the previous day playing barefoot in a field where a particular plant was known to grow, and so may have recognized the curative properties of that plant. It is reasonable to assume that many discoveries were made in this fashion, as indeed were many of the discoveries made in modern medicine, with penicillin being a well-known example. In addition, many plants came to be used for medicinal purposes because of what we now call the "doctrine of signatures". Essentially, what this doctrine means is that the appearance or characteristics of a plant gave clues to its usefulness. For instance, a juicy-looking plant was thought to be useful for cooling fevers or burns. A plant with leaves shaped like the liver was used to treat ailments involving this organ, and a hardy plant known to survive in the harshest conditions would have been used to bring strength to someone weakened by illness. Once the Native people found that a plant possessed healing properties, they would continue to use it. Through experience, they learned which specific parts of each plant were most useful, and how they should be prepared. This information was passed down to the next generation, who expanded on it based on their own experience, and the knowledge about plants continued to grow.

Medicine to the Native Americans was a much larger, and more all-encompassing idea than it is to us today. It did not involve simply healing the sick. Native people found medicine in the world around them; in the power and majesty of a mountain, in the stillness of a lake, or in the smooth, worn edges of a stone. This medicine could heal someone who was sick, but it could also strengthen someone who was well. It could bring understanding and insight, allowing a person to be more successful in their tasks. Medicine was very much connected to spirituality, and the medicine wheels of the Native Americans were important symbols of this fact. Medicine wheels represented the interdependence and balance between the heavens and the earth, plants and animals, people and their environment.

Not all members of a tribe had the same level of knowledge regarding medicine, or the medicinal properties of plants. There were actually three main groups of people within a tribe who used plants for healing. The first of these were the herbalists, elder tribal members who used herbs and other practical remedies to cure common afflictions. They functioned as healers based on their experience and knowledge of tradition. When the remedies of the herbalists failed to cure, a Shaman would be consulted. The Shamans were very powerful healers, attuned to the forces of nature and possessing some ability to harness and direct them. They maintained strong connections with the spirit world and plants often figured as important medicine objects in their healing rituals. The third group of healers were the medicine men, whose position in the tribe fell between that of the herbalists and the Shamans. They were powerful leaders within the society but their spiritual connections were less strong than those of the Shamans. Herbalists, medicine men and Shamans each used plants in some way in their methods of healing.

In terms of the specific species of plants and the methods used to prepare them as treatments for various illnesses, entire volumes have been written to catalogue this information. Moerman's compilation of data (Moerman 1998) lists the ten species in North America most commonly used for medicinal purposes. As an illustration, we will focus here on the plants from this list that were traditionally used by people living in the area that is now Alberta, and was largely occupied by the Cree and Blackfoot tribes. The information which follows, as well as additional material for interested readers, can be found in references by Moerman (Moerman 1998) and Kerik (Kerik 1975).

Achillea millefolium is a plant which grows in meadows and pastures, and has a faint fragrance. Also known as common yarrow, it was used by both the Blackfoot and Cree tribes for medicinal purposes. The Blackfoot used the flowers and stems of the plant for a variety of illnesses. They were made into an extract which eased problems of the liver, sore throats, and the pain of childbirth. An infusion was given to people with stomach aches or skin sores, and was also used as a diuretic to flush out illness. As well, the flowers and stems were chewed and made into a poultice that was applied to decrease swelling. The Cree, in contrast, used the dried leaves and flowers of the plant for menstrual problems, or made them into a tea for stomach ache, headache and sore eyes. They also used the yarrow root along with wild strawberry as a cure for insanity. The entire plant was employed in treatments for burns, and made into a poultice for infections of the areas around finger and toenails. Finally, the Cree also used the whole plant as a laxative. While there were a few similarities in the uses of this plant between the Blackfoot and Cree, for the most part each tribe had its own remedies.

Acorus calamus, also known as sweet flag, is a common herb found growing near ponds and marshes, in moist soil. Its medicinal properties, according to both the Blackfoot and the Cree, were contained in the rhizome, which is the part of the root that grows horizontally underground. Blackfoot healers told those with a cough or liver problems to chew the root, while those with a headache were to grind, mix and then smoke it with tobacco. It was also made into a poultice and applied for cramps, toothache, sore throat and chest pain. The Cree chewed calamus root as well, for its hallucinogenic, stimulatory and general curative effects. They also used it for colds, toothache, stomachache, sore throat, and as an abortion-inducing agent. So while each tribe had slightly different uses for the plant, it seems significant that both used only the root in their treatments.

Lomatium dissectum, or biscuitroot, was another plant of which only the root had medicinal value. The Blackfoot used it in a tonic which was given to people weakened by illness to help them gain weight. It was also thought to be a stimulant. In this culture, the health of horses was very important as well, and biscuitroot was used to treat distemper and sinus problems in these animals. Burning roots were placed where the horses would inhale their smoke and thus benefit from the plant's medicinal properties. Blackfoot healers had many more uses for this plant then did Cree healers, which is possibly a reflection of its availability to them.

The chokecherry, or *Prunus virginiana*, is a plant very familiar to us today and was also well known to Native Americans. The Blackfoot ate its berries for food, but also as a treatment for canker sores because of their ability to coat the mouth. Berry juice was used to treat sore throat, sore eyes, and diarrhea. Diarrhea was also treated using an extract made from the bark of the plant, a remedy which was shared by the Cree. In addition, the Blackfoot placed the root of the plant, after it had been dried and chewed, into wounds to prevent bleeding. The twigs though were boiled into a strong tea and given to those who were feverish, or those who were nursing babies so that these infants would benefit from the medicinal properties of the plant. For a plant we think of as common, the chokecherry had a surprising number of traditional medicinal uses.

Artemesia ludoviciana, also known as sagewort, had a number of interesting uses among the Native tribes. The Blackfoot, for instance, placed its leaves in their moccasins to prevent foot odor, and also applied a poultice of leaves to blisters and boils. An infusion made from sagewort leaves was used to treat many ailments, including hemorrhoids, stomach and liver problems, and tightness of the chest or throat. It was supposedly good for cough in both humans and horses, and had particular benefit in children with respiratory problems. The Cree used sagewort in a cure for headaches. This was done by pulverizing the entire plant, placing it on hot stones, and then inhaling the fumes that were produced. Sagewort clearly had a variety of uses in relieving common ailments.

Juniperus communis and *Mentha canadensis* are two additional plants which were used by the Native people of Alberta. Common juniper, as the former is also known, is an evergreen member of the pine family which grows in drier areas, preferring hillsides. The Blackfoot used an extract of this plant to treat lung and venereal diseases. The Cree, however, employed juniper bark in a poultice which was applied to wounds, and boiled the branches of the plant in water to be gargled for a sore throat. Finally, *Mentha canadensis*, or Canadian mint, is another plant with uses in both the Blackfoot and Cree tribes. It can be distinguished from other types of mint by

the fact that its flowers grow from the axils of its leaves rather than from the upper portion of its stems. Its leaves were dried and used by the Blackfoot for heart problems and chest pain, and the Cree used not only the leaves but the entire plant to make a tea that was taken as a general tonic. Juniper and mint both provided important healing agents to the people of these tribes.

We have seen examples of how Native Americans used plants for healing purposes, but the question remains: do these plants have value in terms of modern medicine? Today's scientists might look at the fact that different tribes often used the same plant for different illnesses, and see inconsistency. They might also question the Native method of gaining knowledge based on simple experience, because it does not meet up to today's standards of randomized, controlled, clinical trials. These are valid criticisms, but in order to truly appreciate the value of the knowledge that the Native Americans collected, we need to look at it from their perspective as well. Little communication and great distances existed between tribes, and because each healer's knowledge was based on his own experience combined with that of his predecessors, there is little wonder that a healer from one tribe used different remedies than that from another. Plants were used as mixtures, not the single chemical compounds that drug companies today search for, and were most often combined with other plants, other treatments, and important spiritual ceremonies when they were used by the healers.

In spite of the differences between traditional Native American culture and our own, it is interesting to note that many of the plants used by the Native people, including those mentioned here, can be easily found in any modern herbal remedy reference. Mainstream medicine has been slower to accept them because of the long process of research required. This research is ongoing, and much still needs to be done. The product of the healing experiences of countless generations of people is an invaluable base of knowledge to study, and there is a great deal left for us to learn.

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THE ROYAL TOUCH

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ABSTRACT

Scrofula is an ancient disease that was not often fatal but could be disfiguring and socially isolating, on a par with leprosy. During the latter portion of the Middle Ages (476-1453) and into the modern era it was one of the commonest afflictions. The disease was widespread in Europe and mainly plagued the poor and working classes. Thus scrofula attacked those least able to afford good medical care. Fortunately, it had a cheap (indeed it was profitable for the patient!), effective, and readily available cure that bordered on the wondrous.

The disease for once is not the focus rather the cure or more precisely the physician is the key component and not just any ordinary physician either. Custom and divine right granted the monarchs of England and France the power to heal this repulsive disease with but a touch of their hand upon the scrofulous tumours. For over seven centuries these physician-rulers brought more human happiness and hope with their regal touch than all the physicians and chirurgeons with their concoctions and tools. Indeed the touch for scrofula was popular to the very last, when war and revolution brought a violent end to a noble miracle.

This royal right evolved overtime from a simple touch to a complex ceremony that incorporated many virtues: compassion, charity, faith, and hope. Its progression is a wondrous look at a systematic miracle that incorporated all that is good and ideal in a physician-patient relationship: patients who needed it most, the weak and destitute; the administration of an effective and non invasive cure; mass distribution and availability to the common person; a benevolent, kind, caring physician; the giving and not receiving of money by the physician to the patient. It would be no difficult argument to say that the practise of the royal touch is perhaps the only instance in human history where the absolute ideals of a physician became a reality. This achievement required no less than a miracle and the Lord's anointed.

There never has been or perhaps ever will be a more misunderstood or pervasive disease in human history than scrofula. Everything about this disease stirs up the imagination and allows speculation to run amok. The word scrofula conjures up an image of an old and mysterious disease that plagued centuries past. One imagines vile people like lepers. Its cause and impact seems unreal to us and its cure seems no less wondrous thanks to Shakespeare (Bloch, 1973). Scrofula is also forevermore linked with a much more emotional synonym, "King's Evil", a term

that is as misleading as it is bizarre. For this evil was not caused by their majesties but rather cured by them. To understand this disease in its historical context and influence upon the centuries is my object; to see that its clinical progression and arrest by these royal physicians represented an instance of perfect physician-patient relations is my desire.

The modern day story of scrofula is most mundane. Scrofula today is known as tuberculosis lymphadenitis and is one of the manifestations of tuberculosis. Often it afflicts children but it is relatively easy to cure with anti-tuberculosis drugs (Merck, 2000). However scrofula is an ancient disease, on which antiquity teaches us a great deal. The actual origin of the term scrofula is obscure and confused. The word means little sow but why the disease was labeled thus is unclear. Some believe it is because the swellings around the neck resemble the sub maxillary glands of a pig, others because many swellings appear like the many off-spring of a sow; still others more daring claim it is because the swellings look like rock raised above the surface of the water and appear like a pig swimming (Phillips, 1846).

Numerous ancient physicians have tried to deal with scrofula on a clinical basis. Hippocrates in his *De glandulis* believed that scrofula was the result of overactive glands due to an inflamed pituitary, in which case, "the glands shall have been enlarged and dammed, out of which the fluid may be still and thus swellings are generated,"(Phillips, 1846). These swellings he called strumae, another name for scrofula. Celsus was more specific on the composition of these swellings and believed that, "the struma is a tumour, underneath is formed out of pus and blood, as if the glands rise up," (Phillips, 1846). Galen offered two cures, "with a scalpel to excise as with cancer or to putrefy it with a medicine over the whole thing," (Phillips, 1846). So much then for the wisdom of antiquity. Scrofula seemed not to have begun in a unique position; its origin is the story of countless diseases. How then did this "regular" disease take on such vital political, social, miraculous definitions in the ensuing centuries?

The concept of rulers as being sacred or semi sacred persons was nothing new in the West. The Roman emperors after Augustus Caesar were considered exceptional and after death were often deified. It was not then an unnatural thing to attribute to them the ability to perform certain miracles. The emperor Vespasian was said to have opened the eyes of a blind man and to make a lame man leap as an hart by his touch (Crawfurd, 1911). In a similar manner Hadrian was reputed to cure dropsy (Crawfurd, 1911). Despite all this, the attributes of these pagan monarchs were sporadic at best and certainly presumed upon their personal nature rather than their office. Moreover, with the Christianisation of Europe it would hardly do to have deified human gods running around and about competing with our Lord.

Christmas day A.D. 800 was a crucial symbolic point in the development of European monarchies. Pope Leo III crowned Charlemagne as Emperor of the Romans thus the official sanctions of rulers by Holy Mother Church began (Hollister, 1994). Rulers now could act with legitimacy and were able to build up ideas of divine rights of kings that were in accord with sacred scriptures and Rome. Examples were drawn from the New Testament to show the divine rights of the king. The phrases "Fear God. Honour the King" (1 Peter 2,17) and "Render unto Caesar the things that are Caesar" (Matthew 22,21) were often espoused. The Middle Ages saw this royalist movement in full force in the centralised monarchies of England and France, which

incidentally were the two kingdoms that claimed a monopoly on the cure for scrofula (Bloch, 1973).

England and France were unique monarchies in Europe that were relatively stable and could afford to raise the dignity of the king higher than elsewhere. France could claim direct lineage to Charlemagne and the English line was so well mixed with French royal blood that a war lasting about a century ensued (they called this the Hundred Year's War) in which the English King claimed also to be the French king, a claim that is still made today on rare occasions. Both countries had centralisation of power in the king and firm governments (Hollister, 1994). Most importantly, they had the benefit of a certain tolerance from the see of Rome that allowed them to make claims of being able to perform a systematic miracle. The pope, especially due to the Gregorian reform movement of the 11th and 12th centuries, were loathe to recognise that laymen, even if they were kings, could perform miracles because of their position (Bloch, 1973). However, the pope had much bigger problems to deal with throughout the Middle Ages, mainly the affairs of the Holy Roman Empire and the emperor. This problem was a much greater threat and thus the energies of Rome were diverted there (Hollister, 1994). Besides, by the time the English and French rulers were exercising this right regularly it had such a strong history and such enormous popularity, that it could hardly be constrained (Bloch, 1973).

The origin of the royal touch in France is obscure. There are unverified claims that it originated all the way from Clovis and the Merovingians (Bloch, 1973). The first documented proof was that Philip I (1060-1108) touched for scrofula or as it was called in France, mal du roi (the King's evil). More remarkable was that there was full proof that his son, Louis VI (1108-1137) also had this ability (Bloch, 1973). This went far to establish that the royal touch was indeed due not to the personal aspects of the king but only to his position. This custom was a firm tradition by the time of St. Louis IX (1226-1270).

In England, the situation was the similar. There were unproven fables of the right beginning through an ancient king of Briton, Lucius but this is highly unlikely- mainly because no such king ever existed (Boch, 1973). However, the custom was believed to have begun by St. Edward the Confessor (1003-1066) and was immortalised by Shakespeare's eloquent description:

> Strangely visited people,
> All sworn and ulcerous, pitiful to the eye
> The mere despair of chirurgery, cures,
> Hanging a golden stamp about their necks,
> Put on with holy prayers and 'tis spoken,
> The healing benediction"
> -Macbeth, IV, iii

The new Norman rulers, anxious to prove themselves rightful rulers, maintained this custom for themselves and the King's evil and its royal cure were well established by the time of Henry I (1100-1135) (Bloch, 1973).

The goal of the royal touch was part and parcel of the panoply to display to the people the sacred character of the king. The king was not clergy but neither was he a layman; he was in between and more important he was the Lord's anointed (Crawfurd, 1911). It served the king in the sense that it gave him unique and miraculous abilities but it served the people more in that it provided them with hope and treatment. Scrofula is rarely fatal but it can be debilitating and even more humiliating and socially stigmatising (Bloch, 1973). It can be said that through this act the king was elevated but the people were saved.

The rite in France and England differed in significant ceremonial aspects but the main goals were accomplished in either case. It is of some interest to point out these aspects. Originally the rite was the same in both countries and was very informal (Bloch, 1973). The king touched people when he was approached or petitioned. There were no formal ceremonies. As the rite increased in popularity new methods had to be found to more efficiently carry out the king's medical duties. In France at the conclusion of the wars of religion and the final establishment of Henry IV (1589-1610) on the throne, the royal touch was making up for lost time. A picture of Henry IV exists, showing him touching the people still informally in a sort of outside royal walkabout (Bloch, 1973). With the restoration of the stability of the French throne the rite was formalised. By the time of Louis XIV (1643-1715) the king usually touched once a week, after taking communion, and usually in a church. Placards would be placed up to advertise when the king would be available to heal (Bloch, 1973). Money was also given, thus not only alleviating the physical ills but also providing monetary support to the patients. The donation was usually the equivalent of two shillings (Bloch, 1973). Nor was the king so haughty as to claim full benefit for himself for he always made the sign of the cross and said, "Le Roi te touche et dieu te guerit" (The King touches thee but God heals thee) to everyone he touched (Crawfurd, 1911).

England was not to be outdone. After England was recovering from her own War of the Roses and Henry VII (1485-1509) was established, the royal touch was in full force again. This time the king set up an entire liturgy to accompany the healing. The liturgy was first Latin and then changed to English after the Protestant Reformation and consisted of a confession and several relevant passages from the New Testament including a reading from the Gospel according to St. Mark in which Christ exhorts and gives his apostles the power to go forth and perform miracles, amongst which he said, "they shall impose hands upon the sick, and they shall be whole", an allusion not lost on the audience (Crawfurd, 1911). The king would be seated on his canopied throne while the patients were brought to him one at a time. The monarch would touch the patient and then would touch him a second time by placing a gold coin around his neck. This gold coin was the donation of the king, valued at six shillings eightpence. Henry VIII (1509-1547) later raised this to seven shillings eightpence (Bloch, 1973). This was a lot of money, the equivalent of a consulting fee of a renowned physician only this time it was the doctor giving the patient the fee! The gold coin showed the picture of the archangel Michael and would be called the angelus or angel piece (Crawfurd, 1911). However its monetary value was not as great as its intrinsic value, for many of the sick believed that this would keep them healthy and thus kept them as sacred medallions. Queen Mary I (1553-1558) would often exhort those who received an angel to never part with it unless they were in the direst of need, and many heeded her advice (Bloch, 1973).

The impact of the royal touch was quite large. Rich and poor alike flocked to their respective rulers to be healed although more often the poor. Statistics are scanty and often vague but exist for kings as early as England's Edward I (1272-1307) who touched 938 persons in his 23rd year and 1219 in his 32nd year. In France, Louis XIV touched 3000 people at Pentecost in 1698 and this dutiful king managed to touch 1700 persons when he was on the verge of death on June 8, 1715. The record however must be accorded to England's Charles II (1649-1685). (Bloch, 1973) He may have been the merry monarch but he took this duty very seriously and touched people even when he was in exile. All in all, it is estimated he managed to touch over 100 000 people during the course of his reign and they included American colonists who braved the arduous trip back to be healed. Such was the hope of the people vested in their king! Even afflicted foreigners would make journeys to England or France and be touched or even better take advantage of these kings when they traveled to their country.

Now we must try to interpret this systematic miracle as best we can. Modern science must doubt this miracle but such numerous testimony and healed patients exist that it cannot doubt that it worked. Science must then equivocate by trying to find an explanation on why such cures worked. The easiest would be to say that the king's did indeed have the right to practise a systematic miracle because they were the Lord's anointed. Those with faith may believe this but science would scorn such things. Another would be that it was psychogenic inducement; the pageantry, the ceremony, and all the glitter would stun the poor peasants senses and give him great hope and uplift him as him he was cured. After all, the King's name is a tower of strength is it not? Another reasonable explanation was that scrofula is rarely fatal and if left on its own will most likely go away. Most will get better regardless of treatment and even as late as the 19th century the recommended cures included mercury, antimony, purgatives, bark, iron, opium, hemlock, belladonna, digitalis, mineral water, sea water, iodine, and confidence and hope. (Phillips, 1846).

The opinions of physicians during those times varied too. John Browne, chirurgeon royal to Charles II, said, "More souls have been healed by His Majesties sacred Hand in one year than have ever been cured by all the physicians and chirurgeons of his three kingdoms" (Crawfurd, 1911). Michael Servetus on the continent rebuts with, "I have seen with my own eyes this king touching several sufferers from this affection. If they were really restored to health- well, that is something I did not see" (Bloch, 1973). In the main though, physicians were ready to grudgingly accept the royal touch as valid though not perhaps the first choice. It did rank better than another form of treatment, which was viewed with grand scepticism and disdain and can be summed up by the English physician, John Gaddesden, "If all remedies prove ineffective let the patient go to the king and be touched and blessed by him... in the very last resort, if everything else has proved ineffective, let him hand himself over to the chirurgeon" (Bloch, 1973).

Regardless of whether it really worked as a miracle or through some other means, the important thing to remember is that it appeared to work. Indeed, even if it did nothing but brought hope to the patient it fared much better than many of the standard treatments of the day that brought death rather than life. It brought much relief to the hundreds of thousands of poor people who had no medical care and no other recourse. It is ironic that such persons, who were ignored by fashionable physicians, were so well treated by the first physician in the land. They were touched, they received individual and caring affection and they received financial support

to assist in their well being. What other doctor then or even now can claim such beneficence with regularity?

All things are subject to demise and unfortunately the miracle of the royal touch was one of the victims of the new scientific age. In France the practise declined during the frivolous reign of Louis XV (1715-1774) due to the King's indiscretions that prevented him from receiving communion and thus from healing. The climate was also changing and Voltaire was able to say, "the time will come when reason, which is already beginning to make some headway in France will abolish this custom" (Bloch, 1973). It fell to the unfortunate lot of Louis XVI (1774-1792) to suffer this "reason" in the form of the guillotine and subsequent reign of terror. For a while Louis XVI dutifully tried to maintain the custom, and four healing certificates of verification exists from his reign. The practise of course was stopped after his regicide and the monstrous French Republic began. For a time it was revived by Charles X (1824-1830) in the brief Bourbon restoration. For an instant the ancien regime returned and the principles of chivalry, charity, and hope was revived for the people. On May 31, 1825, Charles healed the sick in the hospital and it would be the last time a French monarch ever practised this ancient rite. (Bloch, 1973).

In England, the regal right ended with the death of Queen Anne (1702-1714), last of the recognised Stuarts. The Hanoverian succession scorned this miracle and when George I (1714-1727) was approached by a patient he told him to go to the pretender, which he did (Crawfurd, 1911). The Stuarts in exile continued to maintain their right of healing. James III (1701-1766) continued and so did his son Charles III (1766-1788). After Charles' death the last Stuart was his brother Henry IX (1788-1807), cardinal of York. While in Rome, Henry continued to touch and even minted angel coins but the ancient rite died with him in 1807.

For about seven centuries this regal miracle was regularly practised. That it worked for thousands and thousands cannot be denied, and that it brought great human happiness cannot be doubted. Whatever the king's benefits and ulterior motives for maintaining this miracle, they can never supersede the true goals and ultimate benefits of alleviating the sick, performing the acts of charity. Thus, either by accident or design the rulers of England and France fulfilled the highest ideals of the art of medicine. They provided treatment to all, without prejudice, which meant the poorest had free access to them. They provided human comforts through financial support. They gave hope and carried out a sacred trust that must have been very time demanding and tedious. It well worth repeating the phrase of that wise royal doctor, "More souls have been healed by His Majesties sacred hand in one year than have ever been cured by all the physicians and chirurgeons of his three kingdoms" to understand why these kings succeeded where normal physicians had failed.

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AYURVEDIC MEDICINE: A CASE STUDY OF CHANGE

By

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ABSTRACT

The presentation looks at some recent history of the Ayurvedic hospital in the State of Punjab in Northern India. It offers an important case study of efforts to expand Ayurvedic practice by incorporating conventional diagnostic tools, and prompts questions about integration.

Until the 1950's Ayurvedic medicine was practised in homes by Vads (doctors) who passed on their knowledge to their sons. In 1953 the Ayurvedic hospital opened, hereby institutionalizing Ayurvedic medicine for the first time in the State. It faced much competition from conventional (or allopathic) hospitals.

During the early years of the Ayurvedic hospital there were few patients because Ayurvedic treatment was slow and expensive. The number of patients steadily increased as people recognized the few side effects of Ayurvedic medications. However, in 1984 the hospital developed a policy of incorporating conventional medicine. Administrators and physicians were afraid to send patients to the other hospitals so, initially, gynecologists were brought in to perform operations such as hysterectomies. In fact, this has led to an increase in patients for the hospital as a whole.

A consequence of such developments is that, although basic Ayurvedic practice has not changed, the public perception of Ayurveda has risen. Patients now expect Ayurvedic practitioners to employ conventional diagnostic tools. The presentation will conclude with a discussion on the implications of the changes for health care.

Introduction

"We are living a life of stress with changing lifestyles leading to disruption of our normal balance, which further leads to illness," says Dr. Rajesh Sannd who has been practising and teaching Ayurveda medicine for the past few years in the city of Patiala, with a population of 250,000 in the state of Punjab in Northern India. Dr. Sannd believes that Ayurveda medicine is not only to be seen as a disease curing medicine, but also as a lifestyle to prevent disease. He adds that Ayurveda "looks at ways of removing the cause/stresses of the illness, and then treating the illness". In contrast he says, allopathic medicine provides a quick treatment without removing the cause.

Ayurveda is considered to be one of the oldest systems of medicine with roots in texts dating back to the fifth century BC. It involves studying the balance of three forms of 'energies', which are vata (wind), pitta (heat) and kapha (fluids). These energies, if unbalanced due to internal or external stresses, will lead to illness. The most useful and important tool of diagnosis in Ayurveda is the pulse, from which Ayurvedic doctors can diagnose which energy is creating imbalance.

This paper, a case study, looks at some recent history of the Ayurveda hospital in Patiala. It considers the quite dramatic changes associated with the practice of Ayurveda arising from the changing values of patients, and prompts questions about the integrity of Ayurveda and it's relations with allopathic medicine in India and abroad. Ayurvedic medicine has established itself in Canada and elsewhere in the Western world, but concerns exist that, in the hands of many practitioners, it has become diluted with 'new age' ideas and commercialism. I will close with questions about where is Ayurvedic medicine going in North America and whether regulations should be introduced.

Ayurveda in Patiala

In the bustling city of Patiala, Ayurveda was practised long before allopathic or western medicine was introduced in the nineteenth century. Knowledge of Ayurveda was passed on from father to son and a few disciples who lived with their guru until they mastered the art of Ayurveda. However, it was only in 1953 that the opening of the first school and hospital there "indeed in the state"institutionalized Ayurvedic medicine. The consequences were ultimately to provide greater uniformity among Ayurvedic physicians and also to provide greater access to the public. However, there have been striking changes as can be seen in comparing attitudes among older graduates of the school and recent graduates, numbering about thirty per year.

The two main sources of information in my study were interviews with Dr. Pushpa Vats and Dr. Rajesh Sannd. The method of recording the interview was by taking notes, as tape-recording was deemed inappropriate. Dr. Vats was one of the first graduates; she retired in 1992 as a Director of Ayurvedic Health from Patiala after serving in the same hospital for 32 years. Not surprisingly, Vats focussed on traditional Ayurveda and the changes she had seen. Dr. Sannd is a young Ayurvedic physician who has been working in the same hospital for the last few years as an Assistant Research Officer. He focussed more on the integration of Western diagnostic tools in Ayurveda.

"Ayurvedic medicine's cure is very slow and requires a lot of patience from both the patients and physicians" says Dr. Vats. She believes that Ayurvedic medicine has some of the best cures for chronic diseases like asthma and other respiratory problems, digestive disorders and diabetes. She stresses that Ayurvedic medicines are safe natural products. She used to make her own preparations, but nowadays they are mass-produced by the pharmaceutical companies thus providing less practitioner control of Ayurvedic medicines throughout the country. Even though Vats is proud, that with Ayurvedic medicine, she has healed many patients for whom allopathic medicine did not work, she recognizes that Ayurvedic medicine is not for everyone, and that it has limitations. For instance, it does not offer acute emergency or surgical care,

although minor surgery on hemorrhoids and anal fistulas is routinely done. She refers her patients to the allopathic hospital whenever she feels that they would better serve the needs of the patient. Vats also recognizes that most of the Ayurvedic private practitioners in Patiala are prescribing and practising allopathic medicines, which she emphasizes is illegal and professionally unacceptable. At the same time, she acknowledges that these private practitioners are doing this to increase their number of patients, most of whom are looking for a 'quick fix.'

There is too, a problem of declining patient population which occurred in the mid-1980's. It was the time, says Vats, "when people demanded birth control surgeries," that is tubal ligation and vasectomy. The administrators and physicians were afraid to send patients to other hospitals for fear of losing patients altogether, so, initially, gynaecologists were brought in to perform operations. This led to an overall increase in patients for the hospital as a whole. Even though Dr. Vats accepts that this change was for the good, she does not agree to other aspects of changes happening in Ayurvedic practice since the 1980's, namely the use of diagnostic equipment incorporated into Ayurvedic practice by the Ayurvedic physicians.

