

THE TREATMENT OF VENEREAL DISEASES IN THE BRITISH ARMY—1898-1948

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IN a survey of the treatment of venereal diseases in the British Army covering the period 1898 to 1948, it is impossible in a single article to point to more than the main therapeutic developments occurring in this half-century, commencing as it does in what are the early years of venerology as we know it to-day, and terminating in the penicillin era. For it must be remembered that it was not until 1838 that it was generally accepted that syphilis and gonorrhoea were two entirely separate diseases, and the gonococcus was first described by Neisser in 1879. And it was only in May 1905, that Schaudinn and Hoffmann first described the *Spirochæta pallidum*, and one year later (1906) that Wassermann, Neisser and Bruch developed the test for syphilis which now bears Wassermann's name, and in 1909 that Ehrlich discovered arsphenamine ("606"). In 1911 Noguchi cultivated the spirochæte of syphilis *in vitro*, and he also confirmed the syphilitic origin of general paresis of the insane, which had hitherto been classified as a parasyphilitic disease, by demonstrating the organism in the cerebral tissues.

The diagnosis and treatment of venereal diseases has always formed an important part of Army medicine—especially so in the past. Speaking of the early part of this century, one Army venereologist went so far as to say, "some 30 per cent of all diseases in the British Army are due to venereal complaints" (French, 1908). The last fifty years has seen many advances in the treatment of venereal diseases, and also an awakening of the public conscience. However, it cannot be gainsaid that the Army Medical Service has played a very important, and often pioneer, part in many of the advances which have taken place. As Colonel Lambkin stated in 1908, "syphilis is treated in the Army not only with the view of relieving its present manifestations, but also of preventing further trouble, and bringing about a cure of the disease itself," a policy not universally recognized, especially at this time.

It is proposed to consider only each of the main venereal diseases, tracing the evolution of treatment from the beginning of the period to the present year, attention being mainly confined to the diagnosis and therapeutics of early disease. The administrative and prophylactic problems associated with venereal diseases, and consideration of the later manifestations, are subjects on each of which an entire paper could be devoted.

SYPHILIS

To those of us brought up on such methods of diagnosis as dark-ground examination and blood tests, it seems almost unbelievable that for the first seven years of the life of the Royal Army Medical Corps, the causal organism

of syphilis was a matter of conjecture, and that diagnosis could only be made from the clinical appearance of the sore, and the subsequent course of the disease. Contemporary opinion, both civil and military, was divided as to whether the character of the sore alone was sufficient for a certain diagnosis, or whether treatment should be withheld until a local or generalized adenitis occurred, or cutaneous manifestations and general constitutional disturbances became apparent. In this connexion, it is interesting to note that even early in the present century, it was generally held in the Army that treatment, once embarked upon, must be continued until the full course was completed, and that in the early stages treatment should be carried out in hospital to avoid contagion. The mainstay of treatment was mercury in one form or another—mercurial therapy is believed to have been first used for syphilis by Jean de Vigo in 1497.

"The Army Medical Department Report for the Year 1897" in an appendix publishes recommendations for a modified form, for the treatment of soldiers, of the Aix-la-Chappelle system of treatment of syphilis (Dick, 1897). The scheme recommended was as follows:

"1. Every morning the soldier is to take a hot bath at a temperature of 90° to 100° F., into which a handful of ordinary washing soda has been thrown. He should sit in this bath up to the neck for half an hour.

2. Immediately after the bath, 1 to 2 drachms of an ointment (made by adding and mixing well 2 lb. of the ung. hydrarg. of the British Pharmacopœia and 1 lb. of lard), to be rubbed in daily, the parts of the body each day being (a) legs; (b) thighs; (c) back; (d) chest; (e) arms. The rubbing to last for twenty minutes, syphilitic patients being taught to rub each other.

3. A gargle and mouth wash of one ounce of alum to the pint of water; a table-spoonful of this in a glass of water to be used every hour—and the teeth and gums to be brushed after each meal with camphorated chalk. Should the gums become tender they should be painted with a mixture of tincture of galls and tincture of myrrh in equal parts.

4. The treatment to be stopped for a few days on the appearance of mercurial symptoms.

5. The treatment to be carried out for a month, the same underclothing being used the whole time.

6. Ulcers about the mouth, or throat to be touched with a 10 per cent solution of chromic acid.

7. The whole treatment must be carried out under strict supervision."

The author concludes by stating that if taken sufficiently early, the later severe manifestations of constitutional syphilis would in all probability be prevented by this regime. He also gives an account of a visit to Aachen, and after stating that the whole treatment can only be carried out in its entirety at Aachen itself, where the necessary spa facilities exist, concludes that "it is therefore probable that the well-to-do sufferers will always go to Aachen and so far as the Army is concerned, I think I should always recommend officers to go there who had been unfortunate enough to contract the disease."

On October 20, 1905, a series of most interesting and voluminous reports were published by a Committee convened by the Advisory Board for Army Medical Services to inquire into the treatment of venereal disease and scabies.

These reports include extracts from contemporary literature, and opinions expressed by experts (both civil and military), on all the aspects of prevention and treatment of venereal disease, together with recommendations for treatment. On the recommendation of the Advisory Board these reports later formed the basis of a textbook on the diagnosis and treatment of venereal disease, by Lieut.-General Sir Alfred Keogh, *K.C.B.*, *D.G.A.M.S.*; Colonel C. H. Melville; Lieut.-General (then Lieut.-Colonel) Sir William Leishman, and Major-General (then Major) C. E. Pollock. A later edition published in 1913 had additional matter by Colonel (then Major) L. W. Harrison. The Committee was unanimously in favour of the administration of mercury in some form over a period of eighteen to twenty months in the treatment of syphilis, and it expressed the opinion that the results of the then known forms of non-mercurial treatment in every case appeared to be unsatisfactory. They described the two main methods of giving mercury as the continuous method, consisting of a course of mercury for a definite period continuously, or with short interruptions only; and the intermittent, in which the treatment is given for set periods with longer intervals between. Evidently, early in the present century, the usual treatment of syphilis consisted of oral mercury in the form of either grey powder, blue pill, the green iodide, etc., in pill form, or solutions of the perchloride or biniodide, usually in alternating courses with potassium iodide by mouth in the intervals.

A typical course consisted of the following, using a pill containing grain 1 hydrarg. cum creta:—

<i>First course:</i>		<i>Months</i>	<i>Pills</i>
One month, taking 6 pills a day ... ..	...	1	180
Interval of three days without pills ... ..	...	—	—
One month, taking 4 pills a day ... ..	...	1	120
Interval of seven days ... ..	...	—	—
One month, taking 3 pills a day ... ..	...	1	90
Interval of one month ... ..	...	1	—
<i>Second course:</i>			
Three months, taking 3 pills a day ... ..	...	3	270
Interval of one month ... ..	...	1	—
<i>Third course:</i>			
Three months, taking 2 pills a day ... ..	...	3	180
Interval of one month ... ..	...	1	—
<i>Fourth course:</i>			
Three months, taking 1 pill daily ... ..	...	3	90
Interval of three months	3	—
<i>Fifth course:</i>			
Three months, taking 1 pill daily	3	90
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Patients were inspected one a week while under treatment, particular attention being paid to the mucous membranes of the mouth and tongue, and it was advised that the effect on each individual be carefully watched, and the treatment varied to suit each case. After the third, fourth, and fifth courses, a short course of potassium iodide, 15–30 grains daily, was recommended.

