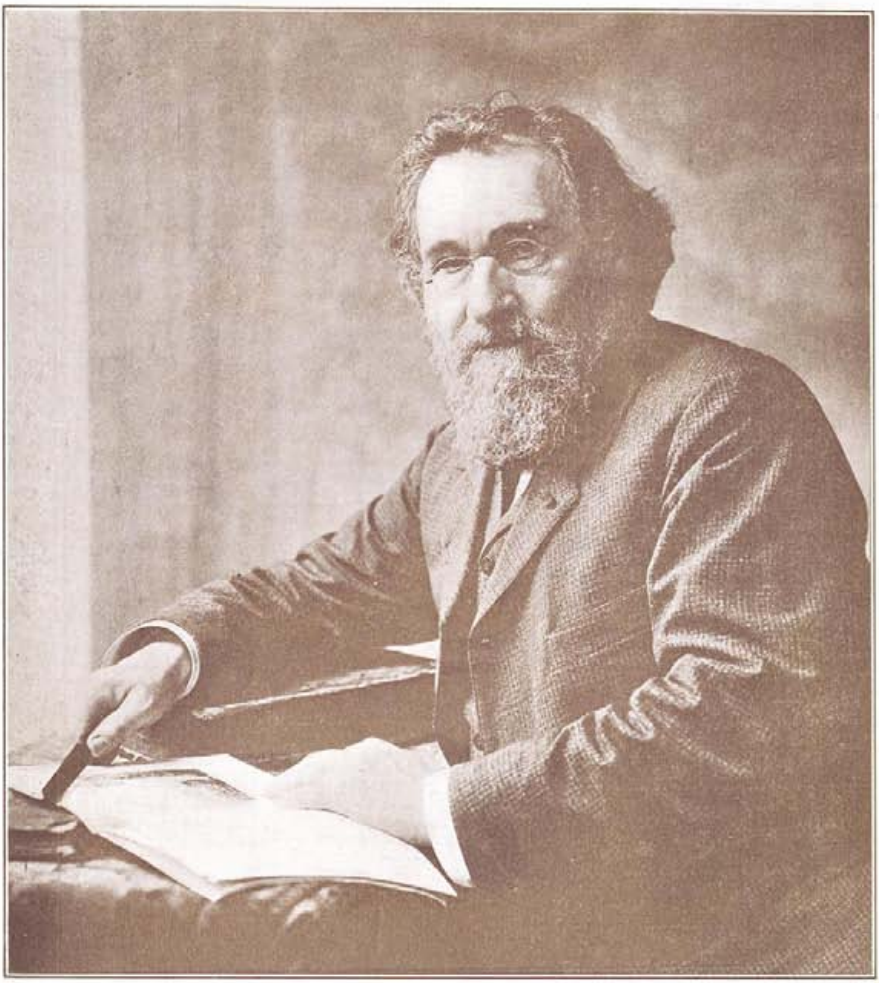
METCHNIKOFF

SCIENTIFICALLY SOURED MILK



Elie Metchnikoff

Scientifically Soured Milk

ITS INFLUENCE IN ARRESTING

INTESTINAL PUTREFACTION

AND ITS ACTION IN THE TREATMENT OF DISEASES CAUSED BY INTESTINAL

AUTO-INTOXICATION

BY

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PREFACE.

The brief reference to the subject of soured milk in its relation to the prolongation of human life, published by Professor Metchnikoff in 1904 in Revue Scientifique, Vol. II, p. 103, created a world-wide interest in this subject and a great demand for further information in detail. A large number of inquiries came from America.

Finding it impossible to respond by letter to all the questions propounded, Professor Metchnikoff decided to extract the following chapter from the manuscript of "The Prolongation of Life," which he was then writing, and permit it to go to the scientific world in the form of a small brochure, answering, as far as possible, all questions that had been put to him, placing before his inquirers all that he had learned up to that time by experimentation and observation on this interesting subject. This paper was published in Paris in 1905, and in May, 1907, in this country. The "Prolongation of Life" was published in America in January, 1908. This paper presents the latest authorative information in reference to scientifically soured milk and its influence in the cure and prevention of diseases and in the arrest of intestinal putrefaction.