" The reason I use a stethoscope, blood pressure cuffs and blood labs are only to satisfy my patients. I don't use these instruments for the purpose of diagnosis, but it makes it easier to explain the diagnosis to them," says Dr. Sannd. He adds that Ayurvedic medicine diagnosis and treatment does not require all of these instruments, but they have to use them as patients seem to expect the results of tests to be part of their diagnosis. Furthermore, he adds that it is very difficult to explain diagnoses and treatment of Ayurveda to young people who don't understand Ayurveda. The reason, he adds, is that Ayurvedic is not a science, which can be explained by cause and effect. Not only does he indicate that modern medicine is the "standard" of care for the ordinary citizen, but that in the "present days of litigation," the lab tests, X-rays etc. are of great help in confirming their diagnosis and treatment.

Despite Sannd's statement that his use of diagnostic instruments has an element of charade, many Ayurvedic physicians "even in the school"have adopted their practice and thereby raised their image in society by incorporating conventional diagnostic tools. Furthermore, most practitioners in private practice now combine allopathic and Ayurvedic medicine. Even though it is illegal to practice allopathic medicine without a license, they are doing so in order to sustain a livelihood. In comparing the attitudes of the older Dr. Vats with the younger Dr. Sannd one get a clear sense that newer graduates are open to changes in order to make Ayurvedic medicine more favourable to the patients. Another main point in the combined practice of conventional and Ayurvedic practice is that many people often use both types of medicine on a home care basis. Whether this can be described as integration is open to discussion. From my own experience when I was growing up in the same city, my parents often took me for Ayurvedic treatment for minor illnesses like coughs, colds and digestive problems whereas if acutely/severely sick I was often taken to the conventional hospital. So what do we make of this change?

Summary and closing thoughts

First of all, the change in the Ayurveda practice, at least initially, was for the wrong reasons, at least not for patient care. Secondly, the new practice of Ayurveda leads to less emphasis on prevention. Can it be still called a "science of life" any more when it departs

substantially from the traditional nature of Ayurveda? Thirdly, with regards to commercialism, are medicines no longer made locally? (It is a traditional teaching that local remedies are considered to be most effective.) Fourthly, there is no enforcement of standards for change, which leads to considerable diversity in practices. (I must emphasise that Ayurvedic medicine in Northern India may not be representative of practices in the South where tradition is stronger.) Concerns exist that the overall quality of care is declining. No longer can it be said that much of the practice represents 2,500 years of experience.

The situation is even more chaotic in North America. For instance Deepak Chopra, a physician who has become the guru of western Ayurveda, teaches a particular 'brand' which embraces the transcendental meditation philosophy of Maharishi Mahesh Yogi. Chopra, too, has contributed much to the commercialism of Ayurvedic medicine in the west. Thereby the question arises as to whether the Chopra's Ayurveda is really something of his own creation? Is it more 'New Age' commercial enterprise? If so, can it still be considered Ayurveda? Such questions are raised in discussions such as A. Skonick's "Maharishi Ayur-Veda: Gurus Marketing Scheme promise the World Eternal 'Perfect Health.'" This prompts questions about physicians' responsibilities to their patients who are using or becoming interested in Ayurveda. Is it safe? Should they be offered advice? A host of questions demand professional judgement, just as much with Ayurveda, as with herbal medicine, the issues of which are now being widely discussed in the conventional medical literature.

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THE TRADITIONAL HEALER: WEST AFRICA AND BEYOND

By

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ABSTRACT

"If it were not for the forces of evil, human beings would live forever in health and happiness." *African Religions and Philosophy*[8]

Since primitive people developed social order, there has been a need for an individual to maintain the health of the community. Any disruption in the course of life, due to illness or dysfunction, has a profound effect on the continued existence of the group. Without someone to maintain balance, survival was precarious. The traditional healers took on this responsibility.

The position of the traditional healer is far more encompassing than that of modern doctors. Healers are considered Holy Men and Women, who possess spiritual authority, the power to judge, and ability to heal. They are also responsible for the maintenance of social order, and they retain intimate knowledge of the culture.

Treatments used by healers address the beliefs about the causes of illness in traditional West African society. In this culture, the causes of illness include wronging the gods, social deviation, and misfortune. Treatments that commonly oppose the forces of evil include; prayer, holy water, herbs and ritual sacrifices. Whether you agree with their methods of treatment or not, for thousands of years the traditional healers have been the exclusive provider of medical care in traditional society. Additionally, they maintain their position in modern West African culture and other nations around the world. Their role meets a need in this context, and it is for you to decide whether it is legitimate.

Introduction

My interest in traditional healers began when I spent four months in La Republique de la Cote d'Ivoire in 1997. La Cote d'Ivoire is located in West Africa, west of Ghana, east of Liberia and south of Guinea, Mali and Burkina Fasa. The work I participated in was with a mission organization that ran a project called the Frontline Heath Education Project. We taught in schools that were set up along the West Side of La Cote d'Ivoire, on the border of Liberia. The center we and our team worked out of was in Danane, one of the major centers along the Liberian border.

At that time in 1997, Liberia was nearing the end of a seven year civil war, and there were hundreds of thousands Liberian refugees in La Cote d'Ivoire. My team and I were there to supervise and teach health education to Liberian refugee children. As health supervisors, we were able to interact with many of the teachers who taught in the Frontline schools. These were mostly people who came from eastern Liberian, typically from the Gio and Mano tribe. These men and women had a traditional upbringing, and intimate knowledge of the role of the healers in their culture. Interacting with the Liberian people, my desire to know more about the traditional healers and their role in West African society grew.

Who are the healers?

As a Westerner, we typically have a biased view of traditional healer. From our limited experience, and slanted exposure, we see healers as medicine men and witch doctors, who have no valid place in modern day practice but only partake in sorcery and witchcraft. However, for thousands of years traditional healers have played a legitimate role in African society. They are an integral part of the medical and social fabric that keeps their communities together. They are heeded as holy men, religious authorities, judges, counselors and healers of disease.

There is no specific time when traditional healers emerged into society. It is assumed that with the evolution of humans into family groups, a specific social order was set up and a division of labour was implemented.[9] This was realized to be a benefit to the sustenance and proliferation of the group. Everyone in the group had a role to play, whether it was hunt animals, draw water, fight in battle or care for the children. Disruption of fabric of life due to illness or social dysfunction could cause chaos and the breakdown of the order. This may have a profound effect of the survival of the grouping. Consequently, individuals were needed to maintain the social order, be the religious and social authorities, and have curative powers to keep disruption of life to a minimum. This facilitated the emergence of healers. They began to treat disease, maintain social order, hold intimate knowledge of culture, offer religious advice and judge people within in the community. This role seems to be much more encompassing than the role of the modern day physician, who deal almost primarily with health and illness.

However, much as there is not one type of modern-day doctor, there was not only one general type of healer. Many healers had their specialties. The different types of healers can typically be placed in two separate categories; healers who deal in supernatural forces and those who are herbalists. These are not exclusive categories, and there is some crossover.

The healers who deal primarily with supernatural forces are the *soma*[7] and the *batigui*[7], who deal with black magic, and curses. There are the *moriba*[7], who read the Koran to interpret the patient's illness from divine intervention, and finally, the faith healers[6], who invoke spiritual power to cure ailments.

This is in contrast to those who are considered herbalists. They are the *furatigui*[7], who used endemic herbs to create medicine that have curative powers. Herbalists also include the umana womoya[1], an elder woman in the community who cures children who are colicky. Finally, the herbalists include the *izangoma* and *izinyanga*[6], who are men and women who treat five specific

conditions, and may be considered the specialists of traditional medicine. The five conditions that the *izangoma* and *izinyanga* treat are[6]: 1) Ukuphambana, a patient who complains of restlessness, talks nonsense, looks worried, is anti-social, and tends to roam aimlessly, 2) Ukuphaphazela, a patient who is considered wild, sees things that are frightening, and tends to be very nervous and noticeably confused, 3) Amafufunyane, a child who has a funny, frightening voice when crying, and imagines things talking. 4) Umoya, an infant who is colicky, who has diarrhea or constipation, chest pain, and is easily frightened, 5) Ukuthwasa, a patient who hears voices of ancestors, dreams about dead people, and is very likely to be suicidal.

Traditional Views of Illness

If there are different types of healers, does it not make sense that there is also a variety of ways illness can manifest itself? Although some traditional cultures have a primitive theory of the germ transmission, most do not. They believe that their illnesses are a result of doing wrong against God or the gods, deviating from the norm of their society or a result of breaking a taboo. They also may believe that illness is a result of behaving badly towards the elderly, individual or community misfortune, or having attracted the malice of an afflicted person.[3] Many of these beliefs are not confined to West Africa. All of these can historically be seen as causes of disease in a variety of traditional cultures.

One vivid example of a belief about illness is represented in a story of man who was impotent.[4] He went to see the traditional healer about his problem. After spending some time listening to the man, and hearing his plight, the healer determined that his problem was a result of a curse his sister had put upon him. So the healer summoned the man's sister. When she arrived, and the healer had a chance confront her, she confessed to putting a curse on her brother because she was jealous he would receive their father's inheritance. The curse had stolen his testicles, put them in a tin box and buried them in an anthill on the other side of town. Later that night, the man and the healer walked across town to the anthill. The healer began to dig in the anthill, and found a tin box. He returned the tin box to the man, and his impotence was resolved. Now whether the man's testicles were actually in the box, or whether there truly was a curse, is somewhat irrelevant, as the healer was able to cure the man's impotence.

Within the illness belief model of traditional cultures, both from within West Africa and beyond, the causes of illness can be categorized into proximal and remote causes.[10] Proximate causes tend to be ones that take place within the immediate environment, whether it is an individual's being or community. These include object intrusion, where physical object is causing illness, or spiritual intrusion, where a spiritual entity is present and causing the disease. It may also be individuals who have 'lost their soul', because of something they have done. This is in contrast to the remote causes, that that take place in the 'spiritual' realm, removed from the immediate area. This includes such things as divine wrath, where they believe God or one of the gods is angry and punishing them. Dreaming in the forbidden 'spiritual world' may be a cause of ailment, or as we saw with the man has his testicles in the anthill, black magic curses may be a cause.

This is a quote from the book entitled 'African Religions and Philosophy' by John S. Mbiti.[8] It speaks to the heart of what many traditional cultures believe about health.

"If it were not for the forces of evil, human beings would live forever in health and happiness."
African Religions and Philosophy[2]

Due to a lack of better theories, the people attribute illness to these forces, and therefore to be without this 'evil', they would live forever. The best substitute they have for being without these forces is to have a healer who counteracts them.

Methods of Diagnosis

In modern medicine, the methodology of the traditional healers has been compared to that of modern day psychiatry.[5] The healer was able to delve into the minds of the individuals, and based on the healer's intimate knowledge of the culture and community, was able to elucidate the problem and subsequently counsel for treatment. The diagnosis would include praying over the patient, talking with them at length, and performing ceremonies and rituals. Historically, this type of diagnostic approach would fit with the role of the healer, due to his high position in society and role as counselor. A case study illustrates this point.

Case

A woman is brought to a traditional healer because she has become mute. She has not spoken to anyone for months, even though her husband is not aware of any physical impairment or sickness. After discussing at the length with the husband, the healer goes to talk with the woman. The healers sees her for only a few minutes and asks a few unanswered questions before comeing to the realization that this woman is getting older and the time has probably come for her husband to take on a new wife. With this information, he puts together the diagnosis of spiritual intrusion due to jealousy. The husband, in looking for a second wife, has angered his current wife and she has become full of the spirit of jealousy, and therefore become an elected mute.

As this case demonstrates, without intimate knowledge of the community and culture, the healer would not be able to have such diagnostic ability. It is their place in society that provides such mastery.

Success of the Traditional Healer

In the "Africa and the Africans' by Paul Bohanna and Philip Curtin, Dr TA Lambo, a practicing Nigerian psychiatrist and vice-chancellor of Ibadan University was quoted from a radio broadcast on the success rates of traditional healers vs. western doctors in Nigeria in the treatment of neurosis.[2] He stated that traditional healers cure approximately sixty percent of their case of neurosis, as compared to western doctors, who only cure approximately forty.

This is an interesting statement about the methodology of the healers. This is not to say that psychotherapy by Western doctors is poor, but that the position a healer has in traditional culture is an integral part to the fabric of their society and consequently to the treatment of disease.

Methods of Treatment

The types of treatments that are used by traditional healers have been around for thousands of years, and they include several aspects[1]. These are prayer and fasting, to show devotion and reverence to God or the gods they have angered. Treatment may also involve ashes and cloves, which are used by herbalists to create curative medications, or amulets and holy water, which are typically employed, by faith healers and *moribas* to ward off evil sprits and cast away spiritual forces. Finally ritual sacrifices that attempt to appease the gods who have been upset or the taboos that have been broken.

One example of such a treatment is a woman who was unable to conceive any children. Her and her husband had been attempting to for some time, but had no luck. She went to see her local healer, who told her that she should go down to the barren oak tree in the middle of town. When a branch fell from the tree, she should tie it around her waist in her lapa, similar to how she would carry her child. So she did this for many months, and within a year she had conceived a boy. Did the oak branch have curative powers, or did she will herself to conceive? The answer is irrelevant. The healer had curative powers, since as he was able to counteract what she thought to be the cause of her illness.

Modern Day Doctors and Traditional Healers

As demonstrated by the statement by Dr TA Lambo, we are aware that Traditional Healers are still being used in a variety of ways in West Africa and other traditional cultures. A survey appeared in the SAMJ in December of 1979, that questioned whether doctors in Mali, West Africa would be willing to utilize traditional healers are complementary medical providers[7]. Twelve of sixteen doctors interviewed said they would be willing to utilize the *furatigui* or primary herbalist healers. This would indicate a support of the herbalists in the administration of curative health care. However, none of the sixteen Western doctors would be willing to utilize the *soma*, *batigui*, or *moriba*, who indicates that they are unwilling to utilize the 'spiritual' or 'black magic' healers. This is interesting considering the Nigerian doctor, Dr. Lambo who considers that traditional healers are curing twenty percent more of the Neurosis cases.

Conclusion

Now that we have a sense that traditional Healers are still being used in a variety of ways in West African and will most likely continue to employed, the question is up to us, as doctors or future doctors, as to whether we are willing to support this type of healing. The question is whether you will support the work of a traditional Healer in order to cure one of your patients? I challenge you all to examine you views on illness and treatment of disease to determine whether you would be willing to incorporate spiritual power into your patients care.

In any medical field, we will be faced with a gamut of problems, some which have no easy answers. In context of other cultures and belief systems, we may be asked to incorporate spiritual and religious views of health and in treatment of out patients. Perhaps we should examine the

approach of the traditional healers in West Africa who use their power to counteract what the patients believe to be the cause of their illness. Belief can be a powerful tool in curing the patient.

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"ABOVE ALL, THEY HAVE HARMED: VIOLATING THE OATH THROUGH INVOLVEMENT WITH TORTURE"

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ABSTRACT

In 1977, Steve Biko was severely beaten and tortured, then left lying on the urine and blood-soaked floor of his prison cell. While unconsciousness and suffering from brain damage, he was driven 800 miles from Port Elizabeth to Pretoria, South Africa where he died tragically the following day. After an inquest into the jailed political activist's death, the supervising physicians of the prison were accused of gross neglect and falsification of medical records by the South African Medical and Dental Council. Later, In 1980, the council exonerated Dr. Benjamin Tucker and Dr. Ivor Lang from any professional misconduct, despite strong protests from the international medical community. The physicians had violated international guidelines and participated in Steve Biko's torture.

During the 15th and 16th centuries, as medical knowledge was emerging, early doctors used science for a dual purpose: to treat the sick and to participate in judicial torture. Recently, research from The Rehabilitation and Research Centre for Torture Victims in Copenhagen has shown that doctors were involved in 60% of the cases of survivors. Physicians participate in torture by designing torture techniques, performing medical exams on detainees before or after torture, intervening to treat a patient so that torture may continue or falsifying medical and autopsy reports.

Doctors are involved in many aspects of torture against international principles of medical ethics that state clearly that doctors should not participate in torture, executions, or other human rights violations. The physician's oath to sustain life where there is hope of doing so makes collusion in torture especially abhorrent.

Background

Throughout history, society has charged healers with the duty of understanding and alleviating causes of human suffering. In the past century, the world has witnessed ongoing epidemics of armed conflicts and violations of human rights, epidemics that have devastated and continue to devastate the health and well-being of humanity. As we enter the twenty-first century, the nature and extent of human suffering has compelled health providers to redefine their understanding of health and the scope of their professional interests and responsibilities.

In the past, torture was used as a method of demonstrating the superiority of the torturer over the defeated enemy. From the Bible, the Second Book of Kings (25:7): "And they slew the sons of Zedekiah before his eyes and then put out the eyes of Zedekiah and bound him in fetters, and carried him to Babylon." Through the Middle Ages, as scientific understanding of the human body was growing, torture was applied with a dual purpose: to increase the knowledge of anatomy, but also to allow executioners in judicial torture to prolong the suffering of the guilty (Lavik and Vesti, 1991). Judicial torture became accepted as a routine manner of dealing with the condemned, and especially by the Church in discouraging heretics and the general population from challenging its truths (Ettinger, 1991). Torture became accepted as an effective method of gaining the truth, or more often to hear what the inquisitors wanted as in the cases of witches, sorcerers and other heretics being burnt at the stake. Doctors during the 15th and 16th centuries were just learning the science of medicine, and used this new knowledge of anatomy for example, to help the ill but also to oversee the physical condition of the accused thereby legitimizing the torture and executions (Lavik and Vesti, 1991).

The first human rights declaration was created in 1789, and only then was humanitarianism introduced and the concept of torture converted to an uncivilized practice (Ettinger, 1991). Though torture became officially abolished in many countries wishing to become civilized, it was not until post-World War II that general opinion including that of the medical profession was swayed. Before, society was mostly concerned about its strong, victorious men while the victims raised little interest amongst academic populations. However, when those persecuted, arrested and tortured during World War II returned from prisons, forced labour and concentration camps, they were the heroes who bore the physical and mental scars of abuse (Hanauske-Abel, 1986). The purpose of torture was changing during this time of increased humanitarianism. While the purpose initially was to extract information, it now also included the destruction of the individual. In the 21st century, the new purpose has become to destroy psychological resistance, to destroy personalities and therefore serve as a deterrent to others (Lavik and Vesti, 1991).

Understanding the modern use of torture entails the dispelling of myths about its nature and purpose. There remains a perception that torture is practiced randomly, that it is punishment carried to an extreme, that it is performed by psychopaths or sadists, that it exists outside of governmental responsibility and is practiced by "less civilized" societies. Compounding the problem is a wall of sustained disbelief that allows complacency and prevents full comprehension of the enormity of this gross human rights violation.

Common misconceptions about torture do not hold up to evidence obtained from human rights organizations, international monitoring agencies, and documented testimonies of survivors, which suggest a more sinister scenario (Simalchik, 1995). While torture may be utilized for a variety of purposes (to punish, to obtain information, or to coerce a third party), a primary reason for its use is as a means of social control. Governments employ torture as part of state policy in order to deter real or suspected dissidents. Regimes use torture as part of a continuum of repressive measures and suppression of democratic rights. Rarely, if ever, is torture practiced alone; it has become a constituent part of mechanisms for domination.

Doctors and medical personnel participate during torture sessions so as to ensure that the victim will live long enough for the strategy to be effective. During one of the 21st century's worst genocides, documents on the Khmer Rouge were compiled by David Hawk of the Cambodia Documentation Commission and underscore this point. The Tuol Sleng Prison Interrogator's Manual states that torture is used "...to break them [psychologically] and to make them lose their will. It's not something that's done out of individual anger, or for self-satisfaction. Thus we beat them to make them afraid but absolutely not to kill them. When torturing it is necessary to examine their state of health first and necessary to examine the whip." (Cambodian Documentation Commission, 1986). State involvement creates an institutional foundation from which torturers are authorized, supported and protected from judicial harm.

Today, in many countries torture has become institutionalized as in countries observing Islamic Sharia law, during apartheid in South Africa, in Northern Ireland "depth interrogation" methods or in Israeli "shabeh" techniques. Torture continues and is believed by many human rights organizations to be increasing. Accounts of torture and other human rights abuses reach us daily through the news media. Amnesty International, recipient of the 1977 Nobel Peace Prize for its human rights efforts, reports that between 1980 –1984, in just four years, one third of the world's governments systematically practiced or tacitly condoned torture or ill-treatment to interrogate, punish and intimidate political opponents (Amnesty International, 1984). The techniques they use may include electric shock, prolonged beating, sham executions, sensory and sleep deprivation, cigarette burns, water submersion, and more recently mind-altering drugs. (Amnesty International, 1984)

Health and Human Rights

Physicians have a responsibility to protect and promote all human rights. This is the case not only because human rights violations have devastating health consequences, but because protecting and promoting human rights may be the most effective means to providing the conditions for health and well-being.

The United Nations 1948 Declaration of Human Rights states clearly in Article 5, "no one shall be subjected to torture or to cruel, inhuman or degrading treatment or punishment" (United Nations General Assembly, 1948). The United Nations Declaration of Human Rights has universal application. It remains one of the few rights that may not be derogated: there can be no justification for torture or mitigating circumstances for its practice. Subsequent United Nations instruments include the 1984 Convention Against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment, which defines torture as: "any act by which severe pain or suffering, whether physical or mental, is intentionally inflicted on a person for such purposes as obtaining from him or a third person information or a confession, punishing him for an act he or a third person has committed or is suspected of having committed, or intimidating or coercing him or a third person, or for any reason based on discrimination of any kind, when such pain or suffering is inflicted by or at the instigation of or with the consent or acquiescence of a public official or other person acting in an official capacity. It does not include pain or suffering arising only from, inherent in or incidental to lawful sanctions" (United Nations General Assembly, 1984). The convention against torture also clearly states that governments must not justify torture, but actively prevent torture, even under circumstances of armed conflict (United Nations

General Assembly, 1984). Yet Amnesty International describes torture as the modern epidemic and reports that it is currently employed in more than a hundred countries (Amnesty International, 2000). From 1982-1994, the Canadian Centre for Victims of Torture has documented the histories of 8000 survivors from 75 countries (Simalchik, 1995).

Medical Ethics

Physicians throughout the world have been ill-equipped to address human suffering caused by armed conflict and human rights abuses. Medical and health concerns in the twentieth century have dealt almost exclusively with the diagnosis, treatment and prevention of disease. Traditional disease concerns often fail to recognize the physical, psychological, and social health consequences of violations of human rights and humanitarian law. In contemporary medical practice, rational and empirical traditions that form the basis of scientific through largely reduce the complex phenomenon of suffering to the concern of the disease: its diagnosis, treatment and prevention. By decontextualizing suffering and neglecting the social conditions that affect health and well-being, health providers marginalize their roles in society.

Furthermore, medical codes of ethics tend to focus narrowly on the provider-physician relationship, thereby neglecting the institutional context in which health professionals function. They do not, however, generally address interference with health care and well-being by the state.

Medical ethics hold highest the fundamental principle of the Hippocratic Oath, "above all, do no harm". Using this credo, numerous ethical codes have been developed and with the relatively recent creation of professional associations, these ethical codes have been articulated and agreed on as guiding principles. With respect to the medical involvement in torture and other cruel, inhuman or degrading treatment, the World Medical Association adopted the Declaration of Tokyo (1975), stating in Article 1:

> "The doctor shall not countenance, condone or participate in the practice of torture or other forms of cruel, inhuman or degrading procedures, whatever the offence of which the victim of such procedures is suspected, accused or guilty, and whatever the victim's beliefs or motives and in all situations, including armed conflict and civil strife" (Amnesty International, 1985).

In the World Medical Association Declaration of Geneva (1948, 1994), the ethical guideline states:

> "I will not permit considerations of age, disease of disability, creed, ethic origin, gender, nationality, political affiliation, race, sexual orientation or social standing to intervene between my duty and my patient. I will maintain the utmost respect for human life from its beginning even under threat and I will not use my medical knowledge contrary to the laws of humanity." (Amnesty International, 1985)

Further, the International Code of Medical Ethics adopted by the World Medical Association declares:

> "A physician shall, in all types of medical practice, be dedicated to providing competent medical services in full technical and moral independence, with compassion and respect for human dignity." (Amnesty International, 1985)

Finally, the United Nations Principles of Medical Ethics (1982):

> "It is a gross contravention of medical ethics, as well as an offence under applicable international instruments, for health personnel, particularly physicians, to engage, actively or passively, in acts which constitute participation in, complicity in, incitement to or attempts to commit torture or other cruel, inhuman, or degrading treatment or punishment."(Amnesty International, 1985)

It is obvious then from international principles of medical ethics, that all forms of doctor participation in torture are unethical; however none of the declarations carry any legal obligations for physicians or their governments. In addition, principles of bioethics, such as beneficence, nonmaleficence, confidentiality, autonomy and informed consent aim to regulate the conduct of physicians in their encounters with individual patients. Such principles do not provide a conceptualization of health, nor do they help health professionals to understand causes of human suffering.

Too often, physicians are silent in the face of such practices and become complicit through their silence. Pressures to remain silent, whether political or economic, threaten the independence of the physician and the autonomy of the profession as a whole. Education in medical ethics and human rights can foster an understanding of core concepts and international norms so that physicians can avoid or refuse complicity in human rights violations and work to protect and promote human rights as a necessary prerequisite for health. Health professionals have a responsibility to protect and promote all human rights not only because human rights violations have devastating health consequences, but because protecting and promoting human rights (civil, political, economic, social and cultural) may be the most effective means of providing the conditions for health and well-being in a global civil society, a society that recognizes the inherent dignity and the equal and unalienable rights of all members of the human family as the foundation of freedom, justice, and peace in the world.

The Case of Steve Biko

In South Africa, as in other countries, narrow conceptualizations of health care and the ethical responsibilities of physicians have contributed greatly to the silence and inaction in the face of the suffering caused by human rights violations. Although some progressive health professionals in South Africa worked for the protection and promotion of human rights during apartheid, most did not.

Stephen Bantu Biko was born in 1946, and went to Natal University to study medicine in 1966. From the beginning he became involved in student groups against apartheid but by the end of his third year, he was expelled for his political activities. In the early 1970's he spearheaded the Black Consciousness Movement with the aim of uniting black people to oppose apartheid and white supremacy. Educated, intellectual and articulate, he was not only the

founder of and leader of the Black Consciousness Movement but also became more widely known to members of the privileged white minority in South Africa. He met senators and embassy officials from around the world and became friends with many journalists (Woods, 1979). He was under constant surveillance and harassment from the security police and in 1973 was served with a banning order preventing him from associating with any organizations, attending any meetings, and communicating with other banned people and restricted from movement from his home town (Woods, 1979). The basic human rights violations Biko suffered only increased his determination to work against apartheid. As a result, he was arrested and detained many times on breaking his banning orders. A journalist from the same town as Biko wrote, "In a country where violence by the State and its police is endemic, Biko managed to remain non-violent" (Bernstein, 1978). Steve Biko was finally arrested on August 18, 1977 and ironically accused under the Terrorism Act allowing for the indefinite detention, for the purposes of interrogation, of any person suspected to be a terrorist, or to be in possession of information regarding activities of terrorists.

Early on September 7, 1977, a Port Elizabeth district surgeon, Dr. Ivor Lang, was called by Colonel Goosen, head of the security police in the Eastern Cape, to examine Biko for a suspected stroke. By WMA guidelines, the doctor has the right to examine the detainee in private, without the presence of a security officer (Amnesty International, 1985). Nevertheless, Dr. Lang examined Biko under the watchful eye of Colonel Goosen. Biko was moved from his cell into a policeman's office at security headquarters, placed on a mat, and shackled to a metal grill. Dr. Lang found that the patient, "...was walking with an ataxic gait; spoke in a slurred manner; and, was suffering from: a laceration on the upper lip; a superficial bruise over the sternum at the level of the second rib; ring marks around each wrist; the swelling of both hands, feet, and ankles." (Bernstein, 1979) Yet when summoned by Colonel Goosen for a medical certificate, Dr. Lang reported in his medical record: "This is to certify that I have examined Stephen Biko as a result of a request from Colonel Goosen of the security police who complained that the above-mentioned would not speak. I have found no evidence of any abnormality or pathology on the patient." (Bernstein, 1979) The following day Dr. Lang's presence was again requested along with that of his superior, Dr. Benjamin Tucker, the chief district surgeon for Port Elizabeth. Biko, still manacled to the metal grille, and on the same mat now soaked with urine, was once again examined. Dr. Tucker observed a possible extensor plantar reflex in the detainee, and concluded that could possibly be the result of brain injury (Bernstein, 1979). Further examination was requested and on September 9, 1977 a specialist at the Sydenham Prison Hospital, Dr. Hersch, performed a lumbar puncture which revealed blood in the cerebrospinal fluid. A neurosurgeon, Dr. Keely, was consulted and advised Dr. Lang to keep Biko under close observation. (Bernstein, 1979)

Dr. Lang arranged for Biko to be relocated to the Walmer police station cells, where he might be kept under observation. Dr. Lang then recorded in his medical record: "No change in condition. Have informed him [Biko] that Dr. Hersch and myself find no pathology, that the lumbar puncture was normal, and as a result, I was returning him to the police cells. "(Bernstein, 1979) Once again, Biko was left lying on a mat on a cement floor, under no observation. On September 11, 1977 Colonel Goosen once again had Dr. Tucker visit the Biko where he found his patient to be unresponsive, frothing at the mouth, glossy-eyed, and hyperventilating. Dr. Tucker recommended that Biko be transferred to a provincial hospital in Port Elizabeth, but

Colonel Goosen refused to allow this for security reasons. Surrendering to the wishes of the security police, Tucker gave his permission for Biko to be transferred by motor vehicle 750 miles to the Pretoria Central Prison (Bernstein, 1979).