Mercurial inunction similar to the modified Aachen method previously described was in common use. This treatment was continued over a period of nearly two years as follows:

However, the Committee of the Advisory Board for Army Medical Services, in their Final Report, concluded that far and away the most effective and foolproof method of treatment was by means of intramuscular injections of an insoluble preparation of mercury into either the gluteal or deltoid regions. A "depot" being formed from which mercury was slowly absorbed. The following cream, introduced into the British Army by Colonel Lambkin in 1890, and stated to be in frequent use was recommended:

The mercury and the wool fat by weight, the liquid paraffin to be added by volume.

The Committee, while making it clear that no hard-and-fast rule can be laid down to suit every case, considered that the following course then in routine use at the Military Hospital, Woolwich, was the average treatment required "to cure the disease and to permit of the soldier fulfilling his contract with the State," and "likely in the majority of cases, to be an improvement on the plan of giving mixtures or pills to the patient and leaving them to be taken or not at his own convenience."

Six weeks' treatment, 6 injections	grains 9 of mercury
Two months' interval with medical inspection every fourteen days. If signs recur during interval repeat six weeks' course and then give two months' rest	
Two months' treatment, 4 injections	grains 6 of mercury
Four months' interval with medical inspection every fourteen days. If not free from signs of the disease, decrease interval to two months.	
Two months' treatment, 4 injections	grains 6 of mercury
Six months' interval.	
Four months' treatment, 4 injections	grains 6 of mercury
Total, 21½ months' treatment, 18 injections	grains 27 of mercury

The Report also expresses several opinions which mirror the unsatisfactory state of diagnosis and treatment early in the century. Examples of such are the statement that hot mercurial baths are of value in patients suffering from multiple ulcerated, and necrotic syphilitic lesions, who are also debilitated from other causes, such as tropical service, prior to the commencement of other forms of treatment, also the recommendation that "the employment of surgical treatment by the removal of bony sequestra or other necrosed tissues and various plastic operations should be utilized with discretion." Mercury vapour baths were used in the treatment of selected cases for many years. Also a regime of treatment known as Zittmann's treatment was used in "malignant cases, where the patient is debilitated and will not bear mercury when prescribed by any of the commoner methods." This treatment consisted of keeping the patient on a light diet in a room at a temperature of 80° F. to promote sweating, for fifteen days. During this period he takes mercury in minute doses in pills, and in hot decoctions, a half-pint eight times a day—it was suggested that "smaller quantities may have to be used at first as the mixture is rather nauseating." Special rooms for carrying out this form of treatment were constructed in certain military hospitals, e.g. the Military Hospitals at Rochester Row, London, and Woolwich. Great stress at this time was laid on the building up of debilitated patients by means of diet, e.g. milk, eggs and port wine (French, 1908).

Attempts had been made from time to time to render painless the treatment by means of the insoluble salts of mercury, by incorporating various local anæsthetics into the preparations used. This was especially necessary in the case of calomel. In 1907 Colonel F. J. Lambkin published reports of two types of mercurial cream, which were later extensively used in the Army (Marshall and French, 1921), and which he stated were more effective than the original, and almost painless in use, even in the case of calomel. The formulæ of these were as follows:—

Hydrargyrum pur.	10 grammes
Creo-camph. (Equal parts of absolute creosote and camphoric acid)	20 c.c.
Palmitin basis	to 100 c.c.
10m equals metallic mercury grain 1	

Calomel.	5 grammes
Creo-camph. (Equal parts of absolute creosote and camphoric acid)	20 c.c.
Palmitin basis.	to 100 c.c.
10m equals calomel grain $\frac{1}{2}$	
Melting point, 37° C.	

The pages of both contemporary civilian medical journals, and those of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS during the period 1903–10 contain many papers and letters, sometimes acrimonious, dealing with the merits and demerits of the various forms of mercurial treatment, showing that no uniformity existed. Certain Army venereologists were of the opinion that intramuscular injections were ineffective as compared with other methods of administration such as inunction, or that the former were painful and caused patients to refuse this form of treatment. For example, Major H. C. French, R.A.M.C., writing in the *British Journal of Dermatology* (November–December 1908) as regards early syphilis, expressed the following opinion: “I am fully convinced that both the mouth and inunction methods of administering mercury in suitable and average cases are infinitely preferable as regards curative action on syphilis to the injection of insoluble salts, such as grey oil.” It is further pointed out that patients receiving inunctions “use condemned hospital flannel underclothing, which is changed once a month and then destroyed—so the cost is very slight.”

As regards follow-up and post-hospital treatment, it was not until 1903 that an Army Order (No. 158 of September 1903) was published, ensuring the attendance of “soldiers not requiring hospital treatment” for out-patient treatment and observation. This was later embodied in King’s Regulations and R.A.M.C. Regulations (French, 1908). As regards documentation, a permanent records and statistics scheme was introduced in January 1904: “Instructions Regarding Procedure in Cases of Syphilis.” This was later embodied in Regulations for the Army Medical Services.

So unsatisfactory was treatment by means of mercury, that often it was questionable which was worse, the ulceration due to syphilis or that of the mucosæ due to treatment. Attention to oral hygiene, removal of stumps, and the regular use of an astringent mouthwash, and the touching of ulcers with 10 per cent chromic acid followed by silver nitrate, and attention to the general health and well-being of the patient were all a very necessary part of the mercurial treatment regime. Sarsaparilla and iodides were also used to help in the elimination of mercury from the body, the latter also being prescribed in gummata and periosteal lesions, and in order to prevent the onset later of parasyphilis (French, 1908). One Army venereologist, later recalling the effects of this form of treatment, wrote as follows: “Picture the cases long treated by mercury; the debilitated condition, the frequent and distressing diarrhoea, the loss of weight, the ulceration of the mouth, the stomatitis, the loosening of the teeth, the foul breath, the intense salivation and the feeling of sheer misery which many of these patients developed. The physicians were satisfied, for their cases were said to be mercurialized. The patients were not, for they preferred the disease which was painless to the treatment which was painful.

The wealthy in their hundreds moved to Aix-la-Chapelle and consumed gallons of sulphur waters, the poor in their thousands remained at home and endured the misery of their condition with such philosophy as they could command" (Clarke, 1933).

It would not be out of place here to consider the developments in the diagnosis of syphilis which occurred during the early part of the present century. As has been already pointed out, it was not until 1905 that Schaudinn discovered the *Spirochæta pallidum*, and even then, this was at first discounted from the point of view of its clinical utility by the extreme difficulty of demonstrating the organism, and clinical appearances were considered by many to be of more diagnostic value (French, 1911). Later, the staining methods of Giemsa, Leishman and others, and silhouette methods using Indian ink, etc., made diagnosis somewhat less hazardous. But the situation remained much the same until the examination by dark-ground illumination became a practical proposition. In May 1910, Colonel L. W. Harrison describing this advance, and reviewing the literature, concludes: "By its means and that of the Wassermann reaction, the treatment and general management of syphilis will become a much more exact science than heretofore, and the importance of both to the Army cannot be over-estimated."

