LEPROSY REVIEW.

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Contents.

The Association does not accept responsibility for views expressed by the writers. Communications may be sent to the Editor, at 29 Dorset Square, London, N.W.1.

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Editorial.

THE leprosy situation in Palestine is one which is full of interest. Undoubtedly leprosy at one time must have been fairly prevalent throughout the Holy Land, but as Dr. Canaan points out, the disease now seems mainly to be confined to a few centres, the chief foci being situated in the Jerusalem district. At a Conference held recently in Calcutta for leprosy workers in India, Col. Stewart, the Director of Public Health of the All India Institute of Hygiene, laid stress on the fact that few realised that there were epidemics of chronic diseases such as tuberculosis and leprosy, just as there are epidemics of the more acute diseases such as cholera and smallpox. Unfortunately, epidemics of tuberculosis and probably also leprosy, cannot be studied in the life-time of one individual. The example of tuberculosis in England was cited by him, and it was suggested that the most important factor in the improvement was due to the natural decline of the epidemic, which had come to a peak during the last 50 or more years and was now rapidly on the wane. This may be the case with leprosy in Palestine, and therefore a careful study of the type and distribution of the disease, and the conditions of the people should elicit important epidemiological facts. If the measures indicated by Dr. Canaan are put into force, there is every reason to believe that the disease will be fairly rapidly controlled and the curve of the decline of the epidemic in Palestine hastened.

We conclude Dr. McKenzie's article on certain serological tests in leprosy, and his conclusions with regard to the Serum Formalin Test and the Sedimentation Index Test are of importance and deserve further attention. Unfortunately serological tests in leprosy remain only indications as to progress, and while they are useful guides to the physician treating cases, one must remember that nothing can replace clinical experience and the clinical sense which is acquired after much experience in the treatment of the disease.

Dr. Ryles, of Dhanbad, India, contributes a most interesting and instructive article on the use of aniline dyes in leprosy. It is well known that it is possible by eosin and other aniline dyes to sensitize living cells and to cause by the action of visible light abnormal conditions, similar to those produced by ultra-violet radiation. The Secretary of the Association recently visited the Dhanbad leprosy clinic and

was most impressed by the work done there. It is a model of its kind and the type of work that might well be copied by those in charge of coalfields and others who have, in addition to their mines or factories, the responsibility of surrounding villages.

The employment of Brilliant Green in the treatment of leprosy certainly seems to be promising, and its painlessness, extreme cheapness and many uses would appear to make it an ideal drug if first impressions are confirmed. We would be glad to secure samples for testing out by those in charge of institutions adequately equipped and large enough for the purpose. The whole field of the aniline dyes deserves further attention, and we believe those in Malaya are experimenting along these lines. We trust as a result of Dr. Ryles' paper others will be encouraged to follow suit. With regard to such experiments we would suggest that at least fifty patients should be chosen, and, when comparing the efficacy of two drugs, *e.g.* Brilliant Green and hydnocarpic preparations, the patients in each group should be, as far as possible, in the same stage of the disease.

In the Indian Section we would lay stress on two articles, *viz* : " Re-examination of Discharged Leprosy Cases " and " Slight Lesions in Leprosy and the Importance of their Recognition." If we are to evaluate the results of treatment, careful examination and observation of discharged cases is essential. With regard to the administration of potassium iodide as a test of fitness for discharge, this may be safe in the hands of those in charge of the larger institutions and who have adequate experience, but we do not recommend it as a routine test of fitness for discharge. If an adequate parole period has been allowed, then we suggest that to endeavour to see whether there are latent foci capable of being lit up is unsound therapeutics.

The importance of the slight skin lesion in leprosy cannot be exaggerated, and it behoves all who read this article carefully to study the early manifestations of the disease.

The Secretary had the privilege of being present and taking part in the All India Leprosy Conference held in Calcutta during March. We hope to make available for our readers the findings and some of the more important papers presented to this conference in a subsequent number of the REVIEW.

Obituary.

LORD CHELMSFORD.

The British Empire Leprosy Relief Association has suffered a great loss in the death of Lord Chelmsford, who was its Chairman since 1924.

Lord Chelmsford will probably be remembered chiefly by the public for the great constitutional reforms brought about in India during the period of his viceroyalty, but the keen sense of duty which impelled him to undertake that great task was displayed in every aspect of his life.

His unflagging industry, sound judgment and conspicuous fairness, together with his unfailing tact, enabled him to fill many high official posts with distinction, yet, after having been Governor of New South Wales, he was content to serve as a captain in the Dorsetshire Regiment on the outbreak of war.

In small things as in great, service was the keynote of his life, and it was characteristic of his attachment to India, and his concern for everything relating to the welfare of its peoples, that he accepted the chairmanship of this Association at the time of its inception.

Though the attack on leprosy which was made possible by the discovery of a treatment had not commenced in the time of his viceroyalty, his experience had brought him abundant proof of the necessity for energetic measures against that scourge, and his interest remained unabated until his death.

All who knew him will bear witness to the fineness of his character, and his record will remain as that of a man animated by the highest ideals.

Corrigendum.

In the article entitled "The Modern Treatment of Leprosy," which appeared in the April issue, the dosage of Solganol B given on p. 74 should read :—

1st and second weeks	...	0.01 grams.
3rd week	...	0.025 ,,
4th week	...	0.05 ,,
5th and 6th weeks	...	0.1 ,,

Ridding Palestine of Leprosy.

T. CANAAN.

THE population of Palestine according to the last census (1931) is 1,035,145, making a density of 54 inhabitants to every square kilometre. Some parts of the country are less densely populated than others. The districts situated to the south of Hebron and Gaza are less inhabitated than most parts of the mountainous ridge and the Mediterranean plain lying to the north of Gaza.

Leprosy has been endemic in Palestine since its occupation by the Israelites. The Bible not only mentions this disease, but gives a detailed description of it. This scourge was more prevalent in olden times than it is at present. Even in the last fifty years there has been a marked decrease as may be seen from the statistics of the Leprosy Home in Jerusalem. This Home is directed and supported by the Moravian congregations and has its Board of Directors in London (32 Fetter Lane). It was founded in the year 1867 ; and has since continued to work without any interruption ; the present building dating from 1887.

It is difficult to give the exact number of sufferers from leprosy in Palestine, for only the advanced cases come to the Home. An exact survey of the country to find all those infected is a very difficult task. The approximate number is eighty. Trans-Jordan and Syria have about another hundred cases. Only a few are at present housed in the leprosy Home (21, to be exact). There are nine in the concentration centre in Siloah, and many live undisturbed in their villages. Due to the above mentioned fact that there is only a small number of cases in Palestine, and wide experience showing that leprosy is not very contagious, the important question arises : Is it possible to rid Palestine of leprosy ?

It is instructive, before answering this question, to study two points which have a direct bearing on the subject, namely, the mode of infection and the attitude of the population towards patients afflicted with this scourge.

The liability to infection with the Hansen bacilli is, according to general experience, very slight. It takes place from the dessiminated germs originating from the discharges of the nose, mouth, throat, and lungs and from suppurating leprous nodules. The leprosy Home in Jerusalem, like every other such institution, is to be regarded, from this point of view, as a highly infective centre. But facts gathered in our Home speak decidedly against any great

virulence of the bacilli. Three of our nurses who worked continually for 33, 28 and 27 years respectively in the Leprosarium, mixing daily and intimately with the patients while visiting them, dressing their wounds, giving them injections, washing their clothes and sitting with them in meetings, were not infected. A still more conclusive proof is the fact that four patients not suffering from the disease were admitted to the Leprosarium by my predecessor. This was done out of pity for their deplorable condition. These mixed quite intimately with the patients for a period of 48, 27, 17 and 14 years respectively. They lived in the same room, played, ate and worked together. Often they used the spoons, dishes, water-pitchers, etc. belonging to the patients, and during sickness they were nursed by them. But none showed any sign of infection.

These observations illustrate the very important fact, that infection with Hansen's bacilli is not so easy and simple as with other pathogenic germs. The leprosy micro-organisms are attenuated in their virulence. Children are more prone to succumb to infection, especially if they are exposed to the germs for a long period. The greater number of our patients were probably infected in childhood or in their youth.

The natives of Palestine dread this disease. Although with the former popular rules regulating the life of the sufferers are not as strict as they used to be, a leprous person is always avoided. As a rule, in the villages, he has to live in a separate room, lying at some distance from the other houses.

These data, namely, the restricted number of sufferers, the slight danger of infection, and the attitude of the population towards them make it a comparatively easy task to rid Palestine of leprosy. This conclusion is further supported by the fact that leprosy is endemic only in a few centres and in some families. The statistics of the last twenty-five years show that our Home has housed patients from 101 different villages of Palestine. Fifteen villages are more infected than the others. From each of them we had four patients or more. Esawizeh, Bet Unia and Abu Dis show the highest index of infection, with 9, 9 and 8 patients respectively, and forty per cent of these fifteen villages lie in the Jerusalem district. Of the remaining 86 villages, nine had sent three cases, 25 two, and the rest one case each.

Another important fact is that 26 per cent of all the patients accepted in the Home since December, 1896, had one

or more relatives suffering from leprosy. The percentage would certainly be higher if every member of such a family had been examined by an experienced physician. This has been hitherto impossible.

The best way to eradicate leprosy from a small country like Palestine, with such a small number of patients, is to follow the system of compulsory segregation. In countries like India and the Philippines, where the cases number thousands, the colony system with out-patient clinics is not only more human, but more practical and more effective. The expenses connected with changing the present Leprosy Home of the Moravian Mission to the colony system are not justified by the small number of cases. Even if the colony system were followed in Palestine the expected results would not be attained, due to the present official regulations. The fundamental requirements which will ultimately enable us to free Palestine from leprosy are, in my opinion :—

1. Complete and forced segregation of all infectious patients.

2. Only negative and thus non-infective cases should be allowed to leave the hospital.

3. No case should be regarded as " clinically " cured before he has been two and a half to three years " negative " in symptoms and in bacilli.

4. A non-infective and " paroled " case should report every three months to a Public Health Department officer, or to our Home, for a thorough physical and microscopic examination.

5. All relatives and direct neighbours of every case should be examined once every six months for a period not less than two years, to discover all hidden, latent, and early cases. Clinical examination alone is not sufficient, it must be supported in every case by laboratory work.

6. Young children and babies of leprous patients should be removed from the infectious area.

7. A thorough disinfection of every house known to harbour a sufferer should be undertaken.

Doubtless many difficulties will confront every worker who is trying to carry out the above mentioned requirements. But the present writer believes that good-will combined with some energy will overcome all these difficulties. The following points of criticism are raised against such a method :

1. Complete and forced segregation is said to be inhuman and unpractical. It is true that it is not the ideal method, but as there is no other method which will suit the present

conditions of Palestine, this seemingly inhuman way is in reality more humane than allowing sufferers to live in the same unhygienic, small and dark rooms, with the other members of their family, thus exposing the children to infection with this terrible disease. It is at the same time more humane than the custom, followed by many inhabitants of Palestine, of throwing the afflicted out of their houses and villages, and forcing them to live quite alone, or driving them to cities where they sit in the streets, begging from passers-by. Forced segregation is only then inadvisable if the Leprosy Home in Jerusalem were to refuse to accept them all. But the Board of Directors of the Institution has offered to house as many as 80—100 patients.