Professor Metchnikoff also refers at length to harmful preparations of artificially soured milk in which the fermentation is created by the use of yeasts. This chapter being a resumé of the latest discoveries and experiments of Professor Metchnikoff and his colleagues, the information it contains will undoubtedly prove of interest to every physician.

A Few Remarks on Soured Milk.

Man comes into this world with intestinal contents absolutely free from any form of germ life. But little time is lost, however, before the omnipresent microbe takes up its residence in the digestive tube, where it finds an excellent culture medium consisting of bile, intestinal mucus and the disquamations which go to make up the meconium. A few hours after birth microbes penetrate into the intestines through inhalation of air and the opening of the anus. Even during the first day after birth, and before the infant has taken food of any sort, the meconium exhibits a varied flora consisting of many different species of microbes. Under the influence of the mother's milk this flora becomes very much reduced, and, for the major part, is composed of a particular microbe discovered by Tissier and named the *bacillus bifidus*.

From this it is evident that the intestinal microbes are influenced by the food we eat. A child nourished with cow's milk has an intestinal flora richer in species than one that is nursed at the breast. Later in life, as different articles of diet are added, there is a greater variation among the microbes of the digestive tract. This fact has been amply verified by the observations of Macfadyen, Neucki and Mme. Sieber in the case of a woman with a fæcal fistula. This variation of the intestinal microbes in its relation to our foods permits us to modify the intestinal flora by replacing harmful microbes with those that are useful.

Unfortunately, the actual knowledge we possess of the intestinal flora is still imperfect. This is mainly due to the difficulty in finding an artificial medium in which to cultivate these different microbes. This circumstance renders the task of research extremely difficult. However, the problem can be approached by rational deductions from observation.

Man, even in his savage state, prepares his food before consuming it. He submits many of his aliments to the influence of fire, which causes a notable diminution of the number of microbes as com-

pared with the multitudes absorbed when food is taken raw. Therefore, in order to reduce the intestinal flora, it is necessary only to eat or drink such substances as have been previously boiled or cooked. Even under these conditions all the microbes are not destroyed, for there are many that will resist a temperature of 100c degrees; but a large majority are killed.

The opinion has been offered that cooked or completeiy sterilized victuals (heated from 120c to 140c degrees) are unhealthy, and in this state are poorly digested. From this point of view a campaign has been organized against feeding to infants boiled or sterilized milk. Admitting that in certain cases boiled or sterilized milk is not well borne by the infant, the majority of nurselings can and do thrive upon a diet of boiled milk. The great number of children fed on boiled milk, together with the experience of Arctic travelers, is a strong plea in favor of such procedure.

I have learned a very important fact from Charcot. During his stay of sixteen months in the Antarctic regions, neither he nor his crew ate any uncooked food, except a small quantity of cheese. Their bill of fare consisted of preserves of all kinds, together with the cooked flesh of seals. penguins, etc. The whole personnel of this expedition enjoyed most excellent health and in no instance was there a single case of derangement of the digestion.

It is reasonable to deduce from the above facts that abstinence from uncooked food markedly reduces the number of new microbes, but it causes very little change in the number and variety of the preexisting flora. Therefore, we have only to consider the constant inhabitants of our intestines and defend ourselves against the harm they are capable of producing in our bodies by enfeebling our organs and their noble elements.

In this flora there are constantly present the microbes which provoke putrefaction in the intestines and injurious fermentations, among which the butyric acid fermentation preponderates. It is against these alterations of the organic substances that we must direct our attack.

Long before the science of microbes had been created, humanity had already occupied itself in a search for means to prevent putrefaction. Food in warm and damp weather, or in a warm climate, soon begins to rot and becomes disgusting to the taste and a menace to health. Every one knows how frequently we have disastrous examples of poisoning from meat and other articles of diet that have become putrified.

The African explorer Foa (1) recounts the following incident: Famished with hunger one day, he and his men ran across the putrefying body of an elephant. The half-starved negroes immediately surrounded the carcass and prepared to help themselves to the rotten flesh, but Foa persuaded them not to touch it and explained the danger of poisoning they incurred from eating such flesh. This advice was listened to by all except three of the negroes, who cut off a large strip of flesh and ate it half cooked. A few days afterwards these men died in great agony. Their necks and throats were swollen, their tongues paralyzed and their stomachs enormously distended.

