LEPROSY REVIEW.

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NOTES ON CONTRIBUTORS.

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Editorial.

THE contributions to this number of the REVIEW are of extreme interest and raise once again, the question of the efficacy of treatment and the much discussed subject of out-patient clinics *versus* leprosy hospitals. It might be profitable to consider the pros and cons of these problems in the light of the articles published.

Dr. Fletcher, of Taiku, contributes a most interesting article on Country Clinics, and is speaking from his experience in Korea. It cannot be too greatly stressed that whenever statements are made they must be judged according to prevailing conditions in the country of the author. Schemes suitable for Korea are not necessarily suitable for Central Africa. Schemes in Central Africa may not be at all applicable to South Africa. Further, the disease shows entirely different manifestations in different countries. The Secretary of the Association laid stress on this after his tour in Africa, and Dr. Wade, who has recently made a similar tour, has made some illuminating observations concerning types of leprosy which will be published in due course, in the new " International Journal of Leprosy."

To return to the original theme, the system laid down of country clinics in Korea is admirable, but one must remember that in the less civilised countries where there is not the same fear of the disease, the clinic system may break down because of the general inertia of the patients.

The article by the late Dr. Robertson emphasises the point that for that part of Africa, at any rate, the only practical method of prevention is prolonged treatment in leprosy settlements. While we would be the last to decry dispensary treatment, its definite drawbacks need to be realised. We are aware that in many areas it is impossible to treat all cases in settlements or colonies, and, therefore, the dispensary treatment must have a part. However, because it is impossible to control the regularity of the attendance or of lives of patients, dispensary treatment, we fear, in many countries, will for a long time remain a second best.

Dr. Fletcher writes very encouragingly regarding treatment. We are of the opinion that the hydnocarpus remedies have a definite value. The facts given by Dr. Fletcher, and those given by Dr. Rose, in LEPROSY REVIEW, Vol. II, No. 4, October, 1931, are fairly conclusive. Again in the large colony under the charge of Mr. Mackenzie in Fusan, a settlement which is always chronically overcrowded and where general conditions have remained unchanged,

the fall of the annual death rate from over 12 per cent. to less than 2 per cent. since the introduction of the chaulmoogra group oils is at least significant.

Dr. Wade tells us that between 1906 and 1921, about 88 cases were discharged from the various leprosy stations in the Philippine Islands, and since 1921, to the present date over two thousand cases have been discharged from Culion Leprosy Colony and other hospitals in the Philippine Islands. Such results cannot be ignored. It is not our present task to raise the question of relapse rate or the relatively disappointing results reported elsewhere. All that is said is that these figures cannot be gainsaid. We are willing to admit that just as types of leprosy vary in different countries, so may the result of treatment vary.

Mr. Jackson contributes an interesting article on a series of investigations carried out on the relation of the Hydrogen-ion Concentration and the Pain Factor in the Administration of Sodium Hydnocarpate. This work was done with great care. Mr. Jackson has taken individual idiosyncrasies into account in his work, and while no mathematical statements can take cognisance of such, yet the suggested formula may be of help in future work on the estimation of the pain factor of various drugs used in leprosy treatment.

Dr. Wilson, of Soonchun, Korea, gives an account of the progress of the work in his colony ; he has so organised his routine that the patients carry on all the necessary duties of the place, even to performing minor surgical operations. It is of interest to note that in this colony plain hydnocarpus oil with camphor is preferred before any other method of treatment.

On going to press, we have heard of the untimely death of Dr. Russell Robertson, of Garkida. Dr. Robertson was within a month of leaving for America on furlough, when he was stricken down with yellow fever and succumbed. Dr. T. F. G. Mayer, until recently Leprosy Specialist in Nigeria, writes a personal note of appreciation of his work, and states : " Dr. Robertson's death is a great loss to leprosy work in Nigeria. He was the one man who was keen on leprosy, apart from other diseases, and his camp at Garkida promised to be a great success. I can't tell you how very sorry I was to hear of Dr. Robertson's death." Dr. Robertson's name must be added to the great roll of medical men whom West Africa has claimed in the hey day of their lives. We associate ourselves with all those who mourn the loss of this pioneer worker in the field of leprosy in West Africa.

Garkida Agricultural-Industrial Leprosy Colony.

(Late) RUSSELL L. ROBERTSON.

Introduction.

THE purpose of the writer in this paper is, partly to make the Second Annual Report of the Garkida Leprosy Colony, the colony having been officially opened early in September, 1929, and partly to present some views and conclusions relative to leprosy treatment and the management of a leprosy colony in Nigeria.

When the colony was opened for the reception of cases on September 7th, 1929, there came a nucleus of 36 far-advanced cases, what we then termed " burned out," or nearly so. Early, hopeful cases came slowly the first year ; therefore, the report a year ago was also not hopeful and meant very little. In the last twelve months, progress has been made ; changes and improvements in the administration have occurred and the following statistics will mean something and can teach some things which may be helpful. However, since it has been found that the average time of treatment for all cases is about four years, even this report does not mean as much as future reports will mean.

Garkida Leprosy Colony is unique, first, because of its geographical position, located in north-eastern Nigeria, with a radius of at least 300 miles from the nearest treatment centre run on modern lines ; second, because of its location in the midst of many small, pagan tribes which are very different and very much harder to impress with a new idea than are their large, partly civilised, kindred tribes of Southern Nigeria ; third, because of the variety of organisations and agencies interested in and promoting the colony, *viz.*, the Adamawa Native Administration gave 500 acres on which to build the colony and for farming land. The British Empire Leprosy Relief Association has given two donations for the first buildings and improvements in the colony. The American Mission to Lepers is helping splendidly with an annual gift of money for permanent buildings, touring, propaganda, medicine, school and industrial activities ; the Native Administrations in the surrounding provinces, sponsored and encouraged by Government officials, are giving one shilling per week per case for food ; and lastly, the Church of the Brethren Mission (United States) is furnishing the staff, some financial aid, and acting as a unifying agent for all those named above.

Statistics

Number in the colony 1 year ago	65	
Total new patients since 1 year ago	68	
Deaths in colony in last year	5	
Number who left colony without permission	14	
Net increase in last year	49	
Number being treated regularly now ...	114	
Number of different tribes represented ...	27	
Number of males	82	72%
Number of females	28	28%
Number of adults, or over 15 years	89	78%
Number of children, or under 15 years ...	25	22%
*Number of cripples, or C-2 and C-3 cases (or N-2 and N-3)	49	43%
Number early cases, not past C-1 or N-1 ...	65	57%
Number discharged as arrested last year ...	1	
Number ready to go home now, arrested (waiting until end of rainy season) ...	6	5%
Number almost ready to go home, arrested ...	7	6%
Number of cases definitely improved ...	75	65%
Number of cases, no improvement	17	14%
Number of cases actually worse	9	7%
Total number of arrested, almost arrested and improved cases	88	77%

Detailed causes of the five deaths :—

One gastric ulcer, perforated, early case, aged 19 years, male, autopsy done.

One syphilis, elephantiasis of breast, multiple sclerosis, old case, aged 40 years, refused treatment, female.

One pneumonia, advanced case, aged 35 years, female.

One generalised leprosy, " relapsed case," aged 50 years, male.

One syphilis, herxheimer's reaction, too persistent antiluetic treatment, advanced case, aged 30 years, female.

The case discharged was with deformity. The six cases ready to be discharged are all with deformity, *i.e.*, having lost digits or having some degree of paralysis. The seven cases almost ready for discharge are all early cases, without deformity, except one.

By studying the above figures, the reader will note that an unbiased report is given, not over optimistic, showing the failures and mistakes; but considering that the colony is only two years old and that the early cases have nearly all come within the last 18 months, the percentage of arrested

* New classification according to International Leprosy Association.

cases should rise with each succeeding year, and what is more important, the percentage of cases arrested without deformity should also rise.

Immediate Contagiousness of Leprosy.

By taking a careful history and much questioning of 148 patients, 94, or 64 per cent., give a definite history of near relatives having leprosy, members of the immediate family; 33, or 22 per cent., are doubtful, or gave a poor history and, in some cases, refused to answer; while only 21, or 14 per cent., denied close association with sufferers from leprosy. In the class giving a history of familial contact were grandparents, parents, brother, sister, or several of them. One case had ten brothers and sisters who contracted leprosy some time in their lives. There are many brothers and cousins in the colony. There are four cases of parents and children in the colony, all helping to prove that leprosy is contracted after a long period of close contact, in most cases; however, there are some cases who deny ever having seen a case of leprosy before.

Treatment.

The following has become the routine treatment after trying others and searching for a standard. (1) Injections with alepol, intramuscular and subcutaneous, every fifth day. Ethyl esters of hydnocarpus wightiana were tried. The injections caused much pain, evidently too much of the fatty acids were left in during the preparation and after some days the site of injection would still be swollen and painful, the oil not being absorbed would have to be evacuated. (2) Trichloracetic acid applied to the lesions every 15 days. (3) The infiltration or Plancha method to those cases having a few, definitely outlined cutaneous lesions, every 20 days, and (4) gold chloride in 1/20 gr. doses to all cases of leprosy having eye involvement. This is given every 10 days. In eye affections whose etiology is thought to be the mycobacterium lepræ, gold chloride in small doses will clear up most of the cases in three to six injections, depending on the severity and the depth of the lesion. Of course, after ulceration and thickening of the cornea have started, the lesions can only be aborted and the pathology checked. I have not found that gold chloride acts except in the eye. Ptosis of the eyelids and cutaneous leprosy were not affected by this drug. But in institutional cases where the patients are being observed regularly, and when the myco-

bacterium lepræ infiltrates into the lymph vessels of the eyes, causing lacrimation, photophobia, conjunctivitis, or even to the deeper layers causing uveitis, our cases have reacted very well to the drug.

Intercurrent Diseases.

I am convinced that Dr. Muir[1] and others are right when they advise the treatment of all other diseases from which the leprous patient is suffering; that very little progress can be made until all other diseases are treated; and also, if such diseases are cured, the resistance of patient in good surroundings, on a well-balanced diet, and getting proper exercise, will be raised and, with any little help in the way of antileprosy drugs an improvement will be noticed.