Biko, semi-comatose, naked, and handcuffed, was put in the back of a Land Rover and driven unaccompanied by any medical personnel, and without any record of his medical history, to the Pretoria Central Prison. There, many hours after his arrival, district surgeon Dr. A. Van Zyl, who had been summoned because the detainee was refusing to eat, examined him. An intravenous drip was administered but on September 12, 1977, Stephen Bantu Biko died on the floor of his cell, unattended, twenty-six days after his arrest. An autopsy revealed "head injury with associated extensive brain injury, followed by contusion of the blood circulation, disseminated intravascular coagulation as well as renal failure with uremia" (Bernstein, 1979, Rayner, 1987).

Initially, public press releases created by government officials declared a hunger strike as the cause of death. The widespread anger generated by Biko's death, resulted in an inquest to examine the conduct and medical negligence of the doctors involved. In 1978, following the inquest, an ombudsman with the South African Council of Churches submitted a complaint to the South African Medical and Dental Council (SAMDC), alleging indifferent and irresponsible medical care by the physicians who had attended Mr. Biko between the time of his assault and the time of his death. The SAMDC is the licensing body for physicians and also investigates medical misconduct.

In early 1980, a SAMDC inquiry committee announced publicly that it had found no evidence of improper conduct by the doctors who attended Mr. Biko, and the entire Council confirmed the finding by a majority vote (Rayner, 1987). Significant portions of the South African medical community, troubled by the failure of SAMDC to investigate, asked for support from the Medical Association of South Africa (MASA). The MASA executive committee supported the decision of the SAMDC and criticized those who had brought the charges, asserting that the critics had relied on flawed newspaper reports (Rayner, 1987). The South African Medical Journal refused to publish letters opposing the decision. Several prominent MASA members subsequently resigned in protest (Dowdall, 1991). A MASA member then persuaded the organization to set up a select committee to examine the ethical issues raised by the medical treatment of Mr. Biko. This committee's findings disagreed with those of the SAMDC (Rayner, 1987). Encouraged by this, several physicians lodged complaints with the SAMDC to no avail however, then successfully petitioned the Supreme Court, which set aside the SAMDC's initial findings and ordered the SAMDC to initiate a new inquiry (Rayner, 1987). In July 1985, the SAMDC finally held disciplinary hearings against the doctors who had treated Biko.

The SAMDC found Dr. Ivor Lang guilty of improper conduct on five counts that he had 1) issued an incorrect medical certificate and misleading medical record 2) had failed to examine the patient properly 3) had failed to inquire into and ascertain the possibilities of a head injury 4) had failed to obtain a proper medical history of the patient and 5) had failed to observe the patient and keep proper notes (Rayner, 1987). The SAMDC found Dr. Benjamin Tucker guilty of improper and disgraceful conduct on three counts that he 1) failed to object to the patient's

transportation to Pretoria 2) should have insisted upon transportation by ambulance and 3) failed to examine the patient properly for CNS function prior to falsifying the medical record (Rayner, 1987). Dr. Tucker received a suspension of three months, but the Council recommended that the punishment be delayed for two years conditional on his not being found guilty by the Council of any other contravention during the period. He was later stripped of his medical qualifications. As of June 23, 1997, Dr. Ivor Lang was still practicing as a district surgeon in the Eastern Cape Province (Channel Africa, 1997).

In the aftermath of this scandal, the legitimacy and agenda of the MASA began to be doubted. The progressive dissatisfaction of many doctors with the racist actions and decisions taken by the MASA, especially as pertained to the issue of the health and welfare of detainees under security legislation, directly precipitated the formation of an alternative organization, The National Medical and Dental Association (NAMDA). NAMDA felt that the MASA was too closely aligned with the apartheid state and took a clear stand against torture, provided medical assistance to ex-prisoners and campaigned actively against the blatant human rights violations. (Dowdall, 1991) Nevertheless, as late at 1984, 80 percent of actively practicing doctors were still members of MASA (Rayner, 1987).

The arrest, detainment, torture, and subsequent death of Stephen Bantu Biko demonstrated the constrained clinical independence of prison doctors in South Africa. At every level of health care human rights violations were perpetrated. The history of apartheid in South Africa created a social and political climate where a white minority government was able to oppress its black majority population. The government supported its security forces in torture who then encouraged prison physicians to engage in torture through performing medical exams on detainees before or after torture, intervening to treat a patient so that torture may continue, failing to treat tortured detainees, and falsifying medical and autopsy reports. The physician associations abided by state laws, promulgating racial discrimination and disregarding international medical codes of ethics. The individual physicians perhaps under coercion by authorities, also failed to assert their clinical independence. Doctors were involved in torture against international principles of medical ethics that state clearly that doctors should not participate in torture and other human rights violations. The physician's oath to sustain life where this is hope of doing so made the South African doctors' collusion in torture especially abhorrent.

Conclusion

Increasingly, physicians are recognizing the importance of protecting and promoting human rights as necessary preconditions for the individual and community health. When health is defined as "completely physical, mental and social well-being, and not just the absence of disease and infirmity" (WHO, 1958) physicians recognize an ethical responsibility to protect and promote human rights in order to provide the conditions for health and well being. In this regard, progressive health professionals in South Africa who have worked for the protection and promotion of human rights have made important contributions to establishing a culture of human rights in the health sector. However, human rights concerns have not yet been formally integrated into the curricular studies of medical schools nor have all international medical associations actively stood against doctor participation in torture.

To establish this concept of health and human rights, educational, organizational and politico-judicial change must occur. Education to increase general awareness about human rights violations, to teach professional norms according to international ethical codes and to emphasize clinical independence from governments and commitment to the patient's health and well-being. Organizational change should empower medical associations and organizations to observe human rights violations, investigate and then be able to judge and penalize while remaining autonomous of government. As well, a universal medical code of ethics from which all associations can devise human rights responsibilities should be widely implemented to confer protection to those doctors who speak out against torture and to encourage clinical independence. A politico-judicial stance can be taken against doctors who have willingly participated in torture where they can be held accountable for the violation of medical ethics and publicly denounced. Most importantly, those physicians who have spoken out against their own personal risk of losing careers, freedom or their lives, must be protected. Concerted action on behalf of medical associations lends support to those who protest human rights violations.

Physicians in South Africa and around the world face immense challenges in addressing human rights concerns and engaging in human rights education. The extent of human rights violations, the complexity of their causes, and the enormity of their consequences make for extraordinarily difficult and emotionally challenging work. Despite such challenges, evolving international standards demand that health professionals adopt adherence to human rights as a fundamental concept of health care.

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SOVIET PSYCHIATRY IN THE COLD WAR ERA: USES AND ABUSES

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ABSTRACT

This paper examines documented abuses of the Soviet psychiatric system during the Cold War era. In particular, it is concerned with the widespread practice of conferring a diagnosis of schizophrenia upon those political dissidents whose ideological beliefs ran counter to party platforms of the time. Included in this analysis is a discussion of the controversial results obtained by a 1972 WHO study of criteria employed to arrive at a diagnosis of schizophrenia. Indeed, most striking to emerge would be the data implicating the Soviet Union and its unofficial policy of consigning outspoken radicals to mental facilities. As such, several examples will be presented that illustrate how concocted psychiatric diagnoses were used to incarcerate political dissidents. Finally, a commentary will be offered on the inhumane treatments accorded to those prisoners erroneously branded as schizophrenics who were subsequently confined to Soviet psychiatric hospitals.

At one point in post-war Soviet Union, the concept of schizophrenia was so loosely defined that psychiatrists from Leningrad, Kiev, and Moscow could not even agree on a description of the illness. If there was very little agreement on the disease's aetiology, there was virtually no consensus on its pathology, for what one psychiatrist considered symptomatic of schizophrenia was just as likely to be dismissed by the next. Perhaps such ambiguity surrounding the diagnosis of schizophrenia is what prompted esteemed Soviet psychiatrists to once note that "the varieties of the disease [were] practically inexhaustible" (Snezhnevsky and Vartanian, 1970). At any rate, by the early 1970s, schizophrenia was twice as prevalent in the USSR as it was in Great Britain, after controlling for population differences. Unable to turn a blind eye to such fascinating data, given the relatively equal distribution of schizophrenia among the rest of the world's populations, the West proceeded to investigate. It was during this time, as well, when rumours began to surface about the Soviet Union's highly suspect psychiatric facilities. However, not until a team of Canadian scientists published a 1971 report condemning the Soviet Union's practice of committing political dissidents would a plausible argument be advanced attempting to explain the endemic nature of schizophrenia in Russia. Accordingly, this paper will examine to what extent such dissidents in the former USSR were diagnosed schizophrenic and subsequently confined to mental facilities as a result of their non-conformist views.

Indeed, a 1972 study examining cross-cultural patterns of diagnosing schizophrenia was viewed with keen interest, especially by those already critical of the Soviet Union. Operating

under the auspices of the World Health Organization, psychiatrists from Denmark, India, Columbia, Nigeria, England, Czechoslovakia, the former USSR and the United States all participated in the study. In each case, psychiatrists were requested to diagnose certain patients who manifested various psychiatric symptoms. Upon completion of their examinations, the results of these mental health specialists were compared with those generated by patient profiles fed to computer software programs. Such programs, it must be noted, were originally designed for the purpose of evaluating patients based on European models or standards. Nonetheless, after complex statistical analyses were performed on the data, it became evident that Soviet psychiatrists employed the least rigorous standards for their criteria of what constituted a schizophrenic. It goes without saying that such glaring discrepancies in the diagnostic practices of different psychiatrists harbours grave implications, for as Malcolm Lader explains, "many of the patients diagnosed as schizophrenics by Moscow psychiatrists would be pronounced mentally healthy by British psychiatrists" (1977). Given the information presented above, one has no difficulty envisioning scores of mentally healthy individuals persecuted by a system all too willing to treat the seemingly normal.

Whilst political dissidents were, indeed, unjustly imprisoned in Tsarist Russia, it was not until Stalin's reign of terror that the practice became much more widespread. For example, in 1953, party member Sergei Pisarev was arrested after submitting a report to Stalin in which he denounced the secret police's fabrication of a non-existent plot to poison party officials. Declared insane by psychiatrists from the Serbsky Institute of Forensic Psychiatry, Pisarev was subsequently detained at Moscow's Butyrka Prison and then transferred to the Leningrad Prison Psychiatric Hospital. Pisarev's diagnosis at each facility was officially schizophrenia; however, one brave psychiatrist in Leningrad finally asserted that the patient was "healthy and fully capable of accepting responsibility for his actions" (Pisarev, 1970). Pisarev was eventually released in 1955, whereupon he mounted a campaign attacking the legitimacy of the Soviet psychiatric system. The former party member cited the names of several scholars, writers, and party members who had been erroneously diagnosed schizophrenic and then subsequently institutionalised. In the end Pisarev's outcry produced the desired effect when the Central Committee responded to his appeals. Although a thorough investigation was conducted, the final report never reached the Central Committee. Instead, it remained in the hands of an unnamed party official who quickly consigned the damning evidence to the central archives. Thus, if Pisarev's efforts achieved nothing else, they had already succeeded in heightening the awareness of his country's methods for dealing with political dissidents.

Yet, in spite of Pisarev's fierce tenacity in lodging complaints against Soviet mental institutions, there appeared to be no hiatus in the practice of committing dissidents to such facilities. As Sidney Bloch and Peter Reddaway note in *Psychiatric Terror*, a possible explanation for this continued phenomenon was a result of the tacit approval such methods received from Soviet leader Nikita Khrushchev. Although eager to extricate himself and his party from the atrocities associated with his predecessor's regime, Khrushchev, who had always adamantly denied detaining political prisoners, was nonetheless quoted in the May 24, 1959 edition of the *Pravda* as having essentially equated social deviance with insanity:

> A crime is a deviation from the generally recognised standards of behaviour, frequently caused by mental disorder. Can there be diseases, nervous disorders

> among certain people in the Communist Society [of the future]? Evidently, there can be. If that is so, then there are characteristics of people with abnormal minds . . . To those who might start calling for opposition to communism on this "basis," we can say that now, too, there are people who fight against Communism . . . but clearly the mental state of such people is not normal (Bloch and Reddaway, 1977).

Following Khrushchev's line of reasoning, then, any Russian brash enough to denounce communism, was, by definition, mentally abnormal. Many of Khrushchev's pre-conceived notions, therefore, significantly increased the likelihood of political dissidents being consigned to mental institutions.

Whilst Sergei Pisarev's case illustrates the propensity of psychiatrists to deliver contradictory diagnoses between extended periods of time, the case of Pyotr Grigorenko, a distinguished military scientist, illustrates the propensity of psychiatrists to deliver blatantly contradictory diagnoses virtually simultaneously. In 1961, General Grigorenko wrote an open letter to the Moscow public denouncing the harmful activities of Khrushchev's government. Not surprisingly, Grigorenko was banished to the Far East soon thereafter, where it was reasoned that he would be much less of a pernicious influence. Such a move, however, did not prove to act as a sufficient deterrent, for Grigorenko continued to disseminate his anti-government literature. Finally, in 1964, the decorated military official was arrested, declared mentally unfit, and subsequently committed to an insane asylum. With the demise of Khrushchev some fifteen months later, Grigorenko was eventually released. Not one to learn from the past, however, the impassioned general continued to launch derisive attacks against his government's regime. It was during this time that support for the general began to grow rapidly, much to the chagrin of Soviet officials. Becoming increasingly reluctant about taking visible action against Grigorenko, the government, instead, resorted to circulating false rumours about his conduct and having the KGB set traps for him. Their efforts eventually paid off when in 1969 Grigorenko was once again arrested and remanded to a psychiatric facility.

One eventuality that the government did not anticipate, however, was the possibility of Grigorenko being declared of sound mind. In fact, psychiatrists at the Tashkent Committee of Forensic Psychiatry concluded the following in August 1969:

Grigorenko at the present time shows no symptoms of mental illness, just as he did not show any in the period of the offences incriminating him when he understood the nature of his activities and was capable of directing them. In what he did was of sound mind (United States Senate Committee on the Judiciary, 1972).

Evidently this diagnosis did not satisfy the Soviet authorities, because two months later Grigorenko was transferred to the Serbsky Institute where he became subject to further psychiatric evaluations. The results of these examinations, however, could not have been more different than those obtained from the previous institution. Despite being declared virtually free of mental defects two months prior, Grigorenko was literally made out to be a raving lunatic by psychiatrists at the Serbsky Institute:

> Grigorenko is suffering from a mental illness in the form of a pathological (paranoid) development of the personality, and with psychopathic features of the character and first signs of cerebral arteriosclerosis (United States Committee on the Judiciary, 1972).

Clearly, the diagnosis fabricated in this second evaluation was an egregious attempt to label Grigorenko a social misfit, a deviant without a modicum of credibility. For even if one concedes the possibility that Grigorenko could have, indeed, been "psychopathic," the odds are extremely unlikely that his initial diagnosis would have failed to detect any evidence of this condition. Furthermore, it is even more unlikely that Grigorenko could have undergone the transition from sound mind to paranoid personality within the short span of two months.

If Soviet psychiatrists were skilled in the art of committing perfectly healthy individuals, then they were positively adept in committing those individuals with a relatively benign psychiatric history. Take the case of Natalia Gorbanevskaya, for instance. Poet, editor, and translator, young Gorbanevskaya first commanded the attention of the government with the publication of her highly controversial poems in Soviet periodicals. However, it was not until Gorbanevskaya's participation in a demonstration condemning the USSR's 1968 invasion of Czechoslovakia and the subsequent publication of a book on the subject that Soviet authorities promptly arrested her. Sentenced to an unlimited term in a prison hospital, Miss Gorbanevskaya was examined by a panel of psychiatrists who ultimately rejected a diagnosis of schizophrenia. In fact, they even went so far as to recommend that she be released from the psychiatric facility. Like General Grigorenko, however, Gorbanevskaya became subject to a second round of evaluations led by a different team of psychiatrists. Delving deep into her past, these mental health specialists focused primarily on the young women's susceptibility to fits of melancholy as well as her fear of heights to arrive at a diagnosis of chronic schizophrenia. Yet, as psychiatrist Malcolm Lader contends, the description of Gorbanevskaya's symptoms, as recorded in her official medical records, was not consistent with a diagnosis of chronic schizophrenia. In fact, Dr. Lader states: "I could not have made this diagnosis but would have regarded Miss Gorbanevskaya as having repeated depressive episodes" (1977). Thus, whilst the extent of Gorbanevskaya's mental illness was certainly open to debate, the fact remains that Soviet psychiatrists relied on irrelevant information to manipulate a diagnosis of chronic schizophrenia.

In addition to the detention of political dissidents, Soviet psychiatric hospitals or SPHs also became ill famed for the cruel and unusual punishments accorded to their inmates. In fact, Bloch and Reddaway contend that "SPHs [ranked] among the most cruel of such institutions in the world" (1977). Support for this contention stems largely from the appeals of political prisoner Victor Fainberg to human rights organisations. In what can only be described as appalling, Fainberg recounts incidents of random assaults and vicious beatings as being routine activities in such facilities (United States Senate Committee on the Judiciary, 1972). More common as a form of punishment, however, was the administration of various drugs to inmates. Whilst in many instances such drugs, notably Sulphazin, were employed as remedies to rectify the "misbehaviour" of patients, in other instances these psychotropic medications were employed to force recantations out of unusually obstinate dissidents (United States Senate Committee on the Judiciary, 1972). Thus, given the evidence presented above, there can be little disagreement over the fact that SPHs were excessively brutal and inhumane in their treatment of political dissidents.

Given that the discipline of psychiatry is not so much an exact science as it is a subjective process of inquiry, the integrity of the professional becomes paramount. Psychiatrists the world over must therefore remain vigilant in maintaining a certain level of decorum. For as the Soviet example illustrates, when ethical standards become compromised for political agendas, one must consider whether it is, in fact, the profession, and not the patient, that is the real schizophrenic.

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FIVE LITTLE PIGGIES...
AN ANECDOTAL ACCOUNT OF THE HISTORY OF THE ANTI-VIVISECTION MOVEMENT

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ABSTRACT

Animals are used in biomedical research. This is a reality and its practice has a long and fruitful history. The same can also be said for the movement against using animals for such purposes. The scientific community maintains that it still requires the use of live animal experimentation. Supporters of the anti-vivisection movement want to see this practice stopped. On the surface the debate appears irreconcilable-or is it? There has been productive communication between pro- and anti-vivisection groups and this has changed the way animals are used in the name of scientific research. This adversarial relationship, while stressful, has not been without beneficial effects. Perhaps some insight into the critical issues can be gained by looking at how both sides in the debate have evolved throughout their respective histories. When did scientists and doctors start using animals for their experiments? Why did people begin to question the use of animals for research? Has the basis for their opposition changed in response to changes made in regulation of animal experimentation? The answers to these questions form the framework for an exciting exploration into the history of the anti-vivisection movement.

Remember back to a time in childhood when nursery rhymes abounded. Recall one tale in particular: the tale of the five little piggies. The first pig went to market. The second pig stayed home. The third pig ate roast beef, the fourth ate none. The final pig cried, "Wee, wee, wee, I can't find my way home!" We used to play this game with our fingers and toes all the while completely unaware of what actually happened to all these little piggies.

The truth of the matter is that the carnivores among us ate the first pig. In our breakfast sausage, our lunch time cold cuts and in our dinner pork chops, we consume the pigs for our daily nutrition. The second pig stayed home because his home was a farm that bred pigs specifically for organ harvest. Once harvested, these organs would serve for human transplantation as a temporary organ replacement until a human donor could be found. The third and fourth pigs were part of a study, treatment and control, respectively, to determine the effect of roast beef on the rate of artherosclerosis. The fifth pig couldn't find his way home because he had been blinded in experiments to determine if cosmetics and hand creams were hypoallergenic. Startling revelations to be sure but how far from reality is it?

The truth is humans use animals for many, many purposes and have done so for a long, long time. Throughout history and evolution, the fate of animals and humans has been inextricably linked. However, this does not imply that all human actions have been normatively good. Nor does it imply that these actions have been normatively bad. There are some people who hold the belief that all uses of animals are justified, while others believe no animal should be used to further the human condition. Between these two seemingly irreconcilable views, the vast majority of people exist in a middle area. They approve varying extents of animal use. One issue that generates many heated arguments centers on the use of live animals in scientific experiments, the process of vivisection. Given the sentiments of some in society, it follows that people would oppose this type of animal use and hence the anti-vivisection movement is born.

It appears as though the acceptability of using animals for experimentation depends on how society defines the nature of the animal. As such, this evaluation depends on societal morés, beliefs and ethics in society. Society as a whole has evolved over time and, therefore, it is not surprising to see an evolution of the anti-vivisection movement over time as well. This also implies the reverse is true: the anti-vivisection movement could not progress until society was ready. Thus progress in the anti-vivisection movement was often precipitated by other issues of the day.

Starting in Aristotlean times, in the fourth century before Christ, there was a belief that animal souls are substantial forms. However this did not supersede their use by humans as it was recognized that "after the birth of animals, plants exist for their sake, and that the other animals exist for the sake of man..." (in Aristotle's (384-322 BC) *Politics*, Book I, Chapters 5 & 8). Even within the Bible, there exists the notion that man should "Hurt not the earth, neither the sea nor the trees." (*Revelation*, 7:3) Again, it is accepted that the "...fear of you and the dread of you upon every beast of the earth and upon every bird of the air, upon everything that creeps on the ground and all the fish of the sea; into your hands they are delivered." (*Genesis*, 9:1-3)

From these early writings, it appears the notion of speciesism-the belief that one species has more importance and stature than another-was well enshrined and accepted within society. If one believes in the tenet of speciesism and views human beings as a higher form of life, then the use of animals for human benefit is therefore justified. The boundary of concern extends only to the boundary of the group, in this case, *Homo sapiens*. The noted theologian Saint Thomas Aquinas (1224-1274) had written on the subject of animal use in the thirteenth century. He clarified the writings in the Bible and reaffirmed "...by divine providence they [the animals] are intended for man's use in the natural order." (*Summa Contra Gentiles*, third book, part II, Chapter CXII) However, the need for clarification of the writings in the Bible must indicate that there was questioning of the treatment of animals in that time.

The belief in speciesism is not problematical until one attempts to justify why one species is "above" another. If blessing by a deity is not enough, then why do humans feel they are a higher form of life than the animals who surround them? Many philosophers have weighed in on this subject. Rene Descartes (1596-1650) developed a strict dichotomy to separate res extensia and res cognitans, or the physical being from the metaphysical being. He argued only minds or souls can suffer; the metaphysical being is what makes a higher life form. He viewed animals as incapable of having this type of being and they are, therefore, at the mercy of man.

During the Renaissance, the age of enlightenment, people started to question what defined humanity. In the struggle to elaborate the meaning of what it is to be human, it became apparent that animals had many of the same characteristics: loyalty, compassion, sense of purpose are but a few examples. It appeared the animals may not have quite as clear a separation of res extensia and res cognitans as was thought. Thus perhaps the justification for using animals for any human purpose was not as solid as previously perceived. Voltaire (1694-1778) commented in his *Philosophical Dictionary*, under "Animals" that:

> "Barbarians seize this dog, which in friendship passes man so prodigiously; they nail it on a table, and dissect it alive in order to show the mesenetric veins. You discover in it all the same organs of feeling that are in yourself. Answer me, machinist, has nature arranged all the means of feeling in this animal, so that it may not feel? has it nerves in order to be impassible? Do not suppose this impertinent contradiction in nature."

The argument centers on the belief that the physical human is very similar in terms of organs, physiology and other physical processes. It is then not absurd to believe that animals may have some of the res cognitans features as well. If it is accepted that animals may exhibit a metaphysical being, it is far more difficult to justify the unrestricted use of animals in research. Immanuel Kant (1724-1804), the genius behind the deontology school of philosophy, argues in favour of limits on the use of animals in experimentation. He argues that "If he is not to stifle his human feelings, he must practice kindness towards animals, for he who is cruel to animals becomes hard also in his dealings with men." (*Duties to Animals and Spirits*) He believed that human beings should be treated not as a means to an end but as ends in themselves. He also argued for animals to receive the same treatment.

At the opposite end of the philosophical spectrum, those that held a consequentialist view (that the rightness or wrongness of an action is determined solely by its consequences) began to question the unrestricted use of animals. Jeremy Bentham (1748-1832), who proposed the theory of utilitarianism, asked how "...a full grown horse or dog is beyond comparison a more rational, as well as a more conversable animal, than an infant of a day, or a week, or a month, old." (*The Principles of Morals and Legislation*, Chapter XVII, section I). The implication being the distinction between animals and humans may not in fact justify the speciesism upon which lay the foundation to justify experimentation on animals. In determining the rightness or wrongness of vivisection "...the question is not can they reason? Nor, can they talk? But, can they suffer?"(*The Principles of Morals and Legislation*, Chapter XVII, section I)

The situation at the beginning of the nineteenth century was one where there was opposition to vivisection just as there were laboratories actively engaged in this pursuit. It was further recognized that humans might have a more extensive duty to animals. Sir Charles Darwin (1809-1882), speaking about a scientist performing vivisection, noted "...this man, unless the operation was fully justified by an increase in our knowledge, or unless he had a heart of stone, must have felt remorse to the last hour of his life." (*The Descent of Man*, Chapter III) Particularly in Europe, this period in history showed the development of various forms of legislation to govern the use of animals in research experiments. This did not, however, appease

the various anti-vivisection groups of the time. Unfortunately, the rate of progress in protection of animals was slowed due to the disagreement between the anti-vivisection groups as to the best way to control experiments on animals. The main issue of contention was that of gradualism versus instant, revolutionary change. This was the same dilemma facing many other issues of the day.

In 1903 in Battersea, a borough in London, England, two female medical students, Liese Schartau and Louise Lind-af-Hageby, witnessed the vivisection of a brown terrier dog. They wrote about the ordeal in their diaries. Eventually they spoke of the experience to the leader of one of the anti-vivisection groups in the area. Battersea was particularly supportive of the anti-vivisection movement and the release of this story definitely offended the sensibilities of residents. The result was the dedication of a fountain, in the Latchmere Recreation Ground, with a statue of the terrier dog. The inscription read: "In memory of the Brown Terrier Dog done to death in the Laboratories of the University College in February 1903, after having endured vivisection extending over more than two months and having been handed over from one vivisector to another till death came to his release. Also in memory of the 232 dogs vivisected at the same place during the year 1902. Men and Women of England, how long shall these things be?"

The medical students at the University College discovered the statue. They took offense at the inflammatory language used. They, in part representing the medical community, believed that vivisection was a very important aspect of medical research. They asked for the plaque to be removed. The citizens of Battersea refused. This led to the Brown Dog Riots of 1907 that saw multiple clashes between university students and the citizens of Battersea. The interesting part about these riots was that vivisection was only adding fuel to an already smoldering fire. The underlying conditions in Battersea were those of a largely unemployed middle class as well as a strong movement to secure the vote for women. Thus the Brown Dog riots symbolized the citizens of Battersea revolting against what they perceived as an unjust and cruel upper class. This illustrates how underlying social conditions have the potential to affect the perception of the use of animals in science.

The beginning of what can be considered the contemporary animal rights activism started in the 1970's. In fact, one incident in particular gave the movement the publicity necessary to vault into the public eye. The people who were involved in the various anti-vivisection groups acknowledged that in order to make progress in limiting experimentation on animals, the movement had to galvanize, unite and mobilize the general public. The movement needed a single, specific target, a focused and achievable goal and, above all, a well-publicized victory. The target was identified in 1976: the American Museum of Natural History in New York City. Oddly enough, one of the museum's departments was engaged in the study of sexual behavior. Their model involved inducing lesions in the brains of live cats and then observing their sexual function. Due to funding received from the United States National Institutes of Health, their research proposals were open to public scrutiny. Experienced labor and civil rights-turned animal rights activist Henry Spira came across this research and readily identified it as just the target the movement was looking for.

By presenting the more sensational aspects of this research to the public, it touched the sensitivities of many cat lovers and the general public in New York City. Demonstrations were held outside the museum and outside city hall and rapidly gained broad public interest and media attention. This exposé succeeded in creating the moral outrage deemed necessary to get the public thinking about the use of animals in research. Due to the onslaught of negative publicity, the museum closed down the research labs in an attempt to mitigate the damage caused by the negative public opinion. It was a victory for the anti-vivisection movement, which up to this point had been restricted predominantly to academic circles. It now appeared the general populace was starting to grasp what the anti-vivisectionists were opposing.