In another instance it was deteriorated horse-meat sausage that caused an epidemic in 1885 (2) at Rohrsdorf, Prussia, whereby forty people fell ill after having eaten of this sausage. One among this number died in great agony with symptoms of gastro-intestinal irritation similar to that in cholera.

On the other hand it is undeniably true that decomposed food does not always produce an injurious effect. To verify this Tissier and Martelly (3) ate freely of meat that was completely rotten and never experienced the slightest gastric inconvenience. Experiments on animals fed with putrefied meat have given a variety of results. In some instances the animals exhibited no bad effects, whereas, in other cases, there followed persistent vomiting and such a distaste for the meat that it was necessary to discontinue the experiments.

It is not only meat and other animal products, but vegetables as well, that undergo putrefaction and form those abnormal ferments (butyric fermentation) which render their consumption so dangerous. Many cases of poisoning have been noted as a result of eating tainted preserves. Vegetable matter that is to be used for cattle food, while undergoing its curing process in silo, frequently becomes deteriorated. If, for example, a few rainy days succeed several days of hot sunshine and the forage is only half cured; that is, it is still in the sweating stage, the result will be an ensilage with a butyric odor and so detestable to the taste that animals will refuse to eat it. Sometimes the forage in silo becomes black and takes on a peculiar odor. When animals, in default of other food, are compelled to eat this ensilage, their dejections become absolutely black. If this course of feeding is prolonged the animals arrive at a state of extreme emaciation.

In hunting for a means to combat this condition the popular mind has recognized the utility of acids for the purpose of preventing putrefaction. To this end vinegar has been largely employed as a sort

of pickle to preserve meats, fish, vegetables, etc. Owing to the presence of acetic acid in the vinegar (which, by the way, is the product of a particular microbe), many animal and vegetable substances are preserved against putrefaction. When the substance to be preserved can itself produce an acid, it then becomes useless to add an acid already prepared; as, for example, those substances that can generate an acid from the sugar they contain and are thereby preserved against putrefaction. It is for these reasons that such animal products as milk, or vegetables rich in sugar, become spontaneously acid and are thus indefinitely preserved. Thus does soured milk, when transformed into cheese, become capable of preservation for a considerable length of time. Many vegetable substances also undergo an acid transformation and can be preserved. Cabbage becomes sauerkraut, and cucumbers and beets are converted into pickles.

In many countries, particularly in Russia, vegetables that have undergone an acid transformation form a large portion of the food of the population. During the long winter, in default of fresh fruits and vegetables, preserves of watermelon, cucumbers, apples and other fruits that have been subjected to an acid fermentation are consumed. The principal product generated in these fruits and vegetables is lactic acid, and it is due to the presence of this acid that putrefaction is prevented. In summer lactic acid is furnished by soured milk and goes to make up a very popular drink known as "Kwass," much employed among the peasants. This beverage is made by mixing black bread with milk. The starch in the bread ferments and furnishes a small percentage of alcohol, and the milk takes on a lactic acid fermentation and quite a large proportion of that acid is generated.

Rye bread, which constitutes the principle article of food for the masses, is equally a product of fermentation—and lactic acid fermentation occupies the most important place in this process. This statement is not confined to the process of making rye bread alone, but applies to all bread. The lactic acid generated is formed at the expense of the sugar contained in the bread. Sour milk, owing to the lactic acid which it contains, has the power to prevent the putrefaction of meat. This property is so well known in certain countries that sour milk is used as a pickle for the preservation of all meats. The lactic acid fermentation also plays an important role in the preparation of food for cattle, for by exciting the lactic fermentation in silo, putrefaction of the vegetable matter is prevented.

This brief resumé of facts is intended to illustrate the import-

ance of the lactic acid fermentation as a means of preventing putrefaction and butyric fermentation—two processes that are so destructive to organic matter and so capable of provoking such serious results to the animal organism.