In this vicinity, the prevalent intercurrent diseases are in the order of their prevalence: syphilis, yaws, bilharzia (both types), tapeworm, scabies, chest infections, malaria, and filariasis. These prevent improvement of leprosy, and until they are cured very little headway can be made. The truth of the matter is that after a few months of consistent treatment, if improvement is not seen in the leprosy, one of the above-named infections is generally to be found lurking in the system. Of course, a thorough examination and history is taken when a new patient is admitted, but all the diseases mentioned above may not be detected on admittance and on one examination. These intercurrent diseases, along with ulcers and the whole category of maladies that the sufferer may fall prey to, are a great stumbling block in the propaganda against leprosy. Leprosy associations and philanthropic organisations supply the specific drugs to cure the disease, but, as a matter of fact, those specific, antileprosy drugs are only a very small part of the drugs needed to treat cases. Every case is a potential in-patient, and frequently falls a prey to all the diseases rife in any vicinity or country. Injections are only to be given at most twice a week, while any or all the cases may need to be treated every day for some other complaint. Our records show that during the last nine months 3,205 injections were given, while for the same time 6,356 other treatments were given. The larger the percentage of early and young cases, the fewer the other treatments necessary. This not only calls for dispensers and a great deal of nursing care, but entails an outlay for all the drugs in any common dispensary and added equipment.

Each Case of Leprosy should be Treated as an Individual Case.

While this is partly true of any disease, it is very true of leprosy, perhaps more so than in syphilis or tuberculosis. I doubt whether in 100 cases of leprosy, any two would be alike in all phases. The extent and manifestation would be different; the resistance of the two patients would be different; the extent of invasion would be different; and last and most important, the reactions to treatment and dosage would be different. We would say that those having the most success in treatment are those who are studying their individual cases the longest and closest. In addition to the sedimentation test to show the resistance and reaction level of the patient, there should be a close scrutiny clinically of each case on every injection day to gauge his general condition, change in lesions, musculature, ulcers, burns, facial expression and general attitude. Lacking native assistants properly to check temperature and run the sedimentation test, I place individual clinical examination of each patient on each injection day above those laboratory tests. In addition to this, at the Itu Leprosy Settlement, accurate temperatures are taken, which is possible with trained natives.

Leprosy is so protean in its manifestations and each case so different in its reactions and changes that the successful physician must be personally acquainted with each individual case under his care. No rule for the treatment of leprosy applies to all cases. The watchword in the treatment is care and slowness. It is much better to go slowly, increasing the amount of the drug very gradually than to hurry, giving a large dose, thus causing a greater reaction than the patient's resistance can stand and putting him back many months. The disease goes in cycles regardless of treatment, and it is necessary, therefore, to become acquainted with the patient and to know whether he is in the midst of a remission or an exacerbation. I am sure that I have made some patients worse by treating them too vigorously, and some of them a great deal worse. Medical officers and those in charge of treatment in any colony should not be changed often and in each case the patient should be studied individually.

When the colony was opened for patients two years ago, only early cases were encouraged to come. A nucleus of old cases were taken in from the segregation camp at Yola, but otherwise, such cases were discouraged from coming, and some were refused admittance because they

were past being infective, and their deformities could not be remedied. The main reason for limiting the cases to those in the early state was so as not to fill up the camp with old cases and then subject a few young cases to living with a camp full of hopeless ones. The reputation of the camp was at stake. We wanted to get several good cases, prove to them that there was hope for them and thus spread the good news.

That purpose has been accomplished to some extent, sufficiently so that we feel safe in throwing the doors open to all cases now. There is much superstition connected with leprosy in the pagan tribes, and, of course, there is still doubt in many minds. The approach even here is different from the partly-civilised, sophisticated tribes of Southern Nigeria. I am safe in saying that the incidence of leprosy is much higher in Adamawa and Bornu Provinces than has ever been recorded. Dr. Mayer[2] records 0·3 to 0·5 per mille for Adamawa. I would say for the Hawal Valley and Adamawa Province the incidence is more than 5·0 per mille, *i.e.*, more than 1 per 200. And from examination of school children and touring, I am prepared to say that it is either spreading rapidly or else it is being recognised more readily. We have hardly touched the problem yet, in fact, just begun the work, but the machinery is set up, the reputation of the colony is established, and a constant growth and development is to be expected.

Segregation Camp.

The segregation camp, apart from the early cases, is the solution of many problems in a colony. We might have followed this idea earlier in the history of our colony, and thus could have received all cases, but we thought the colony too small to start this before. About four months ago, we began segregating all far advanced cases, *i.e.*, C-3, N-2 and N-3 cases on a site about $\frac{1}{4}$ mile from the main colony, but still within the 500 acres. This is not only more hygienic and an attempt to prevent reinfection, if this is possible, but the psychological effect on the early cases is wonderful. They see the demarkation. The fate of long-standing cases, untreated and hopeless physically, is not constantly thrust before their eyes. Thus the colony serves two major purposes. First, institutional segregation of, and care of the old, helpless cases. Second, institutional treatment of, and healing of early cases.

At the beginning of 1931, Mr. Harold A. Royer, a full-time Superintendent, assumed his duties. These are varied.

The first requirement for such a position is versatility. He must be father, adviser, superviser of all works, gardener, horticulturist, carpenter, builder, blacksmith, artisan, plumber, well-digger, teacher, judge, lawyer, defender, and above all, a good foreman. The Government could well afford to combine agricultural experimental stations with their leprosy colonies. Agricultural stations have the problem of labour. Leprosy colonies have the problem of unemployment. The secret of a successful colony, especially among doubtful pagans is to keep them busy and happy. Even at best, the time spent in camp is a long time. The idea is to have plenty of outdoor labour, a great variety of trades to learn, and opportunities to learn something new. At Garkida, besides having all the farming land they desire, there is a school with an average attendance of 48, which is an attraction to the young patients. There are buildings going up, not only of local mud and grass, but stone and cement, with roofs of grass, tile and metal. A trained mason is teaching several assistants. A carpenter is teaching his trade, a blacksmith has his following. An industrial building is planned for the near future in which to teach and learn the crafts. However, the most important, from the writer's viewpoint, are the agricultural experiments ; fruits, vegetables and grains, not only those peculiar to Nigeria but experiments with imported fruits, vegetables and small grains are cultivated. Then there is a herd of cattle, about 40 head, where breeding will be done to produce the best milkers, and incidentally, the manure adds to the agricultural work. Ploughing and green manuring is another feature ; all of these are stressed in the Native Administration Agriculture Stations. At Garkida everybody works until noon. The afternoons are given over to school and treatments. There are, too, many cases of leprosy in Nigeria, or in the world for that matter, for them to gather into colonies and sit and wait to be treated free of charge. But, if revenue, tax money, Governments, education departments, missions, and philanthropic organisations can provide schools, work, learning of new trades, and healing at the same time, this certainly means conservation of energy and money.

Admission has been voluntary from the beginning. No coercion is wanted. In fact, the less we beg them to come, the more likely are they to come. Those who do not suffer from leprosy are not allowed to spend any length of time in the colony and never to spend the night. Traders do bring their wares and food for sale. The patients are allowed

certain freedom in returning home for a few days occasionally. They usually bring back one or more friends with them. At first, we wrongly thought that separate locations must be provided for separate tribes. They, however, live together, work together, go to school together, get their treatments together and laugh and cry together. Thus, the colony is only another agency for amalgamating and bringing under one central government all these hundreds of tribes of Nigeria to make of them some day an independent country able to run their own affairs.

The writer feels that false hopes and too optimistic views were expressed by writers and workers concerning leprosy some two or three years ago; that rapid cures had been discovered and that as high as 80 per cent. of all sufferers could be cured. I have heard of cases being cured in a few months. I doubt it now having given most of the medicines a fair trial and having treated cases for more than two years. I agree that great strides have been made and that the outlook for the sufferer is very hopeful. I have much faith in treatment now, but it still resolves itself into a game of patience and years of treatment. Instead of months, it is years before a case can be pronounced arrested. There is nothing gained in setting up temporary treatment centres. There is nothing gained in treating out-patients irregularly, nor in visiting villages for a few months treating patients and then abandoning the venture. But great good can be done, the world can be rid of leprosy in a few generations if those taking up the work, either financially or personally, will determine to make their efforts permanent and pledge themselves to stay by the job until something is accomplished. Permanent camps must be set up, permanent buildings built, and an attractive educational programme offered to all cases of leprosy. The surroundings and the environment must be inviting. True, there must be some advertising and propaganda work done. In the last year, 1,330 miles were travelled advertising the colony. Patients were brought in by motor. They were not promised a cure in a few weeks or months. No false hopes were set up. We simply said that we had good houses in which they could live, a pleasant environment, work with remuneration and medicine which would help them and cure many of them if they co-operated and stayed three or four years.

Begin on a small scale but have permanent plans. Develop the colony as the number of cases increases. The initial outlay is small but a permanent income must be assured. If the leprosy colony and the Agricultural

Experiment Stations can be linked up, each supplying the other's needs, then Government is not adding financial responsibilities but is in a fair way to solving two problems with one staff.

(1) Muir, Ernest. (1931). The Treatment of Leprosy, Transactions of the Royal Society of Tropical Med. and Hygiene. Vol. 15. No. 2, page 87-102.
2) Mayer, T. F. G. (1930). Distribution of Leprosy in Nigeria with special reference to the Aetiological Factors on which it depends.

Country Clinics or Dispensaries for Treatment of Cases of Leprosy.

A. G. FLETCHER.

IN the annual report of the Taiku Leprosy Hospital for the year beginning June 1st, 1923, we wrote as follows :—

" The ever increasing number of patients being dismissed as apparently cured makes us long to be able to place the benefits of the modern treatment within reach of every sufferer in the province. It has long been our dream to send out a qualified assistant who would visit regularly once a week each of six large towns in the province holding a clinic and administering treatment to all the cases in and around each town. By this means, hundreds whom we could never care for in our institution could be treated, cases needing hospital treatment could be better selected, and those discharged as free from symptoms could be kept under observation and further treatment administered if desirable.