There were several factors that influenced the timing of these events. It was not as if people did not have opinions regarding the use of animals in scientific research before the 1960's. However what was novel was a forum for people to do something about their beliefs by participating in the various animal rights groups. One of the legacies of the 1960's Hippie era was a broadening horizon of moral consciousness. The civil rights and liberty, anti-war, abortion, euthanasia, feminist, anti-racism and anti-nuclear war movements created an elevated sense for general activism. There was also an increase in scientific knowledge at this time. Not only in terms of the ability to put a man on the moon but also in the study of animal behavior. It was becoming increasing clear that the characteristics thought to be distinctly human were actually demonstrated by animals too. This made it more and more difficult to justify experimentation on animals simply because they did not exhibit "humanity". Another aspect, which altered the perception of humans and their interaction with the surrounding world, was the study of ecology and the notion of the intimate inter-relation of all living beings. This was also impacted by the development of environmental sciences as a discipline in its own right. This information showed that humans were rapidly destroying the planet. Perhaps might is not always right.

The net result of the animal rights movement saw the development of a dichotomy of anti-vivisection groups similar to what existed at the turn of the century. The essential disagreement stemmed from demanding gradual change by working within the established bureaucracy versus radical, revolutionary change arrived at through guerrilla tactics. There are several militant animal rights group, such as People for the Ethical Treatment of Animals (PETA) and the Animal Liberation Front (ALF) that perform illegal raids on facilities that conduct experiments on animals. They destroy laboratories and free the animals. There are also peaceful groups that prefer to work within the legislation. The Animal Legal Defense Fund (ALDF) is an example of an organization that is trying to establish basic moral ideas of equality and rights for all animals. This of course has implications for the use of animals for vivisection..

In addition to animal welfare groups, there is also legislation in most countries governing the use of animals for research purposes. Examples include the Animal Welfare Act of 1966 and 1985 in the United States and similar laws in Canada. A further result of the anti-vivisection movement is that animal care committees are standard at all research facilities. They oversee all experiments involving animals. In addition to reviewing all applications for experiments using animals, they enforce guidelines and standards of care that have been painstakingly developed to justify using these animals. These guidelines are set to ensure animal pain and suffering is kept to a minimum. The experiment proposal review is conducted in order to assure the experiments

are justified. This justification must show a balance in terms of the harm done to the animals against the potential gain of new information, the acquisition of which will lead to advances in human health.

In the new millennium, there are many challenges facing the vivisector. So far it has been the anti-vivisection movement that has made the most significant gains in terms of public support. At some point, the researchers conducting experimentation on animals must make their vital contributions known. Although technology has made research more powerful, it poses a major obstacle for the researcher. Arguments have been made that computers can be programmed to perform simulations of body processes. This would, anti-vivisectionists might argue, eliminate the need to use live animals to test scientific theories or drug safety and efficacy. Although simulations may have a role in limiting the numbers of animals used, there is an issue as to whether a computer can capture all the complexities of a living system. It will not yield the crucial safety information for drug doses nor will it show any unanticipated physiological adaptations or adverse reactions.

People engaged in animal experimentation face a tough road ahead. The information they provide is crucial to medical progress yet the public has little knowledge of what is actually done and why it is done. Here lies the problem. If a researcher is to take a pro-vivisectionist stance, they identify themselves as a target for the more militant anti-vivisection groups. Most researchers readily accept the animal care committee regulations. They are often the most vocal supporters of legislation to govern the use of animals for research. Nevertheless, there is a difficulty in developing the justification to do the experiments. There exists a continuum of beliefs in regards to how animals are defined, what is the duty to these animals and what types of experiments justify their use in medical research. Most researchers opinions and beliefs lie somewhere within the troubled middle ground. There is an acceptance for the need to use animals although this use should be judicious. Ultimately, there is little upon which to base the ethical rightness or wrongness of this judicious use.

There has not yet been developed an effective ethical framework by which to evaluate experiments on animals. Perhaps the first step is to accept the notion of speciesism without a normative valuation. Just as the cheetah on the Sahara kills the antelope, humans must use the environment around themselves to survive. This does not condone random, irrational experimentation on animals. However, it should leave the possibility of ethical goodness for those experiments that have a justifiable and demonstrable benefit for medical research.

Irrespective of their personal beliefs, people use information everyday that has been generated from experiments done on animals. As members of the medical community we have a positive duty to inform ourselves about both sides of the debate.

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ETHICAL DILEMMAS WITH THE USE OF NAZI MEDICAL RESEARCH

By

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ABSTRACT

During the Second World War, Nazi physicians conducted medical experiments on concentration camp victims. No consent was obtained. The experiments resulted in harm to the subjects, or even death. Further, these subjects were treated cruelly and had no hope of ever benefiting from this research. The nature of the experiments conducted by the Nazi doctors raises a number of ethical issues with respect to research protocol.

There will be a discussion of the various types of experiments performed during the war, their purpose and their potential current applications. In an effort to determine the appropriateness of using this data today, one must consider ethical principles involved in conducting research on humans. Some of these principles were first outlined in the Hippocratic Oath which was intended to guide every physician to provide the best possible care and treatment of their patient. More recently, human research guidelines have been formally documented in the Nuremberg, Helsinki and Tri-Council of Canada Codes. Subsequent to the publication of these documents, a major concept known as clinical equipoise was introduced to medical literature. The ethics of Nazi experimentation will be examined using these criteria.

In addition to the primary focus of Nazi medical research, parallel examples from more recent times will be discussed. This will serve to challenge the reader to explore his/her feelings as to how far the ethical limits of research process can be pushed. At what point is the use of information obtained by unethical means invalid?

Examples of Nazi Medical Research

1. Military Research

A series of Nazi experiments were conducted in order to explore mechanisms of coping with the medical and physical challenges facing German soldiers during WWII.

(a) Hypothermia Experiments

The hypothermia experiments were intended to obtain information that would better equip German soldiers to cope with freezing temperatures on the battlefield. The goals were to determine the length of time required for the onset of hypothermia as well as effective methods for recovery. Concentration camp prisoners were either placed into an ice vat or left outdoors naked in the bitter cold. Those placed in the ice vat were first required to remove their clothing and then had an insulated probe inserted into their rectums to monitor changes in core body temperature. In both experimental conditions, subjects were left in freezing conditions until loss of consciousness or death ensued. It was found that most subjects died once their bodies dropped to a temperature of 25 degrees Celsius.

Several strategies were tested to determine the best method of re-warming an individual following an episode of hypothermia. One method involved placing subjects under sun lamps. These lamps were, however, so hot that they would often burn the subjects' skin. There is an account of one individual who was repeatedly cooled to unconsciousness and then re-warmed by the heat of the lamps. After several repetitions he died. Another re-warming strategy involved "internal irrigation". The frozen victim would have boiling water forcefully administered to the stomach, bladder and intestines. All subjects receiving this treatment died. The third strategy involved placing the frozen subject in warm water and slowly increasing the temperature. This was the method that proved to be the most effective and it was demonstrated that if the water was warmed too quickly, the subjects would die of shock. The fourth and final strategy employed body heat. Women were used to warm the frozen men through coitus. While somewhat effective, it was reported by the Nazi doctors to be less effective than the warm bath.

(b) Sulfanilamide Experiments

Gas gangrene was another major cause of soldier casualty. The Nazi doctors wanted to find a medical or chemotherapeutic strategy to treat this condition, as an alternative to the surgical technique being used at the time. Sulfanilamide seemed to offer potential for this purpose. In order to test its efficacy, battlefield wounds were re-created on Jewish concentration camp victims and the wounds were deliberately infected with bacteria including Streptococcus, Clostridium and Tetanus in an effort to reproduce the wounds typical of those experienced by the German soldiers. Additionally, blood circulation to the wound was cut off to further mimic the injury.

(c) Tuberculosis Experiments

The researchers sought to determine whether any natural immunity to Tuberculosis existed and to develop a vaccine for Tuberculosis. Live tubercle bacilli were injected into subjects' lungs in an attempt to immunize them. The axillary lymph nodes were then excised to evaluate the effectiveness of the vaccination. Approximately 200 adults and 20 children died as a result of these experiments.

2. Genetic Experiments

(a) Twin Experiments

Dr. Joseph Mengele, a particularly notorious Nazi physician, had a fascination with twins and dwarfs. His intention was to reveal the "secret" of multiple births and utilize this knowledge to further the Aryan race, which he regarded as superior. Upon arrival at the concentration camps, Auschwitz in particular, twins (and dwarfs) were immediately taken to barracks reserved for experimental subjects. Mengele conducted a thorough and detailed examination of each twin comparing physical characteristics. To this end, the twins were forced to stand naked in uncomfortable and humiliating conditions and positions for hours, even days. Extensive photographs and radiographs were taken for analysis and record-keeping. Moreover, twins and dwarfs were subjected to many cruel and painful experiments. For example, during a urologic examination performed on 18-year old twins, tissue samples were taken from their prostates, kidneys and testes, without anaesthetic. Upon the completion of the experiments, subjects would be killed by an injection of chloroform to the heart. The bodies would then be dissected for further analysis.

(b) Racial Analysis

Groups of Jewish concentration camp inmates were gathered and gassed. Their bodies were then taken to be dissected. Their anatomical structures were examined and analysed and comparisons were drawn to the physical characteristics of the Aryan race. The purpose of these experiments was to distinguish between the "superior" physical characteristics of the Aryan race and those of the "inferior", non-Aryan races.

(c) Sterilization Experiments

Various experimental sterilization techniques were employed in order to determine the most effective and economical method in both men and women. Strategies included genital mutilation and injections of toxic substances into a woman's cervix or uterus. This latter technique resulted in significant pain, ovarian inflammation, hemorrhage and stomach spasms. In experiments of male sterilization, testicles were subjected to large doses of radiation and the men were subsequently castrated to determine the resultant pathological change.

What Benefit Could This Research Afford Today?

It has been argued by many that medical research conducted during the Holocaust could provide unique and valuable information that could not be obtained today with current ethical protocols. This information could potentially lead to an increased understanding of disease processes, treatments and ultimately an improved quality of life. For example, Dr. Robert Pozos, the director of the hypothermia laboratory at the University of Minnesota of Medicine at Duluth, seeks to find optimal methods of re-warming hypothermic patients who present to the emergency department. He and his colleagues have had to rely largely on a trial-and-error system in attempting to treat. He feels that access to information gathered in the Nazi hypothermia experiments would provide otherwise unobtainable information that could save the lives of

many. Currently, animal experiments provide the only insight into managing this medical condition. As a second example, Dr. Berhard Bogerts, a neuropsychologist, collects brain specimens to compare the brains of normal versus schizophrenic individuals. In the course of his research, he came across specimens that were likely obtained through Nazi experimentation. The use of these brains and other specimens obtained during the Nazi period could clarify pathological changes resulting from various diseases and exposures. While the methods used can, of course, not be condoned, one might argue that use of the data in the aforementioned examples could allow for some societal benefit to emerge from a tragedy. Given that the injustice suffered by the victims of the Nazi experiments cannot be undone, use of the research results may mean that those involved in the experiments did not suffer entirely in vain.

Current Ethical Codes and Principles as Applied to Human Research and Related Ethical Dilemmas

1. Nuremberg, Helsinki and Tri-Council of Canada

The Nuremberg Code was drafted in 1947. Its most significant contribution was establishing the necessity for voluntary consent on the part of research participants. "Consent" includes that the subject be fully informed about the nature of the experiment and its potential outcomes and that this consent is given freely. The subject must be free to discontinue his/her participation at any time. Additionally, the Nuremberg Code requires that researchers do their utmost to avoid harm and suffering to the subject. If, during the course of the experiment, it becomes apparent to the researcher that harm is likely to result, he/she is obligated to terminate the experiment.

Many medical researchers in the 1950s and 1960s regarded the Nuremberg Code as lofty and idealized. The Helsinki Declaration of 1964 outlined more practical and applicable guidelines for obtaining subjects' consent. It encouraged researchers to obtain the written consent of the subjects. It differentiates between clinical experiments that are conducted for therapeutic purposes on patients versus non-therapeutic research conducted on healthy subjects. The guidelines for the latter were more stringent. Additionally, the Helsinki Declaration requires that a mandatory appointed committee independent of the researcher and sponsor be involved to approve a proposed research project involving human subjects. If the subject could not provide consent, the Helsinki Declaration introduced the idea of third party permission from a legal guardian. The interests of the subjects must always remain a priority. Only research that adheres to the Helsinki Guidelines is eligible for publication.

More recently, the Tri-Council of Canada (1998) drafted a document that expands on the ethical principles outlined in the Nuremberg and Helsinki Codes. This document seeks to ensure that a respect for human dignity is maintained. Human dignity includes the protection of the bodily, psychological and cultural integrity of the individual. The confidentiality and anonymity of the subjects is also a basic requirement. Any committee involved in the ethical approval of a given research project must have a pre-determined method and standardized assessment. In an effort to minimize harm, the Tri-Council of Canada encourages the inclusion of the fewest number of subjects and investigations necessary to ensure scientific validity.

The Nuremberg, Helsinki and Tri-Council of Canada Codes were designed to uphold the integrity and dignity of research subjects. They formalized the imperative that subjects' rights must always remain paramount to the needs of society and medicine. No hint of the ideas expressed in the above-mentioned codes exists in the Nazi experiments in that no consideration was given to the subjects. They were seen as "pawns" in the Nazi experiments. The Nazi movement's belief that Jews, Gypsies and homosexuals were "metaphors for disease" (Lerner and Rothman, 1995, p. 793), were subhuman and, therefore, not worthy of existence justified the subordination of the subjects in their minds.

In judging the actions of the Nazi doctors, many turn to the various ethical codes now in existence. However, current ethical standards for research involving human subjects were not yet codified by WWII. Further, patient consent as a prerequisite for inclusion in research was given little attention prior to the war. With this in mind, can one reasonably hold the Nazi experimenters accountable for breach of their ethical responsibilities as physicians? Can one dismiss their research findings on this basis alone? In reflecting on these issues, consideration must be given to the fact that some formal research principles were in place. For example, in 1931, the German Minister of the Interior created guidelines which "included the requirement for unequivocal or unambiguous consent from patient subjects". (Katz, 1996, p. 1663) Were the Nazi doctors unaware of these guidelines? Did existing guidelines have the same degree of significance at the time as post-war protocols do today?

2. The Role of the Physician

> "...That into whatsoever house I shall enter, it shall be for the good of the sick to the utmost of my power, holding myself far aloof from wrong, from corruption, from the tempting of others to vice;
>
> That I will exercise my profession solely for the cure of my patients and will give no drug, perform no operation, for a criminal purpose, even if solicited, far less suggest it."
>
> (excerpt from Hippocratic Oath)

Physicians have been guided by the principles of the Hippocratic Oath for over two thousand years. However, during WWII the Nazi doctors violated virtually all of its concepts. " It is no exaggeration to declare that the greatest blot on the record of medicine in the 20th century is the role played by the German physicians in the Nazi era." (Lerner and Rothman, 1995, p. 793). The actions of the Nazis stood in marked opposition to the very essence of what is seen to be a physician's role. In Nazi medical research "...the doctor turn[ed] into a licensed killer and publicly employed torturer…his aggressive search for the truth met with the ideology of the dictatorship." (Aly et. al., 1994)

By 1937, 45% of physicians belonged to the Nazi party. This was seven times the average frequency seen in other professions. Most of these physicians believed in Nazi supremacist ideals and accepted the protocols of Nazi racial hygiene. The "Racial Hygiene Movement"

sought to halt what was seen as the beginning of the degeneration of the human species. This was to be accomplished by "cleansing" the Aryan race of "inferior" peoples, namely Jews, Gypsies and homosexuals.

In the Nazi physician's defense, it has been said that "The German medical profession had been indoctrinated for more than a decade by the Nazi Party apparatus, with relation to its special role in healing the country and in applying a radicalized eugenics to cleansing the *Volk* of inferior elements". (Barondess, 1996, p. 1660) The "Racial Hygiene Movement" began before the turn of the century and in the 1920s it became a widely accepted component of medical science. By 1932, formal courses on racial hygiene were taught in most German medical schools. In addition, physicians involved in the Nazi party benefited from government support, both financial and otherwise.

> "Thus, the physicians could believe what they were doing was right…The physicians were operating in a social subsystem that had been enfranchised, in fact exhorted, and in many instances required by the state to engage in these atrocities. At the level of the individual, some type of psychologic defense mechanism must have been required; the extent to which this embraced elements of 'doubling', or repression, or other phenomena remains unclear." (Barondess, 1996, p. 1660)

Since the Nazi physicians were so deeply embedded in this supremacist culture, can one expect that they would be able to clearly see how their values strayed from the Hippocratic Oath which they had once sworn?

Of the 45% of German physicians belonging to the Nazi Party, one may assume that many chose to become involved primarily out of fear. During WWII, a failure to comply with state requests often resulted in penalty and/or death not only to the individual but also to his/her family. In an effort to protect themselves and their families some physicians who were opposed to Nazi doctrine may have, nonetheless, chosen to involve themselves.

Although the actions of the physicians cannot be excused, an understanding of the circumstances under which they were operating may allow one to overlook the overt ethical problems in the research process and utilize the research data. However, accepting such behaviour may set a precedent for future physicians who find themselves under duress.

3. Clinical Equipoise

"Clinical Equipoise" is a modern ethical principle defined by Benjamin Freedman in the 1980s. It builds upon the basic concepts established in the Nuremberg and Helsinki Codes and is now regarded as an essential component of any research experiment. It states that the potential for benefit to the subject must be equal to or greater than known benefits of existing treatments. In the research design, uncertainty must exist as to which treatment group is receiving optimal therapy. If it is clear that one treatment alternative is superior, clinical equipoise does not exist.

Clearly, no clinical equipoise is to be found in any of the research conducted by the Nazis. The Nazi experiments failed to comply with any components of Freedman's concept. In fact, "Most of these experiments were conducted with the expectation that the inmates would die, and hundreds did." (Barondess, 1996, p. 1660) In the Nazi research there was never any foreseeable benefit to the subjects and, as such, clinical equipoise could not even begin to exist.

Scientific Validity of the Experiments

Some doubt has been cast upon the scientific validity of the Nazi medical experiments. Several problems have been noted with regards to research design. The study sample was not representative of the individuals to which the information was to be applied. Due to the physical, emotional and mental state of these wounded, malnourished, and mentally tortured victims, the various experimental results likely did not reflect those of a normal, healthy individual. Further, the Nazis harboured biases that may have led them astray. In the attempt to find results consistent with Nazi ideology, objectivity was lacking. In good science, one must establish a hypothesis that is either proved or disproved. These physicians, however, had arrived at a conclusion even before the experiments were initiated. Lastly, results were not published and therefore had no opportunity to be scrutinised by peer-review for accuracy and scientific validity.

Related Cases

Subsequent to the Nazi experiments, many other scientific studies have been conducted that have also violated the core ethical principles of informed consent and clinical equipoise. An example might be the well-known Tuskegee experiments. However, the information obtained through some of these studies has already been used and applied in current practice. In other cases, the information has been gathered with the intent to apply the data in the near future. If Nazi data is rejected on the premise that ethical principles of research were violated, does it follow that all other useful information obtained through questionable methodology, and particularly questionable ethics, is also null and void?

Some examples follow:

(a) In the late 1960s in Montevideo, Uruguay, a well-known obstetrician named Roberto Caldeyro-Barcia conducted experiments tracking fetal progress during labour. He placed a recording device on the abdomens of women in labour in order to measure both intrauterine pressure and fetal heart rate. He then correlated recorded patterns with clinical outcomes. To ensure the scientific validity of his study, Barcia was required to permit the labour to run to completion. This allowed him to determine if certain findings were consistently predictive of fetal distress and/or birth complications. Due to the lack of intervention, many fetal deaths resulted. However, Barcia's experiments demonstrated the usefulness of fetal monitors that are currently used worldwide and continue to save the lives of thousands of babies.

(b) In 1976, John Moore was diagnosed with hairy-cell leukemia at the University of California at Los Angeles. The recommended treatment was a splenectomy. Mr. Moore provided written consent for this procedure. However, the physicians performing the surgery were aware that the

tissues obtained through the surgery could be used for the development of new pharmaceutical agents. The written intent to capitalize on this potential was outlined/documented before the outset of the surgery, though Mr. Moore was neither informed of these plans much less did he consent to it. In fact, he was led to believe that his repeated visits to the clinic in Los Angeles were purely part of his medical therapy.

Following the splenectomy, his cells were used to derive a new cell line that was then sold to a pharmaceutical company to develop a monoclonal antibody product. The pharmaceutical company agreed to pay the physicians involved a sum of $330,000 over three years.

(c) In a similar, more recent case, the Alder Hey Children's Hospital in Liverpool, England engaged in the selling of paediatric thymus glands. The thymus glands were removed during complex heart surgeries performed on hospital patients. Without obtaining parental consent, these organs were sold to a pharmaceutical company for research purposes in return for financial donations. Ultimately, this research would be used to improve treatment options.

As was the case with the Nazi data, the information obtained in the above-mentioned cases was gathered unethically. In the case of the Barcia experiment, data collection was continued even when it was clear that harm would result to the fetus. Currently, fetal monitors are of great benefit to thousands, even millions. Does this situation parallel the Nazi case? If it does, must we either reject fetal monitors or accept the Nazi data? In considering this question, is it relevant that Barcia's experiment involved acts of omission whereas the Nazi experiments involved acts of commission? Does actively causing harm have more severe ethical implications than merely failing to act?

In the Moore and Alder Hey cases, the primary ethical violation was a failure to obtain consent. However, if used, the products yielded from the research could benefit many. Do these situations parallel the Nazi case? Is it ethical to use products derived from the Moore and Liverpool cases? Does an affirmative answer to this question imply that use of Nazi research is justified?

Conclusion

Appropriate ethical standards for human research are now well established and widely accepted. The central question remaining is whether it is appropriate to use research data collected in an unethical manner-whether in the extreme situation, as in the Nazi case, or with more minor violations of ethical protocol. To what degree must ethical principles be violated for research to be considered invalid and unusable? Can one ever make exceptions and use research data obtained in an unethical manner? If exceptions are made, how can one "draw the line" so as to safeguard human integrity and the credibility of ethical protocols? In considering the possibility of granting an exception, does a minimal amount of benefit to society have to be achieved?

In Rome in 1952, Pope Pius XII addressed a group of international medical researchers. He strongly supported the principle of obtaining consent from human research subjects. With reference to the Nuremberg Codes, he stated that "man should not exist for the use of society; on

the contrary, the community exists for the good of man." (Faden et al., 1996, p. 1669) By rigid adherence to established ethical principles as has been defined over the past fifty years, not only will scientific research be more valid, but society will treat research subjects more humanely and justly.

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WHY DEFINE DEATH? BRAIN DEATH AND ORGAN SUPPLY

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ABSTRACT

In the 42 years since Canada's first kidney transplant, transplantation medicine has made gains in terms of both success and donation rates. The introduction of brain death criteria in 1968, beyond which the body is deemed incompatible with sentient life, heralded an era of fresh organs accessible for replacements and the potential for more procedures and higher success rates.

The criteria for death have been revised and promoted several times, often involving removal and liberalization of diagnostic tests, expanding the potential donor pool. Over the long term, the annual number of transplants has increased. This may have resulted from more liberal pronouncements of death, but increasing public awareness of organ need and procedural success are likely important factors. This study elaborates the history of brain death criteria in Canada and how it impacts organ supply. During years when the criteria for brain death were made more lax (1975 and 1987) or use of the criteria was more enforced (1991), we observe unanticipated declines in actual transplant numbers. There was also no significant change in the growth rate of annual kidney transplant numbers, contradicting the hypothesis that expanded potential donor pool should increase organ supply.

Redefining brain death may be motivated by donor pool expansion, but every recent revision to more liberal criteria acutely reduced transplant numbers. Indeed, both the public and physicians expressed mistrust about the motivation behind such changes and further insist that that the definition of death should not be a tool to serve social needs.

Introduction

While technically advanced at the turn of the millennium, transplantation in Canada was characterized by among the lowest organ donation rates among developed countries. In the past, this situation has been attributed to the limited procedural success. However, low rates persist despite excellent graft and patient prognoses, and one must question what else can be done to raise donation rates so that organ demand can be satisfied in the current setting of public reluctance to participate. The novel definition of brain death in 1968 to be diagnosed clinically by a neurological exam potentiated extraction of fresh organs, but revisions to these criteria that

have had the effect of expanding the potential donor pool has met criticism from those asserting that death is not a tool to serve social utility.

Has the redefinition of brain death positively affected organ supply? This must be answered in terms of absolute changes in procedure numbers as well as population-adjusted annualized growth rates to ascertain whether the expanded potential donor pool affected society's mentality above and beyond other factors such as procedural success and public education. This study elaborates the history of brain death criteria in Canada and how it has affected organ supply. The criteria for brain death have been changed several times, and the annual number of transplants has increased in the long term. However, years when the criteria for brain death were made more lax or use of the criteria was more enforced, despite being medically valid, were found to evidence declines in actual transplant numbers. Controversies surrounding these revisions will be outlined and other viable methods of increasing donation will be examined.

Death and Brain Death

Advent of intensive care units brought to light the distinction between biological death and the end of the person. Previous to this, circulatory, ventilatory, and brain function were irrevocably linked because failure of one system inevitably leads the others to fail. Now, the ability to maintain circulation and ventilation to perfuse the body with oxygen raises the question as to when someone can be defined as dead. The reasons for this are in the necessity to free up medical resources as well as to assess the moment at which it is ethically permissible to remove organs from a cadaver. While this new notion of death must be ascertained by those unrelated to the transplantation team, this motivation of earlier organ procurement has been recurrently stated in the literature outlining guidelines for the diagnosis of brain death, thereby inextricably linking the two in the public eye.

Following irreversible loss of brain function, all other organs will inevitably cease to function. The integrative function that characterizes human thought, action, coordination, and reaction is not recoverable. As such, the medical basis for the diagnosis of brain death lies in that the recognition of this loss of function is doing little more than stating overtly the reason underlying the traditional diagnosis of death in the setting of inadequate perfusion. A legal basis for this definition exists to protect physicians from litigation subsequent to terminating resuscitative measures with the diagnosis of brain-death.

Society is not so quick to accept such changes. History is fraught with examples of periodic fear about false-positives in ascertainments of death. It was popular among the affluent in the eighteenth and nineteenth centuries for coffins to be equipped with special ventilation and complex bell-signaling mechanisms to allow the presumed dead to survive and to alert others if they revived. It is from this fear that sprouts the mandate of any attempt to define brain death in Canada:

- Eliminate errors in misdiagnosing living people as dead
- Minimize errors in misdiagnosing dead people as living
- Minimize unreasonable delay in diagnosis

- Adaptability over a wide range of scenarios, hence must be largely clinically defined
- Signs must be explicit to allow for verification without controversy

Criteria for brain death in Canada were established by the Canadian Neurological Society and the Canadian Medical Association congruent with those suggested by the Ad Hoc Committee of the Harvard Medical School in 1968. Death is newly defined as the irreversible cessation of circulatory and respiratory function that, in the presence of artificial means of life support, can now be assessed by the absence of brain stem and cerebral function. The stated reasons for such changes involved an endpoint at which resuscitative and supportive measures maintain a beating heart with an irreversibly damaged brain and facilitation of obtaining transplant organs. The diagnosis of death must be confirmed by two physicians unrelated to the transplant team for this would be akin to conflict of interests in law or collusion in business. The cause of coma must be established and the potential for recovery excluded. Criteria involve unreceptivity to external stimuli and unresponsiveness to noxious stimuli, no spontaneous movements over the course of one hour, no brainstem reflexes (pupils, VOR with 20 mL ice water, corneal, pharyngeal), no stretch tendon reflexes, apnea despite disconnection from the ventilator for 3 minutes, and isoelectric EEG. Hypothermia and CNS depressant medication must be excluded as etiologies.

Since the publication of the first criteria for brain death (1968), there have been four notable occasions when the criteria were changed. Guidelines were made more lax (1975), revised (1987), use of the criteria was more enforced (1991), and paediatric criteria were introduced (1999).

Between 1975 and 1976, changes occurred regarding EEG, apnea, spinal cord reflexes, and protocol. EEG was no longer a necessary component of the diagnosis, but simply a confirmatory test. A case series with 1000 isoelectric EEG patients and 147 patients with persistent activity, all of whom met the clinical criteria for brain death, demonstrated that all experienced cardiac arrest within a few days. While the test may identify patients with persistent neuronal activity, it is not a predictor of outcome once brainstem function is clinically absent. Spinal cord reflexes, based on a reflex arc not involving the brainstem, may persist after brain death is clinically determined and hence their persistence does not contravene the declaration of death. Apnea testing became far more defined to include withdrawing ventilator support with a pCO2 between 40 and 45 mmHg and waiting for at least a rise in pCO2 to 50 mmHg to induce respiration. Given that this may take time, the patient is oxygenated through at endotracheal tube catheter for tissue protection. The last change involved mandating that the assessment by the second physician must be made at least 24 hours after the first.