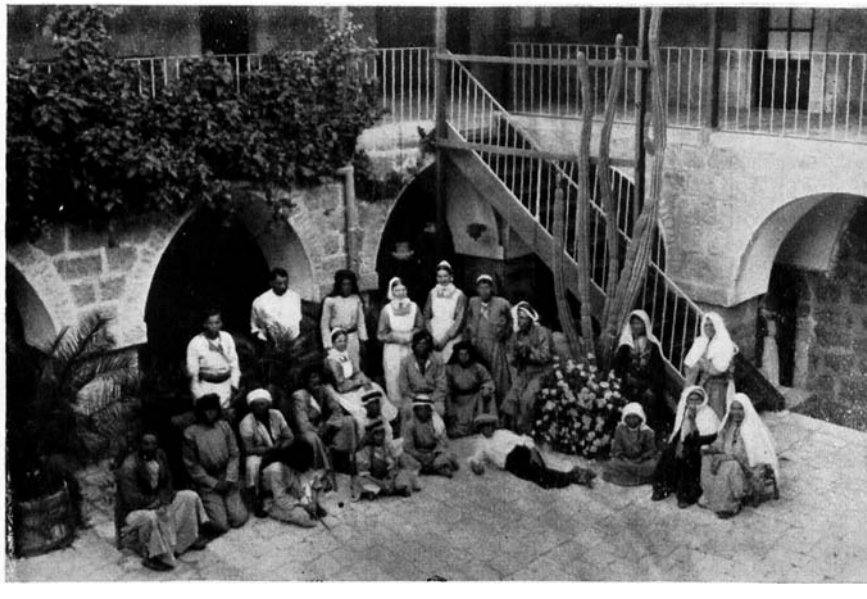
2. Competent physicians of the Public Health Department have a double duty: first to re-examine "paroled" cases, who have to call from time to time on them, and to decide if the disease has reappeared or not; secondly, to examine the members of every family with a history of leprosy in order to detect any latent, early or hidden case. The experience of every leprologist demands a very thorough physical examination, combined with microscopic examination of several slides with material taken from the scrapings of nodules, ulcers or scars from the nose, mouth, throat and skin. Only a conscientious and skilled person is able to take the right material from the right spot. Our experience has shown that if a skilled person is entrusted with taking the material for the microscopic examination from "negative" cases he will find bacilli in 27% more than a non-trained physician.

As soon as a "negative" and "paroled" case becomes "positive" he should be returned to the leprosarium, for he is no longer "non-infectious."

3. The disinfection of houses costs a certain amount, not only to cover the actual cost of the disinfecting material, but also to compensate poor people for the loss they suffer in burning some of their household goods. Such expenses are, and will remain, very small in Palestine.

The prevailing conditions help in no way to rid Palestine of leprosy, for they do not fulfil any of our requirements. The Leprosy Home is a private missionary institution. It does not possess any power to hold its patients or to force the "paroled" cases to report for re-examination. The Home is thus labouring under constant difficulties. The patients can leave the institution at any time. Among the inmates are notorious agitators who continually break the fundamental regulations of the Home, and have to be

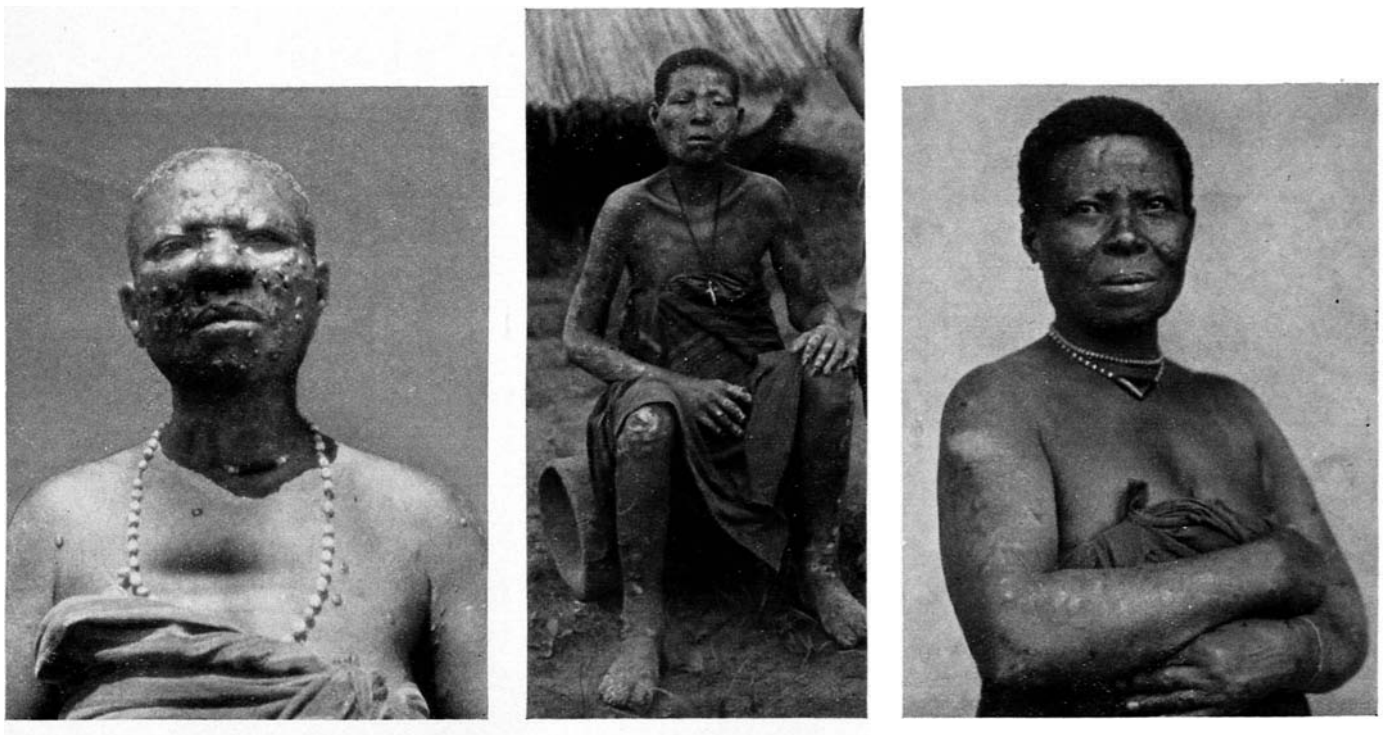
THE LEPROSY HOME AT JERUSALEM. UNDER THE AUSPICES OF THE MORAVIAN MISSIONS.



GROUP OF PATIENTS AND NURSES.

(Blocks kindly lent by Moravian Missions)

SOME NON-SPECIFIC SEROLOGICAL TESTS IN LEPROSY



Types of Cases Under Treatment at Songea, Tanganyika Territory.

dismissed. The matron and the physician can in such cases only report such conduct to the Public Health authorities. Our constant advice to paroled cases to report at regular intervals is seldom followed, for once set free they will not come back unless relapses have completely weakened their health and disfigured their appearance. No Public Health ordinance forces the segregation of the patients and the reporting of released cases.

Marriage is another problem which needs more consideration. On principle it is inhuman to deprive inmates of such a natural right. But in the light of scientific experience one is forced to advocate one of the following two methods: (*a*) Prevention of marriage, or (*b*) the removal of newly born babies from their leprous parents. The last way is doubtless the better one, and the Leprosy Home has been and is always ready to take over such babies, bring them up, and arrange for their education. But no fathers or mothers in Palestine ever give away their children, and there is no official ordinance regulating this question. Lately a pregnant leprous woman was admitted. She gave birth while in our institution to a healthy boy. During all the period she was with us the child was removed from his mother. She nursed him under the strictest hygienic conditions and under the supervision of a sister. Five months later the father—who was free from leprosy—insisted upon taking his wife and son away. All our requests to keep the boy were frustrated by the stupidity of the father. Poverty of the parents, unhygienic conditions in their home, and their stupidity, have surely sealed the pitiful fate of the child.

It is a blessing that most marriages amongst sufferers remain childless or nearly so. Nevertheless, it is the duty of every physician to advise against such a step. In a small country, like Palestine, which has only few cases, such a decision is more justified than elsewhere. The Grand Mufti of Palestine has in his far-sightedness understood the situation, and has promised to issue an order preventing marriages of sufferers from leprosy among his people.

The more present conditions of Palestine are studied the more it becomes clear that the situation can be mastered. The comparatively small number of cases is no excuse for not beginning the work. A private institution like our Home, which has no legislative and executive powers whatsoever, cannot do the work alone. The help and support of the official authorities is absolutely necessary.

Some Non-Specific Serological Tests in Leprosy

ALAN MCKENZIE.

(*Continued from Vol.* IV, *No.* 2.)

THE SERUM FORMALIN REACTION AMONG CASES OF LEPROSY.

The Serum Formalin Reaction has been investigated among a series of 130 cases of leprosy during a period of two years. All these patients have been under continuous treatment and the variations of the reaction have been correlated with changes in their conditions.

Table 1 gives an analysis of the reaction among each of the three classifications of the disease on the first occasion on which it was performed in each case.

TABLE 1.

Value of Serum Formalin Reaction.	0	1	2	3	4	5	6	*Totals.*
Number of patients examined	15	19	21	18	17	23	17	130
Group I	1	1	2	7	8	8	14	41
Group II	11	17	16	6	8	9	3	70
Group III	3	1	3	5	1	6	0	19

The majority of these cases had been under treatment for some considerable time prior to the performance of the reaction, and the table can show nothing more than that there are a greater proportion of high Serum Formalin Reactions among those patients who belong to Group I, and perhaps that the greater the number of bacilli in the body the higher one may expect the S.F.R. to be.

Only 36 patients had their S.F.R. examined prior to the commencement of treatment and the analysis is given in Table 2. All these cases were very early ones, generally showing only slight evidence of the disease.

TABLE 2.

Value of Serum Formalin Reaction.	0	1	2	3	4	5	6	*Totals.*
Number of patients examined	1	5	6	6	4	9	5	36
Group I				2		4	3	9
Group II	1	5	6	3	3	3	2	23
Group. III				1	1	2		4

The higher figures are again seen among Group I cases while the reaction of the Group II tends to be low. As a diagnostic aid, therefore, the Serum Formalin Reaction is of no use at all since the diagnosis of Group I rarely presents any difficulty, and there is no guarantee of a high reaction in a Group II case.

Turning to the changes of this reaction during treatment and examining the results in each class separately, we have the results shown in Tables 3, 4 and 5. Again the S.F.R. recorded is the value on the first occasion it was performed on that particular case, and the behaviour of the reactions is given in the final three columns.

Table 3 shows the variation of the reaction among the Group I cases where the progress of the disease can be assessed with more accuracy than in the other Groups. Progress is recorded as Much Improved (M.I.), Improved (I.), No Change (I.S.Q.) and Worse (W.).

TABLE 3.

All observations have been recorded over a minimum of nine months.

Results of Treatment.	*Number of Cases.*	*Behaviour of S.F. Reaction.*		
		Rose.	*Stationary.*	*Fell.*
M.I.	13	0	1	12
I.	5	1	3	1
I.S.Q.	5	1	3	1
W.	13	9	4*	0

* The S.F.R. of all these four cases was 6 at the commencement of the period under review.

I think, without further amplification, this Table clearly shows that the S.F. Reaction tends to rise or fall with the varying fortunes of the disease; falling as the leprotic condition improves (out of 13 recorded as Much Improved the reaction was seen to fall in 12), and rising as the disease progresses (among 13 who became worse in spite of treatment, the S.F. values rose in all but 4, who all showed the maximum value from the first).

Certain of the more striking cases can well be taken as examples.

P.122.—A very early Ib case, whose sole lesion was a small patch of thickened skin near the left nostril. B. leprae were found in this patch

18/6/30— S.F.R.3
28/10/30—Lesion was much flatter, but bacilli could still be found S.F.R.2
22/12/30—Had frequent slight reactions, with mild temperature, face, legs and hands became swollen S.F.R.4
2/3/31—Swelling of face diminished S.F.R.3
11/5/31—Original patch disappeared S.F.R.2

P.121.—Originally a IIa case on admission, with patches all over the body and anaesthesia in some of them.
16/6/30— S.F.R.4
29/9/30—Fine nodules appeared over the forehead in which B. leprae were found S.F.R.6
3/11/30—Reaction finished, but B. leprae still found in forehead S.F.R.5
8/12/30—Lesions flatter, B. leprae nil S.F.R.4
10/2/31—Appears practically normal S.F.R.4

P.36.—A Ib case, with early nodules in face and ears.
1/4/30— S.F.R.3
Condition appeared to improve until
2/12/30—Lesions began to swell and there was a rise of temperature S.F.R.5
10/2/31—Lesions less, but painless enlargement of testicles appeared S.F.R.6

P.11 Ib.—A case of long history who had been treated without reaction or change in the lesions for two years. General condition appeared good but there were many nodules all over the face and trunk, appearing and disappearing without any febrile or other constitutional disturbance. Before reaction S.F.R. was 6.
17/3/30—Severe reaction commenced. All nodules swelled up and ulcerated. Grave constitutional disturbance. Great loss of weight and high temperature. This reaction lasted until
10/6/30—When ulcers started to heal and there was no signs of raised nodules left.
1/7/30—Patient started to put on weight again S.F.R.5
24/9/30—No further ulceration or nodule formation S.F.R.4
10/2/31—Patient regained normal weight, lesions better ... S.F.R.3

Tables 4 and 5 show the changes in the Serum Formalin Reaction among patients of Groups II and III respectively.