" It will always be financially impossible to care for more than a fraction of the sufferers from leprosy in this province by gathering them into institutions. But what a great and beneficent work could be done by making the modern treatment easily accessible to all ! Such a programme, if inaugurated, would inspire us with new enthusiasm in our task, and would bring the day near when our dream of ridding the country of this baneful disease might be realised."

During the year 1925, in a pamphlet designated the " Romance, Tragedy and Opportunity of Leprosy Treatment," we set forth a very definite plan, with budget attached, for taking the treatment to every sufferer in the province. We quote the following :—

" *Our problem :—*

" The Taiku Leprosy Hospital is located in the capital

of North Kyong-Sang Province (Keisho-do). At present, it accommodates 410 patients. In this province, with an area of about 7,380 square miles, and a population of a little more than 2,000,000, a recent survey revealed the location of 1,700 sufferers. Undoubtedly there are a few hundred not yet discovered. For financial and other reasons, the leprosy hospital has almost reached its limit of capacity. Two thousand cases in the province are depending upon us for treatment. Shall they suffer and die without help when there is a well-established remedy ? "

" *Our plan* :—

" The plan is to get all the cases of leprosy in this province under treatment as soon as possible. To this end, country clinics will be established in centres where the greatest number of sufferers are located. This will be a comparatively inexpensive method as the great majority of those who will come regularly to the stations for treatment will continue to live in their homes and be self-supporting.

" Where conditions in the home, or the contagious stage of the disease, indicate the need of isolation, such cases will be referred to the Taiku Leprosy Hospital. Patients discharged from this hospital as apparently cured will be kept under observation at the country clinic nearest their home and additional treatment given if indicated.

" As the disease is not hereditary, untainted children of leprous parents will be removed to a home for such children where they will be properly cared for and permitted to grow up healthy and strong. This home will be centrally located in the city of Taiku.

" Medical supervision of these country clinics will be provided by a doctor who will have an itinerary that will make possible a visit to each station once every week, or once every ten days. To visit each of the ten stations, the doctor will travel a distance of 322 miles. Part of the time he will travel by rail and part by car.

" At each country clinic, a nurse or some one qualified to give the hypodermic treatments will be permanently located. Preferably the nurse should be one, who in the early stage of the disease, having entered the leprosy hospital as a patient, was not only freed from all symptoms but trained in the treatment and care of the disease.

" The following budget for ten country clinics is made on the assumption that the Government will co-operate and provide the ethyl esters free of charge.

BUDGET FOR TEN COUNTRY CLINICS.

To establish site and buildings, 10, at $500	$5,000
To maintain :	Per yr.
Korean doctor's salary, 12 months at $75	$900
,, ,, travelling expenses, three trips per month, 36 trips at $12	$432
,, ,, food, 12 months at $15	$180
Clinic Assistants' salaries, 10, 12 months at $10	$1,200
,, fuel, water, 10, 12 months at $5	$600
,, repair, 10, 12 months at $2	$240
Total cost maintenance ..	$3,552

" *Our opportunity :—*

" By removing untainted children from their leprous parents—by isolating more severe cases—and by treating all cases—to prevent further spread of the disease, and thus entirely to eliminate it from this province. Such an opportunity as this will find its climax, either in a great tragedy or a great romance."

" *Tragedy :—*

" If treatment is withheld, 2,000 sufferers without any hope of a cure, will be left to the ravages of the most loathsome of all diseases, which destroys both the flesh and the spirit. As the 2,000 deteriorate, they will gradually spread the infection, hundreds of others will contract the disease, helpless children fall victims to their parents' malady, and thus the vicious cycle of the tragedy of leprosy will go on and on."

" *Romance :—*

" On the other hand, if treatment is made available according to the plan proposed above a new chapter will be written in the history of leprosy, a chapter full of thrilling interest and ' with a happy ending ' that might well rival that of any ancient romance. It would mean that not only 2,000 sufferers would be given new life, and new hope, but the other 2,000,000 inhabitants of the province would be safeguarded from the contagion of this dreaded disease, and perhaps the first forward step taken in a definite programme to ' rid the world of leprosy.' "

" *Fear* :—

" This plan made a strong appeal to people in America who freely offered the necessary funds. However, Government officials were fearful that the country clinic would attract vagrants. They thought these would take up their abode in the vicinity and, being without means of a livelihood, would wander about to beg in such numbers as to

become a menace to the healthy community of the district. For this reason, although we had the money necessary to initiate our plan, we were unable to secure permission from the Government until 1928. Even then, we were only permitted to establish one clinic as a demonstration.

Demonstration Results :—

1. Early cases discovered. The three years' work of our clinic in Koon We county has been very interesting and very successful. We have demonstrated that the total number of cases in any given district cannot be ascertained even by the most modern and thorough methods of survey, and that the actual number is many more than the survey number. For instance, in our Koon We clinic district, the police reported 20 cases whereas we have now 70 registered. As we only give treatment to those who are permanent residents, evidence of which is required in the form of a copy of registration from the Government official of the district, we are certain that none of these 70 have migrated from neighbouring districts. Another clinic was started at the beginning of this year and within two months, 75 patients were receiving treatment. On my last visit, I saw several very early cases of leprosy, a case of psoriasis and several other cases of skin diseases.

2. Chaulmoogra oil is in itself a sufficient remedy for early cases of leprosy. The results obtained depend largely upon the proper administration of the oil. However, the method of treatment is another subject which we discuss more at length in our paper on " Massive Doses of Chaulmoogra Oil in the Treatment of Leprosy."* In the report on the Study Tour of the Secretary of the Leprosy Commission of the League of Nations is the following paragraph :

" The efficacy of chaulmoogra should be tested as follows :—Two groups of cases, as nearly as possible of the same type, should be placed under the same régime and general treatment, one being given chaulmoogra but not the other. After treatment for a certain period, the two groups should be compared. This comparison, which is a crucial test, has, according to the above authorities (Denny and Wayson) never been made."

The inference from this report is that the great improvement in the condition of cases, which is noted so frequently in leprosy hospitals, may not be due so much to the chaulmoogra oil treatment as to the improved régime of the hospital as compared with the home condition of the sufferer.

* To be published in a forthcoming number of the International Journal of Leprosy.

The patients attending our clinic live in their homes under exactly the same conditions as before treatment. Their food, their work and their habits remain just the same as before. At the clinic we give no money, clothing or food to our patients. Twice a week they are given injections of chaulmoogra oil. All of our early cases have shown a decided improvement, some being entirely freed from all symptoms, while 10 to 15 per cent. of our more advanced cases have also been greatly benefited.

3. Country clinics, when properly conducted, are not in any way a menace to the healthy people of the district. On the contrary, they are the greatest blessing imaginable. It is unnecessary to go into details here as to the character of the blessing, for we all know that cure of the early cases prevents further spread of the infection to relatives and friends. We also know that if these early cases are not treated, the disease will continue to make progress, and it is only a matter of time until finally they, as advanced cases, would be disfigured and crippled and cast out from home and friends. As " the proof of the pudding is in the eating of it," the fact that from the healthy people of many widely separated districts we are receiving urgent requests to establish clinics for the treatment of leprosy, is in itself sufficient evidence that the country clinic is not a menace.

Psychology :—

The victim of leprosy dislikes, above all things in the world, to be known to be suffering from the disease. For this reason he will conceal his disease just as long as he possibly can. He will forego the benefits of treatment and make all sorts of sacrifices in order to avoid being identified as having leprosy. In the vicinity of our clinic, a young woman, the daughter-in-law in a family of the gentry, contracted leprosy. Her husband, a student in the Keijo Law College, brought a suit for a divorce. The father of this young woman was perfectly familiar with the clinic and its purposes, yet he postponed coming to the clinic because he could not get up the courage to speak of his daughter as suffering from leprosy, although he knew that once he did so the treatment would immediately be available. Finally, he came to the clinic but went away again without mentioning the reason for his visit. Five or six times he came before he got up sufficient courage to interrogate the nurse. When he did ask at what time the doctor would make his next visit, he said that some one in his neighbourhood was suffering from a " skin disease "

and would like an examination. Later, he appeared again at the clinic and waited for three hours until the doctor had finished his work and the patients were all leaving. Then he said, in a very low tone of voice, " I am ashamed to mention it." " What is it ? " said the doctor. " Please lower your voice, doctor, so that no one can hear you," he said excitedly. Then he whispered, " Do you think you could go to my house and examine my daughter ? I think she has a skin disease." The doctor advised that the daughter come to see him at his next visit, as it would then be possible to administer the proper treatment after the examination. Some time later she came, and with the exception of one eye, she was entirely covered and thoroughly protected from view. When opportunity was afforded, she said " My disease is unclean," and burst into tears. Since then, she has attended regularly twice a week, and being an early case has made rapid improvement and bids fair to be entirely relieved of all her symptoms.

Early Cases :—

Many early cases who are attending the clinic conceal this fact from their neighbours in order that the identity of their disease may not become known. Before leaving their homes to go to the clinic men patients will, to disguise the fact that they are going for treatment, make preparation in the way of proper dress, etc., to visit the market or to get wood from the hills, while women will prepare to gather wild herbs and roots.

Skin Diseases :—

Although we have separate days for the treatment of early and advanced cases and during the past three years have made every possible effort to secure the early cases, we are convinced that there are still some who are in hiding in this district. Our next step is to establish a separate room and a separate day for the diagnosis and treatment of skin diseases other than leprosy. To this clinic will come, we believe, the early case who as yet has not the courage to make his disease known. In this way we hope to discover every case of leprosy in the district.

Contacts :—

When all cases have been discovered we hope that it will be possible through the department of the clinic for skin diseases and by visits to the homes to examine the relatives and others who for some time have been exposed by close association with those suffering from leprosy.

Suspicious cases will be kept under careful observation and examined frequently.

House Infections :—

According to Sir Leonard Rogers, Hon. Medical Adviser of the British Empire Leprosy Relief Association, 80 per cent. of the infections in leprosy are house infections, and in 80 per cent. the incubation period is under five years. Therefore, whenever a case of leprosy is discovered, all his household and other close contacts should be repeatedly examined for leprous lesions. If these early cases are treated as discovered it follows that within five years, 80 per cent. of the foci of infection will be removed. By the same process, within another five years the remaining 20 per cent. of foci of infection would be reduced by 80 per cent., so that at the end of ten years but 4 per cent. of the original foci would remain.