Since the lactic fermentation is such an excellent means of preventing putrefaction in general, why should it not exercise this same power and prevent putrefaction in the digestive tube of man? It is now an old and well established fact that putrefaction and butyric fermentation are prevented by the presence of sugar. Meat that has not been treated with some sort of preservative, maintained exposed to the ordinary conditions of temperature and humidity, soon becomes rotten, whereas milk, under exactly the same conditions, does not spoil but does turn sour. This would mean that meat contains but little sugar, while, on the other hand, milk should be considered as containing a large percentage of that element.

If we wish to explain these phenomena upon a scientific basis, we immediately encounter many difficulties. At the outset we learn the well established fact that sugar in itself has no power to prevent putrefaction. Also that milk, which is so rich in sugar (lactose) can, under certain circumstances, become putrid. Sugar preserves organic matter from putrefaction owing to the lactic fermentation to which it submits so easily. This fermentation is the work of certain microbes, which were discovered by Pasteur almost fifty years ago. This great discovery established the part played by microbes in fermentation and finally led up to the creation of that branch of medical research known as Microbiology, which is so rich in fact and theory as well as in its many practical applications.

I need not dwell further on the statement that the anti-putrefactive action of the lactic fermentation is due to the product of lactic acid microbes, for that has been thoroughly discussed in Chapter X in my "The Nature of Man." In spite of the presence of lactic microbes, it is only necessary to neutralize the acid in order that organic matter should at once begin to putrefy. What especially interests us is to know whether lactic ferment is really capable of preventing intestinal putrefaction.

With this object in view a number of experiments have been made, some of which merit closer examination. Dr. Herter, of New York (British Medical Journal, December 25th, 1897, p. 1848), injected quantities of different microbes directly into the smaller intestines of a series of dogs. To judge of their effect on intestinal putrefaction, he carefully analyzed the urine to estimate the sulpho-

conjugate ethers, persuaded that these substances are the best indications of the measure of intestinal putrefaction. The Colon bacillus and Proteus bacillus only served to augment putrefaction in the intestines, while the introduction of large quantities of lactic bacilli was followed by notably diminished putrefaction, indicated by marked absence in the urine of indican and of sulpho-conjugate ethers in general.

Still more interesting and conclusive are the experiments performed by Dr. Michael Cohendy, which occupied a period of over six months. Adopting the same control indicator as described above, the sulpho-conjugate ethers excreted in the urine, he continued his ordinary line of diet, consisting of vegetables, meat and farinaceous substances, for several days, his coadjutor, Dr. Tendron, noting the amount of sulpho-conjugate ethers in his urine. The results obtained, after a few days' observation under this regime, were adopted as a basis for comparison. Cohendy now changed his line of diet largely to meat and found a notable augmentation of the sulpho-conjugate ethers in the urine. This result pointed conclusively to a proportionate increase of intestinal putrefaction. Following this last experiment, Cohendy now excluded all meats from his diet and in lieu thereof subsisted during several weeks solely upon vegetable matter together with one litre of Lactobacilline (Bacillac) per day The result was astonishing. The sulpho-conjugate ethers in the urine were reduced to a minimum, thus indicating marked cessation of putrefaction in the intestines. The excretion of sulpho-conjugate ethers did not again begin to rise for several months.

In addition to this, an examination of the feces revealed the presence of the bacillus that had been implanted in the milk to produce Lactobacilline (Bacillac), which is recognized as the micro-organism that will produce the largest percentage of lactic acid known. This microbe persisted in the feces for several months after the administration of Lactobacilline (Bacillac), and continued to control putrefaction in the intestines.

Parallel to these experiments, the results of Grundzach (4), Schmitz (5), and Singer (6), obtained by the administration of pure lactic acid, illustrate the overwhelming advantage a lactic-acid producing microbe has over lactic acid itself. It is an undeniable fact that lactic acid pure has, when administered by the mouth, the property of inhibiting in a marked degree intestinal putrefaction and thereby benefiting many intestinal diseases, such as infantile diarrhoea, tubercular enteritis and even Asiatic cholera.

Professor Hayem has pointed out the value of lactic acid, not only in gastro-intestinal diseases, but in the treatment of diabetes. It has been found, however, that the large doses of lactic acid employed in the treatment of the latter disease caused so much derangement of the stomach and irritation to the gastro-intestinal mucus membrane that it became necessary to discontinue the medication. Still another injurious effect was noted by Stadelmann (7)—the excretion by the kidneys of lactic acid and the consequent irritation of those organs.