The 1987 revision made the criteria more stringent but made the protocol more lax. Testing for vestibulo-ocular reflexes was now performed with 120 mL of ice water in order to exclude the possibility of a blunted response in lieu of a complete absence of brain stem function. The second physician's assessment was now only required to occur between 2 and 24 hours after the first.

In 1991, the Canadian Neurological Society and the Canadian Medical Association encouraged more education and physician responsibility concerning brain death. This was in

response to assessments of the incompetence of nearly 1/3 of physicians to correctly apply the brain death criteria in an ICU setting, as well as the perception of nonequivalence between personal death and brain death. A *CMAJ* editorial strongly suggested that ICUs integrate checklists and protocols to ensure that all tests be performed correctly and that neurological death be equated with personal death. Many anesthesiologists noted time of death as when the patient was removed from the respirator, but new protocols established time of death as the moment neurological function had irreversibly ceased.

The most recent revision, 1999, involved the inclusion of brain death criteria for neonates, infants, and young children. Adult criteria can be applied to those patients older than 1 year. Patients older than 2 months should be evaluated with a minimum of 12 hours between assessments, and those full-term infants less than 2 months should have 24 hours between examinations. All patients less than 1 year should also have radionuclide scans to evaluate cerebral perfusion. To date, no criteria have been elaborated for preterm babies.

Objections and Controversies

Expansion of a donor pool by a more liberal definition of death is expected to herald public controversy fearing uncertainty about end-of-life care. In the short term, the reluctance met by the criteria precision caused a paradoxical decline in the number of transplants performed. In the long term, while total transplant numbers rose, there was no significant increase in the annual growth rate from the previous to the new regulations. These data suggest that while the potential donor pool may be enlarged, there is minimal tangible benefit in organ supply. Much of this is due to public reluctance to accept such changes manifested in exercising the right to not become donors. The controversies surrounding such mistrust are now outlined:

An important distinction is the non-equivalence of death and terminal illness, of prognosis and current status. While there are no adequately authenticated incidents in which subjects meeting all of the criteria for brain death have recovered, the controversy also exists that brain-death is an implication that the patient's condition is irreversible. Indeed cardiac arrest occurs usually between 48 to 72 hours of brain death and thus the diagnosis is akin to that of terminal cancer where death is certain but not yet present. Indeed, a brain-dead pregnant woman was maintained from 22 to 31 weeks gestation to give birth to a viable infant and the question arises as to whether she was alive or simply an incubator. Similarly, blood pressure responses to surgical incision and spontaneous esophageal constriction were noted in a series of patients, and it was suggested that current criteria are not intended to identify the functional incompetence of all brain stem neurons, but rather to confirm the irreversibility of brain stem damage. Social utility to harvest organs and free resources must not be put ahead of medico-ethical considerations, but one must also be aware not to equate biological life of human organs with human personal life experience. The residual body function is devoid of the brain's integrative function.

Means of artificial life support were introduced with the expressed purpose of sustaining life by supplying the body's needs when function was lost but structure remained intact. Indeed, mild hypoxic crises leading to transient ischemic attacks by definition cause reversible changes in brain cells leading to loss of function but preserved structure such that normal function can be

resumed with restoration of blood flow. Clinical assessment is insufficient to ascertain that irreversible changes have occurred and that recovery is impossible. Proponents of brain death state that it is the integrative function and not structure alone that defines brain activity; and that while cells may be alive, the capacity of the brain to act as an integrator cannot be resumed after prolonged periods of functional inactivity.

A danger arises when society maintains two tiers of death: a traditional definition for most people, and a more lenient definition in those from whom organ procurement is being considered. The end of life must be uniquely established so as to foster trust in the quality of care provided to those who are acutely ill. The definition of death in Canada involves the irreversible cessation of a person's brain function assessed either by the absence of spontaneous circulatory and respiratory drive, or if this is confounded by the use of artificial life support, then by brain death criteria. It thus becomes apparent that death in both cases is being diagnosed as the irreversible process rather than the precise moment and that the conventional dichotomy separating the two means of diagnosing death is invalid.

There is philosophical support to the higher-brain centre equation of death. Descartes, in expressing "*I think therefore I am*," would suggest a separation between mind and body. An Aristotelian perspective would reinforce the same:

> *Now I say that man, and in general every rational being, exists as an end in himself and not merely as a means to be arbitrarily used by this or that will. Beings whose existence depends not on our will but on nature have, if they are not rational beings, only a relative value as means and are therefore called things.*

Implicit is the assertion defining humanity by the ability to think, choose, and interact with one another, and that the absence of such capacity carries the implication of the end of human life. There is a danger that this could lead to idolizing intellectual capacity and bring into doubt the human status of the seriously mentally retarded. On a practical level, any such system would difficult to implement as it would require a widespread change in public attitudes to accept a breathing person as dead.

Transplant Statistics – Results

Transplant numbers from 1981 to 1999 were available from the Canadian Organ Replacement Register, and data from 1969 to 1978 were obtained from the Surgical Procedures and Treatments series from the Health Division of Statistics Canada. Population data for Canada were available from the British Columbia Ministry of Finance and Corporate Relations. This allowed for correction of procedure number growth for an expanding population. Donation rates were only available from 1990 onwards hence requiring the use of absolute and population corrected transplant numbers. World donation rates for 1999 were compiled by Spain's Organizacion Nacional de Transplantes.

When tracking the absolute and population-adjusted number of transplants performed between 1969 and 1999, one sees a consistent growth. The correlation of increase with time is $r^2 = 0.965$ and a slope of 56 more transplants per year. The annual relative increase in population-

adjusted transplant rates has a geometric mean of 1.067 or 6.7%. During years when the criteria for brain death were made more lax (1975 and 1987) or use of the criteria was more enforced (1991), we observe acute paradoxical declines in actual transplant numbers. There was also a significant decrease in the subsequent growth rates of annual transplant numbers from 13% in the 1970s and 1980s to approximately 5% in the 1990s. Between 1995 and 1999, transplant growth rates did not vary significantly from population growth rates (1.2%). These data suggest that while the potential donor pool may be enlarged, there is no tangible benefit in organ donation. Although redefining brain death may be motivated by donor pool expansion, every recent revision to more liberal criteria acutely reduced transplant numbers and further reduced future growth of transplant numbers.

Nevertheless, over the last 30 years, the long-term rise in annual transplant numbers has a geometric mean of 6.8% per year, but Canada's growing population cannot alone explain this. A survey questioning motivation for organ donation in Canada cites the increasing success of transplant operations between 70% for intestines to 95% for kidneys shifting from an era of research to one of relatively widespread therapeutic, intervention as the most influential factor in donors' enthusiasm. Current underestimating of the procedures success thus defines a role for the distribution of information to the public regarding the need and therapeutic benefit of transplants. Conversely, patients and families cite the importance of improving physician approach to requesting organ donation; and both the public and physicians have continued mistrust about the motivation behind revisions in brain death criteria insisting that that the definition of death must not a tool to serve social needs.

Alternative Methods

As a nation, Canada defines itself by a system of universal health care where no patient in need is turned away; and Canadians are often describe as "unarmed Americans with health insurance" emphasizing society's expectation of the health industry. Having said this, Canada's organ donation rates of 14.8 per million is among the lowest in the developed world with less than a half of the participation of the world leader, Spain, of 33.6 per million. When limited supply of organs is overwhelmed by excessive demand, one must question what strategies may help satisfy the transplant needs in Canada. This approach must be two-pronged: to affect societal decision and to improve physician participation.

Society

Changing society's values is difficult and those who are firmly against donating their organs by religious, moral, or familial convictions must be respected. However, there is concern that those who might want to participate in such a process are unable to do so.

The public must be educated and induced to discuss organ donation with family. This is not meant to increase the pool of those who want to donate, but rather facilitate the process for those who have already decided. If the deceased patient's wishes were known, nearly 92% of families give consent whereas this is substantially lower at 53% if no discussion of organ donation had taken place. Similarly, approximately 60% of those who consider themselves donors believe that only signing a donor card is necessary, and only 10% realize the importance

of informing their next of kin who will be equally responsible for confirming their wishes to the physician. Austria, Belgium, and France have instituted "presumed consent" system with the option of opting out; and, while there is no correlation with higher donation rates, their annual growth rate has been positively affected. This system would force consideration of organ donation amidst the public, 38% of whom in Canada do not sign either way on their organ donation cards.

The public understands the need for transplantation, and procedural success as a therapeutic modality rather than a temporary cure is often cited as motivation to donate. A well-informed public, involving addressing the 50% of Canadians between 16 and 20 years who haven't considered donation, is essential to improving the low donation rates. Again, this population would not be switched to donating, but rather be presented with the information they demand for making the decision.

Incentives to make organ donation personally attractive to those who currently deny participation must be considered. Over 50% of Canadians support incentives as a means of increasing organ supply, and the most attractive of these is a "preferred status" incentive whereby those who are willing to donate are also given higher position on waiting lists. Small financial incentives have increased numbers of donated organs in Quebec as a response to falling rates in the early 1990s. Non-tangible incentives for families to consent to harvesting include positive hospital experiences, being given enough time to acknowledge brain death, and the physician's attitude and approach.

Physicians

Fewer than 2 of every 3 physicians in Canada acknowledge the equivalence of brain death with death of the person, and only 63% of physicians and nurses involved in patients who could be declared brain dead were able to correctly define the diagnosis. Furthermore, only 35% were able to correctly identify the legal death status of patients in two hypothetical case scenarios. Given the public controversy surrounding the acceptability of brain death as death, it is important that physicians stand competent and united in the perception of end-of-life definitions. In 1991, the Canadian Journal of Neurological Science and the Canadian Medical Association promoted ICU protocols to ensure that tests be complete to preclude any misdiagnosis. The need for education thus extends to physicians who must be ready be able to correctly declare death by neurological criteria.

Physician responsibility for requesting organs from next of kin demonstrates a marked lack of congruence between accepted medical standards and actual practice. Physicians often claim that the emotional demands and the increased strain of such interaction on the grieving family limits their participation in organ procurement. This discomfort of the physician has been shown to make families less likely to give consent regardless of the patient's requests, and perhaps improved communication between families and doctors would potentiate better results from a required request system. These claims could not be more askew as the public expects to be presented with the option of donation, and those who do not wish to donate organs recognize the physician's responsibility to health at a societal level for seeking consent from next of kin. Often, donor families stated donation to be positive experience and helps in the grieving process

and feel robbed when this option is not presented. The introduction of "required request legislation" in New York State resulted in acute 23% increase in kidney donation and 58% increase in eye donors. When will the first knowledgeable family bring a lawsuit against a hospital for failing to satisfy this expectation? The concern over aggravating the grieving process is valid, but misunderstandings about the gap between performance and expectation must be addressed. Such empowering of physicians with new responsibility was the target of Spain's endeavours to avoid the stagnation in donation rates that characterized the rest of the world in the 1990s, and instead more than double to boast the world's highest participation rate.

Changing clinical practice could be one approach towards further bridging this gap. An Illinois study involved perfusing trauma patients who die in the emergency department and then asking the next of kin about donation. This pilot consisted of 21 families and uniform donation was the result. In England, elective ventilation in the ICU of patients dying of CVA in the general ward was followed by request of the patient's family to donate. In 1989, the Royal Revon and Exeter Hospital instituted this policy and fostered a donation rate of 37.5 per million compared to the national average of 14.6 per million.

Conclusions

A crude perspective on death suggests that "*A man is dead when he has undergone irreversible changes of a type that makes it impossible for him to seek to litigate."* (Medawar, 1957) From philosophical prehistory to mid-twentieth century declarations such as these, unofficial public attitudes suggested that previous definitions of death were becoming obsolete. With the advent of ICUs, the medical profession was forced with a practical reason to examine death as a person as being distinct from the end of the body; and hence question whether every organ wasted is another life lost. Over the 42 years of Canada's transplant history, transplantation medicine has improved in both success and donation rates. The introduction of brain death criteria in 1968, beyond which the body is deemed incompatible with sentient life, heralded an era of fresh organs accessible for replacements.

The criteria for death have been revised and promoted several times, often involving removal and liberalization of diagnostic tests expanding the potential donor pool. Over the long-term, the annual number of transplants may have increased from more liberal pronouncements of death, but more likely from increasing public awareness of organ need and procedural success. The history of brain death criteria in Canada has been elaborated outlining how it impacts organ supply. During years when the criteria for brain death were changed (1975 and 1987) or use of the criteria was more enforced (1991), we observe short-term paradoxical declines in transplants performed numbers. There was also no increase in the growth rate of transplants, contradicting the hypothesis that expanded potential donor pool would increase actual organ supply.

Redefining brain death may be partially motivated by donor pool expansion, but every recent revision acutely reduced transplant numbers without any future increase in donation rate. Indeed, public and physician mistrust about the motivation behind such changes echo that the definition of death should not be a tool to serve social needs. New approaches to increasing the organ supply such as public and physician education, increasing physician responsibility, as well as providing incentives are generally accepted and may prove more effective.

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TOWARDS PERFECTION: THE INVOLVEMENT OF AMERICAN PHYSICIANS IN EUGENICS

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ABSTRACT

Eugenics is the term coined by Francis Galton to describe "the science of improving inherited stock, not only by judicious matings, but by all the influences, which give more suitable strains a better chance". He developed his theory after studying eminent British families in the 1860s and 1870s and concluding that intelligence was an inherited trait. By using "better breeding" schemes, valued traits could be passed down to children while undesirable traits could be extinguished from the population. By using his schemes, Galton envisioned a better society and fostered the support of many.

His vision was embraced in the United States. From 1880 to as late as 1950, sterilization and castration laws were passed in various states to control the reproduction of criminals, the mentally ill and the feeble-minded. Physicians were key figures in implementing these laws to improve the genetic make-up of America. According to the book *Problems of Human Reproduction*, published in 1926, physicians also had the power to influence reproduction by deciding for whom they would provide birth control and fertility treatments. Eugenic tenets dictated that it was the moral responsibility of the physician to examine the eugenic suitability of any person he assisted in reproduction. As molecular genetics advances, Galton's vision has the potential of reality. Technologies such as preimplantation genetic screening of embryos allow for gene selection; people can choose the traits they want in their child. As physicians are providers of this service, they are once again tossed in the middle of the race towards perfection and must decide what their new moral responsibility is to the public.

The Birth of Eugenics

The idea of a utopia, a perfect society, has existed as far back as Plato's time and can be seen in his work *The Republic*. The birth of modern day eugenics occurred much later, after the publication of Darwin's *The Origin of Species* in 1859. Having read Darwin's work, his cousin Francis Galton formulated the concept of eugenics. He believed that traits such as personality and intelligence were inheritable, passed from one generation to the next (Wikler, D, 1999). To prove his theories, he studied intelligence in prominent English families in the 1860s and 1870s (Cooke, K.J, 1998). He used his research to write *Hereditary Genius* where he emphasized the need for a eugenic registry for families. According to his work, intelligence in families could be

classified as degenerate, average, capable or gifted (Galton, DJ & Galton CJ, 1998). This registry could be used to identify families that seemed to have higher intelligence so they could be encouraged to have more children. Conversely, families of lower intelligence could also be found and discouraged from having children. Instead of relying solely on natural selection to allow for the survival of the fittest, people could manipulate reproduction to improve the human gene pool and give rise to a better society. Many countries, including the United States saw eugenics as a way of improving their countries' social structures and embraced his vision quickly.

Eugenics in the United States

In the United States, the movement towards eugenics seemed to be fuelled through the study of differential birth rates in the population. American eugenicists such as Charles Davenport and Paul Popenoe noted that birth rates among the competent, self-controlled types (upper class) were decreasing while they remained high among less intelligent types (lower class). This was the opposite of the situation in the States in the previous century where birth rates in richer classes were higher. With the improvements in medicine and the creation of finer housing, more poor seemed to be surviving. In contrast richer families were getting married at later ages and limiting the size of their families (Huntington, E, 1935). There was a concern that the differential birth rate would ruin the "stock" of the American people.

Eugenics seemed to provide the answer to this dilemma. In his book *Tomorrow's Children: The Goal of Eugenics*, American eugenicist Elisworth Huntington describes the role of eugenics by saying "just as the medical profession guards the community against ill health, so eugenics strives to protect the coming generation against the evils arising from a poor biological inheritance" (Huntington, E, 1935). He describes how positive eugenics can be used to encourage genetically superior families to increase the number of children they have for the "good of society". Intelligent young people such as those in university and college should receive eugenic education so they can do their part to contribute to society. These individuals should learn biology, genetics, eugenics, demography, the role of the family, eugenics in history and eugenics and social problems so they will increase their fitness in the population by having more children. By practicing positive eugenics, desirable traits such as emotional stability, strong character, consideration for other people, tendency to uphold or improve moral standards, intelligence, adaptability and originality could be fostered in the population.

Conversely, negative eugenics could be used to limit the reproduction of less desirable individuals in the population. Characteristics such as chronic dependency, feeblemindedness, epilepsy, insanity and crime could all be used as criteria to find families suitable for negative eugenics. Methods of negative eugenics include birth control, segregation and sterilization of unfit individuals. Suggested methods of birth control were marital continence, contraception and restriction of intercourse to the "safe period". Contraception was seen as the best method since it does not rely on the intelligence and self-control of the couple to be effective. However, the problem of using birth control seemed to be that the different classes did not use it equally; it was used more frequently by classes where reproduction was encouraged. Another problem with using birth control for the betterment of society was that it required that the people who should use it needed to embrace eugenic tenets and believe controlling their reproduction would

improve society. This concept was difficult to market since people would have to acknowledge their own genetic impairments.

Segregation seemed to be a more viable option according to Huntington. Individuals with "bad" traits as mentioned above could be segregated from the rest of the population by being put in jails, insane asylums or schools and homes for the feebleminded. Men and women could be put in separate institutions or be segregated within an institution to keep them from reproducing and passing on their undesirable traits. Sterilization of these individuals was the ultimate recommendation to deter their reproduction. Vasectomy and salpingectomy procedures of these individuals would guarantee poor biological traits would not be spread.

Huntington goes on to describe how society would improve over time by adopting these eugenic practices. He noted that education in the country would improve since teachers would receive more bright, industrious pupils and fewer lazy, dull ones. Churches would benefit since parishes would have more thoughtful and reliable people as a part of their congregations. Crime rates would decrease because reproduction in families with criminal tendencies would be diminished. Government would improve because voters would be better balanced and more intelligent, allowing them to make better-informed decisions when choosing who would run the country. Since less unfit individuals would be born, there would be a decrease in the number of people in jails and asylums, which would benefit society by decreasing the amount of public funding that would go into creating and maintaining these institutes. This funding could then be reallocated to education or other health services that would better serve the entire population. Overall, it was thought eugenic practices would improve all aspects of society. Physicians were key players in the eugenics movements since both positive and negative eugenic practices required their participation; they allowed eugenic proposals to become eugenic practices.

American Physicians and Eugenics

Physicians, like many groups in society, embraced eugenic concepts to create a perfect society. "There is power in blood" seemed to be the hymn sung by many that supported the eugenic movement. In particular, psychiatrists played pivotal roles in eugenic practices. Many reforms occurred in the practice of psychiatry in the mid 1800's. Society moved away from harsh treatment of the mentally ill and feeble-minded to a more humane approach that would allow for better treatment of psychiatric patients. Funding was created to build institutions, which would offer safe treatment of patients where they could receive adequate nutrition and clean, comfortable living conditions. Social programs and work therapy was also initiated to help psychiatric patients integrate and contribute positively to society (Dowbiggin, I.R., 1997). It was thought that psychiatric illness could be treated and possibly cured by improving the social situation of the patients.

By the late 1800s, this positive attitude in patient treatment was slowly diminishing. Decreased funding, therapeutic frustration, overcrowded asylums and decreasing professional independence for psychiatrists seemed to shift attitudes away from previous approaches to patient treatment (Dowbiggin, I.R, 1997). The public started seeing asylums as places where society allowed the survival of the biologically unfit instead of viewing them as institutions of healing. Prominent psychiatrists in America, such as George Adler Blumer, began embracing

eugenic ideology as a more viable option in the treatment of the mentally ill and feebleminded. When Michigan passed its Asexualization bill in 1897, which restricted reproduction of unfit individuals, Blumer expressed his approval by saying, "this is a hopeful sign of the times". Like Blumer, many psychiatrists began to see mental illness as degenerative, incurable conditions with prevention of illness as their only curative means.

Physicians first vocalized their support of eugenics through supporting restrictive marriage laws. In 1895, Connecticut was the first state to introduce laws preventing the marriage of the feebleminded. Over the next twenty years, 24 other states enacted similar laws. Any person deemed "unfit" by a physician in these states would not be allowed to get married. Although these marriage laws did prevent the reproduction of the "unfit", they were difficult to enforce in the population. A better solution seemed to be sterilization of biologically poorer individuals. The first incidence of this occurred in the Kansas State Home for the Feebleminded (Dowbiggin, I.R., 1997). Hoyt Pilcher, superintendent of the school, authorized the castration of 44 boys and 14 girls. As surgical techniques advanced, the use of vasectomies and salpingectomies became more humane options to sterilize individuals.

Psychiatrists approved the use of sterilization for four reasons: 1. It prevented the reproduction of unfit individuals 2. It curbed the sexual desire of the feebleminded and mentally ill who were seen as "notoriously loose" 3. It prevented women from becoming psychotic owing to gestation and parturition and 4. It improved the mental and physical health of male patients (Dowbiggin, I.R, 1997). In 1902, Henry C. Sharp, who worked as a surgeon at the Indiana reformatory, publicly announced he used vasectomy for the eugenic sterilization of 42 inmates. His declaration seemed to spur the move towards state supported sterilization laws. In 1907, Indiana became the first state to approve sterilization laws and by 1940, 30 states had enacted similar laws for patients in state hospitals. Psychiatrists were granted public permission to prescribe sterilization for their "unfit" patients. By 1940, the number of known sterilizations totaled 18, 552 (Dowbiggin, I.R., 1997).

As America entered the First World War, the move toward eugenic sterilization in psychiatry began to diminish slowly. Many psychiatrists went overseas to treat soldiers who degenerated mentally from the shock and strain of war. Since an environmental condition seemed to create mental deterioration, many psychiatrists began believing again that mental illness could be highly treatable and curable. Milder preventive methods such as child guidance clinics, psychiatric social work and hospital outpatient programs in the treatment of the mentally ill were embraced, while the use of sterilization or marriage laws was regarded as an admission of failure. In America the acceptance and later rejection of eugenic practices by physicians seemed to follow new discoveries in genetics and inheritance, society's view on the value and treatment of the mentally ill and the perfection of new medical technologies. Like other groups in society, physicians embraced the idea of a better, fitter society, which allowed them to approve and use treatments that today are considered inhumane and run contrary to the rights of the individual.

Eugenics, Physicians and the future

In the late twentieth century, the world experienced the birth of a new technology-pre-implantation genetic diagnosis. Advances in nucleic acid technology, in vitro fertilization techniques and embryo culture have given us the potential to implant women with embryos that have been screened for genetic illnesses such as X-linked mental retardation or Tay-Sachs disease (Nisker, J & Gore-Loughton, RE, 1995). In their paper Nisker and Gore-Loughton warn that this new technology has potential for misuse and abuse if not monitored properly. They strongly recommend that Research Ethics Boards comprised of physicians, basic scientists, statisticians, lawyers and allied health professionals create policies to govern the use of this technology to avoid its abuse. They cite the use of these techniques by the George Washington University of potential human "cloning" as a dangerous way genetic technology can be misused eugenically.

Before embracing PID fully, physicians need to ask themselves how permissible it is to maximize advantageous traits and minimize disadvantageous traits in the population. Will eliminating differences and abolishing traits such as inheritable deafness create increased discrimination and intolerance for individuals who still retain these characteristics (Draper, H. & Chadwick, R., 1999)? Another question this paper poses is whether or not embryos that carry potentially harmful traits that they could pass on to the next generation (carrier state embryos) should be selected against in the name of eugenic principles? Eugenics has had an impact on the reproductive freedom of people in the past in the form of forced sterilizations of the eugenically unfit and once again has the potential to play a role on the reproductive choices of today. Although state eugenics is no longer practiced, non-directive genetic counseling still has potential to embrace eugenic practices. Many geneticists today, especially in Eastern and Southern Europe, the Middle East, Asia and Latin America still hold eugenic ideas and do not have concerns advising their clients towards these ideas (King, D.S., 1999). PID technology has the potential to be the eugenic solution towards the creation of a genetically fit human race. The question physicians need to ask is if they should and to what extent?

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WAS THERE A EUGENIC MOVEMENT IN SASKATCHEWAN?

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ABSTRACT

The twentieth century saw a rise and fall in the Eugenics movement. This movement received a great deal of attention in Nazi Germany in the 1930's. At the same time, Eugenicists were pushing their presence in North America. The Eugenics movement that took place in Alberta is well documented; however, little is known about this issue in Saskatchewan history. Did such activities stop at the border? This paper will explore the experience in Saskatchewan in the 1930's and 40's, the time when Tommy Douglas was developing his theories of Social Healthcare.

"Feeblemindedness", "moron", "mental retardation", and "mentally defective" are just some of the terms surrounding the infrequently addressed Eugenics debate in Saskatchewan. Eugenics is a word that literally means a good birth.

Why, when the eugenics movement was such a powerful issue in Alberta, did so little seem to be said or done about it across the border in Saskatchewan? The Sexual Sterilization Act became law in Alberta on March 21, 1929. It has been documented that between October of 1929 and February of 1972, 2832 people were sterilized in Alberta (Newman 1999, 330-332). This Act stated that in the sterilization of mentally "retarded" individuals consent was not required by the patient nor by the patient's guardian. The two justifications for sterilization defined in the Act were first of all to prevent the transmission of any mental deficiency to offspring and secondly to prevent the risk of mental injury to the parent or the child if the sterilization was otherwise not carried out. The Act was repealed in 1972 due to opposition from a number of groups. The leaders in the opposition were the geneticists who argued that many of the individuals who were referred for sterilization did not have a genetically transmissible disorder. The law societies argued that the lack of consent required from patient or guardian in the sterilization of mentally "retarded" patients was a strict violation of human rights (Law Reform Commission 1979, 27).

In 1928, the city council of Weyburn, a town in Saskatchewan, called on the government of Saskatchewan to pass legislation that would permit the sterilization of the insane and the mentally 'defective'. The council's arguments in favour of the sterilization were that mental retardation was largely inherited and that "sterilization would allow the release of some who were responsible, except for the fear that they would have children" (Nishida 1988, 74). This motion was opposed by Liberal leader James Gardiner and Public Health Minister J.M. Uhrich.

They and their supporters argued that hereditary was not as crucial a factor in determining mental deficiencies as had previously been believed. They also argued that mental retardation was too difficult to define and that forced sterilization would be a violation of personal rights. Uhrich stated: "I feel that in championing the cause of the individual I am upholding the fundamentals on which state authority rests….I do not concede that man belongs body and soul to the state and that the latter can use him as a means to a further end" (Nashida 1988, 74). After heated debate, in 1930, at a time when sterilization was permitted by law in Alberta and B.C., the government rejected the motion and the sterilization of the mentally retarded apparently stopped in Saskatchewan. Or did it?

The report of the Saskatchewan Health Services Survey Commission presented to the Minister of Public Health on October 4, 1944 also addresses the issue of sterilization. It notes that serious consideration should be given to the sterilization of mental 'defectives'. It also recognizes the experience that has been gained by America and Europe since the beginning of the century. In the report it is stated that "one should not be deterred by the fact that Nazi Germany has practiced sterilization in a brutal and wholesale manner" (Sk. Health 1944, 7). Rather it suggests that the positive results of the more humane and cautiously practiced sterilization programs of the Scandinavian countries, Switzerland and some of the American states should be studied (Sk. Health 1944, 7).

In a report submitted in 1945 by The Canadian National Committee on *A Mental Hygiene Program for Saskatchewan*, it is suggested that the experience of sterilization in Alberta would be useful as a model for Saskatchewan. It notes that Alberta takes great care in selecting the cases, in obtaining the consent of relatives and in carrying out the operative procedure. It is suggested that the course of action for Saskatchewan could best be determined by studying the extensive Eugenics programs conducted in both Alberta and California. The selective eugenical sterilization for mental "defectives" is included in the summary of recommendations for this report (Dept. Public Health 1945, 15).

The same Mental Hygiene report also states that because "over half of the mental defectives come from poor stock, a contribution can be made to prevention through the sterilization of selected cases who without the precaution of this operative procedure transmit their mental defect to offspring" (Dept. Public Health 1945, 12). The report also indicates a special need for the sterilization of "physically attractive moron girls" before they are released from the residential training school. It is explained that apart from the fact that these girls may produce children with mental deficiencies, they will never make suitable mothers, regardless of how well trained they may be (Dept. Public Health 1945, 12).