Leprolin Test :—

Should the intradermal leprolin test of P. Bargehr, which has been confirmed by C. D. de Longen and W. de Vogel, for the detection of early and latent leprosy prove to be reliable, this problem of discovering infections among the contacts would be greatly simplified.

SUMMARY.

1. Country clinics constitute one of, if not the most important single factor in the eradication of leprosy from any district or country for the following reasons :—

(*a*) Early cases of leprosy can be freed from all symptoms and rendered negative by treatment with chaulmoogra oil. This is not only our experience but also the experience of men of world-wide reputation such as Drs. Wade and Lara in the Philippines and Dr. E. Muir in Calcutta. The latter says that almost 100 per cent. of cures may be expected in early cases if they are thoroughly treated. By cure is meant the disappearance of all active signs of the disease.

(*b*) Early cases are discovered through the country clinic. Surveys do not detect early cases. They do not come to the leprosy colonies. The psychology of those suffering from the disease is such that the greatest tact and wisdom is necessary in order to discover him. The early case of leprosy before disfigurement occurs goes about undiscovered, just as certain

birds, whose feathers are the same colour as their surroundings, are not readily detected.

(*c*) Contacts are best discovered and examined regularly through the country clinic. If all contacts were examined and those infected given prompt and thorough treatment, within ten years the number infected would be reduced to 4 per cent.

(*d*) Paroled cases are re-examined and treated if necessary.

2. Country clinics should function also as out-patient departments of a well-equipped modern leprosy hospital, and also as out-patient departments of a suitably located leprosy colony.

(*a*) Feeder for leprosy hospital. Among the cases which come to the country clinics are those whose disease is in the infectious stage. The small houses in Chosen and the crowded circumstances under which the average family live constitute conditions that are very suitable for the spread of infection. It is desirable, therefore, that in so far as possible, all those in the infectious stage be referred to the leprosy hospital. The leprosy hospital is a treatment institution with ample provision for research. It should be centrally located and modern in every respect. Advanced and deformed cases should not be admitted. When the Taiku Leprosy Hospital was opened 15 years ago, there was no place where advanced cases could be cared for, so we found it necessary to admit them. However, the Government now has an ideal colony, where the capacity is always increasing, so that for the past two years we have not admitted to our hospital any cases with deformity. The object of the leprosy hospital, aside from research, is two-fold. First, to isolate those in the infectious stage. Secondly, to give these cases the very best treatment so as to free them from all symptoms, render them non-infectious and return them to their homes as soon as possible. In this way, the greatest number of sufferers can be treated and the maximum amount of prevention of infection accomplished.

(*b*) Feeder for leprosy colony. Advanced cases of leprosy tend to hinder the work of the country clinic. They are always the first cases to come and many of them are the first to become discouraged. There

are three reasons for this. Comparatively few are materially benefited by the treatment; such improvement is only manifest after some months of treatment; lastly, their weakened physical condition makes the necessary bi-weekly travel of several miles to and from the clinic a real hardship. For these reasons, therefore, after taking treatment for some months, without appreciable benefit they begin to complain to their relatives and friends and to other patients that the treatment is no good. In this way, they scatter rumours that tend to discourage prospective early cases and those already attending. There is another and more important consideration attached to the advanced case who attends the clinic. Although we always separate the early and advanced cases and treat them on different days, nevertheless, the advanced case by his very disgusting appearance, which he cannot help, casts a stigma on the clinic, which tends to keep early cases away.

For these reasons, advanced cases should be sent to a distant colony, located on an island or peninsula where there is plenty of land and room and where they may spend the rest of their days in comfort and peace so far as the disease will permit. The central Government of Chosen has such a place on Little Deer Island, and as many of our advanced cases as possible are referred to this institution. The system of segregating early cases who come for treatment with the late hopelessly-deformed cases constitutes the most serious obstacle to the solving of the leprosy problem in any district and should be condemned. We should always put ourselves in the place of the sufferers from leprosy, and in accordance with his desires, plan for his treatment. As an early case of leprosy, before the disease has become infectious, would you not prefer treatment, ostensibly for a mere skin disease at a near-by clinic to segregation in a leprosy hospital with frankly infectious cases, or worse still in a leprosy colony with those who are badly deformed and doomed to death? We must conclude then that the country clinic is the most humane and efficient method of eradicating leprosy.

We feel, therefore, that our plan for ten country clinics, in conjunction with our treatment hospital near Taiku City and in co-operation with the Government colony at Little Deer Island will meet every need of all the sufferers of our province, and will within a minimum time, and for a minimum cost, insure the complete eradication of the disease.

Some Observations on the Influence of the Hydrogen-ion Concentration on the Pain Reaction in the Administration of Sodium Hydnocarpate Solutions by Subcutaneous Infiltration.

J. T. JACKSON.

IN the administration of sodium hydnocarpate products by the subcutaneous infiltration method commonly employed in the treatment of leprosy, it has been remarked by various users, that the amount of pain experienced by the patient following the injection, varies with different batches of the same product.

The writer thought that perhaps one factor influencing the pain reaction might probably be due to variations in the hydrogen-ion concentration of the solutions injected. Mention of this suggestion is referred to by Dr. Cochrane[1] in his paper on the use of " Alepol."

Dr. Cochrane was good enough to refer this suggestion to Dr. T. A. Henry, of Messrs. Burroughs, Wellcome and Co.'s research laboratories, and Dr. Henry very kindly supplied the author with samples of the sodium salts of a fraction of the fatty acids from hydnocarpus oil. He also had carried out in his laboratories the determination of the hydrogen-ion concentrations employed in this investigation. The samples of sodium hydnocarpate used were tested on guinea pigs before being sent to India.

This paper is an account of the experimental work carried out by the author on patients at the Bankura Leprosy Home in Bengal, and the observations and conclusions arising therefrom.

Pain Reaction.

It is realised that there are many components affecting the pain following the administration of aqueous solutions of sodium hydnocarpate by the subcutaneous infiltration method. The pain reaction varies with the temperament of the patient, his general health and physique, the extent and degree of anæsthesia over areas where injections are made, the psychological factor which exists when treating a number of patients together, the climatic conditions and also the technique and general personal equation of the experimentalist.

In order to keep these varying factors uniform, as

constant and as small as possible, the experimental details outlined below were adopted. The personal equation was kept as constant as possible throughout by the writer himself carrying out all the experimental details such as the preparation of the solutions, the injection of patients and the taking of observations of signs and symptoms for the record of the pain reaction resulting from each injection.

For the purpose of collating all the observations made, a mathematical expression for the pain reaction has been originated as explained below. It has been named the "Pain Factor," and is denoted throughout by the letters "P.F." This has enabled comparative results to be made and has a purely relative value.

EXPERIMENTAL.

Sodium Hydnocarpate Fractions and Solutions.

Two separate batches of sodium hydnocarpate were supplied by Dr. Henry. The first batch of five samples (A, B, C, D, E) were supplied from one fraction "X" of the fatty acids from hydnocarpus oil and were tested at the Leprosy Home from August to October, of 1929. A further batch of samples (F, G, H, J) were examined in June, of 1930. This batch was prepared separately from the first batch and has been treated as such.

The solutions used throughout for injection were of the same strength as that generally employed in routine work, *i.e.*, 3 per cent. aqueous sodium hydnocarpate containing 0·5 per cent. of carbolic acid. The solutions were accurately prepared and sterilised in rubber capsuled bottles. The sodium hydnocarpate was dissolved in the dilute carbolic acid, made up to the correct volume and sterilised. The records below were made of the solutions.

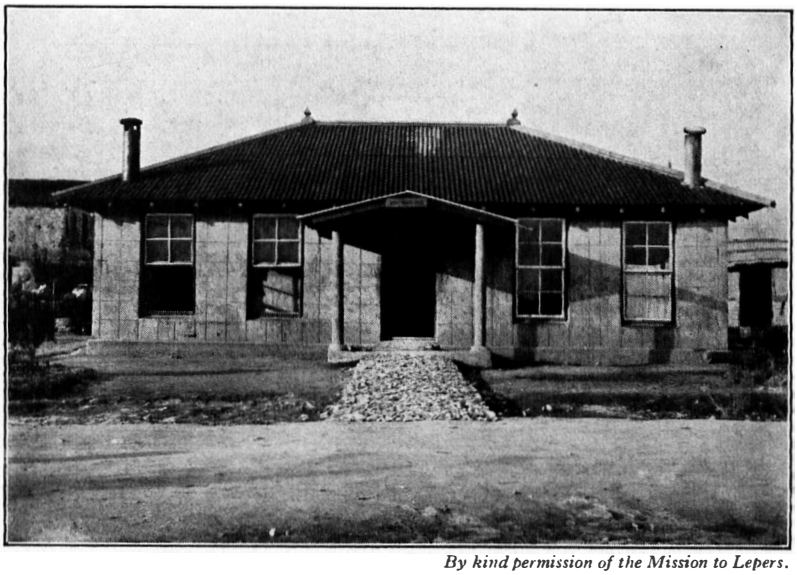
Some of the samples tended to cake up and form a colloidal mass before dissolving whilst others were more of a powder and dissolved readily.

It was found that all the solutions kept well over the period through which they were employed.

Sample A.—A dry powder which caked up before dissolving. It formed a dark yellow solution when hot and on cooling.

Sample B.—More readily soluble than "C." It formed a dark yellow solution when hot which became pale yellow when cold.