TABLE 4.—GROUP II CASES.

Results of Treatment.	*Number of Cases.*	*Behaviour of the S.F. Reaction.*		
		Rose.	*Stationary.*	*Fell.*
M.I.	23	1	10*	12
I.	13	1	10	2
I.S.Q.	13	5	8	0
W.	5	5	0	0

* Four of these ten cases gave a S.F. value of 0 at the commencement of the period in question.

TABLE 5.—GROUP III CASES.

Results of Treatment.	*Number of Cases.*	*Behaviour of the S.F. Reaction.*		
		Rose.	*Stationary.*	*Fell.*
M.I.	6	—	1	5
I.	—	—	—	—
I.S.Q.	10	5	2	3
W.	2	1	1	—

In both these groups it is more difficult to estimate progress than in the first group, and consequently the correlation of a rising S.F. with progression of the disease is less striking.

It is demonstrable, however, that the same tendency exists among these cases in whom few or no bacilli can be found as among that group in which bacilli is found in large numbers and with ease.

ILLUSTRATIVE CASES.

P.111, IIa. Admitted 20/3/30—Pale patches all over body and legs; Anaesthesia at the centre of most of these patches S.F.4
29/9/30—A febrile swelling of many lesions ... S.F.5
11/5/31—Lesions now practically invisible, but anaesthesia as before S.F.2

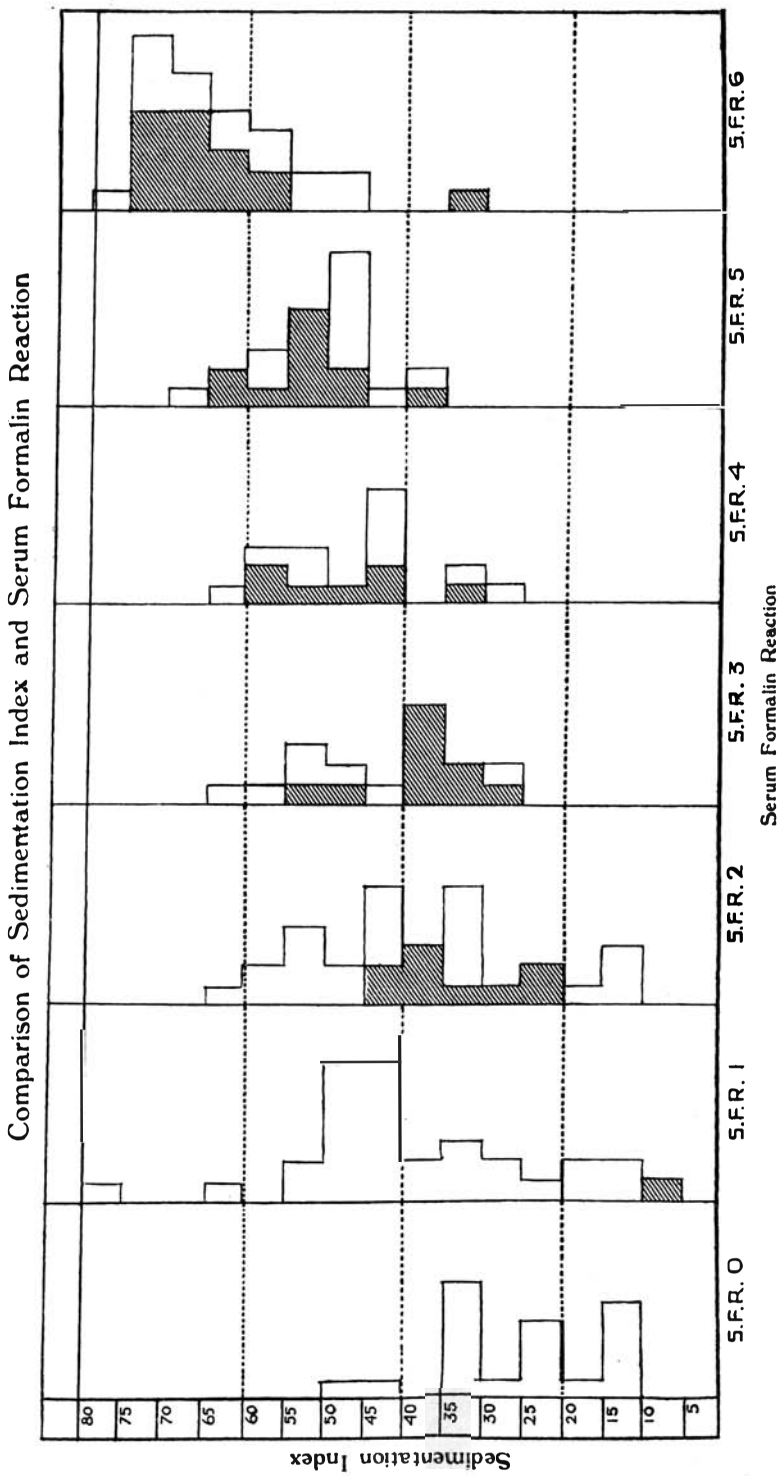
P.114, III Admitted 6/6/30—A few skin patches, but nerve type anaesthesia over both forearms, and both ulnar nerves enlarged.
18/6/30— S.F.3
15/9/30—Anaesthesia diminished in extent; patches darker S.F.2
11/5/31—Patches almost invisible. Area of anaesthesia less on hands S.F.1

The administration of iodides in leprosy produces changes in the Serum Formalin Reaction comparable with that observed in the Sedimentation Index. The following case recounted in detail demonstrates this well.

P.14. An old leonine case, was considered cured. No bacilli had been found after many examinations, either at the sites of the old lesions or by gland puncture. He was admitted to the general hospital, and potassium iodide administered. When the dose of iodide had reached 360 gr. per day he began to show a rise of temperature up to about 102 deg. F., and a few bacilli were found in a nasal scraping. Treatment was recommenced with hydnocreol, and after nine months he was again submitted to the iodide test, this time without any effect following a dosage of 480 gr. of potassium iodide per day. His S.F.R. was now 0. (18/6/30). Treatment was discontinued and he was considered cured.

9/3/31 he appeared again at the clinic and showed some small pale raised patches on the chest and abdomen, which were not anaesthetic and in which no bacilli could be found, S.F.R.2.

He was admitted to hospital and iodides given with the


Comparison of Sedimentation Index and Serum Formalin Reaction
Sedimentation Index
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
S.F.R. 0
S.F.R. 1
S.F.R. 2
S.F.R. 3
S.F.R. 4
S.F.R. 5
S.F.R. 6
Serum Formalin Reaction

following result.

The Sedimentation Index at each examination is also given for comparison.

18/3/31—Admitted to hospital	S.F.2/S.I. 24
21/3/31—KI 30 gr. daily since 18/3	S.F.2/S.I. 23
25/3/31—KI 60 gr. daily since 21/3	S.I. 37
27/3/31—KI 120 gr. daily since 25/3	S.F.4/S.I. 45
8/4/31—No KI since 27/3/31	S.F.2/S.I. 35
10/4/31—T. 100.8 deg. F. (Malaria)	S.F.2/S.I. 45

It was considered that a relapse had occurred and he has now recommenced treatment for a further period.

Other cases in which the iodide test was used to determine whether the patient was cured, and in which the administration of iodides produced no temperature or rise in the Sedimentation Index, also caused no change in the Serum Formalin Reaction.

Leprosy, therefore, especially when a large number of bacilli are found in the body, affects the S.F. reaction in the same way as the granulomatous group of diseases referred to above, and the reaction rises or falls as the disease progresses or improves.

When considering the behaviour of the S.F. Reaction among non-leprous patients it was suggested that the reaction was only slightly, if at all, influenced by the majority of the less chronic diseases ; it should, therefore, be expected that a comparison of the S.F. Reaction with the Sedimentation Index would yield valuable information as to whether an increase in the Sedimentation Index or an observable state of ill-health was due to the primary disease itself or to some other infection. This has proved to be true and is the most valuable application of the Serum Formalin Reaction.

The accompanying graph shows all the simultaneous readings of the Serum Formalin Reaction and the Sedimentation Index that have been performed up-to-date.

The Sedimentation Index is plotted vertically and the Serum Formalin Reaction horizontally.

The shaded portion of the curve represents the cases belonging to Group I and the clear portions those of Groups II and III which are combined, since the number of cases of Group III is relatively small.

It is seen that though there is a general tendency for the results to fall into a definite curve and a high Serum Formalin Reaction to be associated with a high Sedimentation Index, the limits of the corresponding Sedimentation Index associated with the lower values of the Serum Formalin Reaction

tend to broaden out and a high Sedimentation Index is frequently associated with a low Serum Formalin Reaction.

This occurs mainly in the Group II and Group III cases, the symmetry of the curve being well maintained in Group I.

The study of the exceptions to the general drift of the curve forms the greatest proof of its utility.

The history of some of the most prominent exceptions to the general draft of the graph are as follows :—

109. IIa. Had an anaesthetic depigmented patch on the forearm which is now pigmented normally, though anaesthesia is still present at the centre of what was the patch. Leprosy is considered cured but the patient has suffered from a recurrent bronchitis for the last nine months. S.F.R.O., S.I.49.

136. IIa. Depigmented anaesthetic patches on chest and hands which were pigmenting normally.

20/4/31. Has just had a severe attack of broncho-pneumonia in which jaundice appeared, temp. now normal. S.F.1., S.I.63.

29/5/31. Better, but the cough is still troublesome, jaundice has vanished. S.F. 6., S.I. 56.

15/6/31. The cough is better but the general condition of the patient is very poor, he is nearly half his previous weight. S.F. 6, S.I. 44.

(It is suggested that the jaundice can be explained in terms of leprotic invasion of the liver ; an increase of the S.F. Reaction not having been found in four cases of non-leprotic jaundice ; thus accounting for the sudden increase in the S.F. Reaction.)

80. A IIa case, with involvement of the ulnar nerves. Depigmented patch on the back which pigmented normally with disappearance of the anaesthesia. Trophic ulcers continued to appear at infrequent intervals, while the anaesthesia in the distribution of the ulnar nerve remained unchanged.

22/4/31, there were no ulcers on the hands. There was a high temperature which lasted for three days and malaria was diagnosed clinically. S.F.1, S.I.76.

11/5/31. Patient has had no further fever. S.F.3, S.I.60.

29/5/31. Severe trophic ulcers appearing on the left hand. There has been no sign of change in the IIa lesions, and anaesthesia and the old patches have gone. S.F.2, S.I.63.

Of the II and III cases, with a Serum Formalin Reaction of 1 or 2, the incidence of ulcers is interesting. Taking 40

to 45 as the normal upper limit of the Sedimentation Index :

Of 9 cases having a S.F. Reaction of 1 and a S.I. greater than 45, 6, or 66.6%, have ulcers.

Of 19 cases with the same S.F. Reaction whose S.I. is less than 45, only 2, or 10.5%, have ulcers.

Of 8 cases having a S.F. Reaction of 2 and an S.I. of over 45, ulcers are found among 5, or 62.5%, while among 13, where the S.I. is less than 45, only 1 case, or 7.7%, had a trophic ulcer.