Arsenic in such forms as Donovan's solution (liquor arsenii et hydrargyri iodidi) by mouth had been used in the treatment of skin diseases and syphilis for many years. In 1907 and 1908 Col. F. J. Lambkin amongst others reported on the use of injections of atoxyl (sodium anilarsinate) in the treatment of syphilis—"as a result of the apparent beneficial effects from the use of atoxyl in sleeping sickness, it was suggested by Uhlenhuth that this drug might also prove successful in syphilis . . . being a . . . protozoal disease." He also reported a series of cases treated by means of intramuscular injections of soamin (sodium-aminophenyl arsonate), stating—"in these salts (arylarsonates) we are now in possession of a specific for syphilis, and the importance of this cannot well be exaggerated." Other similar arsenicals also were tried. In 1910 Col. Lambkin stated that he found that some cases which did not respond to either mercury or arsenic alone, readily responded to treatment by both metals, and expressed the opinion that a method of treatment combining both these metals would eventually be found to be the best. However, in March 1910, an expert committee at the War Office came to the conclusion "that the utility of these preparations (arylarsonates) . . . has not been proved and did not recommend their administration" (French, 1911).

In 1909 Ehrlich and Hata described salvarsan ("606"), and this was put on the market in December 1910. However, Colonel (then Major) L. W. Harrison, R.A.M.C., obtained a supply of this in July 1910 (Gibbard and Harrison, 1910). Investigations into the treatment of syphilis by means of salvarsan were carried out at the Military Hospital, Rochester Row, London, during 1910 and 1911, and latterly were extended to several other centres. The "Report on the Health of the Army for the Year 1911," referring to this form of treatment says—"the results have been so eminently satisfactory in every way, that arrangements have been made for a greatly extended use of the drug in the Army."

At first it had been hoped that one, or at the most several, injections of "606" would have been effective in promoting a permanent cure (the "therapia sterilisans magna" of Ehrlich), but this was not to be, and as experience grew the number of injections given was increased (Keogh, Melville, Leishman, Pollock, Harrison, 1913). Earlier treatment by means of "606," or "Hata," as it was sometimes then called, was by intramuscular or subcutaneous injection, as Ehrlich originally considered that it should be "fixed in the muscle or subcutaneous tissue" (C. Birt, 1910). A 40 c.c. solution of 0.6 gramme was injected in two injections of 20 c.c. into either buttock, or subcutaneously between the scapulæ or in the pectoral regions. As can be imagined this method of administration caused a varying intensity of pain, often lasting for about two days. Later, injections of 0.6 gramme of "606" in a solution of 200 c.c., however, were given by the intravenous route, in view of the formation of sloughs following subcutaneous injections (Gibbard, Harrison and Cane, 1911). Following the occurrence of a certain number of relapses among patients treated by means of "606" alone, it was decided to give, in addition, the older and more conventional mercurial treatment (Gibbard, Harrison and Cane, 1912), and experience fully justified the adoption of this combined treatment.

Treatment was also carried out at the Military Hospital, Rochester Row, with supplies of neosalvarsan or "914," which had been supplied by Ehrlich, the technique being much the same as that used in the case of "606." It was found that although less stable, "914" was much quicker to prepare, forming as it does a neutral solution in water, and was stated to have caused fewer reactions (Gibbard, Harrison and Cane, 1912). Later it was found to be possible to give concentrated injections of neoarsphenamine in only a few cubic centimetres of distilled water, which considerably simplified the extremely complicated technique which had been necessary heretofore.

The credit for most, if not all, of the pioneer work in the introduction of salvarsan treatment in England lies with the Royal Army Medical Corps. Dr. R. W. Johnstone in his "Report on Venereal Diseases" (1913), presented to both Houses of Parliament by Command of His Majesty, states: "On account of the special facilities for close observation of patients, during the course of treatment and afterwards, which exist at the military hospitals in this country, and because I have been afforded an opportunity of examining the careful and complete records kept at the Military Hospital, Rochester Row, I attach particular importance to the figures which Colonel T. W. Gibbard, R.A.M.C., and Major L. W. Harrison, R.A.M.C., have published on the comparative records of patients treated with salvarsan and without. They reported that out of 162 patients treated from the outset with intravenous injections of salvarsan, either alone or in conjunction with injections of mercurial cream, and observed for periods ranging from six to twenty-one months, 11 relapsed (that is, showed further symptoms, and required further treatment). The average period during which the relapsed cases had remained free from active signs of syphilis was seven months. By contrast with this, out of 102 patients who were thoroughly treated with mercurial injections and observed for six to twelve months, 85

relapsed, the average period during which the relapsed cases had remained free from symptoms being 4.2 months."

The annual return of the Military Hospital, Rochester Row, for 1909 showed that 11.9 per cent of cases of syphilis on mercurial treatment alone were readmitted twice, and 2 per cent on three or more occasions during the first year of disease, whereas no case treated with salvarsan had been readmitted more than once (Gibbard, Harrison and Cane, 1912)—which as can well be realized, considerably reduced the number of beds occupied. But it must be remembered that even in much later years there still existed opponents of salvarsan. However, as Colonel T. W. Gibbard and Major L. W. Harrison stated in a Paper read at the Annual Meeting of the British Medical Association on July 30, 1914, "To-day it is not a question of whether or not we should give salvarsan, but how much of it we should give so as to secure the best result." They also pointed out that the Wassermann test, though an enormous advance, did not tell whether the *Sp. pallidum* was dead or only asleep, and "often fails to tell us of an active process in the central nervous system. . . . With regard to the latter we can always examine the cerebro-spinal fluid but we think it will be a long time before we have educated our patients to submit to lumbar puncture as a routine part of their treatment."

With the outbreak of war, supplies of salvarsan and neosalvarsan, whose sole source was Germany, were cut off. However, the methods of manufacture were known, and a Commission was set up to investigate the situation, and British equivalents manufactured as a result, also a French substitute for "1914"—novarseno-benzol "Billon"—was available. But, in some hospitals, arsenical treatment had to be limited owing to lack of supplies (French, 1915). In 1914 the latest form of treatment at the Military Hospital, Rochester Row, London, consisted of one dose of 0.6 gramme of "606," followed by five injections of mercury (to give a safe interval between doses and to prevent the spirochæte making headway), then one more injection of 0.6 gramme of "606" and five more injections of mercury were given, followed by a final 0.6 gramme of "606." Later experiences showed that this course of treatment gave a relapse rate (clinical and serological) of 25 per cent within one year (Harrison, 1923). It was therefore considered necessary to increase the total dosage of arsphenamine. However, it had been reported that the injections of full doses of "606" at less than fourteen days' interval had caused death with cerebral symptoms in a number of cases, in inverse proportion to the interval between doses. In order to avoid the occurrence of these catastrophes, the policy was adopted of giving 0.3 gramme doses of "606" at short intervals, e.g. eight in twenty-eight days, combined with eight injections of mercury. It was also decided to repeat this course of treatment after a month's interval in those cases with a positive Wassermann reaction, and in secondary cases. Also a new complication arose which had not been experienced in British military hospitals before the war, this was the occurrence in 1915 of a certain number of cases of erythema and of severe dermatitis (History of the Great War, Medical Services). In view of the long period of incubation in some of these cases, it became obvious that even the most careful watching would

not be enough, and so periods of rest were introduced to allow intolerance to manifest itself in susceptible patients. For example, in November 1915 the course used in France was lengthened to forty-two days—four injections of 0.3 gramme of "606" being given in the first fourteen days, followed by a similar series of injections after a rest period of fourteen days. In May 1916 the following course of treatment was in use in England.