Sample C.—This sample caked up and formed a cloudy solution in the cold which clarified on heating; 24 hours

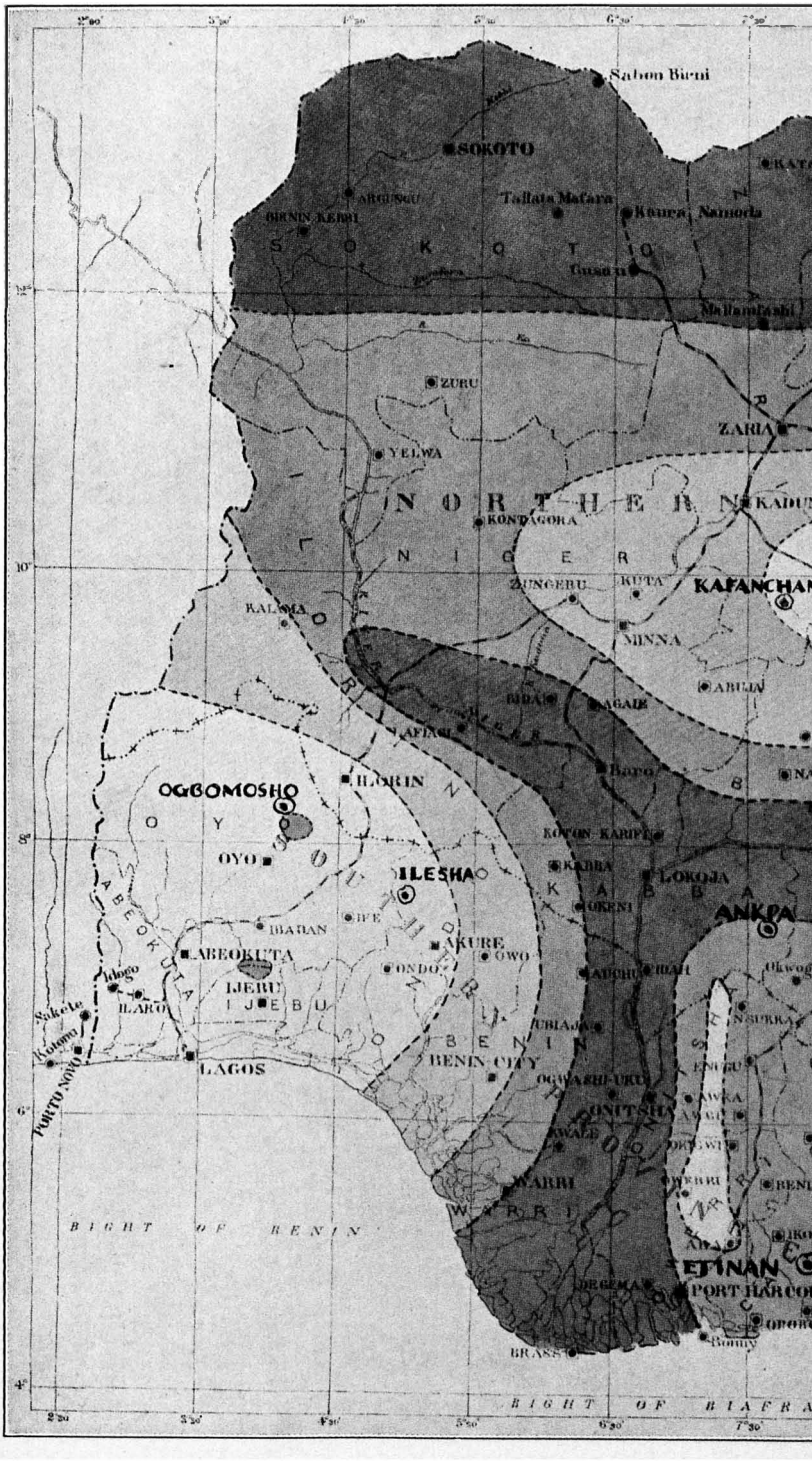


By kind permission of the Mission to Lepers.

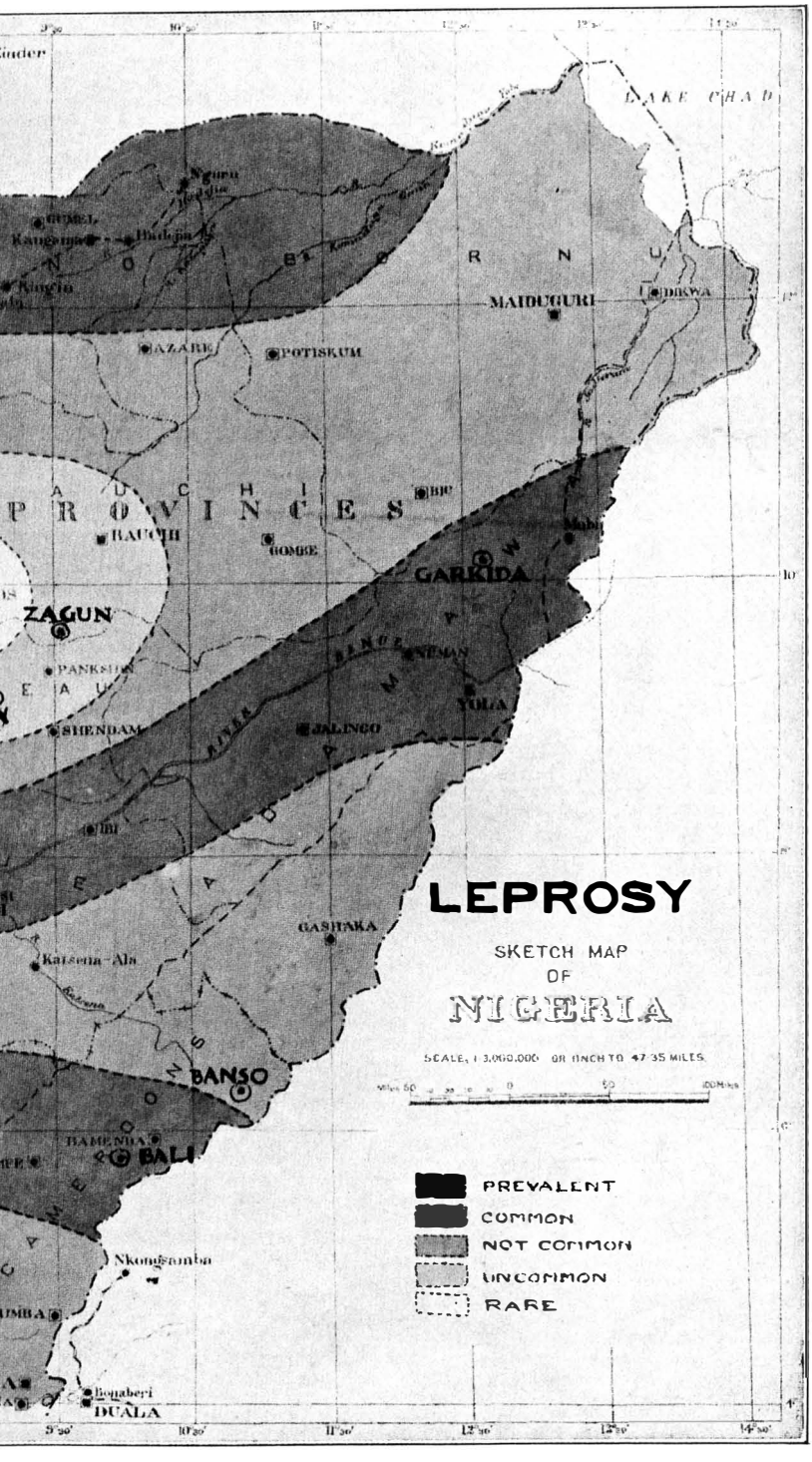
ONE OF THE MEN'S COTTAGES IN THE SOONCHUN LEPROSY SETTLEMENT. IT CONSISTS OF A HALL, FOUR BEDROOMS, A KITCHEN, AND AN ATTIC.

By kind permission of the Mission to Lepers.

TEN TYPICAL CASES ON THE EVE OF THEIR DISCHARGE FROM THE COLONY.


Sabon Birni
SOKOTO
ARGUNGU
BIRNIN KEBBI
Tallata Mafara
Kaura Namoda
S O K O T O
Gusau
ZURU
YELWA
N O R T H E R N
KONTAGORA
N I G E R
ZUNGERU
KUTA
KAFANCHAN
KALOMA
MINNA
BIDA
AGAIE
ABUJA
AFAKO
Baro
OGBOMOSHO
ILORIN
OYO
ILESHA
KOTON KARIFI
KABBA
LOKOJA
OKENE
ANKPA
IBADAN
IFE
ABEOKUTA
AKURE
ONDO
OWO
Ijebu Ode
Sakete
Ilaro
Idogo
ILARO
IJEBU
IJEBU
Aiyetoro
Ayetoro
Ikoma
PORTO NOVO
LAGOS
BENIN CITY
OGWASHI-UKU
UNITSHA
AWKA
AWKA
AWALE
ORLU
WARRI
WARRI
BIGHT OF BENIN
ETINAN
PORT HARCO
OBEGEMA
Bonny
BRASS
BIGHT OF BIAFRA

OF LEPROSY IN NIGERIA.



(*By permission.*)

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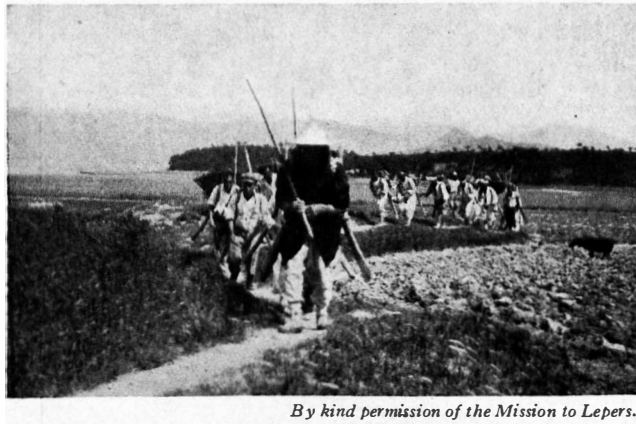
GENERAL VIEW OF THE MEN'S SIDE OF THE SOONCHUN LEPROSY COLONY.