Tommy Douglas, former premier of Saskatchewan and a key figure in the Sask Medical System, wrote a thesis paper for McMaster University in 1933 entitled *The Problems of the Subnormal Family*. Much of his research was conducted at the Mental Institute in the town of Weyburn, Saskatchewan, where he traced the family trees of twelve immoral and nonmoral women who spawned 95 children and 105 grandchildren (McLaren 1990, 8). By the term 'immoral' he was referring to prostitutes and by 'nonmoral' he was referring to mental 'defectives' (Douglas 1933, 2). He noted that these offspring had a greater proportion of individuals who were subnormal mentally, physically and morally compared with the rest of the

population (Douglas 1933, 5). He also noted that the twelve women had a birth rate of 7.9% compared with the average rate of 3.1%. He noted that these individuals were caught in a cycle of immorality, promiscuity and improvidence and that their increasing presence would threaten the function of society by spreading disease, clogging up the school system, promoting crime and prostitution, burdening hospitals, and overwhelming charitable organizations. It was noted that this level of the population was a tax burden on society, particularly at a time of economic depression (Douglas 1933, 2-6). Mr. Douglas' thesis was "in fact a typical eugenic study that began with the popular hereditarian argument that the mentally and physically subnormal were not so much the victims but rather the causes of a good deal of the distress of the depression" (McLaren 1990, 8).

Douglas' thesis strongly emphasized that the reproduction of the unfit had to be controlled to prevent the rest of society from being swept away by economic crisis that Canada was experiencing at the time (McLaren 1990, 8). In the thesis it is stated that the "problem of the subnormal family is chiefly one for the state" (Douglas 1933, 20). One of the suggested remedies stated within the thesis was the "Sterilization of Unfit" (Douglas 1933, 20).

In 1936, Tommy Douglas travelled to Germany and was so disturbed by what he witnessed that he rejected Eugenic principles. As the Saskatchewan Minister of Health, he promptly rejected two reports recommending the sterilization of the feeble- minded in 1944 (McLaren 1990, 166).

The Weyburn Mental Institute was built in 1921 and converted to an extended care home in 1971. Upon examination of the Institute's history, no reference to the practice of sterilization was found in any text. In an interview with the archivist who has been employed for many years at the Weyburn hospital, it was suggested that serilization of the mentally challenged may have taken place in the earlier years of the hospital; however, old patient records could not be examined because they had been removed from the hospital archives in the early 70's. She also explained that the Weyburn Institute was currently trying to separate itself from its reputation in its days as a mental institute and wished to leave in the past any undesirable activities that took place, in particular the unethical research practices. In a second interview, the archivist stated that she was certain that sterilization had never occurred in the past.

A Psychiatric nurse, who wishes to remain anonymous, worked at the Weyburn Hospital from 1952-1964. He stated that to his knowledge no sterilization practices had taken place in the hospital. He also stated that it is possible such practices may have occurred without his knowledge.

It is difficult to definitively state whether Eugenic practices did or did not take place in Saskatchewan. On the one hand, there is a certain amount of evidence suggesting that efforts were made to inhibit such practices. But on the other hand, Saskatchewan has never boasted of a past completely free of Eugenic practices. The issue still sits quietly in the past.

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A WOMAN'S VIEW OF "WOMEN'S DISEASES": *DE PASSSIONIBUS MULIERUM CURANDORUM* BY TROTULA DI RUGGIERO

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ABSTRACT

In spite of the importance of obstetrics and gynecology to the lives of women, historically very few women played a prominent role in this specialty except as midwives and nurses. An exception to this was the celebrated eleventh-century physician, Trotula di Ruggiero. Known variously as Trotta, Trocta and Dame Trott, she was the author of a noted medical treatise, *Sapiens matrona, mulier sapientissima, de passionibus mulierum curandorum*. Written in sixty-three short chapters, this important manuscript is concerned primarily with treatment of the "diseases of women". She was one of the first physicians to describe a number of obstetrical and gynecological conditions, such as polyploid growths of the cervix and uterus and urinary incontinence. She also described perineal lacerations and outlined surgical repair of the perineum. Her work is an interesting compilation of herbal and folk remedies, supplemented with her personal observations as well as references to Greek medical authors such as Galen and Hippocrates. Her manual became the standard for obstetrical care for seven hundred years. In the years following her death, her work was published in a number of medical textbooks, such as the *Medici Antiqui Omnes, Gynaeciorum* and *Empirica Leyden.*

Not much is known about the historical Trotula. She is believed to have been a member of the faculty of the Collegium Hippocraticum in one of the oldest medical schools in Europe, the School of Salerno. Her husband, Johannes Platearius (the Elder), was a physician, as were her two sons, Johannes the Second and Matteus.

Despite the importance of obstetrics and gynecology in the lives of women, historically only a handful of women were involved in this medical specialty, except as midwives and nurses. A notable exception was the eleventh century physician, Trotula di Ruggiero of the famous school of Salerno. Known variously as Trotta, Trocta and Dame Trott, she is the author of a historically significant medical treatise, entitled *De passionibus mulierum (On the suffering or diseases of women).* Written in sixty-three short chapters, this Latin manuscript is concerned primarily with treatment of the "diseases of women". She was one of the first physicians to describe a number of obstetrical and gynecological conditions, such as polypoid growths of the cervix and uterus and urinary incontinence. She also describes perineal lacerations in childbirth and outlined surgical repair of the perineum. Her work is an interesting compilation of herbal

and folk remedies, supplemented with her personal observations as well as references to Greek medical authors such as Galen and Hippocrates.

People have been writing about the diseases of women for as long as there has been medical writing. Nearly a fifth of the oldest corpus of western medical texts, that attributed to Hippocrates, is dedicated to the female body. (Green, 2000) Soranus of Ephesus, a renowned medical author who died prior to the birth of Galen, wrote his most important text on gynecology. There exists a significant body of specialized gynecological texts, with more than a hundred texts produced between the fourth and fifteenth centuries. (Green, 2000) By no means is her manuscript the first of its kind. However, it is a text written by a woman, not a midwife but a full-fledged professor and physician, which was used by midwives and female healers in the aid of women and their unique ailments. As she says in the prologue, "… I, pitying their misfortunes and at the instigation of a certain matron, began to study carefully the sicknesses which most frequently trouble the female sex." (Mason-Hohl, 1940, p. 2)

Not much is known about the historical Trotula. She is an obscure figure, whose identity was lost to modern scholars. Some historians assert that *De passionibus mulierum* was written by a man, Eros, a Roman freedman of the Empress Julia. Other historians deny her existence, stating that the name "Trotula" was a common title attributed to Salernitan midwives. (Longo, 1978) However, there are historical references which indicate that she was called Trotula di Ruggiero and was the wife of Johannes Platerius (the Elder). Both of them were on the faculty of the Collegium Hippocraticum in Salerno and wrote numerous medical texts. One of her sons, Matteus, spoke of her as "his learned mother, Trocta" and stated proudly that his mother cared for sick women as "a *magistra*". (Hurd-Mead, 1973, p. 128) She is believed to have died in 1097 CE and legend has it that her casket was attended by a procession of mourners two miles long (Mason-Hohl, 1940, p. vii)

Located some thirty miles southeast of Naples on the western coast of Italy, Salerno had been famous for its healing springs since Roman times. Salerno was situated at a cultural and economic crossroads and rose to prominence in the eleventh and twelfth centuries with the establishment of the first organized medical school in Europe. It was the prototype for later medieval universities which were to be established in Paris (1110), Bologna (1158), Oxford (1167), Montpellier (1181), Cambridge (1209), Padua (1222) and Naples (1224). Legend has it that the school was founded by "four masters", a Latin, a Greek, a Jew and an Arab. (Porter, 1997) This legend reflects the cosmopolitan atmosphere which existed at the time of the rise of the medical school. Students came from all across Europe, Asia and northern Africa and women were admitted as students to the medical school. The professors or *magistri* were both men and women. The school of Salerno reached its zenith when in 1221 the Holy Roman Emperor Frederik decreed that no one should practice medicine until the masters of Salerno had publicly approved him. (Porter, 1997)

De passionibus mulierum is one of numerous texts that originated from Salerno.

Physicians of Salerno wrote a popular health manual, the *Regimen Sanitatis Salernitatum*. Trotula, her husband and her son worked on a new encyclopedia of medicine called *Practica Brevis*. Her son, John the younger wrote a book on urine, *Regulae Urinarum*. (Hurd-Mead, 1973)

Salerno's importance cannot be underestimated as a centre which disseminated medical knowledge to the rest of medieval Europe. The translation of numerous Arab and Greek medical texts into Latin enabled Latin speakers access to contemporary medical thinking for the first time. (Porter, 1997)

Trotula's knowledge of medicine was informed from texts of Hippocrates, Galen, and Soranus. She probably never dissected a body and without a knowledge of pathology, her diagnoses depended entirely on the symptoms of her patients. There were 29 observations to be made on urine and the pulse, and several on facial expressions and the feel of the skin. (Hurd-Mead, 1973, p. 143) *De passionibus mulierum* was probably her most famous work and she was included in the "famous quartet of Salerno" in the eleventh century by several medical historians. (Hurd-Mead, 1973, p. 126).

The treatise opens with a long and rambling title, which is as follows: "The original book of Trotula on curing the sicknesses of women before, during and after parturition never before published in which is set forth the accidents, diseases, and passions of the female sex; the care of infants and children from birth; the choice of a nurse and other matters related to this; ailments touching upon both sexes; finally the experiences of various illnesses together with certain medicines contributing to the beautification of the body." (Mason-Hohl, 1940, p. 1) This lengthy title accurately describes the content of the sixty-three chapters. While she is concerned principally with the cure of "women's diseases", she also writes on topics such as male infertility, cancer and pediatrics.

The prologue helps to frame the work and outlines important themes which recur in subsequent chapters. As any medieval physician would do, she invokes the name of God and God's role in the arrangement of the universe. She explains the creation of men and women so "by means of their fertile propagation future offspring may never cease to come forth." (Mason-Hohl, 1940, p.1) Furthermore, she reasons that men by nature are hot and dry, while women are cold and wet . In this way, "the man's constitution being hot and dry might assuage the woman's coldness and wetness and on the contrary her nature being cold and wet might soothe his hot and dry embrace." This reflects her debt to Greek thinkers, such as Hippocrates and Galen, who theorized that the human body functioned according to its humors. Furthermore, in her schema, women are considered weaker than men, which she uses as a justification for the illnesses that occur in women. "Since then women are by nature weaker than men it is reasonable that sicknesses more often abound in them especially around the organs involved in the work of nature." (Mason-Hohl, 1940, p. 1)

Menstruation is a biological event unique to women. Trotula writes about menstruation using the hot/dry and cold/wet dichotomy. Menstruation is seen as a means of getting rid of excess moisture, which tends to accumulate due to the "wet" nature of women. As she says, "Nature herself, on account of this deficiency of heat, has assigned for them a certain specific purgation namely the menses, commonly called flowers." (Mason-Hohl, 1940, p. 2) This is the first reference to menstruation by the term "flowers" and she extends the analogy by observing that "just as trees do not produce fruit without flowers so women without menses are deprived of the function of conception" and will not be able to bear fruit (i.e. children) without the occurrence of menstruation. The final portion of the prologue is devoted to a discussion of

menstrual disorders, which highlights the importance of menstruation to medieval women's health.

The first three chapters describe menstrual disorders such as amenorrhea, oligomenorrhea, dysmenorrhea and hypermenorrhea. Trotula advocates bloodletting as a treatment for amenorrhea, a common prescription in medieval medical practice. She refers to Galen to support the rationale for her therapy. It must be noted that most medical teaching at Salerno was based on the teachings of Hippocrates and Galen. However, she does advise caution: "In every sickness general care must be taken and regard must be shown that the patient be not too much weakened." (Mason-Hohl, 1940, p. 5) She also suggests frequent bathing and a decoction of "honey and water." However, in discussing treatments for oligomenorrhea and dysmenorrhea, she suggests herbal preparations and fumigations as treatments. Furthermore, she uses evidence to support the practices she advocates, when she writes, "A certain doctor in the region of Francia did this: he took leaves of laurel and ginger and ground them together in a clean pot; he put this mixture over live coals under a perforated seat and over this he let the woman sit." (Mason-Hohl, 1940, p. 7) Interestingly, she notes that in order to induce menstruation, massage or sexual intercourse is beneficial. Furthermore, she writes, "bloodletting is injurious". (Mason-Hohl, 1940, p. 8) This is in contradiction to her treatment for amenorrhea. This suggests that Trotula may not have been a strong proponent of bloodletting as many other medieval physicians. Her attitude is equivocal on the matter, suggesting its use in some instances but advising against its use in other cases.

As stated earlier, Trotula uses ancient Greek medicine to lend credibility to her position as an authority on women's diseases. In chapter 3, Trotula gives many reasons for excessive menstrual flow: "the veins of the uterus are large and open, or because the patient breaks wind and thence blood flows in great quantities…Because too much food and drink has generated too much blood and since it cannot be contained within the blood vessels, it bursts forth outside. Sometimes it happens on account of excessive heat of the blood. Yellow bile pouring back from the gall bladder makes the blood feverish to such an extent that it cannot be contained in the veins. Sometimes a salty phlegm is mixed with the blood and thins it and makes it burst forth outside." (Mason-Hohl, 1940, p. 9) This passage is an excellent example of classical Greek physiology of the four humors and its role in medieval medical teaching.

Conception is another topic which would not be far from a medieval woman's mind. Indeed, sterility was the ultimate disaster for a woman in a society that defined women's roles by their ability to bear children. Trotula's chapter on the causes of infertility is noteworthy as she recognizes both female and male infertility. Trotula writes that some women "have a womb so soft and slippery that the seed having been received cannot be retained in it. Sometimes this happens through a defect of the male who has seed so thin that when it is poured into the vagina it slips out because of its own liquidness." (Mason-Hohl, 1940, p. 16) Once again, the hot/dry and cold/wet natures of men and women are used to explain infertility. According to her, men by nature should be hot and dry, not cold and dry for those men who have cold and dry testicles "rarely or never beget, because their seed is useless for procreation." She concludes, "It is evident therefore that conception is hindered as often by a defect of the man as of the woman." (Mason-Hohl, 1940, p. 16)

As any good doctor would do, Trotula orders the following diagnostic test, "If the woman or the man be sterile you will ascertain it by this method: take two jars and into each put bran. Into one of them put the urine of the man and into the other put the urine of the woman and let the jars be left for nine or ten days. If the barrenness be from a defect of the woman you will find many worms and the bran foul in her jar. On the other hand you will have similar evidence from the other urine if the barrenness be through the defect of the man." (Mason-Hohl, 1940, p. 18-19)

However, Trotula realizes that not all women would be able to bear children. Childbirth could literally cost a woman her health and her life. Trotula's manuscript provides both primary and secondary intervention for traumatic childbirth experiences.

If a woman with a "narrow vulva" and "tight womb" cannot abstain from sexual intercourse, she recommends that a woman "carry on her naked flesh the womb of a she-goat which has never had offspring." (Mason-Hohl, 1940, p. 19)

Most importantly, Trotula's manuscript is the first to advocate the surgical repair of perineal lacerations during childbirth. She writes, "There are some for whom vulva and anus become one and the same passage. From these women the womb comes out and grows hard. These we aid by putting it back. We apply to the womb hot wine in which butter has boiled. We carefully foment it until the womb is rendered soft, and we gently put it back. After this we sew the break between the anus and the vulva in three or four places with a silk thread; afterwards we apply a linen cloth to the vulva, according to its size." (Mason-Hohl, 1940, p. 28).

For a text that is concerned with obstetrical matters, Trotula never actually describes the process of parturition. She concedes that "there are certain physical remedies whose virtues are obscure to us, but which are advanced as done by midwives." (Mason-Hohl, 1940, p. 22) Furthermore, in a discussion of breech presentation she does not explain how to manipulate the fetus, only that the midwife should place the fetus "in the proper position." (Mason-Hohl, 1940, p. 23) This suggests that physicians and midwives had clear and separately defined domains of participation in the process of labour and delivery.

Turning to other parts of the manuscript, Trotula concentrates her attention to the care of the newborn. She is one of the earliest writers on the topic of pediatrics. She proceeds to explain the importance of a full physical exam and observation of the infant for the first few days. "The head, the brow, the nostrils, the stomach, and the loins should be watched, lest much oily discharge or moisture come out of them." (Mason-Hohl, 1940, p 25) Above all, she is a gentle and compassionate physician, who advises the use of songs and gentle words in the presence of this new human being. (Mason-Hohl, 1940, p. 26)

Trotula's manuscript was not published during her lifetime. Indeed, an age where books were copied painstakingly by hand, her manuscript would not have been widely disseminated. *De passionibus mulierum* was first published in 1544 in Strassburg. The English translation by Elizabeth Mason-Hohl is based on the 1547 publication by the Aldine Press in Venice. There were three subsequent Venice editions. Her manuscript was included in a book, *Medici Antiqui Omnes*, a compilation of the works of the thirteen greatest medical authors from 63 BCE to

Trotula of the eleventh century. In 1566, Trotula was included in the *Gynaecorium* and in 1558 she was included in *Empirica Leyden*. She was recognized as an authority on the diseases of women and children in 1778. (Mason-Hohl, 1940, p. vii)

De passionibus mulierum is a manuscript which reveals much about the medieval medical mind, specifically from a female perspective. Trotula is no revolutionary out to upset the structures of society. She reinforces the notion of a strict order and hierarchy to the world, starting with God and the purpose of human beings in creation. She knew when it was wise to "leave things to God." While she depends on ancient Greek theories of humoral functioning of the human body, she takes medical practice further. She demonstrates extensive knowledge of herbal lore, using examples from her own medical experiences. She is probably an early example of an evidence-based practitioner. Above all, she demonstrates compassion and empathy, qualities a good physician must have in order to help her patients to the best of her ability.

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THE MAN-MIDWIFE: OXYMORON OR FIRST OBSTETRICIAN?

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ABSTRACT

Until the middle of the 18th century, childbirth was not considered to be a medical procedure, and was for the most part attended only by women. While accounts of man-midwifery were sporadic in Europe throughout the 16th and 17th centuries, man-midwifery exploded in England in a short period of time after 1740. The reasons for the rise in popularity of these practitioners have been widely debated, not only by medical historians, but also by social scientists and feminist authors. Though the early phase of man-midwifery did coincide with the introduction of forceps, it is unlikely that this was a major catalyst, as a substantial number of early man-midwives were vehemently opposed to interventionist methods. The advent of man-midwifery and the subsequent medicalization of childbirth appears to have arisen instead through the complex interaction of multiple factors. For instance, there was a profound change in female culture in the 17th century as upper-class women became increasingly literate and educated. Advances in the knowledge of gynecological anatomy and the physiological process of parturition were also major contributing factors. Also, the surgeon-apothecaries who began to train in midwifery likely realized that the ability to offer obstetrical care provided them with the opportunity to forge lifelong relationships with their patients, thus assuring a steady income and an increased patient population. While there is not substantial evidence that man-midwives were responsible for any decline in maternal and child mortality during the 18th century, several prominent man-midwives did contribute substantially to maternal-child care at that time. For instance, Bartholomew Mosse established the first-known maternity hospital in the British isles, William Smellie contributed to the understanding of the mechanics of both normal and obstructed deliveries, and both Percivall Willughby and Fielding Ould wrote influential treatises on midwifery. Though the evolution of man-midwifery remains a controversial subject, it is apparent that these men had a vital role in the establishment of obstetrics as a medical specialty.

"I know myself one of this last trade [pork butchers] who, after passing half his life in stuffing sausages, is turned an intrepid physician and man-midwife." (Kahn-Leavitt 2000) These impassioned words were written in 1760 by midwife Elizabeth Nihell, whose sentiments reflected the prevailing attitude of midwives toward the intrusion of men into the practice of delivering babies. Until the mid-eighteenth century, births were attended almost exclusively by females, and the delivery of an infant was not considered to be a medical procedure (Duffin 1999). It seems counterinuitive then, that mere decades later, the majority of births were

attended to by male practitioners, and a new medical specialty, obstetrics, was born. The reasons behind this sudden transition have long been debated, and the theories are as varied as the points of view from which they come. Though medical historians, social scientists, feminists, and others have often attempted to explain the genesis of man-midwifery from their own respective points of view, it is clear that a more complex interaction of multiple elements was responsible.

A man-midwife was not simply a midwife who happened to be male. Rather, he was a medical practitioner who incorporated the delivery of both normal and abnormal cases as part of his practice (Loudon 1996). Though today obstetrics is considered to be a surgical specialty, the majority of elite man-midwives in eighteenth and nineteenth century Britain were physicians. Surgeons of the day believed that midwifery would lower their status, and attempted to distance themselves from the practice just as they severed their connections with the barber-surgeons and surgeon-apothecaries who were their contemporaries (Loudon 1996).

One of the first schools for midwives was established early in the sixteenth century at the Hotel-Dieu in Paris (Radcliffe 1967). It is reported that the practice of having male birth attendants became fashionable in France after Julian Clement, a prominent surgeon of the time, attended during the labour of Madame de Montespan, a mistress of Louis XIV in 1670. Clement went on to attend the Queen of Spain and several members of the French royal family (Radcliffe 1967). Other esteemed French male midwives at that time included Ambroise Pare and Francois Rousette, who like Clement, were well-respected and accomplished surgeons (Radcliffe 1967). By all accounts, the attitude toward male midwives in France was in stark contrast to that in Britain, where the term man-midwife had derogatory overtones, and the suggested title of "andro-boethogynist" failed to enter common parlance (Dahl 1999) . For this reason, elite man-midwives often preferred to use the French title of "accoucheur" (Loudon 1996).

Man-midwifery in England is said to have arisen in a short period of time after 1740. Prior to that, only when a female midwife could not delivery a baby would she summon a surgeon, who would employ instruments in the event of an obstructed delivery (O'Dowd 1994). However, the necessity of a surgeon at a delivery was seen as a poor prognostic sign, and often meant that either the mother, the child, or both would perish (Donegan 1978). Nonetheless, by the 1770s, the majority of surgeon-apothecaries in provincial towns and villages of England, in addition to a large number of city physicians, had adopted the practice of midwifery (Loudon 1996). A multitude of factors, both directly related to the practice of midwifery and to the evolution of British society at that time played key roles in making male birth attendants commonplace.

The early phase of man-midwifery in England coincided with the publication of the design of the Chamberlen forceps (Loudon 1996)., a device which was shrouded in such secrecy that its design had been concealed through four generations of the Chamberlen family (Radcliffe 1967). William Smellie wrote in 1754 that "the forceps...were contrived with a view to save the child, by helping along the head in extraordinary cases, when nature was exhausted, and to prevent...the use of sharp instruments, when the mother's life was in danger" (Radcliffe, 1967). While indisputably this new technology placed great power in the hands of man-midwives who were able both to intervene in the event of obstructed deliveries and to hasten uncomplicated births (Loudon 1996), there are several reasons for rejecting the theory that man-midwifery came

about solely because of such tools. Most importantly, a substantial number of the earliest and most vocal man-midwives were opposed to the use of forceps. In fact, many were Deventerites, followers of the school of Hendrik van Deventer, who opposed the use of instruments of any kind in the delivery of infants (Loudon 1996). Pioneering man-midwives such as Fielding Ould, the author of the first important British text on the topic of obstetrics, were staunchly opposed to the unnecessary use of instruments (Dunn 1999).

Many social scientists and feminists argue that the birth of man-midwifery was merely a reflection of the male-dominated society at that time. It is apparent that the participation of males in childbirth often meant much more interference with normal labour than was desirable, due in part to the scant and poor training that they obtained (O'Dowd 1994). Initially, there were no standards for the education of man-midwives in Britain, and many physicians venturing into practice had never attended a normal delivery upon the completion of their training (O'Dowd 1994). British midwife Sarah Stone, a vocal opponent of man-midwives, wrote in 1737 that "every young man who had serviced his apprenticeship to a barber-surgeon, immediately sets up as a man-midwife; although he is ignorant and indeed much ignorantor [sic] than the meanest Woman of the profession" (O'Dowd 1994). As man-midwifery became increasingly acceptable and the teachers themselves gained more experience, it is apparent that both male and female pupils were provided with more complete instruction. However, documents from the time show that instruction was segregated by sex, and that the instruction given to female pupils was less intensive and did not include courses on the use of instruments (Donegan 1978). Furthermore, man-midwives likely conveyed to their patients the view that female midwives were ignorant and ill-equipped to safely perform deliveries, thus further securing their positions at the feet of lying-in beds. However, there is no evidence that man-midwives were responsible for any fall in maternal and child mortality, something that did not actually occur until after the Second World War, with the advent of antibiotics, safer anaesthetics, and blood transfusions (O'Dowd 1994). Rather, it has been suggested that the zeal with which man-midwives intervened during the course of labour resulted in the deaths of many mothers and infants. John Blunt, author of the 1793 essay *Man-Midwifery Dissected* wrote that "great mischief...has been done since man-midwifery [became] general, owing to the ignorance and impatience of those professors who erroneously imagined, their instruments must be used on all occasions" (Kahn-Leavitt 2000).

On the other hand, a profound change in female culture during the eighteenth century may have been a major contributing factor in the advent of man-midwifery (Loudon 1996). The rise of literacy and leisure in upper-class women after 1700 and the delegation of domestic labour to servants is said to have caused the destruction of the common female culture shared by all social classes. Thus, it is theorized that the revolution in childbirth was begun by women, as opposed to by medical men (Loudon 1996). This trend is said to have trickled down to the lower classes who saw having a man-midwife as being an affordable and flauntable luxury. In other words, man-midwifery may have arisen due to consumer demand as opposed to provider desires.

Another prevailing theory attributes the advent of man-midwifery to economic factors. The ability of surgeon-apothecaries to offer obstetric care in the form of onset calls allowed them to capture a substantial and growing market for midwifery (Loudon 1996). Prior to the mid-eighteenth century, male practitioners were summoned only for what were termed "late emergencies," such as in the case of obstructed labour. However, after this time, man-midwives

began to offer their services earlier and earlier in the course of labour, until it became commonplace for them to be called upon at its onset. Man-midwives were now able to demonstrate that in cases of delayed or obstructed labour they had the ability to save both the mother and the child (Loudon 1996). In addition, though midwifery was a relatively low-paying and exhausting task, it provided an opportunity for a young physician to build a successful practice through the establishment of lifelong bonds with a woman's family. "It is principally on this account that the practice of midwifery becomes desirable to physicians. It is this which ensures to them the permanency and security of all their other business," wrote Walter Channing, a physician, in 1820 (Kahn-Leavitt 2000).

One of the most agreed-upon contributions to the genesis of man-midwifery was that of medical science. The eighteenth century was an era in which there was intense scientific inquiry into the processes of pregnancy and childbirth. It was during this period that William Hunter published the work *The Anatomy of the Gravid Uterus,* a tome which took Hunter twenty-four years to complete before its publication in 1774. Hunter's accomplishments were crucial in making the practice of man-midwifery in Britain not only acceptable, but also fashionable (Radcliffe 1967). While William Smellie both elucidated the mechanics of normal labour and educated enormous numbers of both male and female midwives (Dunn 1995), he was not interested in winning the favour of the aristocracy, unlike Hunter, who was eventually appointed Physician-Extraordinary to Her Majesty (Radcliffe 1967). Once the nature of obstetric complications was understood, rational measures for dealing with them could be devised, thus further cementing the attitude that physicians' knowledge of both normal and abnormal anatomy made them better equipped at delivering babies than traditional midwives (Loudon 1996). This belief is apparent in the words of John Maubray, who wrote in 1724 that "men...being better versed in Anatomy, better acquainted with Physical Helps, and commonly endued [sic] with greater presence of Mind, have been always found readier...to give quicker relief if difficult...births, than common midwives generally understand (Kahn-Leavitt 1999). It is likely that sentiments such as these served both to influence the decisions of women in choosing birth attendants and to further widen the rift between traditional midwives and the men who would soon call themselves obstetricians.

A number of man-midwives published influential treatises on the practice of midwifery, which provided the foundations of obstetrics as a science. Among the most influential of the British man-midwives was William Smellie, who taught midwifery using life-like models he had constructed and was the first to accurately describe the passage of the fetal head through the female pelvis (O'Dowd 1994). By the mid-eighteenth century, Smellie had given 280 courses to more that 900 male pupils and had taught in the homes of approximately 1150 women whose babies he had delivered (Dunn 1995). Smellie's competency helped to overcome much of the existing prejudices both against male midwives and the use of forceps, though his gruff manner was reported to have antagonized many female midwives practicing in London at the time (O'Dowd 1994). In addition, Britain's first maternity hospital was established in 1745 by Bartholomew Mosse, a physician who became a licentiate in midwifery in 1742. His ten-bed facility, initially dubbed the Hospital for Poor Lying-In Women, was rebuilt in 1767 as the result of a royal charter and renamed the Rotunda Hospital (Dunn 1999). The facility, which still stands in Dublin, is today a world-renowned centre for obstetrical research.

Obstetrical practice was still in an extremely primitive state at the time of these pioneering British man-midwives. Childbirth was far from being safe or routine, and it is often argued that many early obstetrical techniques caused more harm than benefit. The spectres of puerperal fever, unsafe anaesthesia, and maternal hemorrhage were not to be overcome for more than one hundred and fifty years after the era of Ould, Smellie and Hunter. Though the reasons behind the genesis of man-midwifery are still debated, it is clear that these practitioners had a crucial role in the establishment of obstetrics as a medical specialty. However, it is also apparent that the intrusion of men into the birthing chamber at that time laid the groundwork for the animosity that persists even today between physicians and traditional midwives.