Turning to the other end of the graph we have the following case :—

95. This case was admitted with IIa lesions. Five months after admission he began to show thickening of the subcutaneous tissues of the face, in which large numbers of bacilli were found. These gradually increased in size until he became a typical leonine case. During the whole period while these changes took place there was no rise of temperature, and the advance of the disease did not appear to affect his general fitness. The S.F.R. rose from 4 at the beginning of the change, to 6, which is its present value. The S.I. remained throughout around the level of 35.

DISCUSSION.

It has been observed, mainly during the treatment of Group I cases, that an exacerbation of the disease, shown either by an increase in size or extent of the existing lesions, or by the appearance of new ones, was signalled by an increase in the value of the S.F. Reaction. This increase has on occasions been found to precede by some considerable time the observation of clinical change. In other cases the rise in the S.F. Reaction and the clinical changes went hand in hand. Although observations are few it appears that when a sudden " lepra reaction " is about to occur with the concomitant phenomena of general malaise and the abrupt production of a crop of new lesions, the warning conveyed by the increase in the S.F.R. is early. When, however, the lesions slowly extend without the sudden production of new ones and the " reaction " phenomenon is absent to a greater extent, the S.F.R. tends to lag and the clinical and serum changes appear concurrently.

With the termination of the " reaction " the S.F.R. usually falls as the newly-formed lesions subside, lagging behind the clinical improvement. Only in one case has the improvement in the appearance of the lesions after a reaction been unaccompanied by a fall in the S.F. Reaction. In this case, although nodular lesions on the face markedly

decreased, the general condition of the patient remained very poor and a progressive loss of weight was recorded, while subsequent to the termination of the reaction the S.F. Reaction remained high and the S.I. rose considerably.

In only one case has an apparent increase of lesions been unaccompanied by an increase in the S.F. Reaction. This was an early Ia case in whom bacilli, though always present, have throughout been very scanty. His S.F. Reaction has remained constantly for the last eighteen months at 2; although about nine months ago he went through a period when he complained of general malaise and there was an accompanying swelling of the facial tissues which gave the skin a stretched and shiny appearance. No new lesions appeared and although pre-existing nodules in the ears increased in size, there was no fever. The face regained its normal aspect and throughout this period the general health remained good.

Apart from these exceptions the S.F.R. has invariably risen immediately before or with the commencement of a reaction. With the subsidence of symptoms, if the newly-formed lesions abated, the S.F.R. commenced to fall a week or two after the start of the clinical improvement.

During the treatment of patients whose course was not interrupted by the appearance of the dramatic reactive phenomenon, the clinical improvement was generally associated with a fall in the value of the S.F.R. and an advance of the disease by a rise.

In only two cases has an amelioration of the visible signs of leprosy occurred with a rise in the S.F. value, while an advance of the disease has never been accompanied by a fall in this reaction. In only one case (belonging to Group III, and consequently presenting extreme difficulty in the proper apportioning of the clinical picture to the results of leprosy *per se*) has a reaction remained stationary (unless it was previously of the maximum value) while the clinical picture presented an advance of the disease.

From these data and from the fact that the S.F.R. is more generally high in Group I, it is argued that the S.F.R. is a measure of the severity of the disease and that changes in the course of the disease are accompanied by corresponding changes in the reaction.

The simultaneous study of the S.F.R. and S.I. shows that especially among Group 1 cases, and among Groups II and III, where the S.F.R. is 3 or over, definite values of one reaction tend to be associated with definite values of the other.

This association is less marked in Groups II and III cases, where the S.F. Reaction is 2 or under.

From the examination of these two reactions among non-leprous patients, it was concluded that only a small number of diseases seriously affected the S.F.R., while the S.I. was influenced not only by an illness, but also by states of debility, not amounting to actual disease. It may be possible, therefore, to explain the divergencies among the lower values of the S.F.R. in terms of added infections. This hypothesis has been investigated, and it has been shown to hold for several cases where a secondary disease could definitely be demonstrated. Where no secondary disease was found the influence of sepsis as recorded in the greater frequency of ulcers among those with a high S.I., but a low S.F.R., was demonstrated.

One case showed an increasing S.F.R. with a stationary S.I., and clinically, although the leprous lesions appeared to be advancing, there was no debility, and the fitness of the patient was maintained.

It has been noticed that after an acute febrile disease the S.I. having risen during the attack, and the S.F.R. remained low, the S.F.R. might rise subsequent to the recovery of the patient. It may be that this is due to the lowering of resistance by the acute infection, permitting a slight exacerbation of the leprosy, or it may simply be due to the effect of the secondary disease upon the reaction. In the case of 136 quoted above, where the S.F.R. during an attack of pneumonia was 1, and a month later had risen to 6, where it has since remained, it is suggested that the jaundice which accompanied the later stages of the attack can be explained by an infection of the liver by the leprosy bacillus. In other cases, where an attack of malaria was followed by the appearance of severe trophic ulcers in the hands and a rise in the S.F.R., it appears probable that the disease has advanced, though there is a possibility of there having been no change in the leprotic condition; the increase in the S.F.R. being related to the antecedent malaria only, and the ulcers due to coincidence or merely lowered resistance, cannot be disproved.

In a selected number of cases the two reactions have been performed at frequent intervals and it was noticeable that the S.I. was very unstable as compared with the S.F.R. Large variations have occurred in the S.I. which could not be reconciled with any clinical change, while a steady value of the S.F.R. was maintained.

In the discussion of these reactions among normal subjects it was shown with what delicacy the S.I. could express not only observable sickness, but also the finer shades of debility. It is arguable, therefore, that among persons suffering from a disease such as leprosy, whose well-being is in a state of more delicate balance than would be the case of a normal person, quite trivial and unnoticeable factors might have an exaggerated influence upon this test. The patients who are the subject of this enquiry are not living an institutional life, but can more properly be described as out-patients ; and as such they are exposed to many undiscoverable influences and their minor changes of health are difficult to assess.

For some time past the conception of the S.F.R. as being largely a measure of the leprotic portion of a patient's disease and the S.I. as being influenced, firstly by the leprosy, but also by any other concurrent illness and by minor states of ill-health, has been used in the interpretation of results. It has generally been very successful and a distinct aid to treatment.

It has also been shown that the administration of potassium iodide to a patient produces similar rises in both reactions, and that when the administration of the drug is stopped, both tend to fall.

The possibility of the Serum Formalin test having some prognostic value has been examined, and the following Table shows the results obtained. The cases considered are those who have been under treatment for twenty months or more, and in whom the reaction was examined at least a year ago. The reaction given is the finding on the first occasion it was performed in that particular case.

TABLE 6.

Results of Treatment.	*Number of Cases.*	*Value of S.F.R. at beginning of period.*							
		0	1	2	3	4	5	6	
M.I.	17	3	5	2	3	2	2	–	
I.	16	1	4	4	2	1	2	2	
I.S.Q.	7	–	3	1	–	2	1	–	
W.	13	2	–	–	3	1	1	6	
TOTALS	53	6	12	7	8	6	6	8	

On comparing more particularly the " much improved " with the " worse " column, there appears a certain coincidence between a high initial S.F.R. and a poor prognosis and a low S.F.R. and a more hopeful outlook, but it must

be pointed out that a number of these cases had received treatment before the S.F. test was first performed, and it is, of course, impossible to say what influence this may have had. One or two cases appeared practically cured before the initial observation was made.

Regarding the S.F.R. as a measure of the gravity of the disease, the results can be explained by the obvious corollary that a smaller proportion of severe cases will show improvement in a given time than of a like number of mild ones. Among early cases where the reaction is in general low, we should expect a greater average improvement than with later and more involved cases. The Table shows nothing more than can be explained on this basis, and no prognostic value can be placed upon the S.F. Reaction.

As to whether a negative reaction should be achieved by treatment before a patient can be considered cured, it is difficult to speak. During the study of normals it was seen that reactions up to 2 were found among persons apparently in perfect health. The influence of such diseases as yaws, syphilis, tuberculosis, etc., will certainly have to be considered, and not enough work has been done to show how the S.F.R. behaves during the treatment of these diseases. Syphilis, especially during the greater period of its course is most difficult to recognise among Africans, and in the absence of a laboratory sufficiently well equipped to perform the Wasserman test, it is impossible to say how many of the patients are suffering from this disease. The clinical condition has so far been the sole criterion for deciding whether a case should be placed on parole or not, and treatment has not been suspended in any patient where the S.F. Reaction was over 3.

It is suggested that in these cases where the S.F. Reaction will not fall any lower, though the patient appears cured, the existence of some intercurrent disease should be assumed and that a more thorough search with better facilities should reveal it.

CONCLUSION.

The following interpretation of the significance of these reactions has been evolved as a result of this investigation.

The Serum Formalin Reaction, when recorded as described, is of equal value with the Sedimentation Index in controlling the treatment of cases of leprosy. In dealing with the main disease itself it presents certain advantages over the Sedimentation Index in that it is influenced by few diseases, whereas the Sedimentation Index, not only changes with any illness, but is also influenced by the general fitness

of the patient and by states of debility not amounting to actual disease. The comparison of the two reactions is of great assistance in determining whether any state of ill-health is attributable to an exacerbation of the specific disease or to some extraneous cause.

SUMMARY.

1. The Botelho Reaction has been performed over a short series of cases. The proportion of positive results is too low for the reaction to be of value in the diagnosis of leprosy.

2. The Reaction of Rubino has been investigated under conditions that did not exactly correspond with those laid down by the originator of the technique. In these circumstances the test appeared useless for the early diagnosis of leprosy.

3. The Serum Formalin Reaction has been investigated over a series of patients suffering from leprosy and those not suffering, in the manner suggested by Dye, whereby the various intensities of the reaction can be numerically expressed. It was found to be high in such diseases as leprosy (especially of the nodular variety), tuberculosis, early syphilis, florid stages of yaws, trypanosomiasis and chronic bone sepsis. Positive reactions were found in a variety of other diseases, but never so high.

4. The Sedimentation Index has been recorded over the same series of cases. It appears to be a very delicate expression of debility.

5. In leprosy the Serum Formalin Reaction has been found to vary with the severity of the disease.

6. It has been found that simultaneous examination of the Serum Formalin Reaction and the Sedimentation Index in a case of leprosy is of value in the diagnosis of a leprous reaction and in its distinction from inter-current infections.

I have to express my thanks to Dr. A. H. Owen, the Acting Director of Medical and Sanitary Services, Tanganyika, for permission to publish this paper, and Dr. R. R. Scott for valuable assistance in the final revision.

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Brilliant Green and Crystal Violet in the Treatment of Leprosy.

C. S. RYLES.

WHILE preparing for the opening of a Leprosy Clinic on 1st April, 1932, I came upon an article by L. P. Garrod, published in the *British Medical Journal*, in which he shows that Brilliant Green destroys streptococci, even in the presence of blood, at a dilution of 1 in 10,000. In strong solutions it is entirely without irritant action. The same writer also refers to the " blue paint " advocated by Victor Bonney and C. H. Browning, known as " Bonney's Blue," which is composed of Brilliant Green and Crystal Violet in equal parts, as being an even more powerful disinfectant than Brilliant Green alone.

In order to study the possibilities of making some use of the ultra-violet rays so bountifully provided in the Indian sun, I obtained a book on Radiation Therapy by E. H. and W. K. Russell, which emphasizes the sensitising action of the aniline dyes on the skin tissues, so that the effects of ultra-violet rays are enhanced.

About this time I had the opportunity of discussing the question of treatment, as well as the general organisation of a clinic, with Dr. E. Muir, Dr. G. R. Rao, of Purulia, and Dr. Ryrie, of the Federated Malay States, who happened to be here on a visit, all of whom helped with advice and some of whom thought that the aniline dyes might be useful in the treatment of leprosy.

For the first three months after the clinic was opened, the specific treatment consisted entirely of intradermal injections of creosoted hydnocarpus oil and intramuscular injections of its ethyl esters. By this time we had engaged two skilled operators, dressers trained at the Purulia Leprosy Asylum.