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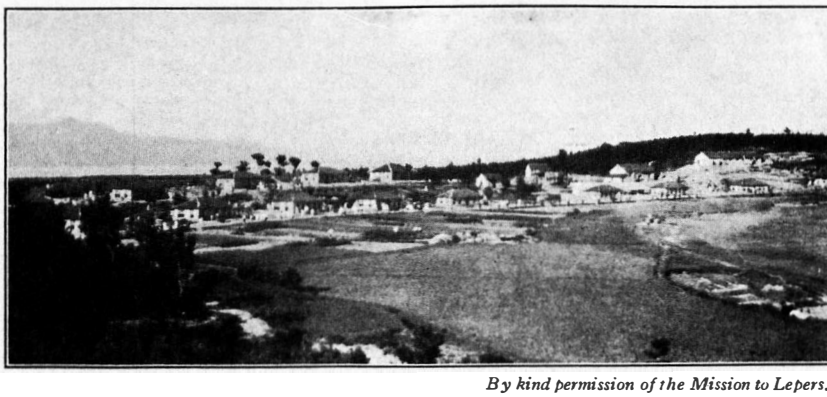
PATIENTS BRINGING STONE FROM THE QUARRIES IN THE COLONY.



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A PARTIAL VIEW OF THE WOMEN'S SECTION OF THE COLONY.

after sterilising, the solution was paler in colour and a slight precipitation (probably of fatty acid) took place.

Sample D.—A finer powder but not so readily soluble as " B," forming a dark yellow solution when hot and cold.

Sample E.—Formed a pale yellow solution when hot and in the cold.

Sample F.—Readily dissolved to a clear solution not changing in colour on cooling.

Sample G.—Slightly adherent. Dissolved readily to a pale yellow solution when hot. The solution on cooling was slightly opalescent.

Sample H.—A dry powder which caked up before dissolving, when it formed a clear solution when hot and in the cold.

Sample J.—Readily dissolved to form a clear solution when hot and in the cold.

The writer was informed that samples " E " and " F " were commercial products and the other samples were laboratory preparations.

Hydrogen-ion Concentrations of the Solutions of Sodium Hydnocarpate.

The solutions prepared for injection were tested for pH by a Universal Indicator with unsatisfactory results and as no suitable apparatus was available at Bankura for the accurate determination of the pH of the solutions, Dr. Henry very kindly had these determined in his laboratory. Injections were proceeded with in the meantime.

A number of determinations were made confirming the difficulties McBain and Hay[2] had found in the estimation of the pH of general soap solutions. The figures given below illustrate some of the difficulties found in this part of the subject.

The pH values adopted for use in the comparisons made are those found for a 3 per cent. aqueous solution of the sodium hydnocarpate sample containing 0·5 per cent. carbolic acid before sterilising, using a quinhydrone electrode and the apparatus of Brown and Broom[3]. The variation in pH after sterilising the solution is negligible as will be seen from the table below. As the upper limit for the readings with a quinhydrone electrode is 8·5, the quinhydrone being affected at a higher alkalinity (see Brown and Broom), Dr. Henry also had a comparison of the pH made above this limit by the hydrogen electrode.

The pH determinations supplied by Dr. Henry are here tabulated.

pH OF SOLUTIONS OF SODIUM HYDNOCARPATE FRACTIONS.

Fraction of Sodium Hydnocarpate.	c.c. of N/10 NaOH for 0·5 gms. in 20 c.c. Water to Phenolphthalein.	pH of 3% Aqueous Solution only, by Universal Indicator.	pH of 3% Aqueous Solution only, by Cresol Red.	pH of 3% Aqueous Solution only, by Quinhydrone Electrode. (Pope's Apparatus.)	pH by Quinhydrone Electrode (Brown and Broom's Apparatus).			pH by Hydrogen Electrode.	
					(a) 3% Aqueous Solution.	(b) 3% Aqueous Solution containing 0·5% Carbolic Acid.	(c) Same Solution as (b) after heating for 30 mins. in boiling water bath.	(a) 3% Aqueous Solution.	(b) 3% Aqueous Solution containing 0·5% Carbolic Acid.
A	0·1	8·0	—	8·8	9·02	8·75	8·75		
B	0·8	7·0	8·6	8·5	8·56	8·40	8·43		
C	1·4	6·5	8·3	8·22	8·38	8·19	8·14		
D	0·45	7·5	—	9·0	9·17	8·86	8·87		
E*	0·45	8·5	8·7	8·48	9·08	8·89	8·84		
F*	0·5				9·20	8·95		9·44	8·94
G	1·3				8·75	8·60		9·03	8·68
H	0·8				9·10	8·90		9·14	8·89
J	0·15				9·55	9·25		10·38	9·38

* Commercial products.

Injections.

For purposes of comparison, three series of patients were selected. Three sets of three such series were then arranged. In the first set of series, patients were selected who were previously receiving injections of "Alepol" by the subcutaneous method as their routine treatment. Details of these determinations are given in Table I.

A second set of series was afterwards arranged composed of patients previously receiving hydnocarpus wightiana oil, and oil of creosote ("hydnocreol") as their routine treatment. The details of these are given in Table II.

Tables I and II comprise the observations made on the samples of sodium hydnocarpate marked A, B, C, D, E.

For the second batch of sodium hydnocarpate fractions (F, G, H, J), a further set of three series was arranged. The patients for this set were selected without respect to previous routine treatment though such is recorded in the observations made on this set given in Table III.

Each series consisted of five patients for the first batch of samples and four patients for the second batch of samples, one for each solution. Injections were given to each patient twice a week, a course* consisting of six injections of 2, 3, 4, 6, 8 and 10 c.c. Injections for each series were given at the same time using a fresh needle of the same size and bore for each patient. Each patient in the series received

* In ordinary routine the course from 2 to 10 c.c. would increase more gradually.

the injection in the left arm on the first day of injection (say Monday), in the right arm on the second day of injection (Thursday), then in the legs and afterwards in the thighs always in the same order and in such a way that the full course was given round the body in the same period, the larger volumes injected (8 and 10 c.c.) being given in the thighs.

The day following injection, each patient of the first series appeared for examination (see below) and a second series of five patients had their first injection.

The next day, the patients of Series I. and II. reported for observations and a third series of five patients received their first injection.

Injections were then proceeded with systematically as recorded in the Tables until each set of series had had the full course possible. By thus treating each series as a separate group on different days, one was able to avoid the psychological factor of a crowd of patients together influencing to some extent each other's report of individual symptoms.

In the selection of patients, the first series given in Tables I, II and III were all females. Series II and III in each case were males. Physique, general health and lack of extensive anæsthesia in injection sites were taken into consideration in the selection of patients for treatment. These factors, together with the approximate age of the patient, are recorded in each Table in columns 2 and 3.

The observations on each set of series were made after another set was completed so that the results given in each Table are independent of each other.

To avoid as far as possible the influence from varying climatic conditions, injections were made at the most stable seasons of the year when patients were not so liable to fall ill from malaria or other causes which would interfere with the course of treatment. The observations in Tables I and II were made in 1929, after the " rains." The period covered by Table I was from the end of August to about the end of September, and the period covered by Table II was from about the end of September to about the end of October. Table III covers the period of the month of June, 1930, which is the latter part of the hot, dry season in Bengal immediately before the " rains."

Pain Factor.

Observations of the signs and symptoms of the pain experienced by each patient were made in the early morning

SOME OBSERVATIONS ON THE INFLUENCE C PAIN REACTION IN THE ADMINISTRATIO SUBCUTANEOU

TAB

(*Patients accustom*

No. and Sex of Patient Treated.	*Leprosy Classification.*	*Remarks on Areas of Anæsthesia possibly affecting Pain Factor. General Health (G.H.) and Age.*	*Fraction of Sodium Hydnocarpate.*	*Left arm, 2 c.c.* Days after Injection. 1	2	3	P.F. (3)	*Right arm, 3 c.c.* Days after Injection. 1	2	3	P.F. (3)	*Left leg, 4 c.c.* Days after Injection. 1	2	3	4	P.F. (3)
Series I (Mon. & Thurs.)																
1 F	C_1/N_2	R. leg probably affected. G.H., good. Age about 40	A	—	[I] —	—	0	v.s.	—	[I] —	0	v.s.	—	—	—	0
2 F	C_3/N_2	Injection areas unaffected. G.H., good. Age about 35	B	v.s.	—	—	0	v.s.	v.v.s.	—	0	v.v.s.	—	—	—	0
3 F	N_1	Anterior R. leg (probably no effect). G.H.,very good. age under 30	C	—	[I] —	—	0	v.s.	—	[I] —	0	v.v.s.	—	—	[I] —	0
4 F	N_1/N_2	Both legs affected. G.H., good. Age about 30	D	v.s.	v.s.	[I] v.s.	0	v.s.	v.v.s.	[I] v.v.s.	0	v.s.	—	—	—	0
5 F	C_1/N_2	R. arm probable, both legs and R. thigh slightly. G.H., fair. Age 30/40	E	—	—	—	0	v.s.	—	—	0	—	—	—	—	0
Series II (Tues.& Fri.)																
6 M	C_2/N_2	Injection sites unaffected. G.H., good. Age about 30	A	—	—	—	0	—	—	—	0	v.v.s.	—	—	—	0
7 M	N_1/N_2	Injection sites unaffected. G.H., fair. Age, 30/40	B	—	—	—	0	v.s.	v.s.	—	0	s.	v.s.	—	—	0
8 M	N_2	Anterior both legs, R. leg probably slightly affected G.H., good. Age about 28	C	—	—	—	0	—	—	[I] —	0	v.s.	—	—	—	0
9 M	N_1	Injection sites unaffected. G.H., good. Age about 24	D	v.s.	—	—	0	v.s.	v.s.	—	0	p	v.s.	—		33·
10 M	C_1/N_2	Injection sites unaffected. G.H., very good. Age about 28	E	—	—	—	0	v.s.	v.s	—	0	v.s.	—	—	—	0
Series III (Wed. & Sat.)																
11 M	C_1/N_2	L. leg affected. Diminished sensation R. leg G. H., fair. Age about 30	A	v.s.	—	—	0	v.s.	v.s.	—	0	v.s.	s.	v.v.s.	—	0
12 M	N_1/N_2	L. leg probably affected. G.H., fair. Age about 30	B	p.	v.s.	—	33·3	s.	v.s.	N (4) v.s.	0	s.	v.s.	v.v.s.	—	0
13 M	N_2	Both legs, anterior and posterior. R. thigh ant. G.H., very good. Age about 50	C	v.s.	—	—	0	v.s.	—	—	0	v.s.	—	—	—	0
14 M	N_1/N_2	Both legs affected. G.H., very good. Age, 40/50	D	v.s.	v.s.	—	0	s.	v.s.	v.v.s.	0	s.	v.s.	v.v.s.	—	0
15 M	N_1/N_2	L. arm ant. Both legs ant. G.H., very good. Age about 40	E	v.s.	—	—	0	v.s.	—	[I] —	0	v.s.	—	—	—	0

p=pain, m.p.=much pain, m.p.i.=much pain increasing, p.d.=pain decreasing, s.=slight pain,

THE HYDROGEN-ION CONCENTRATION ON THE OF SODIUM HYDNOCARPATE SOLUTIONS BY ILTRATION.

