chrome, immediately after the withdrawal of 10 c.cm. of blood for culture purposes. Of this culture three tubes only, containing 2 c.cm., 2 c.cm., and 2.5 c.cm. respectively of blood, showed *Streptococcus longus* (*haemolyticus*) after seventy-two hours' incubation. On the thirty-third day mercurochrome (21 c.cm.) was again injected. A blood culture on the fortieth day was sterile. On the next day the temperature fell to normal and did not rise again.

A girl (D. L.), aged 12, contracted measles at school; eight days later she complained of earache, which passed off. On the fifteenth day of illness the temperature suddenly rose to 103° F., with return of the earache. On the seventeenth day the tympanum was incised and a radical mastoid operation was performed. On the twentieth day a rigor occurred and the temperature rose to 103° F.; 20 c.cm.

CHART E.—M. T.

CHART F.—N. W.

CHART G.—D. L.

of a polyvalent antistreptococcal serum was injected without obvious improvement. On the eighteenth day a blood culture showed a heavy growth of the *Streptococcus pyogenes longus* (*haemolyticus*); 15 c.cm. of mercurochrome was injected immediately after the blood had been withdrawn from the vein. On the twentieth day 12 c.cm. of mercurochrome was injected, on the twenty-first day 10 c.cm., and another 10 c.cm. on the thirtieth day of illness. The temperature had become normal on the thirty-first day, and convalescence thereafter was uninterrupted.

The general impression produced during the use of mercurochrome D was that its therapeutic activity was similar to other types of mercurochrome used during the previous four years, but that it was distinctly less toxic. It is, of course, impossible to discount entirely the operations of the long arm of coincidence. In dealing with clinical evidence of the type here presented it is equally impossible to affirm that no other treatment would have been equally effective, or, indeed, that the patients would not have done equally well without any treatment. But controlled experiments on animals have made it clear that

mercurochrome can effect a cure in a considerable proportion of cases.

We are, of course, aware that it has been stated that animals and men who have received mercurochrome exhibit no bactericidal properties in the blood and bile. This suggests that the action of this substance is not a simple effect on the micro-organisms, but that it follows the law of chemotherapy, in that it acts only through the body tissues. Bayer 205 has little apparent action on trypanosomes *in vitro*, though it may suffice to cure animals and men suffering from *T. gambiense*.

CONCLUSIONS:

1. The various specimens of mercurochrome on the market differ markedly in their chemical composition.
2. Toxicity appears to bear a direct relationship to purity of composition.
3. The nearer mercurochrome approximates in its analytical results to its known chemical constitution, the better the preparation as regards therapeutic efficiency and low toxicity.

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ARTIFICIAL HELIOTHERAPY IN THE ROUTINE TREATMENT OF SURGICAL TUBERCULOSIS.

BY

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WITHIN the past decade much attention has been paid to the curative effect of sunlight, and more especially to the effect of the ultra-violet rays, in many kinds of disease; rickets, marasmus, skin conditions, neurasthenia, rheumatism, hay fever, surgical tuberculosis, and a host of other conditions have been described as being amenable to treatment by heliotherapy. Indeed, a reviewer of a recent publication on this subject says, "apparently there is hardly any condition for which they [the authors] fail to recommend ultra-violet light." Rollier has been the chief advocate of heliotherapy as a method of treating surgical tuberculosis, his results in alpine sanatoriums having been very successful. Owing to the lack of natural sunshine in this country artificial heliotherapy has been strongly urged as a useful and practical substitute, and many hospitals have installed artificial sunlight lamps.

Such an installation was introduced in Edinburgh City Hospital in the latter part of 1924, and since then all cases of surgical tuberculosis in which there was no definite contraindication, such as pulmonary lesions or intolerance to light, have had routine heliotherapy.

Apart from the use of heliotherapy, all the cases have been treated in the same manner as previously. The

treatment of the local lesions consists in putting the part as completely at rest as possible. In the case of bone and joint infection this is attained by splinting; in the case of abdominal tuberculosis and other gland lesions where such anatomical rest cannot be secured, physiological rest is as far as possible obtained. In all cases the general health of the patient has been thoroughly investigated; rest in bed is enforced during the earlier part of treatment, all foci of infection are sought out and, if possible, eradicated. The open-air life of a sanatorium is insisted on, and the wards are so constructed that whenever possible the patients are wheeled out in their beds into the open.