In the earliest days, Brilliant Green, 1 in 10,000, was used for spraying an ulcer on the shin, with marvellous effect, this encouraged us to use it for all ulcers (except the purely trophic) external as well as in the nose, and for leprotic conditions of the palate and tongue. I have not, so far, found it necessary to use anything else, though the strength we now use is 1 in 2,500.

In June, 1932, intradermal injection of Brilliant Green was begun, 1 in 10,000 in normal saline being used, and, as no harmful results followed, the treatment was extended to many other patients, the strength being gradually

increased to 1 in 3,000. During the winter months a strength of 1 in 2,500 was used, but, as the local reaction to intradermal injection appears to be more severe on exposed parts of the body, and as this may be due to the action of the sun's rays, it is possible that this summer we shall have to revert to the lesser strength.

Twenty patients, of both C and N type, were chosen because they had bilateral lesions ; on one side of the body Brilliant Green was injected, and oil on the other. Later, half the number of new patients presenting themselves were put on Brilliant Green and half on oil. Finally, nearly all have been given nothing but Brilliant Green. There are a sufficient number on oil to act as controls.

Up to 10th March, 1933, 1,054 patients had passed through our hands. Of these, 599 attended so seldom or so irregularly that they are not included in the following figures, though some of them, with single, small patches, may have absented themselves because they felt they had been " cured." The remaining 455 patients were classified as follows :—

N1	N2	N3	C1	C2	C3	Mixed N & C	N3 N1 or 2
104	60	19	62	68	23	102	17

Of these 455 patients, 76 were on oil throughout (intradermal oil with intra-muscular ethyl esters). These did well on oil. To those may be added a further 19 who had both oil and Brilliant Green at different times, and were definitely better on the former than on the latter.

All patients except the 76 on oil throughout, and 168 who had Brilliant Green throughout, began on oil and were later changed to Brilliant Green. Of these 211 patients, 135 were definitely better on Brilliant Green than on oil ; 19 were better on oil than on Brilliant Green ; 29 were about equally benefitted by each, while 28 were not improved by either. Thus 303 were improved by Brilliant Green treatment out of the 455 under consideration, or two-thirds.

On oil only.	On B.G. only.	On both. B.G.	On both. oil.	Benefit from equally	neither.
76	168	135	19	29	28

Methods of Treatment.—Intradermal injections are carried out in the same way as with warm hydnocarpus oil, a fine intradermal needle being used. The solution of Brilliant Green is made in normal saline, 1 in 2,500. We have given up to 12 c.c. in one dose, but our dosage is limited by the small size of our staff, and the dose is usually 5–8 c.c.

The injections are no more painful than those of hydnocarpus oil, but for children and for those adults who are

unduly sensitive, we have combined Novocaine, in a strength of 1%, with the usual Brilliant Green solution. The injections are done slowly, with considerable diminution in pain. Nineteen children have been so treated, and two adults.

The immediate effects of Brilliant Green injections are much the same as those of oil. Seen three days after injection, the area of skin treated is slightly though definitely inflamed in most cases. A week after injection the skin has resumed the appearance it had before treatment. Some patients have tolerated weekly injections thrice repeated over the same skin area, though the majority must have at least a fortnight's rest. Here again, exposure to the sun's rays appears to have some effect.

In most cases Brilliant Green seems to aid the return of pigment to the de-pigmented skin, though not in all. I have not been able to determine the deciding factor, though it is not the normal colour of the patient, for dark skins benefit as much, or as little, as fair. Our short experience of Bonney's Blue suggests that it will be more valuable in this direction than Brilliant Green. Other factors being favourable, there is some return of sensation to anaesthetic areas.

C type cases benefit even more than those of N type; where there are definite hard nodules, it is sometimes necessary to use a hypodermic needle and get well into them, and even then results are disappointing, probably because of the large amount of fibrous tissue in the nodules. We have had no more than half-a-dozen " accidents " with Brilliant Green—fewer, in fact, than with oil. The swelling subsided within two or three weeks on the usual treatment.

There are no contra-indications to the use of Brilliant Green. It may be used on seborrhoeic skins and all others.

The cost of Brilliant Green solution (made from Merck's product) is one thirty-sixth of the cost of oil obtained from Ernakulum, not taking into account the freight on the oil. There is no difficulty in obtaining Brilliant Green powder, nor in its carriage or in making up the solution.

Intramuscular injections into the buttock produce a slight burning sensation for a few minutes, which passes off and, as a rule, leaves no reminders. We have given up to 10 c.c. without harm.

Subcutaneously Brilliant Green can be given in massive doses without ill effect, and *intravenously* I have given half a pint without apparent damage to the renal epithelium or elsewhere but, without an adequate hospital at our disposal,

we have been unable to extend our experience in this direction. Dr. G. R. Rao confirms our finding. It is to be hoped that Brilliant Green is partly excreted by the skin.

The use of Brilliant Green as a spray has already been mentioned. From ulcers we do not remove scabs or bits of adherent cotton-wool but spray freely over the ulcer. For the nose and palate we have found it very useful. Brilliant Green may also be given by the mouth. If the stools are coloured green there is hope that the intestinal complications in leprosy will be benefitted, and one possible channel for spreading infection checked. I have not tried it for the eyes but, as it has little, if any, irritant action, it should be useful in suitable dilution. Thus Brilliant Green alone may furnish almost the whole pharmacopœa of a leprosy clinic.

BONNEY'S BLUE.

We use the following prescription :—

Brilliant Green powder	...	0.5 grammes.
Crystal Violet powder	...	0.5 ,,
Absolute Alcohol ...	...	25 c.c.
Distilled Water ...	...	to 2,500 c.c.

The crystal violet is dissolved in the absolute alcohol (rectified spirit will do) and added to the rest.

It is an improvement on Brilliant Green alone.

SUMMARY.

The advantages claimed for Brilliant Green are :—

1. It is at least as efficacious as hydnocarpus oil and its derivatives.
2. There are no contra-indications to its use.
3. It is safe to use, *i.e.*, there are few accidents from its administration.
4. It is not unduly painful on injection and, for children, it can be combined with Novocaine.
5. It is cheap.
6. It is easily obtained, carried, made up and administered.

I am aware of most of the limitations of our work and of this article. It is written in the hope that others will be tempted to try Brilliant Green and other aniline dyes, so that our knowledge will be extended of their uses.

Further Information on Brilliant Green

Extracted from the Extra-Pharmacopœia (Martindale).

Brilliant Green.—Syn Tetra—Ethyl—Diamido—Triphenyl--Carbinol in form of either Sulphate or Zinc Double Chloride (discovered 1879). In medicine the Sulphate $C_{27}H_{34}N_2O_4S$ is to be used. Yellow crystals,

soluble in water and in Normal Saline and in Alcohol, forming a green solution.

Chemical Examination.—Samples which we have examined were mostly the zinc double salt, and probably much of the dye that is sold as Brilliant Green is in reality Malachite Green, the latter being in the form of Oxalate. Fuse with fusion mixture to liberate zinc, if present, before employing usual tests.

Antiseptic Power.—C. H. Browning and his co-workers found this substance to compare favourably with Acriflavine (q.v.), though the latter is more rapid.

Uses.—The dye was much used initially on their recommendation as a substitute for the yellow dye, and is still used, solution of strength 1 in 1,000 being employed. As a dressing it is painless.

Septic Conditions of the ears have been treated with Brilliant Green ½%, Mercuric Chloride ½% in 90% Alcohol.

Bonney and Browning's Violet and Green Solution.—Syn. Blue Paint, Brilliant Green and Crystal Violet (Hexa or Penta-Methyl Violet or a mixture of these), 1% each in a mixture of rectified spirit and water equal parts used to sterilise the skin.—V. Bonney and C. H. Browning, B.M.J., i./18, 562.

Stains on the Skin can be removed with spirit, those on clothes by spirit or washing with soap.

Brilliant Green Ointment.—Brilliant Green 1 or 2% in twice the amount of Alcohol 90% and incorporated with Soft Paraffin.

Epithelial stimulant in various minor injuries and affections, *e.g.*, impetigo, indolent ulcers of various kinds, superficial shell wounds involving only the skin, blisters, etc.—R. W. Hodgson-Jones, B.M.J., i./17, 455.

Sycosis.—Remove crusts with 5% Salicylic Ointment, followed by epilation of loose pustule-encircled hairs and daily painting with 1% Alcoholic solution of Brilliant Green in 70% Alcohol. 53 cases cured after 12 to 25 applications, with no relapses.—L. i./32, 202.

Brilliant Green Paste (Hey's).—Brilliant Green 1, Boric Acid 275, French Chalk 25, Liquid Paraffin 200. The Green is incorporated, dissolved in a little spirit. For filling wound cavities.—Wilson H. Hey, B.M.J. ii./17, 445.

Grants for Leprosy Work.

The Executive Committee of the British Empire Leprosy Relief Association has recently made the following grants :—

TANGANYIKA.

Africa Inland Mission, Shinyanga (Dr. Maynard) for the erection of housing accommodation for 100 patients £100

Capuchin Mission, Mahenge, for new treatment centre at Tabora £100

Applications for financial aid will be sympathetically considered by the Committee, and all applications should, in the first place, be sent to the Director of Medical Services of the colony concerned, who will forward them to the Secretary of the Association.

The Treatment of Burns and Scalds, with especial reference to the use of Tannic Acid.

PHILIP H. MITCHINER.

(This is an abstract, by permission, of the Hunterian Lecture delivered before the Royal College of Surgeons on February 1st, and published in full in "The Lancet," of February 4th, 1933).

WHILE in Europe, Hippocrates in 435 B.C. was advocating the treatment of burns by a mixture of beeswax and myrhh, a far older treatment advocated by physicians in China—the treatment of burns by tannic acid in the form of tea, was in use and is still carried out to this day. This form of treatment has been revived in recent years by the Americans and has reached us from the West instead of the East.

The factors which have contributed to the reduced mortality from burns during the last three decades are :—

(1) Improved social conditions in the homes of the poor ;

(2) The disappearance of the naked light ;

(3) The passing of the Children's Act in 1908, making it a punishable offence to have a child alone in a room containing an open grate insufficiently protected. (The mortality at the London Hospital between the years 1899-1903 was 25.3%, whereas from 1924-28 it was 6.6%, although the treatment used was practically the same during both these periods).

After giving further details concerning the mortality from burns, and stressing the importance of differentiating scalds from burns, the causes of death from burns is next mentioned. The period immediately after the burn or scald is the stage of initial shock which follows the upset of the nervous system resulting from exposure to flames or scalding fluids. From his experience at St. Thomas' Hospital the writer of this article concludes that from 6 to 24 hours after the burn, the stage of acute toxæmia sets in. This is due to the absorption of toxic substances from the damaged tissue in the burnt or scalded area. This toxæmia has been shown to be the result of histamine freed into the blood from the traumatised part. It is stated that such a condition is best combated by removing a measured quantity of toxic blood from the patient and replacing it by a somewhat larger volume of the whole blood from a suitable donor. This step is unnecessary if by coagulation of the damaged tissue we can prevent absorption toxæmia. It is therefore

unnecessary in the treatment of burns the surface of which has been sufficiently coagulated with tannic acid.

Further it is emphasised in this article that an important factor in the causation of shock at a period 6 to 12 hours after the burn or scald, is the loss of blood-serum from the burnt surface; this is clinically demonstrated by the condition of the dressings and the extreme thirst and restlessness of the patient. This loss is most pronounced in third-degree burns, and a man weighing about 10 stone who might be expected to have 5,000 c.c.'s of blood in his body, would lose 3,500. c.c.'s in the 24 hours following a third-degree burn involving one-sixth of the total body surface. This factor constitutes a very potent cause of the collapse which subsequently ensues and is responsible for 80% of the deaths after burns.