"*Alepol.*")

Right leg, 6 *c.c.*					*Left thigh*, 8 *c.c.*					*Right thigh*, 10 *c.c.*						
Days after Injection.				P.F. (4)	*Days after Injection.*				P.F. (4)	*Days after Injection.*				P.F. (5)	*Remarks.*	Average P.F. for each Injection course
1	2	3	4		1	2	3	4		1	2	3	4			
v.v.s.	v.v.s.	—	— N (5)	0	v.s.	—	—	—	0	v.s.	v.v.s.	—	—	— N (8)	0		0
v.v.s.	v.s.	v.v.s.	v.v.s.	0	v.s.	s.	v.s.	—	0	s.	p.	s.	s.d.	v.s.	20	N(5), N(8) = No sensation after 5th and 8th days.	3·3
v.s.	—	—	—	0	v.s.	—	—	— N (5)	0	v.s.	—	—	—	— N (6)	0		0
v.s.	v.s.	v.s.	—	0	p.	p.i.	s.	v.s.	50	p.	p.i.	s.	v.s.	v.s.d	40	N (5), N (6) = Normal 5th and 6th days	15·0
—	—	—	[I] —	0	v.s.	—	—	—	0	v.s.	m.p.	m.p.	i. s.	[I] —	40	The slight induration noticed with 2,3 and 4 c.c. disappeared after 5 or 6 days	6·7
v.s.	v.s.	—	—	0	s.	m.p.	p.	[I] s. N (8)	50	s.	p.	s.	v.s.	[I] —	20		11·7
v.s.	v.s.	v.v.s.	—	0	v.s.	m.p.	p.d.	p.d.	75							Injections stopped after 8 c.c. on account of Fever	15·0
—	s.	v.s.	—	0	v.s.	—	—	— [I]	0	v.s.	v.v.s.	—	—	—	0		0
s.	s.	v.s.	—	0	p.	m.p.	p.d.	p.d. N (6)	100							Injections stopped after 8 c.c. Normal on 8th day	26·7
s.	p.	s.	[I] v.s.	20	s.	p.	p.d.	s.	50	p.	m.p.	s.	s.	[I] N.(8) v.s.	40	N(6), N(8) = Normal on 6th and 8th days	18·3
																Injections stopped after 4 c.c. on account of Fever	
p.	p.i.	p.d.	[I] N (6) s.	75	p.	p.d.	p.d.	N (8) v.s.	75							N(4), N(6), N(8)= Normal on 4th, 6th and 8th days	36·7
s.	v.s.	v.v.s.	—	0	v.s.	—	—	—	0	s.	v.s.	v.v.s.	—	—	0		0
v.s.	p.	p.d.	(I) N(6) s.	50	p.	m.p.	m.p.	N (12) d p.	100							N(6), N(12)=Normal on 6th & 12th days. Injections stopped at 8 c.c. Pain and Induration	30·0
v.s.	v.v.s.	—	—	0	v.s.	s.	v.s.	—	0	p.	m.p.	p.	s.	[I] N.(6) v.s.	60	N(6) = Normal on 6th day	10·0

v.s. = very slight, I = induration, P.F. (3) = Pain Factor, 3 being the normal for that injection (*see* above).

SOME OBSERVATIONS ON THE INFLUENCE C
PAIN REACTION IN THE ADMINISTRATIO
SUBCUTANEOU

TAB

(*Patients accustom*

No. and Sex of Patient Treated.	*Leprosy Classification.*	*Remarks on Areas of Anæsthesia possibly affecting Pain Factor. General Health (G.H.) and Age.*	*Fraction of Sodium Hydnocarpate.*	*Left arm, 2 c.c.* Days after Injection. 1	2	3	P.F. (3)	*Right arm, 3 c.c.* Days after Injection. 1	2	3	4	P.F. (3)	*Left leg, 4 c.c.* Days after Injection. 1	2	3	4	P.F. (3)
Series I. (Thurs. & Mon.)																	
16 F	N_1/N_3	Injection areas unaffected G.H., very good. Age about 35	A	v.s.	v.v.s.	—	9	v.s.	m.p.	p.d.	N_9 s.	66·7	v.s.	v.s.	v.v.s.	—	0
17 F	N_3	Both legs affected, Anterior thighs slightly G.H., good. Age, 40/50	B	—	v.s.	—	0	—	—	—	[I] —	0	—	—	v.s.	—	0
18 F	C_1/N_3	Injection areas unaffected. G.H., fair. Age about 40	C	v.s.	v.v.s.	—	0	v.s.	s.	v.s.	—	0	v.s.	v.s.d.	v.v.s.	—	0
19 F	N_3	Injection areas unaffected. G.H., very good. Age about 40	D	v.s.	v.v.s.	—	0	s.	m.p.	m.p.	N_{10} m.p.	100	p.	s.	v.s.	[I] v.s.	33
20 F	N_1/N_3	Right leg anterior slightly affected. G.H., good. Age about 40	E.	s.	v.s.	—	0	s.	p.	s.	N_9 v.s.	33·3	s.	s.d.	v.s.	v.s.	0
Series II. (Fri. & Tues.)																	
21 M	C_3/N_3	Injection areas unaffected. G.H., good. Age about 35	A	—	—	—	0	—	v.s.	m.p.	N_6 s.	33·3	—	v.s.	—	—	0
22 M	C_1/N_3	Both legs affected. G.H., good. Age about 40	B	—	—	—	0	—	—	—	—	0	—	—	—	—	0
23 M	N_1/N_3	Both legs anterior. G.H., good. Age about 26	C	v.v.s.	—	—	0	s.	v.s.	v.v.s.	—	0	s.	s.	v.s.	v.v.s.	0
24 M	N_3	R. leg affected, L leg slightly G.H., very good. Age about 50	D	—	—	—	0	s.	v.s.	—	—	0	s.	s.d.	v.s.	N_7 v.v.s	0
25 M	C_3/N_3	L. leg slightly affected G.H., very good. Age about 40	E	—	—	—	0	v.s.	v.s.	—	—	0	v.s.	—	—	—	0
Series III (Sat. & Wed.)																	
26 M	C_1/N_3	Both legs affected (Anterior and half posterior) G.H., good. Age about 40	A	—	—	—	0	v.s.	—	—	—	0	—	—	—	—	0
27 M	C_1/N_3	R. leg slightly affected G.H., very good. Age about 35	B	v.s.	—	[I] —	0	v.s.	p.	v.s.	[I] —	33·3	v.s.	—	—	—	0
28 M	C_3/N_3	Injection areas unaffected. G.H., fair. Age about 30	C	s.	v.s.	[I] v.v.s.	0	—	s.	—	—	0	v.s.	—	—	—	0
29 M	C_3/N_3	Injection areas unaffected. G.H. good. Age about 30	D	—	—	—	0	—	s.	—	—	0	—	—	—	—	0
30 M	N_1/N_3	R. leg affected. G.H., very good. Age about 20	E	v.s.	—	—	0	—	—	—	—	0	—	—	—	—	0

p = pain, m.p. = much pain, m.p.i. = much pain increasing, p.d. = pain decreasing, s = slight pain,

THE HYDROGEN-ION CONCENTRATION ON THE OF SODIUM HYDNOCARPATE SOLUTIONS BY FILTRATION.

I

to '*Hydnocreol*')

Right leg, 6 c.c. — *Days after Injection.* 1	2	3	4	5	P.F. (4)	*Left thigh, 8 c.c.* — *Days after Injection.* 1	2	3	4	5	P.F. (4)	*Right thigh, 10 c.c.* — *Days after Injection.* 1	2	3	4	5	P.F. (5)	*Remarks.*	Average P.F. for each Injection Course
v.s.	p.	s.	v.s.	N_6 v.s.	25	—	v.s.	p.	s.	v.s.	25	s.	m.p.	p.	s.	N_6 v.s.	40	N_9, N_6=normal on 9th and 6th days	26·1
v.s.	v.v.s.	—	—	—	0	v.s.	v.v.s.	—	—	[I] —	0	v.s.	p.	p.d.	s.	N_7 v.s.	40	N_7=normal on 7th day	6·7
s.	v.s.	—	—	—	0	s.	v.s.	—	—	—	0	v.s.	v.v.s.	—	—	—	0		0
p.	p.	p.	s.	v.s.	75	s.	s.d.	v.s.	—	—	0	s.	s.	s.	v.s.	—	0	Much pain and induration from 3 c.c. Normal 10th day	34·7
v.s.	v.v.s.	—	—	—	0	v.s.	p.	s.	v.s.	N_7 v.v.s.	25	s.	m.p.	s.	s.d.	N_9 p.	40	N_9, N_7=Normal on 9th and 7th days	16·4
—	—	—	—	—	0	—	p.	p.d.	p.d.	N_6 v.s.	75	v.s.	p.	p.d.	s.	N_6 s.d.	40	N_6=Normal on 6th day	24·7
—	v.s.	—	—	—	0	—	s.	v.s.	—	—	0	p.	p.d.	s.	—	—	40		6·7
s.	v.s.	—	—	—	0	v.s.	m.p.	p.d.	s.	[I] v.s.	50	p.	m.p.	p.d.	s.	—	60		16·3
s.	p.	p.	s.	N_6 v.s.	50	v.s.	p.	p.d.	s.	N_6 v.s.	50	s.	s.d.	s.d.	v.s.	v.v.s.	0	N_7, N_6=Normal on on 7th and 6th days. Slight fever on 2nd day after injection, 6 c.c.	16·7
—	—	—	—	—	0	v.s.	p.	p.d.	s.	v.s.	50	v.s.	p.	m.p.	p.	N_8 s.	60	N_8=Normal on 8th day	18·3
v.v.s.	v.v.s.	—	—	—	0	v.s.	m.p.	p.d.	v.s.	—	50	v.s.	p.	s.	v.s.	—	20		11·7
s.	s.d.	v.s.	—	—	0	s.	m.p.	p.	p.d.	N_{10} p.d.	100							Injection stopped after 8 c.c. on account of non-absorption. N_{10}= Normal on 10th day	26·7
s.	—	—	—	—	0	s.	—	—	—	—	0	v.s.	v.s.	—	—	—	0		0
—	v.s.	—	—	—	0	v.s.	v.s.	v.s.	—	—	0	p.	m.p.	p.	p.d.	N_8 p.d.	100	N_8=Normal on 8th day	16·7
—	v.s.	v.v.s.	—	—	0	—	—	—	—	—	0	v.s.	p.	s.	v.v.s.	—	29		3·2

v.s.=very slight, I=induration, P.F. (3)=Pain Factor, 3 being the normal for that injection (*see* above).