The facts of which I have just given a resumé clearly indicate that in the struggle to overcome intestinal putrefaction and consequent generation and absorption of a host of virulent toxines, it is far more rational and useful to suppress the ordinary intestinal flora by implanting a lactic-acid producing microbe in the intestines, thereby preventing the many objections to pure lactic acid. These microbes continue to grow in the digestive tube, producing small but continuous amounts of lactic acid. They subsist upon the sugars that are contained in the intestinal contents. From this element the lactic acid is generated throughout the digestive canal, where it exercises its power to prevent dangerous fermentations and putrefaction.

With the various articles of diet which have undergone the lactic acid fermentation and been consumed in a raw state (such as sauerkraut, sour milk, kephir, cucumbers, etc.), man from time immemorial has introduced into his intestines enormous quantities of lactic-acid producing microbes. Involuntarily, in this manner, he has, in a certain degree, corrected the poisonous effects from intestinal putrefaction.

The Bible makes mention of soured milk in several places. When Abraham saw three men approaching he invited them to enter and offered them "Some soured milk and some sweet milk, as well as some veal that had just been brought in." (Genesis 18: 8). In the fifth book of Moses there is an enumeration of the different foods which Jehovah accorded to his people—"He made them to eat of the soured milk of cows and the milk of goats with the fat of lambs and sheep, of the animals of Bascan and of bucks with the fat of the kidneys." (8)

In Egypt, since remotest antiquity, the population has eaten a sort of soured milk prepared from the milk of the buffalo, the cow or the goat, known under the name of "leben raib." Another milk prepared much like the above and known as "Yaourth" is largely consumed by the population of the Balkan peninsula. In Algeria the natives also make a ferment of "leben" which, however, is quite dif-

ferent from that used in Egypt. In Russia soured milk is consumed in large quantities in two forms—"prastokwacha," milk that has soured spontaneously, and "varenetz," milk that has been previously boiled and then impregnated with a yeast.

Many of the black tribes in Africa employ soured milk as one of their principal articles of nourishment. Among the Mpeseni sour milk is the national diet (9). Meat is rarely eaten among them. A tribe inhabiting the plateau of Nyassa Tanganyka, as well as the Zulus and the Ouankondés, consume large quantities of milk in the shape of fresh cheese, which they mix with salt and pimenta (10). I learn from Dr. Lima of Mossamedes (Western Africa) that the nations inhabiting the region south of the Angola nourish themselves almost exclusively upon milk. They rub the cream into their skins with the idea of making themselves supple, and the rest of the milk is allowed to become thick and sour and is consumed. This same fact was observed by Nogueira over fifty years ago while exploring in the province of Angola. According to the country, sour milk presents certain different peculiarities which are influenced by the different microbian flora of these regions, exactly as different cheeses are produced in different countries.

In large majority, if not in all, sour milk which has been obtained by the natural process of souring, contains besides the lactic-acid microbes, certain yeasts that produce alcohol. This is particularly so with Kephir and Kumiss, which latter consists of cow's, or mare's, milk that has notably undergone an alcoholic fermentation. Kumiss is a very popular drink among the Kirghises, Tartars and Kalmouka, nomadic tribes of Eastern Russia and Asia. Kephir, on the contrary, is the national beverage of the mountaineers in the Caucases and the Ossetines.

It was formerly thought that Kephir was more easily digested than milk, upon the supposition that during its fermentation a part of the caseine was dissolved. In other words, Kephir was considered as a half digested milk. Now, since the investigations of Hayem and those of Rovighi, the above opinion can no longer be sustained, for they have conclusively proved that what good effects have been obtained from Kephir are solely attributable to the small percentage of lactic acid contained in it.