Day of treatment		Salvarsan or its equivalent		Mercury
1st	...	0.3 gramme	...	grain 1
4th	...	0.3 gramme	...	—
8th	...	0.3 gramme	...	grain 1
15th	...	—	...	grain 1
22nd	...	0.4 gramme	...	grain 1
29th	...	0.5 gramme	...	grain 1
36th	...	—	...	grain 1
43rd	...	0.5 gramme	...	grain 1
50th	...	0.5 gramme	...	grain 1
		Totals	2.8 grammes	grains 8

52nd

Blood test.

If the blood test is negative, treatment to be suspended and blood tests repeated at intervals of three months if practicable. If subsequently found to be positive, the above course to be given and a follow-up course as below. If the blood test on the 52nd day gives a positive reaction, continue as below.

54th to 68th Potassium iodide.

		Salvarsan		Mercury
69th	...	0.3 gramme	...	grain 1
76th	...	0.4 gramme	...	grain 1
83rd	...	0.5 gramme	...	grain 1

If still positive at the end of this time, advise chronic mercurial treatment. (History of the Great War, Medical Services.)

This course was again modified as below early in 1918, in order "to reduce the possibility of acute yellow atrophy, and to reduce the incidence of stomatitis due to mercurial injections."

ALTERNATIVE ARSENICAL PREPARATIONS AND METHODS OF ADMINISTRATION

Day of treatment	Intravenously "606" or "914"		Intramuscularly or into deep sub- cutaneous tissue "914"	Mercury Intramuscularly or Mercurial cream
1st	0.3 gramme	0.45 gramme	0.45 gramme	grain 1
8th	0.3 gramme	0.45 gramme	0.45 gramme	grain 1
15th	0.3 gramme	0.45 gramme	0.6 gramme	grain 1
22nd	—	—	—	grain 1
29th	0.4 gramme	0.6 gramme	0.6 gramme	grain 1
36th	0.4 gramme	0.6 gramme	0.6 gramme	grain 1
43rd	—	—	—	grain 1
50th	0.4 gramme	0.6 gramme	0.6 gramme	—
57th	0.5 gramme	0.75 gramme	0.6 gramme	grain 1
59th	Blood test. If positive or doubtful, continue as below.			
61st to 75th	Potassium iodide.			
82nd	0.3 gramme	0.45 gramme	0.6 gramme	—
92nd	0.4 gramme	0.6 gramme	0.6 gramme	—

If blood is negative on the 59th day, suspend treatment, and, if practicable, repeat blood tests at intervals of three months, but do not hold back from draft overseas.

In tertiary cases, provided that all symptoms have then disappeared, return to duty on 58th day regardless of Wassermann.

The above lines of treatment do not apply to that of syphilis of the central nervous system, cases of which should be treated on individual lines. The principle in such cases is to commence cautiously, increasing the individual dose gradually to 0.3 gramme "606" or equivalent in "914" and prolonging the course until the patient has received 4 to 5 grammes. A very successful method is to give a weekly intravenous injection of "606" and a weekly intramuscular of "914"—0.3 gramme in each case."

According to the History of the Great War, Medical Services, the above course did prove to be followed by "a definite reduction in the amount of dermatitis and ordinary jaundice." Later in some hospitals, courses consisting of four intravenous injections of "606" followed by four deep subcutaneous or intramuscular injections of "914" were adopted. During the period covered by the 1914–18 War, many other preparations were also tried in military hospitals. These in the main consisted of various compounds of "606," such as "Galyl" and "Silbersalvarsan," but their use was attended with little or no advantage.

In summing up the results of the methods of treatment of syphilis used during the Great War, Colonel Harrison, while pointing out that it was only possible to estimate the incidence of clinical relapse, "since it was not possible in any but a small percentage of cases to bring the patients back for blood tests," found a clinical relapse rate of 1.1 per cent in cases treated by means of 2.4 grammes of "606" and 7–8 grammes of mercury by injections in a series of 35,083 case cards scrutinized. He compares this with a series of case sheets of patients treated with mercury alone, studied in 1913, and concludes that it is reasonable to suppose that "under a purely mercurial system of treatment, a scrutiny of cards during the war would have revealed at least 50 per cent of the cases of syphilis to be relapses" (History of Great War, Medical Services).

Until 1923–24, treatment continued on much the same lines, except that the necessity for repeated courses came to be more than ever realized. For example at the Military Hospital, Rochester Row, three courses, each of seven injections of arsenic (combined with mercury), were recommended as a minimum in advanced primary and secondary cases (Frost, 1923). During 1923–24 intramuscular injections of bismuth preparations were introduced to replace mercury. The importance of this advance cannot be exaggerated, for, when used with care, in bismuth we have a more effective drug, with none of the serious toxic effects of mercury such as debility, loss of weight, distressing diarrhoea, stomatitis and ulceration of the mouth, loosening of the teeth, foul breath and intense salivation. For example in Cologne in 1923 there were over one hundred cases of mercurial stomatitis under treatment at the same time (Clarke, 1933).

In order to ensure efficient treatment with the minimum of toxic reactions and adequate post-treatment surveillance, a standard course for patients suffering from early syphilis was issued as a guide by the D.G.A.M.S., in a circular during June 1928. This course, the result of past experience, was advised in sero-negative primary cases, for the average man weighing 140 lb., and was as follows:

Day of treatment	"606" or "914"		Intramuscular Sulphostab or similar preparation		Or Mercury
	Grammes	Grammes	Grammes	Bismuth Metal Grammes	Grains
1st	0.3	0.45	0.45	0.25 - 0.3	1
8th	0.3	0.45	0.45	0.25 - 0.3	1
15th	0.3	0.45	0.45	0.25 - 0.3	1
22nd	—	—	—	—	—
29th	0.4	0.6	0.6	0.25 - 0.3	1
36th	0.4	0.6	0.6	0.25 - 0.3	1
43rd	—	—	—	—	—
50th	0.4	0.6	0.6	0.25 - 0.3	1
57th	0.4	0.6	0.6	0.25 - 0.3	1
64th	Blood to be taken for the Wassermann reaction.				
65th to 84th	Rest of four weeks from last injection.				
85th to 98th	Fourteen days' treatment with potassium iodide.				
99th to 155th	Repeat course as far as the 57th day.				

It was suggested that this course be repeated after an interval of eight weeks in seropositive primary and secondary cases. For tertiary and neurosyphilis cases, while realizing that each case should be treated on its merits, it was recommended, as a guide, that treatment should first consist of the course suggested for seronegative primary cases, this to be followed by similar courses of only five weeks' duration at intervals of twelve weeks, potassium iodide being given by mouth during part of this time, the treatment being continued for at least two years. In the treatment of syphilis of the central nervous system it was suggested that smaller doses of arsenical preparations should be used at first, and that more prolonged treatment should be given than is usually considered necessary for ordinary cases. The employment of tryparsamide, it was suggested, might be considered in suitable cases, e.g. early general paresis. The circular laid down that seronegative primary syphilis cases with normal blood Wassermann and cerebrospinal fluid at the end of treatment, should be examined monthly for the first year after completing treatment, with blood tests every three months, followed by two further blood tests at intervals of six months, and a final examination, including cerebrospinal fluid, at the end of this period of two years. In the event of clinical or serological relapse, a course of treatment was to be given as for secondary syphilis. In seropositive primary and secondary cases, if the blood Wassermann was negative, and the cerebrospinal fluid normal at the end of treatment, a two-year period of observation as above was commenced. If these tests were not negative at the end of treatment, or if negative they subsequently became positive, a series of short courses consisting of three weekly injections of 0.3 gramme of an arsenical preparation together with mercury or bismuth was commenced, after an interval of three months from the last injection. These short courses were to be

continued at six-monthly intervals until the blood and cerebrospinal fluid became negative. Very much similar courses of treatment had been laid down by the D.M.S. in India, and these were amended to conform with the above-detailed schedule later in 1928.