This excessive loss of fluid may be combated by administration of fluid intravenously, but with an extensive burn it is almost impossible to get a sufficient quantity into the tissues to replace the loss. It was here that the picric acid treatment constituted such an advance on the older bath and grease method, but the coagulum formed did not penetrate deep enough to prevent the absorption of toxic substances from the deeper tissues. Again, it was impossible to retain this dressing more than two or three days owing to the toxity of the picric acid manifested by skin rashes, irritation, albuminuria, and therefore paraffin had to be substituted, and sepsis not infrequently supervened. Figures and statistics are given to show the improved results and lowered mortality in St. Thomas' Hospital after the introduction of picric acid. It is noted that the mortality from scalds was not lowered, but that from burns was markedly so.

The tannic acid treatment for burns was introduced in St. Thomas' Hospital in 1928, and a 2% solution of tannic acid was used and the spray method adopted. There was an enormous difference in the general condition of the patient and the entire absence of pain and sepsis was noted as the result of the introduction of this method. The disadvantages of the method were (*a*) the necessity for keeping the area exposed to air while at the same time keeping the patient warm; (*b*) the disadvantage of mechanical restraint in order to keep the damaged area at rest; (*c*) the need for constant attention and hourly sprayings for from 10—24 hours; (*d*) the impossibility of being able to expose the entire burnt or scalded surface in those cases burnt both in front and at the back; (*e*) the necessity for fresh solutions hourly. Because of these difficulties work was done to

devise a method to overcome the drawbacks of this technique, and the steps taken in the discovery of the compress method are detailed.

TECHNIQUE OF THE COMPRESS METHOD.

A compress of 2% tannic acid with 1/2,000 perchloride of mercury, makes a most efficient first-aid dressing for all burns and scalds, but in the home and other places where burns occur but rarely, tablets or powder to be dissolved in warm water and applied by soaking clean linen in the resulting solution will be found more advantageous than keeping a large quantity of a stock 2% solution. The formulæ given are as follow :—

Powder.—Tannic acid, grs. 17½ ; perchloride of mercury, gr. ½ ; to be dissolved in 2 oz. of warm water when a 2% solution will result.

Tablets.—Tannic acid, grs. 17½ ; perchloride of mercury, gr. ½ ; boric acid, gr. 1 ; to be dissolved in 2 oz. warm water when a 2% solution will result.

Whatever method of first-aid may have been employed it is essential that the first-aid dressing, even if of tannic acid, should be removed and the area carefully cleaned before the final tannic acid dressing is applied. By this careful dressing alone can subsequent sepsis be avoided. Should sepsis supervene during the course, it is necessary to remove the dressing and reclean the area thoroughly, and apply a new tannic acid dressing in order to get a good result.

The cleansing must start by removal of all dead and charred tissue, the excision of all loose skin raised over blisters and the removal of grease, especial attention being given to the edges of the damaged area. The whole area should then be gently but thoroughly cleansed with soap and water, applied with a sterile swab, and finally carefully sponged over with ether to remove all natural and applied grease, in order to get thorough coagulation. It is obvious that this cannot be carried out unless the patient is rendered insensible to the pain, which this cleansing must entail. Anæsthetics are not advised, but large doses of opium are given and the following recommended :—

TABLE.—OPIUM DOSAGE FOR CLEANINGS BURNS AND SCALDS.

I.—IN CHILDREN

Age.	*Preparation.*	*Dose.*
1/12	Tinct. camph. co.	*m* ii.–iii.
2/12	,, ,, ,,	*m* iv.–vi.
3/12	Tinct. opii.	*m* ¼–⅓.
6/12	,, ,,	*m* ⅓–½.
1 year	Tinct. opii (*a*)	*m* ii.–iii.
	or	
	Inj. morph.	gr. 1/75.
Over 1 year	Tinct. opii	*m* ii. for each year and *m* ii.
	or	in 15 min. if necessary.
	Inj. morph.	gr. 1/75 for each year.

II.—IN ADULTS

12–15 years ..	Tinct. opii	*m* xxx.
	and	
	Inj. morph.	gr. $\frac{1}{6}$.
15–20 ,, ..	Tinct. opii.	*m* xxx.
	and	
	Inj. morph.	gr. $\frac{1}{4}$.
Over 20 ,, ..	Tinct. opii.	*m* xxx.
	and	
	Inj. morph. (*b*)	gr. $\frac{1}{4}$–$\frac{1}{3}$.
	or	
	Inj. morph. (*c*)	gr. $\frac{1}{3}$–$\frac{1}{2}$.

Remarks.—(*a*) Tinct. opii is more satisfactory than morphia. (*b*) For women. (*c*) For men according to stamina.

N.B.—Should slow or shallow breathing give rise to anxiety, atrophine sulphate gr. 1/200–1/50 should be administered hypodermically.

APPLICATION OF COMPRESS.

This consists of either six layers of sterile gauze or three layers of lint, which should be thoroughly soaked in a stock solution of 2% tannic acid and 1/2,000 mercury perchloride, and applied closely and evenly over the entire burnt surface without wringing the dressing out. This compress should then be firmly and evenly bandaged in position, the bandage being applied directly to the outer side of the compress. The whole of the outside of the bandage may then be soaked with a spray of 2% tannic acid and 1/2,000 perchloride in order to ensure that the underlying dressing is thoroughly wet. Mackintosh or jaconet should be placed under the patient until the dressing is dry, in order to save soiling the sheets. It is also well to secure the burnt limb temporarily in order to prevent undue movement until the tannic acid coagulum has formed firmly. The dressing should be left in position for a fortnight in the case of small burns and three weeks where large areas are involved. At the end of this time the bandage should be cut and the dressing lifted when the scab will usually separate completely from the burn; if it does not the dressing can be re-bandaged and removed later. The separation can be rendered painless by spraying with tannic acid solution between the coagulum and the skin during this process.

Temperature and toxæmia as shown by rapid pulse, dried and furred tongue and pain, with possibly the escape of sero-pus in considerable quantities, are the only indications calling for the removal of these dressings before the time stated. Should removal be necessary the area should be re-cleaned carefully and another tannic acid dressing applied.

As indicated, the dressing must be closely and evenly applied to the burnt area, and there are certain regions,

e.g., perineum, groin, axillæ, neck and face, where the absence of bandages is an advantage and where the spraying method gives better results, but the compress method has been and can be used with good effect in these areas. It must be realised where destruction of subcutaneous muscular tissues has occurred, that scarring and contracture are inevitable, and therefore compresses or spraying should be applied in such a position, that subsequent contractures may be counteracted. Equally is it obvious that although full epithelialisation will have occurred in those areas where the first, second or third degree burns have occurred, an ulcer must be expected, and will be met with in deeper burns, and this, if extensive, should be treated by subsequent autogenous skin grafting, or if small, by the application of some such lotion as the following : purified alum, grs. 20 ; zinc sulphate, grs. 10 ; glycerin, 7 fluid ounces ; water, to one pint.

In order to meet the desirability of applying the solution warm, it is advised to keep a concentrated solution of tannic acid and mercury chloride and dilute with warm water when required. This stock solution should not be more than double strength, as in stronger strengths it is inclined to decompose more quickly. The tablets, the formula of which has been given, are advised where storage of solution is likely to be a bother. The tablets when dissolved in water make a slightly muddy solution due to the boric acid used as an excipient ; this does not interfere in any way with its efficacy of coagulation.

In St. Thomas' Hospital, from 1924—1928, the mortality from burns was 15.5% and that from scalds 7.5%. In the period from 1929-32, when 2% tannic acid and Hg Cl_2 1/2,000 was used, the mortality fell in the case of burns to 4% and in the case of scalds to 1.7%.

(*We are indebted to the Editor of "The Lancet" for permission to abstract this valuable article, and would advise the reader to consult the original for further details.*)

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INDIAN SECTION.

History of the Dhanbad and District Leprosy Clinics.

C. S. RYLES.

THE Jharia Mines Board of Health having allotted Rs. 1,600 for leprosy work in the 1932-33 budget, it was resolved to open a clinic at Jharia on April 1st, 1932. Jharia was chosen because it was the largest town in the coalfield area, and there are disused sweepers' quarters there which were capable of conversion into a suitable clinic. There is room for about 10 beds, though so far there has been no attempt to keep patients in hospital.

The clinic at Jharia was largely attended from the first, so much so that the necessity for further clinics quickly became evident. Patients attend not only from the collieries, but also from villages, many of them 20 or more miles away.

From a cinema charity performance held at Jharia in March, 1932, a sum of Rs. 750 accrued which was earmarked for feeding the patients. This was good propaganda, because the Indian's idea of benevolence leans towards feeding something, whether it be the priests or the poor, or cattle or other animals; thus their interest in the leprosy work was enlisted from the beginning.

In April, 1932, a public meeting was convened to devise a suitable means of perpetuating the memory of Dr. G. C. Ghosh, a skilful and popular physician, who had recently died. There had been some idea of endowing a bed in the local hospital but, instead, the meeting was induced to form "The Dr. G. C. Ghosh Memorial Leper Fund." A large committee was appointed and a few meetings were held, but few took any interest in its activities, till finally it was absorbed into another body, to be mentioned. The clinic later opened at Katras was called "The Dr. G. C. Ghosh Memorial Leprosy Clinic."

On 2nd June, 1932, another public meeting was called at Dhanbad, with the Additional Deputy Commissioner in the chair, when The Dhanbad and District Leprosy Relief Fund was formed. Mr. S. R. Zaman, I.C.S., was appointed Chairman, Rai H. P. Banerji Bahadur, Honorary Treasurer; Dr. C. S. Ryles, Honorary Secretary; and a strong and influential committee, representative of all classes of the community. This body shows no signs of inanition as yet.

On 1st September, 1932, a second clinic was opened near

SAMPLE VILLAGE CARD

LEPROSY SURVEY

Name of Village :
DAMODARPUR

Circle : **IV. DHANBAD**

Population : **500**

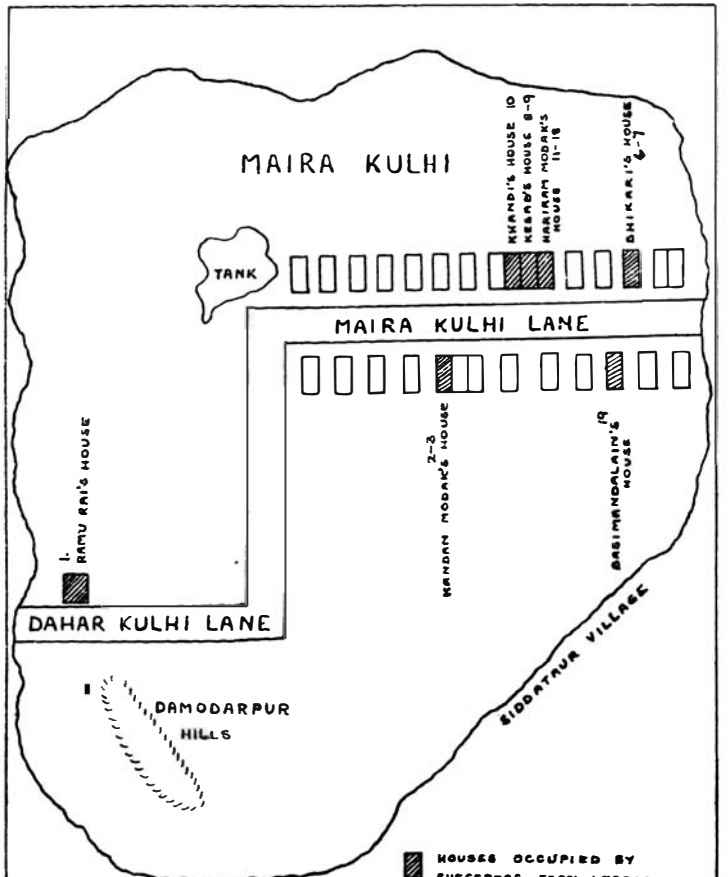
Notes on Village :

Cases Nos.—11 to 18 are of one family. The father of Case No. 11 had leprosy. From him, his sons, nephews, daughters-in-law and nieces caught the infection.
This is a typical example of the havoc played by a single case of leprosy, which has resulted in a whole family becoming infected.

Cases Nos.—2 and 3 have caught the disease from the above. Case No. 3 is the wife of No. 2.