The results of treatment by heliotherapy in cases of surgical tuberculosis have been gauged hitherto chiefly by the clinical observation of individual cases, but statistics of larger series of cases are now available.

I have attempted in the following statistics to tabulate the results of the treatment of surgical tuberculosis in the Edinburgh City Hospital, and to compare these with the results obtained before the introduction of heliotherapy.

The method of heliotherapy employed has been general exposure to the rays from a carbon arc lamp—using tungsten-cored carbons. The patients commenced with an exposure for ten minutes, and this was increased daily by ten minutes until a daily exposure of two hours was being received. With this routine very few patients have come under my notice on whom the treatment had any deleterious effect, such as skin irritation, gastro-intestinal upset, rise of temperature, loss of sleep, or general malaise. In a few

cases patients were found to be more tolerant to treatment by the mercury vapour lamp than by the carbon arc, the maximum exposure to the mercury lamp being half an hour.

The clinical result of this treatment was frequently most gratifying. I have personally observed how the general condition of the patient was improved, the muscle tone maintained or bettered, the appetite became good, the skin rapidly assumed a healthy tanned appearance, and how well the patients slept. In many instances the blood changes resultant upon the commencement of heliotherapy were studied, and in almost every case there was material increase of the red cell count and the haemoglobin content. The white cells also seemed to respond rapidly to the exhibition of ultra-violet rays, and a moderate leucocytosis has been demonstrable within a few days of the commencement of treatment. In a considerable number of cases the lymphocytes showed a relatively greater increase than the polymorphonuclear cells.

The statistics of the results of treatment have been compiled from the case records and discharge notes of the patients, and the features selected have been chosen as being most likely to exclude errors and anomalies, and so to form a sound basis upon which to draw conclusions likely to be of value. Certain facts had therefore to be considered. (1) In many of the cases it was impossible to estimate with any degree of accuracy the extent of the lesion when the patient commenced treatment. (2) Many of the patients had long-standing disease, and some showed gross deformity which demanded, if any such treatment were possible, operative intervention when the tuberculous process had quieted down. (3) The results of the treatment in hospital have been estimated by different medical officers; by some the results are claimed as cures in a higher percentage of cases than by others, who more modestly have estimated the majority of their patients as having made marked improvement or simply improvement. (4) The number of the cases is comparatively small when the different types of the disease are separately considered.

In order to exclude fallacies and arrive at sound conclusions the statistics given below have been selected as follows:

(1) The results of treatment classified as "cures" or "much improved" have been taken together in the statistics given as "very satisfactory." Further, to obtain broad general results, all cases shown as "cures," "much improved," or "improved" are classified as "satisfactory." All other cases are recorded together as "unsatisfactory."

(2) The cases have been dealt with in two age groups—up to 21 years and over 21 years; the total results for all ages have also been considered. It is hoped that by this division into age groups the majority of the frankly chronic cases will fall into the second age group, and can therefore be considered separately from the more recent cases.

(3) The average stay of the cases in each group in hospital has been approximately estimated in months.

(4) Only in those types of disease which were represented by a considerable number of cases are the figures tabulated in detail. The smaller groups of cases were also studied, and a note is added about their similarity to the other groups given.

The total number of patients with surgical tuberculosis treated before the introduction of artificial heliotherapy was 169, of whom 125 were below the age of 21. Since the artificial sunlight was introduced 153 patients have been treated, 114 being under 21 years of age. Table I shows the various types of disease treated.

TABLE I.

Type of disease or site.	Cases before light treatment.	Cases since light treatment.
Hip disease	26	25
Knee	7	20
Spinal	40	37
Abdominal	44	42
Glandular (cervical)	16	14
Lupus	5	3
Genito-urinary	5	2
Dactylitis	4	6
Ankle	4	2
Bone (miscellaneous)	5	4
Multiple	14	8
Joints (miscellaneous)	—	3
Other cases (eyes, etc.)	3	2

Several cases where only two lesions were demonstrable have been included under two groups rather than classifying them as multiple.

The detailed analysis of all these types of disease and the results of treatment to a very great extent agree, and the salient features to which I would draw attention may best be demonstrated by the table given below.

TABLE II.—Patients under 21 Years of Age.