Later, some Army venereologists, however, preferred courses of treatment similar to those described above, but modified by increasing the series of injections to ten, and still retaining the intervals in the course with a view to avoiding toxic effects, the number of injections given being increased in seronegative primary cases to three phases each of ten injections, later cases receiving a minimum of four phases (Clarke, 1933).

During the period between the two world wars, intramuscular injections of sulpharsphenamine were more generally used than intravenous neoarsphenamine owing to greater ease of administration.

The official schedule described above remained routine for some years (Memorandum on Venereal Diseases, 1936), until in the latter part of 1939, "Special Notes on the Treatment of Early V.D.," prepared by Brigadier (then Lieut.-Colonel) T. E. Osmond, was issued, and it was modified. The modifications introduced consisted in the main of omitting the intervals at the fourth and seventh weeks of active treatment, and increasing the dosage of the second and third arsenical injections to 0.6 gramme, and increasing the total number of arsenical and bismuth injections to ten. Four such courses were recommended for seronegative primary syphilis, and three courses following permanent conversion of the blood reaction to negative, for seropositive primary and secondary cases. An interval of four weeks was laid down between the first two courses given, with a five weeks' interval between subsequent courses. It was also recommended that, in spite of the ease of injection of intramuscular sulpharsphenamine, where available neoarsphenamine by the intravenous route was to be preferred as being more active therapeutically, and also less liable to produce side-effects, a fact which had become increasingly realized.

Some time after the commencement of the 1939–45 War, in order to conserve man-power, and at the same time to ensure that adequate treatment was possible under war conditions, various forms of intensive arsenotherapy were tried at certain Army V.D. treatment centres, and in 1944 the "twenty-day" treatment by means of multiple injections of mapharside, then in use in the U.S. Army, was adopted for selected cases. This consisted of 1,200 mgm. of mapharside given in twenty daily injections together with bismuth. Also a trial was made in selected cases in the Middle East to assess the intensive five-day treatment with mapharside, but this was abandoned owing to the incidence of toxic effects, especially encephalopathy (Lees, 1946). Other theatres experienced similar difficulties. However, the continuance of intensive arsenical treatment, with its increased dangers, was soon to be rendered unnecessary with the introduction and availability of penicillin. Also in B.A.L. (British Anti-Lewisite), which had been developed for use against the organic arsenicals used in chemical warfare, there at long last appeared a more promising form of treatment for such complications as arsenical encephalopathy, and arsenical dermatitis.

During 1943, the rising incidence of jaundice following arsenical treatment gave rise to grave concern, for example, at one clinic 46 per cent of all cases treated developed jaundice (Beattie and Marshall, 1944). It was suggested (MacCallum, 1943; Bigger, 1943) that this condition was syringe-borne. This was later confirmed by investigations carried out at military hospitals, it being found that the incidence of this complication was considerably reduced when a system was employed, consisting essentially of the washing and boiling of syringes, which was carried out by one orderly who only handled "dirty" syringes (Salaman, King, Williams and Nicol, 1944; Laird, 1946).

In 1943, Mahoney, Arnold and Harris, in the United States reported the results of treatment of syphilis by means of penicillin, and by 1944 this new and non-toxic intensive method became the treatment of choice in the Army. From the very commencement of the treatment of venereal diseases in the Army by means of penicillin, it was decided that routine courses for the treatment of all early cases would be laid down. Hospitals, or groups of hospitals, were instructed to carry out the same form of treatment, in order that the large number of patients similarly treated would make possible the assessment of the effect of such treatment. The original schedule adopted for the treatment of early syphilis consisted of 2,400,000 units of penicillin in 60 doses, each of 40,000 units given intramuscularly in aqueous solution three-hourly over a period of seven and a half days. Treatment was followed by serum tests at two, four, six, nine, twelve, eighteen, and twenty-four months, and examination of the cerebrospinal fluid at six and twenty-four months.

However, after a time, relapses of an infectious type began to appear. Early in 1945 the Central Syphilis Register had been formed at the War Office. This holds a dossier for each patient under treatment or surveillance for syphilis, and consists essentially of case-notes on a series of Army Forms I 1220 which are forwarded by each Special Treatment Centre on each occasion a patient is either admitted to hospital, or attends for out-patient treatment or surveillance. In 1946, a scrutiny of the records of those patients treated by means of 2.4 mega units of penicillin alone who had been followed for six months, showed that there was a failure rate of 8 per cent (U.S. Public Health figures showed 15 per cent at 11 months) as compared with 2 per cent in patients on the twenty-day treatment with mapharside (Marshall, 1946). It was therefore considered that 2.4 mega units of penicillin was inadequate.

In 1945, in view of the results of experimental work by Eagle in the United States, which showed that penicillin and arsenic had a synergistic action in the treatment of rabbit syphilis, it was decided to try out at certain military hospitals in the United Kingdom a schedule consisting of 2.4 mega units of penicillin combined with ten daily injections of 0.06 gramme of mapharside. At other hospitals a schedule consisting of 4 mega units of penicillin alone, in four-hourly injections of 40,000 units over a period of twelve and a half days was adopted. For hospitals overseas a scheme consisting of 2.4 mega units of penicillin followed by one course of neoarsphenamine and bismuth over a period of ten weeks was laid down (Willcox, 1946). Subsequent scrutiny of record cards in the Central Syphilis Register showed that in round figures, the

calculated cumulative relapse rate at twelve months for seronegative primary cases was 14 per cent, and for seropositive primary cases 13 per cent, and for secondary cases 17.5 per cent, in patients treated by means of 2.4 mega units of penicillin alone, and that the relapse rate using mapharside in addition, and 4 mega units over twelve and a half days, appeared to be essentially much the same (Eames, 1947).

Following reports from the United States early in 1946, which showed that penicillin "K" was less effective than penicillin "G" in the treatment of rabbit syphilis, and that commercial penicillin had recently contained increasing amounts of penicillin "K," it was decided by the Sub-Committee on Venereal Diseases of the Army Medical and Personnel Research Panel to increase the amount of penicillin given to all patients to 4 mega units—50,000 units of penicillin three-hourly for ten days—combined with 1.35 grammes N.A.B. and 0.6 gramme bismuth in divided doses on the second, fifth and ninth days, followed by 0.6 gramme N.A.B. and 0.2 gramme bismuth weekly for eight weeks. This scheme is still the standard treatment in use in the Army. Subsequent investigations have shown that bismuth when given concurrently has no apparent inactivating effect on the penicillin in the blood serum (Eames and Archer, 1947), but it is, as yet, too early to assess the efficacy of this treatment schedule, owing to the small number of cases it has been possible to follow-up, due to postings, and release from the Service.

In view of the greater incidence of arsenical encephalopathy (Prebble, 1946), it was decided that in the treatment of Indian troops arsenic would be omitted, and later because of difficulties in continuation treatment, it was recommended that treatment should consist of 4.8 mega units of penicillin alone in three-hourly injections over a period of twelve days.