Cases Nos.—8, 9 and 19 are members of the same family. They got the disease from the neighbouring house of Cases Nos. 11 to 18.

Cases Nos.—4 to 7 caught the disease from Nos. 8 and 9.



FRONT OF CARD

Serial No.	Name	Reg. No.	Age	Sex	Caste	Type	Remarks
1	Ramu Rai	275	30	M	Ghatwar	C_3	
2	Kandan Modak	275	35	M	Maira	N_3	Cousin of No. 11
3	Nidhi	277	30	F	do	N_2	Wife of No. 2
4	Bhikari Mandal	278	40	M	Mandal (Suri)	N_2	
5	Pabodi	279	10	F	do.	N_1	Daughter of No. 4
6	Amodi	280	12	F	do.	N_1	do.
7	Mohi	281	65	F	do.	N_1	Mother of No. 4
8	Kesab Mandal L.C.R. No. 54	282	38	M	do.	C_1, N_3	Neighbour of No. 11
9	Ilmi L.C.R. No. 57	283	12	F	do.	N_1	Daughter of No. 8
10	Khandi	284	16	F	do.	N_1	Niece of No. 8
11	Hariram Modak	285	45	M	Maira	C_3	His father had leprosy
12	Lerhu	286	25	M	do.	N_2	Nephew of No. 11
13	Fakir Modak	287	50	M	do.	N_1	Father of No. 12
14	Jai	288	30	M	do.	N_2	Brother of No. 13
15	Bodi	289	35	M	do.	N_1	do.
16	Pati	290	25	F	do.	N_2	Wife of No. 15
17	Chari	291	10	F	do.	N_1	Daughter of No. 16
18	Giri	292	40	F	do.	C_1	Wife of No. 11
19	Basi Mandalain	293	35	F	Mandal	N_2	Relative of No.4

BACK OF CARD

Katras, in another part of the coalfield, Mr. G. G. Carapiet kindly lending an empty bungalow for the purpose. Meanwhile, the Dhanbad Municipality voted Rs. 1,500 for a clinic within the municipal area, which was opened in an out-house of the police station on 15th September. Owing to its unpopularity at that site, a small building was put up on the outskirts of the town and was occupied on 11th February, 1933.

Apart from the Rs. 1,600 allotted by the Jharia Mines Board of Health, and the Rs. 1,500 voted by the Municipality, the District Board has given Rs. 500. Mr. G. G. Carapiet has interested himself whole-heartedly throughout in the collection of funds. He suggested that each labourer on the collieries should be asked to contribute from his pay four annas once a year. The idea was put to the various associations and to the collieries themselves, many of whom consented readily. Mr. Abel has applied the same scheme to the local railway workshops. The sum of Rs. 2,970 has been collected mostly from these sources and, considering the present industrial depression, the sum must be regarded as satisfactory.

The staff employed from the beginning has been :—

One Sub-Assistant Surgeon.
Two dressers trained at Purulia Leprosy Hospital.
One dresser trained locally.
One clerk and a handyman.

This " team " is comfortably housed at Jharia and travels by bus or train to Dhanbad and Katras to attend the clinics at those places. Sweepers are supplied from local sources as required.

At present clinics are held twice weekly at Jharia and Dhanbad, and once a week at Katras, though soon it will be necessary to hold two clinics a week at Katras. The following table shows the number of attendances at the various clinics during 1932.

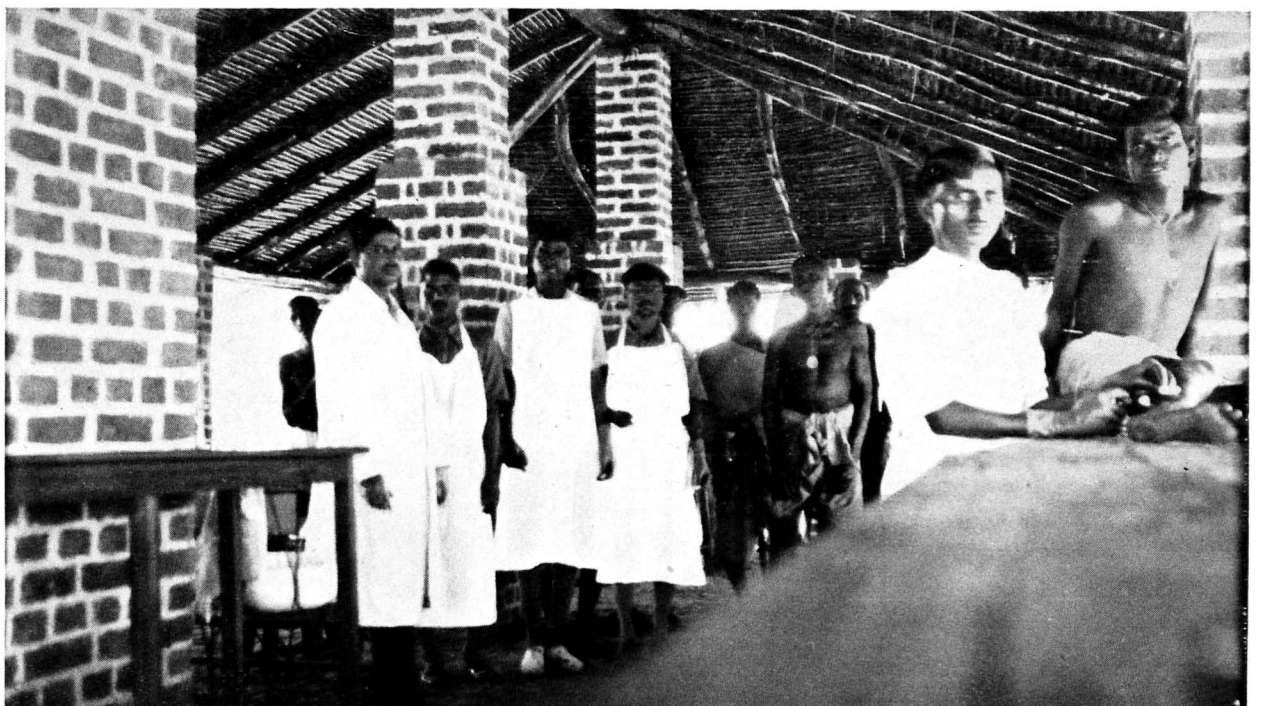
	Number of Clinics held.	*Number of Attendances.*		
		New cases.	*Old cases.*	*Total.*
Jharia ...	82	783	7234	8017
Katras ...	13	84	642	726
Dhanbad ...	20	96	1054	1150
TOTAL ...		963	8930	9893

It is obvious that any further extension of clinics means the employment of a second " team." When that becomes possible, an accurate survey of the collieries and villages

Leprosy Out-Patient Clinic, Dhanbad

View of Building.

Group of Patients and Staff.



INSIDE OF LEPROSY OUT-PATIENT CLINIC, DHANBAD.

must also be undertaken ; for this purpose an extra doctor must be engaged who will also carry on propaganda work. At present, all Sanitary Inspectors are supplied with " village cards " (on Dr. Muir's lines) one for each village ; upon each card a rough plan of the village is drawn and all cases discovered are entered on the plan as well as in the appropriate columns on the other side of the card. (See illustration facing page 123). The lantern operator already employed by the Board to go round the villages lecturing on general health subjects, is supplied with 36 slides on leprosy which are also shown.

On 10th January, 1933, the Jharia Mines Board of Health resolved to transfer its responsibilities in the question of leprosy to the Dhanbad and District Leprosy Relief Fund, subscribing Rs. 1,500 to the fund. The Board's Chief Medical Officer continues, nevertheless, to supervise and direct the work of the clinics ; all correspondence and the checking of accounts and paybills is done in the Board's office ; and in the Board's laboratory are prepared the Brilliant Green solution, the Hydnocarpus Oil and the Ethyl Esters used in treatment. Examination of clinical material and Kahn Tests are also carried out in the Board's laboratory.

The suggestion made in this paper that all Sanitary Inspectors should be trained to make preliminary surveys in the villages they visit, is an excellent one. These surveys will, naturally, not be so complete as one would wish, but if cards of the type illustrated were supplied to Sanitary Inspectors and health visitors, much might be learned of the prevalence and distribution of the disease, information which otherwise would be unobtainable.—EDITOR.

Re-examination of Discharged Leprosy Cases.

JOHN LOWE.

(*Reprinted from " Leprosy in India," January,* 1933.)

IF we are to form a true idea of the value of special treatment for leprosy, it is most important that we should investigate the matter of the permanence of results of treatment. This has been done in some countries with very varying results. In the Philippines a survey of discharged cases has shown about 37% of cases relapsed. In Hawaii a relapse rate of over 90% is reported. The relapse rate must vary because of varying types of cases, varying effectiveness and duration of treatment, varying standards for discharge

of patients and varying periods between discharge and re-examination.

In India, where leprosy treatment is entirely voluntary, we are often able to get cases for treatment at an earlier stage than is possible in some other countries, so our results should be better, but it is often impossible for patients to continue treatment long enough, and even if they continue treatment until discharge it is often impossible to get patients for re-examination after discharge.

In this brief note we produce some facts about a series of 84 cases discharged from the Leprosy Hospital, Dichpali, and re-examined after varying periods. This material is far from satisfactory. The 84 patients form only a fraction of the patients discharged during the period under review. It may be that under a voluntary system patients with signs of recurrence are more likely to come for re-examination than those who remain well. The period that has elapsed between the time of discharge and re-examination will, of course, markedly affect the percentage of relapses, as some relapses may be delayed for many years. In this series of 84 cases the period between discharge and re-examination varied between six months and four years, with an average of only fourteen months, far too short to justify final conclusions being drawn. Another point which should be mentioned is that owing to the great demand for admission of new patients we had to discharge old patients at the earliest possible moment. The standards adopted for discharge were (1) absence of clinical evidence of activity for six months, (2) absence of evidence of discharge of bacilli. (3) Residual bacilli if present in the skin in small number did not necessarily prevent the patients' discharge if the disease was clinically inactive. (4) Failure to react to large doses of potassium iodide. These standards are very much below the generally accepted standards, and were adopted for reasons of expediency, but all patients discharged were strongly recommended to come back for examination within six months. Some of the patients have done this and some have paid several visits at six monthly intervals, and the following data were based on examination of these cases.

For satisfactory estimation of progress, repeated clinical and bacteriological examinations are necessary. In this note, for the sake of brevity, we shall quote only the bacteriological report. Bacteriological examination was made of the nose by scraping and the skin by the clip method.

Bact. Exam. before treatment.	*On discharge.*	*On re-examination.*
Nose and skin showing bacilli .. 43 cases	0 cases	2 cases
Skin only showing bacilli .. 21 cases	*42 cases	40 cases
No bacilli found .. .. 20 cases	42 cases	42 cases

* These cases, though showing a few bacilli, were clinically inactive and were therefore discharged as explained above.

6 cases showed bacteriological evidence of relapse on re-examination.
6 cases showed clinical but no bacteriological evidence of relapse on re-examination.
12 cases in all showed evidence of relapse.
72 cases showed no evidence of reactivation of disease.
4 cases showing bacilli on discharge showed no bacilli on re-examination.

A few interesting points may be discussed.

Of 42 cases clinically inactive but showing a few bacilli in the skin on discharge, 10 showed signs of relapse. Of 42 cases showing no bacilli on discharge 2 showed signs of relapse. Comparison of these two classes shows that, if possible, treatment should be continued until no more bacilli can be found.

Four cases still showing bacilli on discharge, showed no bacilli on re-examination. This shows that improvement in some cases continues, in spite of treatment being stopped.

To most of the patients before discharge large doses (up to gr. 240) of potassium iodide were given, and if this was not followed by lepra reaction it was regarded as evidence of inactivity and possibly as an indication of there being less chance of relapse.

Of the 12 cases showing signs of relapse 11 had received potassium iodide without reaction before discharge. This indicates that the failure to react to large doses of potassium iodide is little guarantee against relapse, though on the other hand reaction to iodide may be a useful indication that further treatment is necessary.