	Hips.	Spine.	Knees.	Abdomen.	Glands.
<i>Pre-light Cases.</i>					
No. of cases	13	28	7	40	10
Percentage very satisfactory	46.15	14.28	42.8	27.5	10
Percentage satisfactory ...	92.3	57.13	85.6	52.5	80
Average stay in hospital in months	10½	10½	13	4½	3½
<i>Post-light Cases.</i>					
No. of cases	14	26	18	38	10
Percentage very satisfactory	57.14	26.92	38.9	21.05	50
Percentage satisfactory ...	71.43	69.3	88.9	68.42	80
Average stay in hospital in months	22	16½	16½	6½	6

In abdominal disease it was impossible to classify the different varieties of tuberculosis in the abdomen, such as plastic peritonitis, ascitic peritonitis, and tabes mesenterica. The total figures have therefore been taken for comparison.

The patients with tuberculous cervical adenitis who came to Edinburgh City Hospital for treatment were those severer cases in which the lymph glands on both sides of the neck were extensively involved and frequently complicated by the presence of one or more sinuses. Not infrequently the patient had had one or more operations for the removal of the glands, but recurrence had followed.

Table III shows the results in all cases in those types of the disease where the figures for the total number of cases is considerably greater than for Age Group I (under 21 years) alone.

TABLE III.—Total Results.

	Hip.	Spine.	Abdomen.
<i>Pre-light Cases.</i>			
No. of cases	26	40	44
Percentage satisfactory	53.8	55	54.5
Average stay in hospital in months	12	11½	6
<i>Post-light Cases.</i>			
No. of cases	25	37	42
Percentage satisfactory	44	69.6	64.3
Average stay in hospital in months	22½	13½	7

COMMENTS.

1. The statistics of the other groups are from so few cases that it would be unwise to base any definite conclusions on them, but the results resemble closely those obtained from the larger series of cases.

2. In the figures detailed it should be noted that there has been an apparent improvement in the results obtained by the treatment of spinal disease and abdominal disease since the patients have had routine treatment by ultra-violet light. The results of treatment of hip disease by heliotherapy are apparently less satisfactory than those previously obtained. The results of treatment of disease of the knee-joint and of cervical glands show no definite difference since heliotherapy has been introduced.

3. It is to be noted also that the average duration of stay in hospital of patients in each of the five types of disease studied has materially increased. In cases of hip-joint disease the average stay in hospital has been doubled; in disease of the spine the stay in hospital has been increased by six months; in knee-joint cases the increase is three months; in abdominal disease two months; in glandular

disease three months' treatment is now, on the average, increased to six months. In the few instances of adults above the age of 21 the figures of the results roughly correspond with the figures of the younger patients.

CONCLUSIONS.

A study of this series of cases forces one to the conclusion that the opinion which many of the earlier observers had that artificial heliotherapy would prove an almost specific treatment for cases of surgical tuberculosis has not been justified.

Without placing too great weight on any of the figures, and without seeking to arrive at final conclusions, I think it may be stated that in the series here detailed the results of cases treated by heliotherapy do not show any marked improvement over the cases of a similar nature treated without heliotherapy. There are figures which suggest that spinal disease and abdominal disease have been benefited by the ultra-violet light treatment, but must we then conclude that the glandular disease in the neck and disease of the knee-joint are unaffected, while disease of the hip-joint is definitely made worse by the heliotherapy? I prefer to draw the simple conclusion that on the whole the results obtained by the use of artificial heliotherapy, when combined with routine sanatorium treatment and efficient local treatment, do not show any material improvement over the results obtained by treating cases by similar methods but without heliotherapy.

I believe that the reason for the increased average stay in hospital is due to the fact that the patients look so well and tanned that we are inclined to give the local lesion, however resistant to treatment, "another chance." One is almost tempted to ask the question, What would the results of the earlier cases have been if they, too, had enjoyed the more prolonged sanatorium treatment?

The conclusion reached is that artificial heliotherapy does not change the fundamental principles of treatment of surgical tuberculosis. The efficient local measures taken to ensure rest and the general sanatorium treatment are the main methods to be adopted; heliotherapy is a useful aid to treatment, as are many drugs. This last point I would specially emphasize, because it is frequently observed that patients are moved in order that they may go to the sun-room; splints and other apparatus which are usually religiously kept in place and undisturbed are then regarded as merely a nuisance and a hindrance to the transporting of the patient to the health-giving rays.

I have to express my indebtedness to Mr. F. E. Jardine for his permission to use these figures.