The standard Army treatment for failures (serological, mucous, cutaneous and mucocutaneous) towards the end of 1945 consisted of 4 mega units of penicillin over twelve and a half days in three-hourly injections combined with 0.06 gramme of mapharside daily for ten days, commencing on the second day of penicillin treatment. This was modified in June 1946, when it was recommended that two courses of treatment, each consisting of 2.4 mega units of penicillin combined with ten weeks' long term arsenic and bismuth therapy, should be given.

GONORRHOEA

The reports of the Sub-Committee of the Advisory Board for Army Medical Services convened in 1903 to consider the treatment of venereal diseases in the Army contain full accounts of the methods of treatment in vogue in civil and military practice in the principal European countries, together with the opinions of experts. Such methods are described as the injection of a strong solution of silver salts which "act by causing desquamation of the superficial layers of the epithelium and active inflammation of the deep layers," medicated soluble bougies of iodoform, various preparations for irrigation of the urethra in the acute stages, and mixtures containing substances such as sandalwood oil, copai-ba and salol for use during "the stage of decline." In its final report the Committee recommended that:

- (i) Diagnosis should always be confirmed, and treatment controlled microscopically.
- (ii) Treatment should be controlled by Thompson's Two Glass Urine test.
- (iii) In anterior urethritis the patient should be put on light diet, and dealt with by one of the following two methods:

(a) By the method suggested by Neisser, viz. "bringing the gonococcus into contact with a powerful antiseptic at regular intervals during the day." For this purpose it is pointed out that silver nitrate solutions are too painful, and it is recommended that urethral injections of such compounds as albargin, argyrol, ichthargan, etc., be carried out at eight-hourly intervals, increasing daily the period during which the fluid is retained in the urethra from two minutes on the first day to finally fifteen minutes;

(b) By irrigation of the anterior urethra with potassium permanganate solutions 1 : 4,000, by means of either a douche can or 6 oz. syringe.

(iv) Chronic anterior urethritis should be treated by dilatation of the urethra by means of the passage of sounds, or an expanding dilator, or, if necessary, slitting open or cauterization of follicles by means of the urethroscope.

(v) For acute posterior urethritis, potassium permanganate irrigations of the bladder should be given, together with urinary antiseptics by mouth. For chronic posterior urethritis bladder irrigations with silver salts, sounds and prostatic massage are advised.

(vi) After the urine has been found to be clear on three successive days, the patient should commence his test of cure. He should be put on full diet and told to take "sharp exercise" for three days, and malt liquor may be given. If, after this, the morning urine is clear, the patient "can safely be considered cured." But, the report goes on to state, in cases with posterior urethral involvement threads will appear in the urine day after day. If this be the case, threads are to be stained and examined microscopically, and if no gonococci are found after three successive mornings, in spite of the application of 1 per cent silver nitrate to the urethra, the patient can be considered cured with reasonable certainty.

At the Royal Herbert Hospital, Woolwich, during 1907-8 gonorrhœa patients were treated by means of rest in bed, light diet, and fluids, alkalies and purgations during the acute stage (French, 1908). On about the sixth day, anterior irrigations of potassium permanganate were commenced. Posterior irrigations were used in posterior urethritis, but usually not before the fourth week. It was considered that all patients should be treated in hospital for six weeks at least, "whether the man says the discharge has stopped or not, unless threads are not present in the urine and microscopic examination of the centrifuged urine shows an absence of the gonococci, which is in the highest degree unlikely within the above-mentioned period." After a patient's discharge had ceased, and urine was quite clear, he was given beer for three days, and if his urine remained clear and no gonococci were found in smears he was "dismissed from hospital when ten to fourteen days free from suppuration." Following discharge from hospital the man was put under weekly surveillance for a period of one month. It was considered that by this system of treatment, relapses, and the then common complications of gonorrhœa such as chronic gleet, stricture, bubo, epididymo-orchitis and rheumatism were much decreased.

During the period immediately prior to the 1914-18 War, the use of vaccines was developed, and treatment tended to lavage of the urethra by means of large quantities of weak solutions of permanganate of potash or physiological salt solution, rather than the application of stronger bactericides. It was also

established that clinical evidence alone could not be relied upon as a criterion of cure (Harrison and Harold, 1912), and that even the microscopic examination of the prostatic secretion in patients harbouring gonococci may fail to reveal their presence unless repeatedly carried out.

During the 1914–18 War, the treatment of acute gonorrhœa continued on much the same lines, and without dramatic improvements. The routine method was twice daily urethral irrigation with potassium permanganate solution: 1 in 8,000 to 1:4,000, and chronic cases were treated by dilatation, prostatic massage, etc. Intravenous injections of about 180 million T.A.B. vaccine, electrargol 2–10 c.c., or 10 per cent peptone solution, or the intramuscular injection of 10 c.c. of sterile milk, or of intramine were also found to be of value in the treatment of the complications of gonorrhœa. As it had been noticed that the symptoms referable to the gonococcal infection in patients suffering from both syphilis and gonorrhœa had undergone improvement following treatment by both mercury and arsenobenzol, trials of this means of treatment of gonorrhœa were carried out, however, improvement did not result. Also in 1917 McDonagh introduced the treatment of both acute and chronic gonorrhœa by means of courses of intramuscular injections of collosol manganese, alone or combined with intramine, and this form of therapy was used in a number of military hospitals (History of the Great War, Medical Services).

Routine local treatment was in many cases supplemented by means of various other therapeutic measures, of which only the most important will be described. Vaccines were extensively employed, including stock vaccines, auto-genous vaccines, mixed vaccines and detoxicated vaccines. In this connexion the following four parallel series of cases investigated by Captain D. Lees quoted in the History of the Great War, Medical Services; Diseases of the War, Vol. II, 1923, is of interest:

	<i>Duration in hospital</i>
(1) Cases untreated with vaccine	58 days
(2) Cases treated with small doses of ordinary vaccine	45 days
(3) Cases treated with larger doses of ordinary vaccine	42 days
(4) Cases treated with very large doses of detoxicated vaccine	35 days

During the period of the Great War, it was found by both observation and controlled experiment, that local treatment was an essential adjuvant to any of the then known forms of general treatment.

In the twenty years following the 1914–18 War, little or no real advance was made in the treatment of gonorrhœa until the sulphonamides came into use. The multiplicity of forms of treatment and research described in the contemporary literature show that the previous state of affairs still continued at this time. Speaking of the Scarborough Congress of the Royal Institute of Public Health in 1923, Major A. T. Frost, R.A.M.C., summed up the position as follows: "In our treatment of gonorrhœa we have had as little success as the rest of the medical profession. So far as drugs are concerned, no advance has been made in sixty years since the introduction of potassium permanganate, and the reason is because we have not yet got the correct line of attack on the disease." It is interesting to find that Major Frost was of the opinion that

attack must be through the blood stream, and in view of recent work on dyes he felt that eventually "one of the dyes formed with the benzene ring as a nucleus" might be found to have a selective action on the gonococcus.