Kephir is useful in certain cases, but it cannot be recommended as a food for prolonged use, as is necessary in combatting the effect of chronic intestinal putrefaction. Kephir is the result of both alcoholic and lactic fermentations taking place together. In fact, it actually contains one per cent. of pure alcohol, and the daily absorption of

even this small amount of alcohol is undesirable. Another objection to Kephir is its variable flora, the action of which is still but imperfectly understood. Hayem disapproves of Kephir for persons with gastric dilatation in whose stomachs the food remains for an unduly prolonged period, for the sojourn of this substance in the stomach encourages butyric and acetic fermentations and in no wise influences intestinal fermentation except to encourage it, thereby aggravating and defeating the very end for which it has been administered (1. c. p. 619). Since it is the lactic fermentation instead of the alcoholic fermentation that makes Kephir useful, it is only rational to replace it with a sour milk containing no trace of alcohol, prepared with a pure culture of a lactic acid producing germ, which is undeniably superior to all other sour milk products.

The fact that so many people in all countries and in all ages have consumed large quantities of sour milk, and are so much benefitted by its use, is a testimonial to its value. The distinguished African explorer, Nogueira, in a letter to us, has described his astonishment upon beholding the well preserved appearance and absence of senility among the natives of Mossamedes, whom he had not visited for a period of many years. Dr. Lima affirms that among the natives of the region south of Angola "there is to be found a very large number of individuals noted for their extraordinary longevity, and, although they are thin and dry, the old people are active and capable of making long voyages."

Grigoroff, a Bulgarian student, has reported an astonishingly large number of centenarians encountered in a region of Bulgaria where sour milk constitutes an essential element of diet. A long list of centenarians has been collected by Chemin among which appears the name of Miss Marie Prion, an inhabitant of Haute Garonne, who died in 1838 at the age of 158 years, having preserved all of her faculties up to the last. During the last ten years of this woman's life she ate nothing but rye bread, sour milk and cheese (1 c.p. 109). A laborer by the name of Ambrose Jantet, who lived at Verdun, attained the age of 111 years upon a diet of barley bread and sour milk. A woman, Nicole Marc, died at the age of 110 in the chateau of Colenberg (Pas-de-Calais). This individual was a hunchback and crippled in her legs. Her principal diet consisted of sour milk and black bread.

We have received a communication from Mr. Simine, a civil engineer in the Caucase, enclosing a clipping from the *Tiflissky Listok*, October 8, 1904, which states that in the village of Sba and district of Gori, there lives an Ossetine woman by the name of Therese Abalva

who has attained the age of 180 years. This woman is still living and daily performs her housework and sewing, and although bent with age her step is firm. This woman's diet has for years consisted of barley bread and sour milk. An American lady, Mrs. Jenny Read, has written to me that her father, 84 years of age, owes his longevity and good health to sour milk, which he has drunk during the past forty years.

In the employment of sour milk, the taste of the product must be consulted and the nearer this property can be maintained toward naturally soured milk the more perfect it will be. Let it be understood, however, that inasmuch as sour milk is to be used daily, the many dangers of naturally soured milk must not be ignored. Raw milk supports a varied and complete flora of microbes among which are many that are capable of causing serious visceral disturbances. Then, too, the tubercle bacillus of bovine tuberculosis is by no means rare in milk. According to the researches of Heim (1) the comma bacillus thrives in milk even after it has turned sour. Under similar conditions the typhoid bacillus has been found alive for 35 days, and it is not until after sojourning 45 days in thoroughly sour milk that these bacilli succumb.

As raw milk almost always contains traces of fecal matter from the cow, other noxious microbes may find their way into it and remain alive in spite of the acid coagulation of the milk. Lactic microbes, it is true, prevent the multiplication of these noxious microbes, just as they do putrefactive organisms, but they cannot destroy them.

In addition to this, raw milk often contains a variety of molds and fungi (yeasts, oidium, torula) that favor the development of such harmful microbes as the bacillus of cholera and of typhoid fever. Therefore, the prolonged use of milk that has soured naturally augments the risk of introducing into the human organism noxious microbes. In order to prepare a sour milk, one that does not contain the microbes that are harmful to man, it is necessary to sterilize the raw milk and afterward implant in it those microbes that are beneficial. It is not a question here, as many think, of the addition of yeasts to milk; but, on the contrary, of the implantation of a true organized ferment.

Rist and Khoury (12) have found that Egyptian leben contains a flora of microbes of not less than five different species—three of bacteria and two of yeast. The former give rise to lactic acid, whereas the latter generate alcohol. The analogy between the Egyptian leben and Kephir is quite parallel, for in both cases it is a question of lactic-

acid and alcoholic fermentations. The remarks that we have already applied while upon the subject of Kephir apply equally to the Eygptian leben.