TUBERCULOSIS AS SEEN BY THE GENERAL PRACTITIONER.*

BY

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TUBERCULOSIS, from the general practitioner's point of view, embraces the whole range of this widespread and fatal scourge of man, from the predisposing and infecting agencies to the successful or unsuccessful termination. There is no one who has more opportunities to watch its inception and course, and there is no one who has more cause to regret lost chances of early recognition. Early diagnosis is in some cases tragically simple, in others as difficult as any which the physician has to make, since signs may be absent, and symptoms may be few, misleading, or equally applicable to other conditions of ill health. It is on early recognition that I wish to speak shortly.

It will be of service in considering our problem if one gets in focus some figures and conditions of the tuberculosis population in such a town as Cardiff and considers the relative numbers of those treated in their own homes and elsewhere. In the year 1926—according to the last available report of Dr. Ralph Picken, the medical officer of health—527 new cases were ascertained by notification and otherwise, and the number of deaths was 288, both being

relatively reduced numbers for this city on account of the absence of any serious epidemic of influenza during the year.

Those figures include both pulmonary and non-pulmonary cases, but they indicate only a small part of the question. The average duration of life of a phthisical person is roughly assumed to be about three years, and an actual survey of the proved cases at the end of 1926 showed that there were 1,274, while at least 150 cases of suspected tuberculosis were under the observation of the public health department.

The mortality mentioned (288) gives a tuberculosis death rate of 1.28 per 1,000, and it is important to note that the proportion of deaths from phthisis alone to deaths from all causes in Cardiff, between the ages of 15 and 65 years, was roughly 20 per cent. (or one-fifth of the whole).

A further investigation revealed a serious condition, which is probably equally prevalent in other towns, and may not be well known to doctors who visit by day; only 46.1 per cent. of the patients slept by themselves or in a separate room, and therefore at least an equal number of contacts were exposed to infection, for eight out of every twenty-four hours, from that class of carrier who is chiefly responsible for dissemination.

It is chiefly of importance to recognize that of the 1,274 patients with frank tuberculosis known to exist in December, 1926, 96 were in institutions and the rest were in their homes. Some of these were having treatment from the general practitioner alone, or in consultation with the tuberculosis physician, but a larger number were quiescent cases. It is obviously desirable that a larger number of beds should be available in hospital for active and advanced stages of the disease.

The practitioner may therefore be said to have his full share, in co-operating with the Welsh National Memorial, in treatment, and it is to be hoped that he will share also, so far as lies in his power, in the responsibility for preventive measures. These include incessant vigilance for indications of the disease, especially in the finding of any material which may be used for laboratory examination, early notification, and early consultation with the tuberculosis physician, in and behind whom lies the whole strength of the tuberculosis service and organization. This includes services of pathologist, radiographer, hospital, and sanatorium. The general practitioner can assist to improve the patient's physique, his habits, and personal hygiene, and note and try to remedy domestic conditions.

To recognize pulmonary tuberculosis when physical signs are well established and sputum abundant is to be wise after the event; to diagnose the disease at such an early period of its course as to afford a reasonable prospect of its cure is an investigation requiring many factors. Two of these are: patience to collect all symptoms which point to the condition, and such knowledge of other diseases with similar onsets as to be able to exclude them. Pottenger's classification of all the well-known symptoms into three groups seems to me of great significance when we are aiming at the diagnosis of an obscure early case. They are: (1) Pulmonary—catarrh, expectoration, haemoptysis, and pleurisy. (2) Reflex—pain, hyperaesthesia, cough, and laryngeal irritation. (3) Toxaemic—pyrexia, malaise, loss of weight, tachycardia, anaemia, indigestion.

Any or all of these may appear in every case of phthisis, but the order of their appearance in the march of events is certainly not always the same. In some they are frankly pulmonary from the beginning—cough, sputum, or haemoptysis—though even here those obvious signs probably obscure our observation of toxic effects. In the others—the larger number, and those most easily overlooked—the only evidence of tuberculosis in the early stage of the disease is toxæmia, with the train of symptoms I have already mentioned. This superficial difference between two groups is due to the one being mainly a local reaction of the pulmonary tissue to the presence of a toxic foreign substance, while the other is chiefly, but not entirely, a poisoning of the tissue cells of the body generally. In reality both processes are taking place in both groups, though not in the same degree of intensity. Even in the catarrhal group physical signs are later in appearing than symptoms, while in the remaining cases reliance has to be

* Read in opening a discussion in the Section of Tuberculosis of the Annual Meeting of the British Medical Association, Cardiff, 1928.