Considerable work was carried out at the Royal Herbert Hospital, Woolwich, in investigating an exotoxic vaccine made from gonococci grown on nucleinic acid media, the vaccine was injected intradermally, and deep subcutaneously, and in some cases instilled into the urethra. Also, the use of intra-urethral instillation of an endotoxin vaccine for test of cure was investigated (Lambkin, Dimond and Robertson, 1927; White and Winter, 1929; Report of the Health of the Army for the years 1925, 1926, 1927, 1928). During this period these vaccines raised great hopes which were unfortunately not fulfilled. Later in consequence a series of different types of mixed polyvalent vaccines was tried (Crawford Jones, 1937).

Trials were also made with various solutions used for urethral lavage, e.g. 1 per cent saline (Clarke, 1929 and 1934), and 1 per cent saline with 5 per cent magnesium sulphate and methylene-blue (Report of the Health of the Army, 1934). By this time, most Army venereologists had come to the conclusion that lavage of the anterior urethra alone was not advisable, and prescribed lavage of the whole urethra in all cases, even in the acute stages, unless lavage was considered to be contra-indicated. Also, of recent years, it had become increasingly realized that the urethral mucosa was a delicate structure, and should be treated with respect. Hence the urethral lavage solutions used were more dilute (cf. Neisser's method above), the rationale being to merely wash away accumulated discharge and organisms. Also, instrumentation was carried out more carefully, and prostatic massage controlled by bacteriological examinations of the prostatic fluid. In consequence, the incidence of complications and sequelæ such as urethral stricture decreased.

Various intramuscular and intravenous injections were tried at different centres from time to time, e.g. intravenous injections of acriflavine (Murray, 1930), intramuscular injections of colloidal manganese, manganese butyrate, S.U.M. 36, protein shock in the form of intravenous T.A.B. vaccine, and Aolan injections for chronic cases. Also such expedients as the local kataphoresis of colloidal antiseptics, and diathermy were tried (Frost, 1925; Report of the Health of the Army for the Year 1924), but these were later discarded.

At this time, observation following the completion of treatment in hospital consisted usually of weekly inspection of the urethra and urine, and prostatic massage for a period of about two months. In 1936 a surveillance period of three months was recommended (Memoranda on Venereal Diseases, 1936). The patient being retained in hospital until he satisfied the following criteria of clinical cure: (a) Absence of urethral discharge or other clinical evidence of disease; (b) absence of gonococci in either urethral or prostatic discharge after instrumentation or massage; (c) no active disease revealed by urethroscope examination, or examination over sounds and prostatic massage.

To-day it seems unbelievable that in comparatively recent times, gonorrhœa in the Army was a far more serious problem than that of syphilis. The unfortunate patient spent long weeks in hospital, receiving changes in the form

of treatment from time to time, the disease often becoming chronic or complicated by bubo, stricture, epididymitis, arthritis, conjunctivitis, iritis, and "watering can" perineum due to sinus-formation following multiple periurethral abscesses.

It is interesting to note that in India during the year 1935, the average number of days in hospital was 47.22, and the relapse rate 23.2 per cent in the case of gonorrhoea patients (Report of the Health of the Army for the Year 1935).

The introduction of the sulphonamide group of drugs truly revolutionized the treatment of gonorrhoea, and from 1937 onwards their use was investigated at the various military hospitals treating venereal disease. At one hospital in 1937, patients suffering from gonorrhoea and urethritis were treated by means of sulphonamide P given in divided doses at six-hourly intervals between 6 a.m. and midnight, 6 grammes for the first four days, followed by 4.5 grammes for three days, and 3 grammes for the next two to four days. This regime reduced the average stay in hospital from sixty-two to twenty-one days (O'Hanlon, 1938). However, it was noticed that 19.5 per cent of patients failed to respond to treatment, and this was considered to be due possibly to the organisms being of a resistant strain. Relapse cases were treated by means of repeating the drug, and where considered necessary urethral lavage. An alternative procedure recommended in India (Winter, 1939) consisted of 1 gramme of sulphanilamide six times a day for four days.

Tests of cure in the early days of sulphonamide treatment remained much the same. After the patient had been dry for four days following completion of treatment, he received provocation on succeeding days, including the drinking of beer and prostatic massage. If he remained clear of symptoms and signs he was discharged from hospital to attend for weekly inspection for a period of two months.

With the elaboration of M & B 693, a further type of treatment was introduced. In early 1939 it was claimed at one hospital that a 95 per cent cure rate was obtained by means of a course of 3 grammes daily for five days, followed by 1.5 grammes for three to five days (Officer, 1939). Later a course of the "8.4.2" type (Bowie, Anderson, Dawson and MacKay, 1939) was used in some military hospitals. This consisted of 15-20 grammes of M & B 693 in seventy-two hours as follows: 4 grammes on admission, 2 grammes after four hours, then 1 gramme every four hours during the waking periods. This method, it was claimed, gave an average stay in hospital of only 5.3 days (Buist and Simon, 1940). Other methods tried included the exhibition of 10 grammes of sulphapyridine immediately on admission in one dose (Dickinson Priest, 1943).

In December 1939, the following scheme of treatment by means of M & B 693 was recommended by Brig. T. E. Osmond in a memorandum, "Special Notes on the Treatment of Early Cases of V.D.": On admission 2 grammes, and 0.5 gramme every four hours during the day and 2 grammes at bedtime on the first day. On the second day 1 gramme on rising, 0.5 gramme after breakfast, dinner, tea and supper, and 1 gramme at bedtime (total 4 grammes). And from the third to the seventh days 1 gramme after breakfast, 0.5 gramme after

dinner and tea, and 1 gramme at bedtime (total 3 grammes). Irrigation was to be used at the discretion of the medical officer. If the urethritis persisted, 3 grammes daily for a further three days was recommended. The following procedure was advised as a test of cure:

"(a) Before discharge from hospital 'to attend for further tests,' the patient should have been free from urethral discharge, and the urine free from heavy threads for one week after suspension of treatment; examination of the prostate and seminal vesicles should have revealed no sign of abnormality, and the expressed fluid should show no gonococci nor any large number of pus cells. Palpation of the anterior urethra over a straight sound should have revealed no abnormality, and full dilatation of the anterior urethra with a mechanical dilator should have provoked no return of discharge. The patient should be discharged at this stage only if he can attend for repetition of the tests as under.

(b) Tests should be repeated once weekly for three consecutive weeks, including urethroscopy, passage of full-sized sound into the bladder and microscopical examination of the prostatic and vesicular secretions.

(c) Three months later tests as in (b) should be repeated. At this sitting the blood should be tested for syphilis and if possible by the gonococcal complement-fixation reaction."

Later, supplies of sulphathiazole became available and was used in the treatment of gonorrhœa—at first the course used was the officially recommended 10 grammes in two days in divided doses, this being later increased to 25.30 grammes in four or five days (The Medical Use of Sulphonamides, 1943).

In view of the excellent results achieved by chemotherapy, and in order to conserve man-power, and reduce the number of occupied hospital beds, the policy of treating patients suffering from gonorrhœa in either unit lines, or forward medical units in the field was adopted. In fact, gonorrhœa had almost ceased to be a problem. However, the picture was soon to change. For some time there had been a feeling that results were not as good as they had been (JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, Editorial, June 1944). But as soon as the campaigns in Sicily and Italy commenced, it was found that less than 25 per cent of patients responded to treatment, and a large number of these relapsed on their way back to their units (Campbell, 1944). Increased dosage, repeated courses, change of preparation, adjuvant urethral lavage, intravenous injections of T.A.B., were all tried and found to be of little or no avail in resistant cases. The average stay in hospital, instead of a matter of hours or days, now became five weeks (Bell, 1945).