Thus the percentage of cases showing relapse within an average period of 14 months is 14%, but this figure cannot be taken as indicating the percentage of relapses in the total number of discharged patients. These 84 cases were only a fraction of the total number discharged during the preceding years, and some of them came for examination because they suspected relapse, otherwise they would not have come.

(The length of treatment of these 84 cases before discharge varied from 6 months to 9 years, with an average of 2 years and 8 months.)

Further Notes on Mercurochrome.

E. MUIR and S. P. CHATTERJI.

(*Reprinted from "Leprosy in India," January,* 1933.)

IN the July, 1932, number of this journal we wrote an article on the uses of mercurochrome in leprosy. In that article three of its actions were mentioned.

1. Clearing up septic conditions.
2. Clearing up the allergic condition known as Lepra Reaction.
3. Breaking down of leproma, causing necrosis and liquefaction of nodules.

It was mentioned that it was yet too soon to state whether this last action would be of real value in clearing up leprous lesions.

Since writing that article we have tried out mercurochrome thoroughly in a large number of cases. This further experience confirms our opinion of the great value of this drug in the first two actions mentioned, *viz.*, clearing up septic conditions and arresting lepra reaction. Lepra reaction is not, however, relieved in every case, but only in a certain proportion, and there is good reason to believe that it is only in cases in which lepra reaction is dependent on a septic condition that mercurochrome is able to control it.

If this is so, then we are able to state that in many cases of leprosy, septic infections predispose to or even cause lepra reaction, and their removal by treatment with mercurochrome often results in the almost immediate disappearance of the signs of reaction.

The third action of mercurochrome, *viz.*, breaking down of leproma, causing necrosis, liquefaction and abscess formation in nodules, is one which must be kept in mind whenever this drug is used. We had hoped that mercurochrome would be useful in the special treatment of leprosy and would gradually eliminate the leprous infection from the body. In practice, however, this has not turned out to be the case. While a considerable amount of leproma is eliminated from the body by the necrosis and liquefaction of nodules, the general health of the patient is apt to deteriorate at the same time, causing increase of leproma in other parts of the skin. Thus the net result does not appear to be favourable, in fact, if the resistance be low the condition of the patient may be rendered considerably worse.

We have used mercurochrome injections into diffuse lepromatous lesions in the hope that side by side with the general effect there would also be a local effect in eliminating the disease in the areas injected. Judging, however, by bacteriological results before treatment, with similar examination after six monthly infiltrations had been made, the acid-fast organisms do not appear to have been diminished to any appreciable extent.

CONCLUSIONS.

1. Mercurochrome should be administered intravenously in a one per cent. solution, the initial dose for an average-sized adult of 10 stones being 3 c.c. rising to a maximum of 10 c.c. Injections should generally be given once a week ; but if no febrile or other marked reaction is caused by the first dose, a second injection of 5 c.c. may be given three days later.

2. Benefit may be derived after a single small dose, but quite commonly improvement is delayed till the maximum dose is reached.

3. In patients suffering from septic conditions it is usual for a *flare-up* to occur in the site of septic infection. This shows itself by focal sign such as pain and swelling of the gums, pains in the bones and joints and other parts of the body, diarrhœa and other signs of gastro-intestinal irritation, swelling and irritation of the skin. These signs generally pass off in a few days and are less on the next injection, showing that there has been not only a lighting up, but also a clearing up of the septic condition.

4. In many patients there is a marked improvement in dermal infections, pyorrhœa, bowel conditions, etc., accompanied by general improvement in the state of the health. In others there is improvement in health without any noticeable focal changes.

5. In a large proportion of patients suffering from lepra reaction (shown by a general febrile condition, swelling and vascular engorgement of lesions, repeated appearance and disappearance of crops of dermal nodules), the improvement is most spectacular and often immediate, both fever and focal signs disappearing within a few days.

6. If during a course of mercurochrome treatment there is any sign of recrudescence of acute signs, such as swelling of lesions or rise of temperature (apart from the temporary rise lasting a few hours immediately after injection) then mercurochrome should be discontinued. Another indication for discontinuation is a marked increase in the rate of red cell sedimentation.

7. As a rule the best results are obtained with a course of five or six injections.

8. Mercurochrome is of no value in the special treatment of leprosy ; *i.e.*, it is unsuitable for the purpose of eliminating leprotic or other lesions, except in so far as it improves the health and removes concomitant infections which might delay recovery. When given in excessive doses or when continued over too long a period it causes the liquefaction of leprous nodules ; but, as far as our experience goes, this is not, in the long run, favourable to the recovery of the patient.

Slight Skin Lesions in Leprosy and the Importance of their Recognition.

JOHN LOWE.

(*Reprinted from "Leprosy in India," January,* 1933.)

ONE of the great advances in leprosy work in recent years has been in the knowledge of early leprosy. We are now able to recognise the early clinical manifestations of leprosy and are prepared to make a diagnosis without finding the lepra bacillus, which in early cases it may be difficult or impossible to find. This knowledge is now common to most leprosy workers; yet there are some who have failed to acquire this knowledge, and who sometimes write articles which may be misleading. They use such terms as "contacts," "suspected cases," "patient with no definite clinical signs of leprosy," for patients who possibly show definite but slight lesions of neural or even of cutaneous leprosy. They report the frequent finding of bacilli in such "contacts with no clinical signs," and this is often very puzzling to other leprosy workers. Such cases do occasionally occur and have been reported by various workers including the present writer, but they are probably rare. On the other hand, in definite cases of leprosy, it is quite common to find lepra bacilli in apparently unaffected areas of skin. Several such cases have been reported by Lowe and Christian[1]. It must be realised that skin apparently normal on superficial clinical examination will often show slight erythema and thickening on careful examination, and that pathological examination of such skin will often show slight but definite lesions. Also lepra reaction, either occurring naturally or induced by the administration of potassium iodide, will sometimes make these slight or undetectable lesions quite obvious. A failure to realise these facts is leading to confusion in leprosy work, and this is shown in certain articles which we have recently read concerning examination of the blood for lepra bacilli in the diagnosis of leprosy.

The value of blood examination in leprosy is generally agreed to be practically nil. Bacilli can sometimes be found, by the use of a special technique, in the circulating blood of lepers, particularly in advanced cutaneous cases and in cases showing lepra reaction, but this fact has been regarded as being of academic interest and of no value whatever in diagnosis, since bacilli could be found with far greater ease by other methods.

Markianos[2], using the thick film method as used in malaria, found that lepra bacilli could be obtained in the thick film only if the puncture was made through definitely leprotic skin, and he considered that the blood simply washed out bacilli lying in the lymph spaces of the skin at the site of puncture. Puncture of normal skin in the same patients showed no bacilli. This is what one would expect. The thick film method is less reliable than the ordinary skin examination for bacilli, by the slit or the clip method.

Two articles we have read recently give a very different account of the results of the thick film method of detecting lepra bacilli.

The first article reports the examination of 26 leper patients by this method. The site at which the blood was taken is not mentioned. Of 4 " skin " cases all showed bacilli. Of 8 " mixed " cases 7 showed bacilli. Of 14 " *nerve* " *cases* 10 *showed bacilli*. In all, positive findings were made in 21 of 26 leprosy cases, and the thick film method is described as a new method of diagnosis of leprosy.

The second article reports even more striking results. Of 38 C cases, 35 showed bacilli in the thick film. Of 14 N cases, 3 showed bacilli. *Of* 129 *healthy people living in contact with infectious lepers,* 6 *showed bacilli in the thick film.* The film was made by puncturing a finger, and in the leprosy cases, a finger showing no leprous lesion was chosen. The results of nasal smears and examination of the ear lobe are given in each case, a comparison is made, and the thick blood film in leprosy cases is found to give a higher percentage of positive findings than either nasal or skin examination. Of the healthy contacts, ten showed lepra bacilli, six in the blood only, four in the nose and one in the skin as well as the nose. The bacilli found in the thick films are considered to be lepra bacilli circulating free in the blood. The article is illustrated by photo-micrographs showing the bacilli in the blood films. One " healthy contact " shows over 50 bacilli in one microscopic field. If this finding is a true one the blood of the patient is teeming with myriads of bacilli, and yet there are no signs of leprosy.

These findings are so much out of keeping with the commonly accepted ideas of leprosy that they are difficult to believe. However, it is no use denying and ignoring these findings. They must be tested experimentally. This we have attempted to do. We examined 50 neural cases by thick film methods and we have not found acid-fast

bacilli in a single blood film. We have examined 50 cutaneous cases by thick film methods and found acid-fast bacilli in 17 cases. Of these cases 10 showed skin lesions at the site of puncture. The venous blood of these cases was taken and thick films made ; bacilli were found in only three of them and then in much smaller number than in the thick film. These three cases were all C3 cases. Thus our conclusions are the same as those of Markianos. For practical purposes bacilli are only found in the thick film when the skin at the site of puncture is leprotic and bacilli are washed out of the skin by the blood. Bacilli are rarely found in the circulating blood.

How then can we explain the findings of the two articles quoted ? We are forced reluctantly to adopt the view that the authors of these articles failed to realise that the skin from which the blood was taken was leprotic. The cutaneous cases probably had a generalised cutaneous leprosy ; some of the neural cases had some, possibly slight, leprotic changes in the skin, and some of the so-called healthy contacts were definite cases of leprosy with cutaneous lesions, possibly quite slight or even undetectable without very careful examination. This seems to be rather a sweeping assumption to make, but there seems to be no other possible explanation. This view receives considerable support from a careful examination of the data given in the articles. Several of the neural cases are reported as showing bacilli in the nasal mucous membrane and the skin of the ear lobe. If very careful examination of the skin at the site of puncture for the blood film had been made, we think that this skin too would probably have shown slight lesions and acid-fast bacilli. The same remark can also be made regarding the healthy contacts, for several of them showed bacilli in the nose and in the skin of the ear lobe.

Another way in which the failure to recognise the slighter lesions of leprosy may lead to confusion is here illustrated. The following is quoted from the description of leprosy in a standard text-book of medicine in its 1930 edition[3]. After classifying cases as " nodular " and " anæsthetic " the writer describes the initial symptoms in the two forms as follows :—

" *Nodular Leprosy.*"

Prodromata are usually marked ; irregular rises of temperature, rigors, lassitude, drowsiness, diarrhæa and profuse sweating. These may be slight and not absolutely pathognomonic of the disease. The first positive evidence is the primary exanthem or macular stage. This may then

disappear leaving only a slight brownish discolouration. Fever, however, recurs with a fresh eruption, and after one or two recurrences the characteristic nodules or tubercles appear.

Anaesthetic Leprosy.

Prodromata are less marked; feelings of depression, chilliness and malaise with shooting pains in the ulnar and peroneal nerves may be encountered.

To an Indian leprosy worker this account is most astonishing. It does not fit in at all with one's practical experience of the initial stages of leprosy. It reads very much more like a description of lepra reaction, and in India reaction is rarely seen at the onset of the disease but usually months or years after the initial symptoms. The earliest stages of leprosy are usually very insidious and not marked by prodromata such as are described above.

There seem to be two possible explanations of this difference of opinion. The first is that leprosy in some countries shows itself in a much more acute form than in India. The second is that the earlier stages and slight lesions are overlooked or ignored and that, until reaction occurs, a diagnosis is not made. Possibly both these factors help to cause this difference of opinion, but on the whole we think that the second factor is much more important. We remember that the Philippine workers used to consider that the slight cases with only one or a few macules, which are so common in India, were extremely uncommon in their country. Further investigation has shown that such cases are not so uncommon as was previously supposed.

The point we would emphasise is that skin which appears normal on casual inspection, may reveal clinical evidence of leprosy on careful examination, and that even if there is little clinical evidence of leprosy, bacteriological and pathological examination may show a very definite leprous lesion containing acid-fast bacilli. The commonest cutaneous lesion of leprosy is not the nodule or the marked thickening, which are detected at a glance, but the very slight erythema and thickening, which are only detected by careful examination.

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