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CARL KOLLER AND THE DISCORVER OF THE FIRST LOCAL ANESTHETIC: COCAINE

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ABSTRACT

Coca shrubs are indigenous to Peru, where the Incas chewed coca leaves throughout the day, abstaining from food for long periods without any ill effects. In 1858, Scherzer brought coca leaves to Austria. Niemann in Vienna first identified cocaine when he extracted it from coca in 1860. For the next two decades, its popularity rose in the general public while scientists detailed its physiological effects. Many noticed its numbing effects, not making the connection to local anesthesia.

Carl Koller, an intern at the Vienna General Hospital, learned of cocaine from Sigmund Freud. Koller, interested in ophthalmology, was searching for a suitable local anesthetic for eye surgery to earn a coveted apprenticeship. Freud had used cocaine to cure a colleague of morphine addiction, and studied its other properties. He asked Koller to help record the effects of oral cocaine on muscle strength. Koller, observing the numbness of his mouth, made the connection to local anesthesia and proved it in a frog's eye, his own and that of a lab technician. A colleague reported and demonstrated his discovery at the Congress of German Ophthalmologists in September 1884. News traveled like wildfire throughout Europe and the United States such that by December, when Koller's paper was officially published, hundreds of testimonies to cocaine's benefit as a local anesthetic had been made.

Due to an anti-Semitic incident and duel, Koller was forced to leave Vienna. He moved to New York City and became an ophthalmologist at Mount Sinai Hospital. He died in 1944.

The coca shrub is a flowering plant indigenous to the eastern slopes of the Andes mountains in South America, specifically Peru and Bolivia. The Incas, the indigenous people of Peru, chewed coca leaves throughout the day. Many reported observing how the coqueros, or coca chewers, could abstain from food for long periods of time without suffering any ill effects.

In 1565, Monardes published the first description of coca in Europe. In 1855, Gaedicke of Germany isolated an alkaloid from the leaves of the coca plant and named it erythroxylin. In 1858, Dr. Scherzer brought coca leaves home with him from Peru**.** Dr. Albert Niemann, the assistant of the great chemist Woehler, extracted the potent principle from coca leaves in 1860.

He named this extract cocaine. For the next two decades, many respected scientists, including Schroff, Moreno y Maiz and von Anrep performed many experiments with cocaine and detailed its physiological effects on animals. In 1880, cocaine became an official drug in the US pharmacopoeia.

During the fall of 1883, Dr. Aschenbrandt gave cocaine to many of his soldiers. He submitted his observations in The Physiological Effect and Significance of Cocaine Muriate on the Human Organism, which he said proved that cocaine was an excellent antidote for fatigue, hunger and thirst. In the non-medical world, the popularity of cocaine was soaring. Its powers seemed to be never-ending: marketers claimed cocaine was able to alleviate or cure typhus, scurvy, gastralgia, anemia, enteralgia, alcoholism and indigestion. It was also marketed as a cure for asthma, hay fever, sinusitis and a cure for the common cold. Cocaine was included in many commercial preparations, such as lozenges, tea, cold cures, chewing gum, nose powders and cigarettes, including the very popular Vin Mariani, and Coca-Cola. Cocaine was also included in the literature of that time, such as Sir Arthur Conan Doyle's Sherlock Holmes.

It is impossible to speak of cocaine without mentioning Sigmund Freud. He first became interested in cocaine for the treatment of the morphine addiction. He used it to cure his friend, Dr. Fleishl, of morphinism. Unfortunately Fleishl also became addicted to cocaine. Combining Freud's own self-observations of cocaine with what researchers had found previously, Freud recommended 6 uses for cocaine: as a stimulant, for digestive disturbances, for the treatment of consumption, a means of withdrawing alcohol and morphine in cases of addiction, for asthma, and as an aphrodisiac. In order to make his and cocaine's case stronger, Freud began to investigate the systemic effects of cocaine on muscle strength. He asked his friend, Dr. Koller, to assist him in investigating whether or not taking cocaine would increase muscle strength, measuring it with a dynamometer.

Carl Koller was born in Schuettenhofen, Bohemia. His father was a businessman who moved to Vienna with his only son when his wife died. He was a Jew who had made the difficult break from ritual and dietary laws, but never ceased to regard himself entirely as a Jew. Koller was privately tutored as a child. He served his required time in the Austrian army and then studied one year of law. He began studying medicine at the University of Vienna in 1876. He interned at the Vienna General Hospital from 1881-84. During his schooling, he also worked in Stricker's laboratory studying embryology, where he focused on the formation of mesoderm in the chick embryo. His research produced, in 1879 and 1881, papers detailing how the mesoderm came about, creating a stir in the embryology world. Prominent men in the field sent him their work for review, not knowing that he had yet to graduate from medical school.

During his internship, Koller decided that he wished to pursue ophthalmology. He aspired to have the position of assistant to one of the large eye clinics, but in order to be considered he had to establish a claim by making a contribution to ophthalmology. There was still no useful anesthetic for eye surgery and Koller seriously wanted to find one. He tried drops of chloral hydrate, bromides and morphine in the eye without any success.

Freud also worked at the Institute of General and Experimental Pathology, where Stricker's lab was located, and he became friends with Koller. He was also trying to make a name for

himself, but for different reasons: he was engaged to Martha Bernays, and was anxious to begin a career so he could marry her. Freud published all his findings on cocaine in July 1884 in "Uber Coca". He had just begun his experiments on muscle strength and had asked Koller to help him with it. In August, Freud obtained some time off and went to visit his fiancée in Hamburg for several weeks.

It is interesting to note that many prominent doctors and scientists had noticed the anesthetizing properties of cocaine and yet did not made the connection with the possibility of a local anesthetic. Even Koller only stumbled upon it by accident. He and a colleague ate some cocaine from the point of a penknife and remarked that it numbed the tongue. It came to Koller that he had in his possession a possible local anesthetic. He went straight to his lab and asked Dr. Gaertner, Stricker's assistant, to help him. They took a few grains of cocaine and dissolved it in distilled water. A large lively frog was held immobile and a drop of the solution was tricked into one if his eyes. At intervals of a few seconds, the reflex of the cornea was tested by touching the eye with a needle. The frog permitted his cornea to be touched and even injured whereas the other eye responded with the usual reflex action to the slightest touch. Next, the experiment was done on the human eye. Gaertner and Koller put the solution in each other's eyes, pricked their own corneas with pins in from of the mirror and realized that they had no awareness of the touch. And thus, the discovery of local anesthesia was made.

Koller, as a student, unfortunately did not have sufficient funds to travel to the Congress of German Ophthalmologists in Heidelberg. He asked his friend, Dr. Josef Berttauer to read his paper for him at the congress. In September 1884, Dr. Berttauer did so and demonstrated corneal anesthesia on a patient. The crowd was astonished and amazed. News of this discovery spread incredibly quickly. News of Koller's paper first reached the United States via a letter to the editor from Dr H.D. Noyes who had attended the congress completely describing what had taken place. Articles began appearing in leading medical journals of Europe, England and the United States, confirming Koller's findings. What is most striking about these reports is that they were all published before Koller's original work appeared in the December issue of the Archives of Ophthalmology.

In 1885, Koller moved to the Netherlands and worked with Dr. Donders. 1n 1888, he moved briefly to London, England and then onto New York City, where he stayed until his death in 1944. He never did receive the apprenticeship he wanted at the eye clinic, even though he name was on the tongues of doctors all over Europe and the United States. So, what happened to the most celebrated man of 1884? Why did he leave? It was a combination of anti-Semitism and an unfortunate incident that took place in January of 1885.

On January 5th, Koller was working in the Admitting Room of the Vienna General Hospital. His responsibility was triage the patients and send them to the appropriate doctor who would take care of them. A patient appeared who had an injured finger that was constricted too tightly by a bandage and was becoming gangrenous. Another intern, Dr.Zinner, felt this patient was suitable for his clinic, which Koller noted. However, before he sent the patient to this intern, he removed the dangerous bandage, to which Zinner objected. Koller paid no attention and removed the bandage, and Zinner insulted him with "impudent Jew". Koller then slapped him in

the face. Zinner felt forced to challenged Koller to a duel the next day. Koller remained unharmed, while the other was carried away after several bouts.

> *Although Koller was pardoned for his role in the duel, while he waiting for his pardon, he saw graffiti on the side of a house that said, "It is not the religious belief that matters to us/the swinishness lies in the race itself". This made him realize that how strong and beyond comprehension anti-Semitism really was. Thus, the bad publicity he received over the illegal duel, combined with the rising anti-Semitism, ruined Koller's hopes of obtaining the position of assistant at the clinic of Ophthalmology and an academic career, for which he was otherwise will qualified.*

Although Koller always regretted having to leave Vienna, he had a very successful career in New York. When he arrived in 1888, he joined the staff at Mt. Sinai Hospital. In 1901, he became the adjunct ophthalmic and aural surgeon. From 1909-1920, he was the attending ophthalmic surgeon, and from 1921 until his death in 1944, he remained the consulting ophthalmic surgeon. During these years he also served as the consulting ophthalmic surgeon at Montefiore Home and the Hebrew orphan Asylum.

Although he never sought out recognition for his discovery, Koller's contribution was later recognized and he was appropriately honoured. He received the Howe gold medal of the American Ophthalmologic Society, the Scroll of Recognition from the International Anesthesia Society, and the Kussmaul medal in commemoration of his discovery for the University of Heidelberg, where his paper was first read by Dr. Brettauer. He was also awarded the first Academy of Medicine Medal from the New York Academy of Medicine, and the Medal of Honor from the American Academy of Ophthalmology and Otolaryngology on the occasion of the 50th anniversary of his discovery.

Although the science of local anesthesia has evolved since Koller's discovery in 1884, it was the only one available for the next 30 years, and it is still used today in otolaryngologic procedures. Lidocaine, discovered in 1943, is now considered the prototype of local anesthetics, but Koller's contribution will always be remembered for paving the way for local anesthesia.

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MESMER: QUACK OR PROPHET BEFORE HIS TIME?

By

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ABSTRACT

In the year 1784, it was with growing excitement that the people of Paris gathered to watch a debate between Benjamin Franklin, who represented scientific reason, and Franz Anton Mesmer, who symbolized the supernatural and spiritual. Both men were powerful figures in France, however only one would emerge victorious and the other would be destroyed.

In his earlier years, Anton Mesmer, a brilliant and charismatic young doctor, developed a theory, termed "animal magnetism", that he believed was a fundamental biophysical force similar to gravity. Animal magnetism was based on the belief that all living beings were permeated by a magnetic fluid, which flowed from the stars, thus all disease was caused by an obstruction in the flow. By manipulating this fluid he believed he could cure all ills.

Mesmer began running magnetic clinics in Vienna but the Viennese Faculty of Medicine disapproved of his claims that he could cure all ills and pressured him to leave the country. He quickly set up secret clinics in Paris which were enormously successful and his sessions acquired a reputation for high drama, with rooms full of fainting patients experiencing emotional catharsis. The spiritualistic overtones of Mesmer's practice soon proved to be a threat to the scientific community. King Louis XVI appointed two commissions, one headed by Dr. Guillotine and the other by Benjamin Franklin (who was the American Ambassador to France), to investigate the practice of mesmerism. In a controlled set of blinded experiments, both commissions concluded that the success of mesmerism was due to the manipulation of the imagination and not magnetic flux. Mesmer protested vigorously but scientific reason prevailed and he was forced to leave France and died in obscurity in 1815.

Franz Anton Mesmer was born in Switzerland on May 23, 1734, near Lake Constance (Mesmer, 1948). At the age of 9 he entered a monastery school. Being the bright young man that he was, by the age of fifteen he had earned a scholarship and transferred to the University of Ingolstadt three years later. He studied the writings of Decartes and Wolff, but soon turned his attention to Paracelsus and his work won him a Ph.D. He also studied law for a time in Vienna, but his love of Paracelsus led him to take up medicine. At 32, he had completed his doctoral thesis, "Dissertatio physicomedice de planetarum influxu", which dealt with the effects of

gravitational fields and cycles on human health, and was extensively influenced by the writings of Paracelsus and the work of Richard Mead (Macklis, 1993).

On May 27, 1766 Mesmer received his medical degree (Mesmer, 1948). Two years later he married a widow ten years his senior and built a beautiful home in Vienna (Hall, 1976). Dr. Mesmer was deeply fond of music, and enjoyed playing the cello and the piano. His home soon became a meeting place for the music of lovers of Vienna, and Hayden and Mozart were daily visitors (Mesmer, 1948). In fact, when the Director of the Imperial Opera refused to present an opera by the then 12 year old Mozart, Mesmer presented Mozart's first work to the public in his own garden theater (Judge, 1938). Mozart later thanked Mesmer by inserting a complimentary reference to him in his work *Cosi fan Tutte* (Lopez, 1993).

Mesmer divided his time between his musical friends, and his philosophical and scientific study. In Europe great scientific studies were being made and people felt surrounded by wonderful, invisible forces: Newton's gravity, Franklin's electricity and miraculous gases of the balloons that lifted man into the air. At this time, durable high-power magnets were available and many European researchers began to investigate the medical powers of these magnets (Macklis, 1993). One of these researchers, was a Czecholosovakian-born Jesuit professor, Maximillian Hell, the chief astronomer at the University of Vienna and a respected experimentalist who published a treatise on magnetism in 1762. Although Father Hell was too busy to develop his ideas on the use of magnets, his work did manage to interest Mesmer.

In 1774, a distinguished foreigner and his wife arrived in Vienna (Judge, 1938). The lady complained of severe stomach cramps and her husband asked for the famous astronomer, Father Hell to prepare a magnet for her. Father Hell laid a powerful magnet on her belly, and to her astonishment the cramps quickly dissipated. Dr. Hell suggested to Mesmer that the magnetic force quite possibly was moving the etheric fluid. This intrigued Mesmer and he decided to investigate magnetism more seriously.

In 1775, at the age of 41, Mesmer published his first major medical treatise, which was in the form of an open letter to a foreign correspondent, Dr. J.C. Unzer, entitled "On the medicinal uses of the magnet"(Macklis, 1993). In his letter he recounts his treatment of a young patient, who was later identified as Francisa Oesterlin, who had episodic convulsions and hysteria. Prior to the treatment, Francisa had been suffering mysterious attacks of uncontrolled and unprovoked vomiting, urinary retention, toothaches, blindness, melancholy and paralysis. Mesmer believed that his magnetotherapy could break the influence of a celestial force that was interfering with the natural magnetic harmony of Francisca's body. He attempted to interrupt these attacks by first having the patient swallow an iron-rich solution and then attaching conformal magnetic soles to each of her feet and a heart-shaped magnetic to her chest. The following is Mesmer's account of what happened next:

> "She soon underwent a burning and piercing pain which climbed from her feet to the crest of her hip bone, where it was united with a similar pain that descended from one side-from the locality of the magnet attached to her chest-and climbed again to the other side where it ended at the crown…This transport of pain lasted all night and

was accompanied by abundant sweating of the side paralyzed by the former attack. Finally (her) symptoms disappeared…"

Since these results were more dramatic than that expected with the use of ordinary magnets, Mesmer proposed that a mysterious type of magnetic force was responsible for Francisca's recovery. This secondary force was derived from his highly advanced psychic abilities as a conduit and focuser of the magnetic flux. The re-establishment of the magnetic harmony was preceded by a "magnetic crisis", in which the patient demonstrated incoherent speech, bizarre behavior and a loss of consciousness. After the magnetic harmony was restored, the patient awoke with only a vague memory of what had transpired. Mesmer termed these forces "animal magnetism".

Thus, his theory of animal magnetism was the belief that magnetic fluid, flowing from the stars, permeated all living things and that every disease was due to an obstruction in the flow (Lopez, 1993). By manipulating this magnetic fluid, all ills could be cured. Mesmer was convinced that he had stumbled on a fundamental biophysical force analogous to gravity (Macklis, 1993).

Although, Mesmer's scientific endeavors are well known to his biographers, his occult status still remains somewhat of a mystery (Judge, 1938). There is evidence that Mesmer was not only a Mason, but also a member of the Brotherhood of Luxor, one of the oldest and most powerful Eastern Fraternities.

In 1776, Count de St. Germain, a fellow member of the Brotherhood of Luxor paid Mesmer a visit, who he had not met before. The following conversation transpired: "You must be the gentleman whose anonymous letter I received yesterday", Mesmer remarked as he took his caller into the study. "Yes," St. Germain replied, "I am he." "You wish to speak with me on the subject of magnetism?" Dr. Mesmer inquired, "I do," St. Germain replied. "That is why I came to Vienna." Dr. Mesmer then told his guest his magnetic experiments, confessing that he was still confused about the higher aspects of magnetism. "Who can enlighten me?" he asked. "I can," said the Count, with the assurance "it is my duty to do so." Both men kept what transpired next in the meeting in strict confidence, though it appears that they discussed the highest aspects of magnetism and the need to sever animal magnetism from the magnet completely (Hall, 1976). Mesmer later wrote: The desire to refute such errors once for all, and to do justice to truth, determined me to make no further use of the magnet from 1776 onward.

Mesmer became quite famous after a hypochondriac baron in Rokow sought his help after his physician had sarcastically referred him because he had finally tired of the baron's constant complaints of back spasms (Judge, 1938). Although the first five days did not improve the baron's condition, on the sixth day of Mesmer's magnetic treatment the baron began to feel relief.

Mesmer was especially interested in neuropsychiatric syndromes and intractable emotional problems, and the treatment of these disorders became his primary focus (Hall, 1976.). His home soon became a convalescent hospital where several patients were freed from nervous

disorders. It should be noted that Mesmer was also very sensitive to the needs of the poor and tended to them without charge, while he earned his living off those who could afford his fees.

Mesmer's most well known case was that of Marie-Therese Paradis, the daughter of Herr van Paradis, the Secretary to the Emperor and Empress of Austria. Miss Paradis had become inexplicably blind at the age of three. Mesmer promised to cure her if she took up residence in his house so he could concentrate his efforts. The titanic effort to restore her sight took time and suffered several setbacks, however she soon believed she could see. Herr von Paradis wrote full accounts of his daughter's cure and publicly thanked Dr. Mesmer (Mesmer, 1948). Various members of the medical community also apologized for previously doubting Mesmer's work (Hall, 1976). However, several physicians remained outraged and claimed that Mesmer was a fraud because Miss Paradis could not recognize or name the objects she allegedly saw for the first time in her life. Paradis was forcibly taken out of Mesmer's house, against her will, and soon her blindness and convulsions returned. Her father became enraged and joined others in demanding for a royal condemnation of Mesmer. Although Mesmer had numerous supporters to testify on his behalf, the pressure of the situation became too much to handle and Mesmer left Vienna and settled in Paris (Macklis, 1993).

Upon his arrival in France, Mesmer quickly opened a private clinic in the exclusive Place Vendome, in which he started developing new treatment methods, designed to reach the greatest number of people in the least amount of time. One of his most used devices was the baquet, which was "an oak tub specially designed to store and transmit magnetic fluid. The tub, some four or five feet in diameter and one foot in depth, had a lid constructed in two pieces. At the bottom of the tub, arranged in concentric circles, were bottles, some empty and pointing towards the center, some containing magnetized water and pointing outward towards the circumference. There were several layers of such rows. The tub was filled with water to which iron filings and powdered glass were added. Iron rods emerging through holes in the tub's lid were bent at right angles so the ends of the rods could be placed against the afflicted areas of the patient's body. A number of patients could use the baquet at on one time. They were encouraged to augment the magnetic fluid by holding hands, thus creating a circuit." (Crabtree, 1993)

In his sessions, Mesmer also used a magnetized tree, so that patients could be healed by holding ropes hanging from its branches. The most dramatic effect of these devices was to induce a crisis convulsion.

Thus, Mesmer's clinics soon developed a reputation for spectacular, high drama therapeutic sessions, with rooms full of fainting patients experiencing sensual release and emotional catharsis (Macklis, 1993). An account of one of the treatments is as follows:

> the patient would place the iron rods of the baquet to the afflicted areas of their body, "…Then came the assistant magnetizers, generally strong, handsome young men, to pour into the patient from their fingertips fresh streams of the wondrous fluid. They embraced the patients between the knees, rubbed them gently down the spine and the course of the nerves, using gentle pressure upon the breasts of the ladies, and staring them out of countenance to magnetize them by eye. All this time the most rigorous silence was maintained, with the exception of a few wild notes on the harmonica…"

The massage of their bodies seemed to loosen the patients knotted flesh, which housed unnatural concentrations of etheric fluid. Thus, long before Freud, Mesmer seemed to realize the effects of sexual repression and nervous hysteria (Mesmer, 1948). His techniques helped release many neurotic patients, to experience freedom from their mental and sexual insecurities.

Although Mesmer gained considerable fame and his techniques were the talk of France, many skeptics still prevailed (Lopez, 1993). In his defense, Mesmer published his French Report on Animal Magnetism, declaring "it is not a secret remedy, but a scientific fact, whose cause and effects can be studied" (Judge, 1938). He admitted that he wished to gain the support of some government courageous enough to give his methods a fair trial and inaugurate a house where the sick may be treated and the claims he made for animal magnetism fully tested.

This publication caused a sensation, and mesmerism was beginning to be considered a threat (Lopez, 1993). This new, universal remedy to prevent and cure illness was still cloaked in mystery. The Clergy attributed his astounding cures to the Devil, whereas the orthodox physicians denounced him as a charlatan. There was tremendous pressure on King Louis XVI to investigate mesmerism, however, since Mesmer had the support of many aristocrats in Paris Louis faced a difficult situation.

King Louis himself looked upon Mesmer's cures with suspicion and ordered an investigation into mesmerism, declaring it would be scandalous from Europe to see people as enlightened as the French forget the lessons of Decartes and stand bitterly divided between those who view magnetism as useful and those who believed it to be a dangerous and ludicrous delusion. He claimed it was the job of a good government to destroy error when dealing with influences possibly deleterious to both body and mind.

The investigation was conducted by two committees chosen from among the members of the Academies of Science and Medicine. Benjamin Franklin, the American Ambassador to France, headed one committee and Dr. Guillotine, the great humanitarian and scientist that developed a humane method of execution, headed the other. Other committee members included Lavoisier, the discoverer of oxygen, and the celebrated botanist, Dr. Jussieu (Hall, 1976).

The committees decided to investigate by conducting a controlled set of blinded experiments in which patients were exposed alternately to a series of magnetic or sham-magnetic objects and were asked to describe their sensations (Macklis, 1993). In one documented account:

> "…they brought a blindfolded young man. They made him embrace several trees for two minutes. At the first three trees which he held in this way, he said that he felt a numbness which redoubled at each tree; finally at the fourth, he remained by the tree and no longer answered; then he fell, and they carried him upon the turf, where he made many singular contortions; then he suddenly arose"(Lopez, 1993).

Two reports appeared during that summer, one for the public and one only for the eyes of Louis XVI. The report for the public revealed that both committees had agreed that the efficacy of the magnetic healing seemed to reside entirely within the mind of the patient. The fluid of

animal magnetism could not be perceived by the senses, and there is nothing to show that it exists, thus this non-existing fluid can serve no useful purpose. They further agreed that to proceed with these methods in the presence of others would undoubtedly prove to be unwholesome.

The secret report issued to King Louis dealt with the impact of animal magnetism on the matters of a sexual nature. The report suggested that women, having less stable nerves than men, a more inflammable imagination and a greater tendency to copy one another, were the predestined victims of such a system. "Touch them in one point, and you touch them everywhere, " it said. There was also the suspicion that older women were simply put to sleep, whereas the younger ones were submitted to *titillations delicieuses*. Therefore, the practice of mesmerism should be condemned on a moral as well as medical ground.

Mesmerism had certainly been dealt a blow. He protested vigorously to the Parliament and the Faculty and offered to mesmerize a horse or two as irrefutable proof that animal magnetism existed. They refused. Mesmer then asked that patients with refractory neuro-psychiatric illness be randomly treated either by his technique or the best medical treatment (Macklis, 1993). The patients would then decide themselves who were the charlatans. The panel again refused, acknowledging that they didn't discount the possible benefits of Mesmer's practice, only its basis as an objective biophysical force. Animal magnetism owed its efficacy to in the power of suggestion in susceptible or naïve individuals.

Mesmer was denounced as an imposter and found himself in the midst of social and political upheaval (Judge, 1938). In 1791, the revolution forced him, now penniless, to leave France. He retired to the small town of Frauenfeld near Zurich and quietly ministered to the local peasantry without revealing his identity.

He died in obscurity in 1815, somewhat vindicated as one of his disciples, the Marquis de Puysgur, accidentally discovered the hypnotic state while trying to magnetize a young shepherd boy (Mesmer, 1948). Although Mesmer was a good man, the debate of his legacy remains heated. Some claim that he was simply too arrogant man to admit his theory was wrong, and soon came to represent the worst of medical quackery (Macklis, 1993). Others believe that he must surely appear to us as no more a quack than some of the 20th century psychologists who must trace their intellectual roots to this man whose name is now a part of our language. Quack or a prophet before his time, the decision is yours to make.

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THE HISTORY OF THE STETHOSCOPE: THE INVENTION OF AUSCULTATION

By

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ABSTRACT

The invention of the stethoscope by Rene Theophile Hyacinthe Laennec (1781-1826) aided in the commencement of auscultation methods. Before Laennac's invention, the patient examination had been based mostly on the sense of sight, complemented by that of touch. With the use of the stethoscope, the period of physical diagnosis began.

Since the time of Hippocrates, physicians listened directly to patients' chests as they tried to assess cardiac health. Laennec relied on this method as well until one day, when he needed to examine a young woman, he hesitated to put his head to her chest. Recalling the concept of sound amplification, he rolled a stack of paper into a cylinder, pressed one end to the patient's chest, and held his ear to the other end.

The first stethoscope that Laennec made in 1816 was monaural, a simple wooden tube. A succession of different designs followed his. In 1850, George Camman (an American) created a better binaural model—the forerunner of today's stethoscopes.

For about a hundred years after its invention in 1816, the stethoscope was the most reliable and informative tool available for diagnosing cardiovascular disease. Although other methods have become better for diagnoses, the stethoscope has never been discarded. The use of the stethoscope has led to better descriptions of heart sounds and has improved a physician's ability to differentiate various murmurs and arrhythmias. It has also enhanced the comprehension of how blood moves through the heart during the cardiac cycle.

Why is René-Théophile-Hyacinthe Laënnec (17 February 1781-13 August 1826) often considered the father of thoracic medicine? Not only is he credited with the invention of the stethoscope, but he inaugurated the concept of diagnosis using a combination of auscultation and observation. It was no accident that Laënnec is remembered for such a historical discovery. This paper will discuss some of the significant events in Laënnec's life and his creation of a monaural stethoscope, concluding with its relevance to modern medicine.

Childhood and Youth

Born in Quimper, in the northwestern region of France called Bretagne, Laënnec left at the age of six, upon the death of his mother, and spent much of his youth in Nantes, where his uncle Guillaume-François Laënnec was Dean of the Faculty of Medicine. With his cousins, Laënnec enjoyed excursions through the countryside to collect insects, plants, and birds. Although he lacked proper clothing and had no money for books or fees, Laënnec, at age 14, attached himself to a military hospital to study medicine. "The civil war had necessitated the creation of new military hospitals, and the work of the medical school at the Hôtel-Dieu (now the Temple of Humanity) had been interrupted, but dissections were continued at the Hôtel-Dieu". His uncle, Guillaume-François, wrote to his father that René-Théophile was "good, gentle and studious". "After following for five years the courses at the Hotel-Dieu and the work at the military hospital, Laënnec passed the examination for the grade of Officier de santé" (Osler1913). After a year in the army, Laënnec went to Paris to the Hôpital Charité.

Paris

Laënnec went to study medicine in Paris where he qualified in 1804. Having left Nantes with a good knowledge of Latin, English, and German, Laënnec worked hard at Greek and wrote his doctor's thesis on the doctrine of Hippocrates (Osler 1913). Among his teachers in Paris were Corvisart and Bayle, who stimulated his interest in the clinical diagnosis of diseases of the chest and especially tuberculosis, from which Laënnec himself suffered. At the Hôpital Charité, Corvisart was revolutionizing the teaching of medicine. He taught his pupils to observe and compare the patients at the bedside to those in the morgue. Percussion was but recently employed in clinical medicine, for it will be remembered that it was Corvisart, Laënnec's teacher, who introduced it, and reclaimed it from obscurity by translating from the Latin Auenbrugger's essay published in 1761 (Camac 1959).

Working at clinical medicine and lecturing upon pathological anatomy, an active participant in the medical societies, by the age of twenty-five, Laënnec had made a strong impression on his contemporaries (Osler 1913). For five years after graduation, he was chief editor of the Journal de Médecine. Each year saw two or three important contributions from him, either to journals or to larger works. It was the age of the encyclopaedia and dictionary, and he contributed extensively to these (Camac 1959).