Through the kindess of Professor Massol, of Geneva, we have been able to procure a sample of Bulgarian Yaourth, of which the flora has been so thoroughly studied by his student, Grigoroff. In our own laboratory Mr. Michelson has made this Bulgarian milk a subject of his research. These two observers have found in Yaourth a number of different microbes, including lactic-acid bacteria and yeasts. In general the flora of Yaourth is analagous to that of leben and consequently their effects are identical. The investigation of the Bulgarian Yaourth conducted in our laboratory at the Institut Pasteur has revealed the presence of quite a variety of microbes, among which we have found a rose-colored torula which favors in a marked degree the growth and virulence of the germs of typhoid fever and cholera, proved by our experiments on young rabbits.

Therefore, should milk not be properly sterilized and then be planted with any of the above mentioned ferments, the products of such a process must necessarily be a menace to health and life. The only safe procedure is to isolate and maintain in pure culture certain lactic-acid producing microbes and implant these in sterilized milk, whereby a fermented milk is produced free from all harmful microbes and without the slightest trace of alcohol.

Among all the microbes that grow in milk, Heuple has isolated one that produces lactic acid in exceedingly large quantities. With this microbe, in pure culture, we have prepared our soured milk, excluding all other microbes and ferments. During a prolonged usage of this soured milk it has been found that the fat in the milk is very undesirable. It is best that the cream be removed, or that another lactic-acid microbe be added that will break up this substance. After having boiled and cooled the milk, it is planted with pure cultures of the lactic-acid bacilli. The period of incubation varies according to the temperature at which the inoculated milk is maintained.

The result, when these directions are followed, is a creamy soured milk, agreeable to the taste and capable of arresting intestinal fermentation.

This milk should be taken each day in the dose of from one to one-and-a-half pints, either with or between meals. Following these directions the functions of the intestines are regulated and the secretion of the kidneys is increased. The employment of milk fermented

as indicated above can be recommended in all diseases of the digestive tube and urinary organs, as well as in many skin diseases.

This microbe with which we are dealing has also the property of living and propagating itself at quite high temperatures. When it is installed in the intestines of man it becomes readily adapted to its environment and forms an important part of the intestinal flora, as has been proved by Cohendy. Soured milk prepared as directed above, with a pure culture of the particular microbe which we have described, has been analyzed by Fouard of the Institut Pasteur. At the moment when this milk is ready for drinking, Fouard found that it contained nearly 10 c.c. of lactic-acid to the litre. In addition to this there was present a large percentage (38%) of caseine that had been rendered soluble by the fermentation. This latter observation demonstrates that the albumenoid matter contained in this milk is in a more digestible state than in any other fermented milk. So far as the mineral constituents of this milk are concerned, it has been found by the analyst that 68% of the calcium phosphate has been rendered soluble.

All of the above facts testify to the excellent qualities of this fermented milk. The reader may be astonished and not able to reconcile himself to the idea of absorbing such enormous quantities of microbes; and above all, while entertaining the popular thought that all microbes are harmful or even dangerous to health and life. This is a great error, for we have many microbes whose uses are absolutely essential to our well being. Occupying the first place of honor among these germs is to be found the lactic-acid producing bacteria. Brudzinsky (13) has employed pure cultures of this microbe in the treatment of the diarrhoeas of nursing infants, and Tissier (14) has made it a practice to use these cultures in all troubles of the digestive tube in both children and adults.

For many years we have prepared the milk described above by first sterilizing it and afterward implanting in it a pure culture of our microbe. We have taken a liberal ration of this soured milk daily and have been exceedingly gratified with the results that we have experienced. After this long trial we feel justified in expressing this favorable opinion. Many of our friends, among them some who suffered from gastro-intestinal troubles and serious kidney diseases, have followed our example and have taken the trouble to testify to the great benefits they have derived from it.

In view of all that has been stated above, we are naturally led to the opinion that in the struggle against intestinal putrefactions the lactic-acid producing bacteria are undeniably serviceable. Finally,

to proclaim that in this specially prepared soured milk we possess a remedy against old age, or a means for prolonging human life, we must let time, experience and observation answer this question.

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