Towards the end of 1941, a special centre under the direction of Lieut.-Col. A. J. King, R.A.M.C., had been opened at the Royal Victoria Hospital, Netley, for the treatment of uncomplicated but resistant cases of gonococcal urethritis, patients suffering from gonorrhœal arthritis, and other complications which had proved resistant to treatment. This centre was equipped with facilities for hyperthermy treatment by means of the Kettering Hypertherm, and a number of sulphonamide-resistant cases were successfully treated by this means (King, Williams and Nicol, 1943).

Luckily, a certain amount of penicillin became available for the treatment of sulphonamide-resistant cases early in 1943, and in October 1944 supplies

allowed of investigation into the optimal time-dosage, using 100,000 units, of this form of treatment at six centres in the U.K. In May 1945 penicillin by intramuscular injection became the official drug of choice for the treatment of acute gonorrhœa, and the policy of treating cases in unit lines was abolished, and all patients suffering from gonorrhœa were admitted for treatment to either a military hospital with a V.D. Department, or in certain cases specially selected Camp Reception Stations. Later the treatment schedule was increased, and patients were given five intramuscular injections of 30,000 units at two-hourly intervals, a total of 150,000, with tests of cure at three months, and a final blood test at six months to exclude syphilitic infection masked by the penicillin treatment (A.M.D. Bulletin, 1945).

As a result of experience, in 1946 it was laid down that the routine standard plan of treatment of gonorrhœa throughout the Army should consist of four intramuscular injections of 50,000 units at three-hourly intervals—a total of 200,000 units in nine hours. This routine has proved most satisfactory, and is in use at the present time. The patient is only detained in hospital, and is discharged as soon as free from signs and symptoms—usually under twenty-four hours. He is examined weekly for three weeks to exclude recurrence, and concomitant syphilis, and again at three months, when the prostatic fluid following massage of the prostate is examined microscopically, and a blood test carried out to exclude syphilis. If the patient passes these tests, he is considered to have been cured, but is advised to have a further test three months later to exclude a masked syphilitic infection.

Satisfactory results have also been obtained in a number of cases treated by means of 250,000–300,000 units of penicillin in oil-wax suspension given in a single intramuscular injection. The same criteria of cure being used as for treatment by means of aqueous penicillin. This is likely to prove a most useful form of treatment for patients stationed near to a Special Treatment Centre.

OTHER DISEASES OF VENEREAL ORIGIN

It is only proposed to touch on the more common diseases of venereal origin.

Soft Chancre (Chancroid).—The diagnosis soft chancre was officially introduced into the Army in 1897 (Army Medical Department Report for the Year 1897, p. ix) the term “ulcer of penis” being “reserved for cases of non-venereal origin.” As will be realized from what has been said of the diagnosis and treatment of syphilis, until the advent of dark-ground illumination, the differential diagnosis between syphilis and soft chancre rested on the presence or absence of induration, and an observation period of four months (Wilson, 1910), although the bacillus generally considered to be the cause of chancroid, and which bears his name, was described by Ducrey in 1889. When the Wassermann reaction came into general use, the observation of all sores of possible venereal origin included periodical examination of the blood serum, in addition to clinical examination. And the routine at the present time is, for all penile sores to be at first dressed with saline, until a series of dark-ground examinations has been carried out to exclude *Spirochæta pallidum*, only thereafter are antiseptics applied. After the sore has healed, the patient is discharged from hospital to attend for blood tests monthly for three months, before a final diag-

nosis of chancroid is made. In its final report the Committee on the Treatment of V.D. and Scabies of the Advisory Board for Army Medical Services (1905) states that the normal treatment for soft chancre is "to apply *lotio hydrargyri nigra* to the sore early and to await events." The report, however, draws attention to alternative methods of treatment, such as the local application of heat in order to destroy the *B. ducrey*, the application of iodoform, and the application of pure nitric acid after the use of an analgesic, pointing out that this latter method is apt to cause pain, and is "naturally not so popular as some of the others recommended." Treatment in the earlier years of the century also consisted of the application of various antiseptics such as perchloride of mercury, or touching with pure carbolic acid (French, 1908).

The treatment of chancroid during the period of the 1914-18 War consisted of the application of either sulphur or hypertonic salines, or after negative examinations for *Sp. pallida*, dressings soaked in a chlorine antiseptic solution. It was generally considered that caustics, and the cautery and iodoform were often harmful, and that the use of ointments interfered with drainage resulting in bubo. Buboës if present were aspirated and injected with various solutions, such as a 1:20 solution of tincture of iodine in water. Incision was only used if aspiration failed.

Much the same forms of treatment continued to be used for many years following the cessation of hostilities. Local measures included the application of various antiseptics, urotropine compresses, and cauterization with camphenol (Crawford-Jones, 1937). Buboës were treated in much the same way as heretofore. In addition to local measures, many forms of injections such as antimony compounds, intramuscular whole blood, intravenous Dmelcos vaccine (*B. ducrey*), and intravenous T.A.B., were all tried with varying success, but without appreciable reduction in the days spent in hospital or the incidence of crippling buboës. In fact no important advance in treatment was made over a period of many years. However, with the advent of the sulphonamides, the picture changed, and in these has been found a form of treatment which has reduced the stay in hospital, and prevented the formation of buboës. For example, it was reported that in the Citadel Military Hospital, Cairo, the number of days in hospital was reduced from twenty-eight to fifteen, and that no case of bubo occurred in a series of cases treated by means of sulphonamide (Clarke and Beamish, 1939). At first sulphanilamide was used in the treatment of chancroid, the dosage being very similar to that used in the treatment of gonorrhœa. Later sulphathiazole was taken into use. Treatment by the sulphonamides is still the most satisfactory form of therapy for chancroid.

Non-specific Urethritis.—Little can be said of the disease or diseases usually described by this name. Much the same unsatisfactory and multifarious forms of treatment were carried out in the past as in the case of gonorrhœa. At present, such cases are normally treated by means of 5 grammes of sulphathiazole for a period of five days, with or without urethral lavage. In mild cases treatment is carried out as an out-patient. Most cases appear to respond, and resistant cases are treated by means of further sulphonamides, urethral lavage, and hyperpyrexial therapy in the form of intravenous T.A.B. vaccine.

Some light has been shed on one aspect of this condition—its possible connexion with abacterial pyuria—by work done at certain military hospitals (Vassallo, 1946; Fieldsend, 1946; Baines, 1947). However, there is no doubt that much remains to be learned about the ætiology of this condition, and investigations continue.

And that completes the account of the main tendencies of venereology in the British Army during the last fifty years. Stress has been laid on the more distant past, possibly to the exclusion of the immediate past and of the present—this was inevitable, but the present is available for all to see. What the future will hold, who can guess? What is the future of penicillin? One might even ask, what is its present position in the treatment of venereal diseases? Is the treatment of syphilis by penicillin alone justified, or should it be combined with both arsenic and bismuth? Some feel that the future lies in a combination of penicillin in the form of crystalline “G” salt with a course of bismuth, and possible repeated courses of penicillin. Does the future hold resistant strains, not only of the gonococcus, but of the *Spirochæta pallidum*? Is penicillin but the forerunner of future more powerful antibiotics? Who knows? One can only agree with Hamlet when he says: “There are more things in heaven and earth, Horatio, than are dreamt of in your philosophy.”

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