Stethoscope and Treatise

Laënnec’s clinical experience and anatomical dissections at the Necker Hospital in Paris culminated in his invention of the stethoscope (1816) and the writing of his masterpiece De l'Auscultation Mediate (1819) which may be regarded as the pioneer treatise from which modern thoracic medicine has evolved.

While conducting physical examinations, Laënnec discovered that the procedure of laying ones ear directly on the patient's chest soon revealed its distinct disadvantages, bringing physician and patient into closer contact than either may have wanted. Moreover, as intimate as this method of auscultation was, it still did not permit the physician to hear the interior of the

body clearly and distinctly (Rothman 1995). Diseases of the thoracic viscera often present similar findings, so auscultation identifies them.

The following is an excerpt from Laënnec's treatise: "The first instrument which I used was a cylinder of paper, formed of three quires, compactly rolled together, and kept in shape by paste. The longitudinal aperture which is always left in the centre of the paper thus rolled led accidentally in my hands to an important discovery. This aperture is essential to the exploration of the voice. A cylinder without any aperture is best for the exploration of the heart: the same kind of instrument will, indeed, suffice for the respiration and rhonchus. The most dense bodies do not, as might have been expected from analogy, furnish the best materials for these instruments. Glass and metals, exclusively of their weight and the sensation of cold occasioned by their application in winter, convey the sounds less distinctly than bodies of inferior density. Upon making this observation, which at once surprised me, I wished to give a trial to materials of the least possible density, and, accordingly, caused to be constructed a cylinder of gold-beater's skin, inflated with air, and having the central aperture formed of pasteboard. This instrument I found to be inferior to all the others, as well from its communicating the sounds of the thoracic organs more imperfectly, as from its giving rise to foreign sounds, from the contact of the hand, etc. Bodies of a moderate density, such as paper, the lighter kinds of wood, or Indian cane, are those which I always found preferable to others. This result is perhaps in opposition to an axiom in physics; it has, nevertheless, appeared to me one which is invariable. In consequence of these various experiments, I now employ a cylinder of wood, an inch and a half in diameter and a foot long, perforated longitudinally by a bore three lines wide, and hollowed out into a funnel shape to the depth of an inch and a half at one of the extremities. It is divided into two portions, partly for the convenience of carriage and partly to permit its being used of half the usual length. ... When applied to the exploration of the heart and the voice it is converted into a simple tube with thick sides by inserting into its excavated extremity a stopper or plug traversed by a small aperture ... This instrument I have denominated the stethoscope" (Camac 1959).

Laënnec is the author of a ground-breaking textbook on diseases of the heart and lungs, which is still worth reading today. After three years of study and patient investigation of the use of auscultation in pulmonary and cardiac diagnosis, Laënnec composed De l'auscultation mediate (Walsh 1970). Almost at once Laënnec's method of auscultation attracted widespread attention, which is unusual for a new invention.

While primarily known for the invention of the stethoscope, Laënnec was also one of the pioneers of precise clinical observation correlated with postmortem physical signs. The most lasting contribution to the study of pathology made by Laënnec was this method of comparing clinical with post-mortem findings. The careful records which he kept in carrying out this method would in themselves probably have kept his name, prominent in the history of medicine (Camac 1959).

Laënnec's reputation progressed during the half-century following his death from being the inventor of auscultation to the man who had linked pathological anatomy to clinical medicine, and then to the greatest French physician of the nineteenth century. This reputation was forged by various groups who sought to identify themselves with the practical benefits of auscultation. By the twentieth century, Laënnec's reputation advanced again. The inventor of the stethoscope

had become the single founding father of the Parisian school and the standardbearer for the clinically centred research traditions of the Parisian medical elite (Weisz 1995). Although Laënnec's medical discovery was, by any standards, extraordinary, there are some people who feel his outstanding reputation has been determined by embellishment of his invention and methods. His reputation evolved in the way it did because various groups at different times found it necessary to create histories for themselves, histories graced with heroes (Weisz 1995).

The especially crucial component of Laënnec's work, however, was not merely the invention of the stethoscope, but the exact inspection of the changes of the breath sounds that could be distinguished with the stethoscope in various forms of thoracic diseases. Laënnec succeeded in pointing out how each one of the various diseases of the heart and lungs might be recognized from each other.

In regards to heart disease, it was, before Laënnec's discovery, almost a closed book in the practice of medicine. It was accepted that people died from heart disease often and, not uncommonly, without much warning. The possibility that heart conditions could be separated one from another, and that some of them could be proven to be relatively harmless, some of them liable to cause persistent illness, while others were certainly allied with the likelihood of sudden fatal termination, was scarcely dreamed of. It is to Laënnec's introduction of auscultation that modern medicine owes all its more exact knowledge of heart conditions and their significance.

Before Laënnec, most of the diseases of the lungs, if joined with any propensity to fever in particular, were called lung fever. He demonstrated the difference between bronchitis and pneumonia, pneumonia and pleurisy, and the an assortment of forms of tuberculosis and even the rarer pathological conditions of the lung at the time, such as cancer, as well as the more familiar conditions usually not associated with fever. This remarkable study of the lungs has allowed physicians to this day to be able to diagnose so many illnesses simply based on listening to the lungs. Laënnec himself did not solve all the mysteries of sound in the heart as he did in the lungs; indeed, he made some mistakes that render him more sympathetic because they bring him down to the level of our humanity (Walsh 1970).

Conclusion

Laënnec will forever be remembered as the inventor of mediate auscultation and the stethoscope. Although he was not elected to the French Academy of Sciences, his posthumous reputation is great. Many consider him to be a martyr to science because he died from tuberculosis, of which his invention allowed for the diagnosis through auscultation and by means of pathological studies, separating it from similar affections of lungs.

The first stethoscope that Laënnec made in 1816 was monaural, a simple wooden tube. For about a hundred years after its invention in 1816, the stethoscope was the most reliable and informative tool available for diagnosing cardiovascular disease. Although other methods have become better for diagnoses, the stethoscope has never been discarded. A succession of different designs followed Laënnec’s. In 1850, George Camman (an American) created a better binaural model—the forerunner of today's stethoscopes. The use of the stethoscope has led to better descriptions of heart sounds and has improved a physician’s ability to differentiate various

murmurs and arrhythmias. It has also enhanced the comprehension of how blood moves through the heart during the cardiac cycle. The practice of internal medicine, especially respirology and cardiology, would not be where they are today without Laënnec's invention of the stethoscope.

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A COUNTRY DOCTOR'S CONTRIBUTION

By

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ABSTRACT

During the nineteenth century in Europe, scientists and physicians continued their age-old struggle against the infectious diseases that plagued humanity. The brilliant French scientist Louis Pasteur proposed the 'Germ Theory' claiming that microorganisms were the cause of such disease. Although evidence for his theory was demonstrated, conflicting results from other researcher's work obscured the nature of the relationship between germs and disease. Pasteur's universal claim that one germ was the cause of a particular disease remained unproven.

A country doctor in Germany named Robert Koch, with a passion for natural science, spent his free time studying microorganisms through the lens of the microscope given to him by his wife. Isolated from the European scientific community and having no prior experience in research, Koch set out to investigate the cause of anthrax. Developing ingenious technical procedures to achieve his objective, Koch proved that the anthrax bacillus was the cause of the disease and he demonstrated that it could be transmitted from seemingly lifeless soil to infect healthy animals.

Koch's systematic approach to his work led him to propose the well-known Koch's Postulates, the tenets that must be satisfied if one is to conclude that a species of bacteria is the cause of a particular disease. The materials and techniques Koch developed in order to achieve his experimental objectives and Koch's Postulates remain cornerstones of bacteriology.

This paper discusses the significant problems in bacteriology in the late nineteenth century that prompted Koch to seek a means of clarifying the relationship between germs and disease while examining the ideas, techniques, and methods that he employed in order to succeed.

In the mid-nineteenth century great change was sweeping the globe. During the renaissance and enlightenment there occurred a revolution in thought that led to a reexamination of the universe (Garraty and Gay 1986, 835; Porter 1997, 168). As developments in science led to industrialization and exploration, infectious disease thrived throughout the densely populated areas of the world (Garraty and Gay 1986, 849; Metchnikoff 1939, 15). Most people believed that the cause of such disease was fetid gas that lingered wherever there was the stench of death (Metchnikoff 1939, 46).

Long before the microscope, Fracastorius suggested that some miniscule organized being in the air was responsible for infection. (de Kruif 1932, 217). Several hundred years later the chemist and microbiologist Louis Pasteur proposed the idea that a particular disease was caused by a specific microbe (Metchnikoff 1939, 43; Vallery-Radot (n.d.), 187). Pasteur's idea was supported by substantial evidence but the scientific establishment, led by Virchow, opposed the 'germ theory', citing numerous criticisms that could not be satisfactorily answered (Metchnikoff 1939, 11, 40, 59). Microbiology was in need of the ideas and innovations that would allow microbiologists to reproduce results free of contamination. This would require someone who was meticulous, persistent and creative.

Nestled in the hills of eastern Germany, far away from this heated debate of biology and disease there lived such a man. Robert Koch graduated from the University of Gottingen in 1866 and worked in the town of Wollstein as a country doctor (Barlow 1971, 16, 38). Bored with his practice and having had a passion for natural science since his childhood, he undertook microbiology as a hobby (Barlow 1971,12, 40; de Kruif 1926, 104).

Koch began his work on anthrax, a disease that was at the time destroying livestock throughout the countryside of Europe (Barlow 1971,40; de Kruif 1926, 104). Familiar with Pasteur's ideas he considered the criticisms that remained unanswered (Barlow 1971,41; Brock 1961, 90; Metchnikoff 1939, 165). Four observations supported the critic's position.

i) Germs isolated from the blood and tissues of animals with various different diseases appeared to be identical (Brock 1961, 97; Metchnikoff 1939, 174).

ii) Some animals inoculated with blood containing the bacilli would go on to develop anthrax, yet no bacillus could later be recovered from their blood (Brock 1961, 90; Metchnikoff 1939, 60).

iii) Animals of all species could be shown to have germs in their blood and yet remain free of disease (Brock 1961, 96). This suggested that high numbers of microbes found in diseased animals was the result of some other pathologic process (Metchnikoff 1939, 168).

iv) Anthrax could remain for years in the air or soil retaining an ability to infect animals, while in the lab bacilli could survive only a few days (de Kruif 1926, 104, 113).

Almost entirely isolated from the European scientific community and without the aid of state of the art apparatus, the doctor set out to explain each of these observations (Porter 1997, 436).

Koch examined the blood of animals that had died of anthrax observing that it was full of tiny threads, while the blood of healthy animals had none (de Kruif 1926, 105). He was skeptical of the claim that an animal could exhibit genuine anthrax symptoms in the absence of bacilli. With improved techniques utilizing stains and light condensers and after infecting and inspecting the blood of hundreds of animals, he satisfied himself that this claim was unfounded. The

threads that he believed to be bacilli were present in every case of the disease (Brock 1961, 91; de Kruif 1926, 105; Metchnikoff 1939, 178, 217).

Next Koch tried to prove that these threads that he saw in the blood of diseased animals were indeed alive. He knew that others had claimed these threads to be bacilli, but nobody had seen them grow. Koch decided that the aqueous humor from an ox's eye could serve as an appropriate medium for culture (de Kruif 1926, 109). After maintaining his specimen at body temperature for several hours he examined it. Peering through his lens at the threads, he thought that they might be growing but was frustrated each time by the growth of other bodies that obliterated his view of the bacillus (de Kruif 1926, 109). Koch was at a standstill frustrated by his inability to keep his samples pure.

In an eloquent demonstration of his creativity and determination, Koch devised the 'hanging drop' solution to his problem (de Kruif 1926, 110; Metchnikoff 1939, 193). Underneath a heat sterilized glass slide he suspended a drop of specimen. He then set this on another piece of sterile glass with a concave well carved into it, so that the drop was untouched. Between the glass pieces the sample was sealed and protected from contamination allowing him to examine it while it was maintained at body temperature (de Kruif 1926, 110; Metchnikoff 1939, 193). He grew generation after generation of his threads, diluting them, growing them again and watching it happen under his lens each time. After eight generations, when there was nothing else but the bacilli he had seen grow in his sample he injected a mouse and waited. The next day when he opened the door to his study, the mouse lay rigid. An examination of the mouse's blood revealed that the bacilli were present (de Kruif 1926, 111). Since he had diluted one part of his sample in ten parts of growth medium, eight times, he was confident that it could not have been a 'non living' entity that had caused the death of this mouse. Only the anthrax bacillus that he had watched growing could have been responsible (de Kruif 1926, 112).

Koch had successfully countered the first three criticisms. Using assorted stains, and observing differential growth rates under various conditions, what other researchers had considered 'identical' microbes, Koch consistently demonstrated to be different (Metchnikoff 1939, 178). With respect to the claim that microbes occur in healthy animal's blood, he concluded after consistently finding none, that previous researchers had mistaken endogenous blood elements for microbes (Metchnikoff 1939, 170). All animals with bacilli in their blood developed anthrax, and all animals without bacilli did not develop anthrax. Koch had proven that a specific microbe caused a specific disease. Yet he was still perplexed with how anthrax survives for years outside of a host and then strikes with alarming swiftness (de Kruif 1926, 113).

Not knowing where to turn Koch repeated his prior experiments over and over, becoming more adept at his techniques and convincing himself beyond doubt of his previous conclusions. One day he examined a 'hanging drop' that had been kept at body temperature for over twenty-four hours (Barlow 1971, 92; de Kruif 1926, 114). Expecting to see the drop bursting with elongating filaments, he was surprised to see something else. Tiny 'light refracting granules' occurred within the faint filaments throughout his droplet (Barlow 1971, 94; de Kruif 1926, 114). After repeating the process of warming, growing, examining and observing these granules, he injected them into a mouse (Barlow 1971, 95; de Kruif 1926, 114). He allowed different

intervals of time to elapse between removing the beads from the heat and injecting the animals. After each period of days, then weeks and then months, the 'granules' he had recovered caused anthrax. Borrowing a word from botany Koch said that the bacilli had formed spores that allowed them to survive indefinitely (Barlow 1971, 95; de Kruif 1926, 115). He had solved the mystery of anthrax, countered all criticisms of the germ theory and completed the work that led him to develop 'Koch's Postulates' (Porter 1997, 436).

i) The specific organism should be shown to be present in all cases of animals suffering from a specific disease but should not be found in healthy animals.

ii) The specific microorganism should be isolated from the diseased animal and grown in pure culture on artificial laboratory media.

iii) This freshly isolated microorganism, when inoculated into a healthy animal, should cause the same disease seen in the original animal.

iv) The microorganism should be re isolated in pure culture from the experimental infection.

Koch finally went to the nearby university in Breslau to show others his work (Metchnikoff 1939, 45). By the end of his presentation, the room of scientists, renowned for their ability to crush fledging scientist's new ideas, sat speechless (de Kruif 1926, 117; Metchnikoff 1939, 45). Koch's work was so complete and so effectively demonstrated that its importance was immediately realized. The medical establishment in Europe could not deny Koch's claims as scientists worldwide were duplicating his results with anthrax and other microbes (Metchnikoff 1939, 64). In formalizing the procedures for identifying microorganisms with a particular infectious disease, Koch had elevated bacteriology to a regular science (Porter 1997, 436). A new era in the fight versus infectious disease had begun.

Koch's life underwent a dramatic change. His work took him to Berlin and eventually around the world, identifying many other important microorganisms and developing other techniques vital to the continued progress of bacteriology (Porter 1997, 437-445). He was awarded the Nobel Prize in medicine in 1905 in recognition of his lifetime achievements in medical microbiology (Metchnikoff 1939, 332).

In the decades following Koch's presentation of his postulates great strides were made in all areas of medicine, especially versus infectious diseases. Pasteur's earlier claim that "one day human's would conquer germs and eliminate the diseases that they caused" suddenly seemed possible (de Kruif 1926, 100). The way that humans perceived themselves and their place in the world had changed forever.

In the twentieth century science made incredible strides in characterizing germs, as well as preventing and curing infections. Our initial naïve claims of universal eradication have been replaced by a more humble realization of the true ubiquitous and tenacious nature of microorganisms. Not unlike the anthrax in Koch's time, the current 'foot and

mouth' crisis boiling in Europe reminds us that despite our continually improving knowledge and technical abilities, we will never conquer microorganisms but will always struggle against them in an eternal competition for survival.

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History of Silicone Breast Implants: Science and Society

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ABSTRACT

In our modern society of science and technology, social policies are not always driven by scientific reasoning and epidemiological studies. The story of silicone breast implants from 1965 to the time they were banned in 1992 provides some insights into the social factors leading to the dismissal of rational thinking and acceptance of "junk science" by the public. The first recorded breast implant surgery was in 1895, with a variety of many different materials used, such as autogenous fat, paraffin, bees wax, and olive oil. The development of silicone breast implants in 1965 led to the widespread use of implants in western society. By the late 1970s, case reports linking silicone and autoimmune diseases began to surface, and by the early 1980s, silicone implants became the focus of floods of civil litigation against implant manufacturers. Although no scientific data was available at the time, the public-at-large had made its decision that breast implants caused connective tissue disorders. Physicians were strongly divided between those who believed in the connection, and those who did not. These opinions were presented in courtrooms as concrete science, as told by "expert witnesses", leading to a number of significant cases ruling in favour of the women suing implant manufacturers. By the time silicone implants were banned in 1992, the wave of public support for women who had received implants was enormous. Less and less evidence was required for larger and larger settlements. The media helped to disseminate the information, convincing the public of the hazards of silicone implants. Significant pressure was also put on the government to prevent the sale of what was perceived to be an extremely harmful product. Eventually governments agreed to ban the sale of implants until they were proven to be safe. Since then, epidemiologic studies have shown no relationship between silicone implants and autoimmune diseases. Armed with this scientific data, we can look back upon the events that transpired before implants were banned. It was a time that was littered with outrageous anecdotes of actions that were once perceived as necessary. These stories reflect on how our social structure led to the widespread hysteria, and many of the beliefs about silicone implants that still exist today.

In our modern world of science and technology, we believe that we are at a stage where science and reasonable thinking rule our social and government policies. Quack cures and random decisions have been replaced by well-planned and documented research with detailed statistical analysis. Yet perhaps our society has not come as far as we might think.

Silicone breast implants were the target of legal prosecution and social persecution in the 80's and 90's with claims that they caused a variety of autoimmune conditions in women. Implants were eventually banned from the market in 1992 following years of civil litigation, which still continues today. It was not until two years after the ban of silicone implants that the first epidemiological study on silicone implants and autoimmune diseases was completed[1]. Since then, many more studies looking at a link between implants and autoimmune diseases have been completed, and the majority of the scientific community accepts that there is no connection between the two. Yet social policy has not changed, and silicone implants are still only available for research purposes.

Many factors led to the moulding of the public's understanding and beliefs regarding silicone implants. Among these are the ability of the public to understand scientific evidence that is available, the role of courts in western society, widespread media dissemination of information, public fear and private greed, and political agendas. With influences from so many aspects, many of the ideas regarding implants are engrained societal beliefs, and many of these myths still exist today. Now, armed with scientific data, we look back upon these events and study the social system that determined the fate of silicone implants.

The concept of breast augmentation surgery has been around for at least the past century. The first recorded breast augmentation surgery was in 1895 by Czerny, a German plastic surgeon[2]. Initial operstions used fat transplants from other parts of the body, but by 1900, surgeons had begun experimenting with various artificial materials. Materials such as paraffin, olive oil, petroleum jelly, and beeswax were experimented with for many years. Free paraffin was the most popular choice until the 1950s, when the Ivalon polyvinyl alcohol sponges came onto the market. These sponges, however, would lead to severe fibrosis and contraction of the implant over time. In the 1950's, silicone also became a common biomaterial for medical equipment such as shunts and catheters. Women were injecting free silicone gel for breast augmentation. This was common among Japanese prostitutes post WWII, and spread to North America where it was mostly used by showgirls and aspiring actresses in North America. Many complications developed from free silicone injections, as the silicone could freely spread systemically. In 1962, Cronin and Gerow developed and implanted the first the silicone breast implant, which involved a silicone envelope enclosing the silicone gel.[3]

There are many complications associated with silicone implants that are accepted by both the manufacturer and the public. Implants can lead to local inflammation and fibrous capsules can form around the implant leading to hardening. Lower molecular weight silicone can also leak out of the elastomer membrane, and occasionally implants can rupture. For a while, implants were believed to be linked to breast cancer, but later were shown to have no connection. A proper mammography can be done with silicone implants, but requires more skill on the part of the technician. Despite these potential complications, silicone implants were the choice of most women before 1992, with 97% of women choosing silicone over saline implants.

From 1965 onwards, the popularity of silicone implants grew tremendously. Implants were used not only by showgirls, but by the general public who sought more subtle breast augmentation surgeries. By 1992, 1 in 100 women in North America had silicone implants. [4]

The first associations between silicone implants and autoimmune diseases came out of Japan. By the late 1970s, there were case reports linking silicone to a "human adjuvant disease"[5]. There were two main problems with these reports. First of all, many of them were from women who had received free silicone injections, and not silicone implants. The second flaw was that they were case studies, not epidemiological studies. These reports however were an important starting point for developing the public viewpoint on silicone and autoimmune diseases. In 1982, an Australian report linked silicone implants to connective tissue diseases in three women. This led many scientists to investigate further the relationship between the two conditions, and helped form many of the strong opinions in the scientific community.

By 1984, a significant civil case was tried in the United States courts, with Maria Stern suing Dow Corning, claiming that her arthritis-like condition was caused by her silicone implants. During this lawsuit, one of her lawyers, Dan Bolton, discovered some internal documents from Dow that showed implants to be unsafe in animal studies. Dow Corning settled the lawsuit for 2 million dollars and also sealed the documents from further court cases. This was the first successful case that linked autoimmune diseases and breast implants. Previously successful lawsuits had been over implant ruptures and not autoimmune diseases[4].

The number of lawsuits increased tremendously after the settlement of the Stern vs. Dow Corning case. Although implant manufacturers won most of the cases brought against them, the cost of litigation was increasing dramatically. The next significant case was in 1991 of Hopkins vs. Dow Corning. Maria Hopkins was diagnosed with a severe form of mixed connective tissue disease in 1979. She believed that there was a connection between the disease and the implants she had received in 1976, but was shrugged off by her physicians. She saw Dan Bolton on television discussing the link between implants and autoimmune diseases, and hired him to represent her in court. There were a few important differences in this case compared to Stern's situation. Hopkins had had her breast implants replaced twice, the first time a few months after her initial implants in 1976, and again in 1986, both due to implant ruptures. What was significant in this case was that Hopkins' rheumatologist believed that she had symptoms of her autoimmune disease before her implants in 1976. Her internist had ordered tests for autoimmune antibody titers in 1975 because he suspected an autoimmune disease. This however did not appear to sway the jury at all, and Hopkins was awarded 7.34 million dollars.

A final significant case was in 1992, just before silicone implants were banned by the FDA. This case involved Pamela Johnson and another implant manufacturer, Bristol-Myer-Squibb. Unlike Hopkins and Stern, Johnson was not diagnosed with a specific autoimmune disease, and her symptoms were fairly vague. She was described as having perpetual flu-like symptoms since her initial breast implant had ruptured. Another important difference was that Johnson had received the implants for cosmetic purposes, whereas Hopkins and Stern had both received implants for reconstructive surgery. Johnson's plastic surgeon had also performed a closed capsulotomy to break the fibrous capsule formed around her implants, causing her implant to rupture. Manufacturers had already warned against doing this procedure since ruptures post-

capsulotomy were common. These factors were expected to lead to a less sympathetic jury; however, the public sentiment was strongly swayed against implant manufacturers at this point, and Johnson was awarded 25 million dollars.[4]

The public by this point was convinced that there was a connection between implants and auto-immune diseases. The perception was that if there was no link at all, courts would not have found in favour of the plaintiffs and awarded such large settlements. The media also fed on the general public's fear for their health. Primetime media and talk shows produced many segments interviewing women with autoimmune diseases, implying that their diseases were caused by their silicone implants. Women who had received implants were often genuinely concerned that their implants could cause serious autoimmune conditions, and there was a flood of surgeries to remove silicone implants.[6]

Adding to the fear were individuals looking to make a profit off this public hysteria. Lawyers are always perceived as the societal vultures, and in this case, they certainly added fuel to the flames. Lawyers such as Dan Bolton specialized in breast implant litigation, with widespread advertising to recruit clients. Physicians were also not immune from the greed. In the United States, where medical care is privately funded, certain physicians accepted referrals from implant lawyers. These physicians diagnosed over 90% of these referred women with some form of autoimmune disease, even if there were no real symptoms[7]. Patients were often not billed until after legal settlements, which was an illegal practice. Television infomercials also existed to sell home diagnostic kits testing for siliconosis, which they advertised as an indicator for autoimmune diseases[8].

As the public became more and more aware of the on goings surrounding silicone implants, they began to put more and more pressure on the government to take action. People believed that since implants were now accepted to be harmful to women's health, the government had a responsibility to protect women against these products.

Silicone implants were under the jurisdiction of the Federal Drug Administration after legislation changes in 1976. In 1982, the FDA drafted legislation requiring premarketing approval for products such as silicone implants, but since implants had been on the market for over 15 years, they were "grandfathered", which meant that implants were allowed to stay on the market while the approval was sought. Implant manufacturers however, continued with their activities, and never sought approval from the FDA. It was not until 1988 that the FDA put together a committee to assess the safety and efficacy of silicone implants. This was a few years after the Stern vs. Dow Corning case, and the public perceptions towards implants had started to put pressure on the FDA to take action. This panel was headed by Dr. Norman Anderson, a surgeon from Johns Hopkins who personally believed that implants had caused autoimmune diseases in these women. Again no progress was made, and implant manufacturers failed to file proper documentation.

In 1991, David Kessler was appointed as the new commissioner of the FDA. He gave implant manufacturers a deadline to file documentation regarding silicone implants, or the implants would be pulled off the market. Only four manufacturers actually filed papers to the FDA, and the documentation was described as sloppy and incomplete. Despite this, the new

committee, this time headed by Dr. Elizabeth Connell from Emory University, unanimously voted to recommend keeping silicone implants on the market. The committee requested better documentation and evidence of safety from the manufacturers, but because of the long time implants had been on the market, they did not see sufficient evidence to require withdrawal of implants from the market while waiting for better studies. Dr. Anderson was at this point a non-voting member of the committee. He was removed from the committee because of his obvious bias against silicone implants. After the decision of the committee, Dr. Anderson approached David Kessler with the internal documents from Dow Corning which were found by Dan Bolton during investigations for the Stern vs. Dow Corning case.

The internal documents from Dow Corning were of animal tests conducted in the 1960s that showed adjuvant properties of silicone when injected into rats. They also showed various animal studies with silicone implants causing sarcomas and inflammation in dogs and rats. There were also memos instructing salesmen for Corning to wash the implants before presentations to remove the oily film left by escaping silicone from the envelope. After these documents were presented to the FDA committee, the committee reversed its earlier decision, and recommended that the silicone implants be removed from the market until further studies could be conducted. A moratorium was placed on silicone implants in 1992, followed closely by the banning of implants in the United States, and elsewhere in the world[4].

What was important to note was that the banning of implants was not because silicone implants were shown to be harmful, but because the manufacturers had failed to provide evidence of their safety. Kessler believed that removing implants from the market would eliminate the controversy surrounding silicone implants[8]. To the contrary, banning of implants led to the class action lawsuits against many manufacturers, and eventually to a 4.5 billion dollar bankruptcy settlement by Dow Corning. The manufacturers did not believe that their product was responsible for the condition of these women, but found it more economically feasible for them to settle the lawsuit than fight the court cases with enormous litigation fees. To the public however, the settlement was an admission of guilt, which probably cemented the perceptions that exist today[4].

Although implants have since been cleared of guilt with regard to autoimmune diseases, there has not been a push to remove the ban placed in 1992. The public perhaps is not ready to admit to their misplaced hysteria, and the media has not been as enthusiastic to spread the news of epidemiological studies contrary to their original beliefs. The Dow Corning settlement is still being finalized in the courts, and continues to proceed despite new scientific data.

Most people have the perception that the settlement will only benefit the women who receive money from the large corporations, and the corporations can afford to give away some of their profits. However, these events have affected everyone, not only those with silicone implants. For a period of time, biomaterial manufacturers were unwilling to produce medically necessary materials for equipment such as shunts and catheters for fear of future litigation. New legislation had to be placed to protect manufacturers against legal action, and protect the supply of medical devices. Silicone implants however were excluded from this legislation[7].

Significant government, legal, and medical resources were also devoted to the area which could have perhaps been better spent elsewhere. Although Corning declared bankruptcy from the court cases, the enormous costs of litigation, and the outrageous legal settlements ultimately came out of the pockets of the public-at-large, and not from the profits of the manufacturer. So this spread of unproven theories as truth has had a widespread effect on everyone, not only on those with silicone implants.

We now look back upon these cases, and see unfounded accusations and outrageous stories, but there is nothing in our social network that would prevent this from happening again. So perhaps we have not really changed that much from our forefathers. Despite what we consider great scientific and educational advances, our society is as gullible as ever before, and public health policies perhaps have less to do with medical research than we might believe.

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