of each day before injections were given. A record was thus obtained for each 24-hour period following each injection until no further sensation at the site of the injection was experienced. These observations are recorded in the Tables under each injection and site of injection. What the author considered to be more than a normal sensation from an injection was recorded as " pain " (p) and anything less than this ignored in calculating the " P.F." as given below. By examining the patients consecutively each day apart from each other, the relative pain recorded was more or less constant. Induration was noted and if severe pain or fever developed during a course of injections, the course was stopped. It was generally found that if the general health of the patient fell much below normal, his pain reaction was more intense.

In order to collate the pain records for the injection courses for comparative purposes, a mathematical expression has been originated which the author has termed the " Pain Factor " denoted by the abbreviation " P.F." This value is arrived at as follows :—

For each particular injection, a normal period in days has been given as the time through which a normal sensation for that particular injection would disappear if unaccompanied by real pain. This period is given thus :—" P.F." (3), " P.F." (4), " P.F." (5), *i.e.*, 3, 4 and 5 days the period is taken as the normal for these " Pain Factors " respectively for the particular volumes injected to which they apply. The normals thus adopted are (3) for injections of 2, 3 and 4 c.c. ; (4) for 6 and 8 c.c., and (5) for 10 c.c.

If only slight, gradually disappearing pain was observed for a particular injection, this was considered to be normal and the " P.F." for that injection recorded as zero. If real pain (recorded as " p ") was observed on say two days during the period of sensation following an injection whose normal is given as (3), then the " P.F." for that particular injection period is given as

$$\frac{2}{3} \times 100 = 66{\cdot}7$$

so that the " P.F." for that injection is 66·7. Should pain (" p ") have been observed on three days or more for the same injection on another patient, then the " P.F." for that patient for that particular injection would be 100.

In such a manner a mathematical expression for the pain found has been recorded for each injection made. This value has been averaged for the injection courses

(see Tables I, II and III) and then again averaged for the three series in each Table for the same fraction of sodium hydnocarpate (see Table IV). The " P.F." for each sample is then given as a final mean in Table IV. In this way, for the samples A, B, C, D, E, a mean " Pain Factor " has been determined from a course of injections over two different periods of about a month each and on six patients for each particular fraction of sodium hydnocarpate. The mean " P.F." for the fractions F, G, H, J, is based on one period of a month and for three patients for each sample. In this case, it was not practicable to carry on observations for a second period during the " rains " and the necessary time was not later available.

It will be realised that the " P.F." as a mathematical expression for each sample of sodium hydnocarpate, is not meant to carry any standard significance as a measurement of the pain value beyond being a measure which, to the mind of the author, is of use for relative purposes and for comparisons in the investigations here recorded. So far as the personal equation of the experimentalist is the same and other factors influencing the pain reaction can be kept common, then the " P.F." is a measure which appears valuable for comparative purposes.

The " P.F." for each fraction of sodium hydnocarpate examined with its corresponding pH is given in Table V.

CONCLUSIONS.

An examination of Table V does not justify the conclusion of a definite relationship between the variations of pH and " P.F." over the limited range of pH examined. For example, the fractions of sodium hydnocarpate C, G and J, giving a pH for the solution injected of 8·19, 8·60 and 9·25 respectively, gave in each case the very low " P.F." of 3·1, 2·8 and 3·3 respectively. Thus, the samples having the lowest and highest alkalinity give equally good results so far as an exceedingly low pain reaction is concerned.

A high pH value, therefore, does not indicate a high " Pain Factor " other conditions being the same.

The writer regrets that he was unable to make a more extensive series of experiments with different strength solutions of the same products and also with further samples of sodium hydnocarpate prepared from the fatty acids from hydnocarpus oil whose " P.F." had also been determined. So far as he is aware, it has not yet been shown whether sodium hydnocarpate prepared from oils which

TABLE

No. and Sex of Patient Treated.	Leprosy classification.	Remarks on Areas of Anæsthesia possibly affecting Pain Factor. General Health (G.H.) and Age.	Fraction of Sodium Hydnocarpate.	Left arm, 2 c.c.				Right arm, 3 c.c.				Left leg 4 c.c.			
				Days after Injection.			P.F. (3)	Days after Injection.			P.F. (3)	Days after Injection.			P.F. (3)
				1	2	3		1	2	3		1	2	3	
Series I. (Sat. & Wed.)															
		R. leg ant. (probably no effect).													
3 F.	N_1	G.H., very good. Age under 30	F	—	—	—	0	v.v.s.	—	—	0	—	—	—	0
		Injection areas unaffected.													
2 F.	C_3/N_2	G.H., good. Age about 35	G	v.v.s	—	—	0	v.v.s.	—	—	0	v.v.s.	v.s.	—	0
		Injection areas unaffected.													
16 F.	N_1/N_2	G.H., very good. Age about 35	H	v.v.s.	v.v.s.	—	0	v.s.	v.v.s	—	0	v.s.	v.v.s.	—	0
		Injection areas unaffected.													
31 F.	N_1	G.H., very good. Age about 25	J	—	—	—	0	—	—	—	0	—	—	—	0
Series II (Fri. & Tues.)															
		Anterior both legs.													
23 M.	N_1/N_2	G.H., good. Age about 26	F	v.v.s.	—	—	0	v.v.s.	—	—	0	v.s.	v.v.s.	—	0
		Right leg affected.													
30 M.	N_1/N_2	G.H., very good. Age about 20	G	—	—	—	0	—	—	—	0	—	—	—	0
		Injection areas unaffected													
29 M.	C_3/N_2	G.H., good. Age about 30	H	v.v.s.	—	—	0	v.s.	—	—	0	v.s.	v.v.s.	—	0
		R. leg slightly affected.													
27 M.	C_1/N_2	G.H., very good. Age about 35	J	v.v.s.	—	—	0	v.v.s.	—	—	0	v.s.	v.v.s.	—	0
Series III (Thurs. & Mon.)															
		Anterior both legs. R. leg probably slightly affected.													
8 M.	N_2	G.H., good. Age about 28	F	v.v.s.	—	—	0	v.s.	—	—	0	s.	v.s.	—	0
		Injection areas unaffected.													
9 M.	N_1	G.H., good. Age about 24	G	v.s.	—	—	0	v.v.s.	—	—	0	v.s.	—	—	0
		Injection areas unaffected.													
6 M.	C_2/N_2	G.H., good. Age about 30	H	v.s.	v.v.s.	—	0	v.s.	v.v.s.	—	0	v.s.	—	—	0
		Injection areas unaffected.													
32 M.	N_1/N_2	G.H., good. Age about 30	J	v.v.s.	v.v.s.	v.v.s.	0	v.s.	v.v.s.	—	0	v.s.	v.v.s.	—	0

TABLE IV.

P.F. AVERAGES.

Fraction of Sodium Hydnocarpate.	Table I.				Table II.				Final Mean P.F.
	Series I. P.F.	*Series II. P.F.*	*Series III. P.F.*	Average P.F. for 3 series of Infection Courses.	*Series I. P.F.*	*Series II. P.F.*	*Series III. P.F.*	Average P.F. for 3 series of Infection Courses.	
A	0	11·7	—	5·9	26·1	24·7	11·7	20·8	13·4
B	3·3	15·0	36·7	18·3	6·7	6·7	26·7	13·4	15·9
C	0	0	0	0	0	18·3	0	6·1	3·1
D	15·0	26·7	30·0	23·9	34·7	16·7	16·7	22·7	23·3
E	6·7	18·3	10·0	11·7	16·4	18·3	3·3	12·7	12·2
	Table III.								
F	0	23·3	0	7·8					7·8
G	0	0	8·3	2·8					2·8
H	15·8	6·7	15·8	12·8					12·8
J	0	0	10·0	3·3					3·3

II.

Right leg, 6 c.c. — *Days after Injection.* 1	2	3	4	P.F. (4)	*Left thigh, 8 c.c.* — *Days after Injection.* 1	2	3	4	5	P.F. (4)	*Right thigh, 10 c.c.* — *Days after Injection.* 1	2	3	4	5	P.F. (5)	*Remarks.*	Average P.F. for each injection course
v.s.	—	—	—	0	v.s.	—	—	—	—	0	s.	s.d.	s.	—	—	0	Patient formerly on "Alepol"	0
v.s.	—	—	—	0	s.	v.s.	—	—	—	0	s.	v.s.	—	—	—	0	" " "	0
p.	v.s.	—	—	25	m.p.	p.	v.s.	—	—	50	s.	m.p.	s.	—	—	20	Patient formerly on Hydnocreol	15·8
—	—	—	—	0	—	—	—	—	—	0	s.	—	—	—	—	0	New patient	0
p.	s.	v.s.	[I] —	25	m.p.	p.	p.d.	s.	—	75	m.p.	p.	s.	v.s.	—	40	Formerly on Hydnocreol	23·3
—	—	—	—	0	s.	—	—	—	—	0	s.	s.d.	—	—	—	0	" " "	0
—	—	—	—	0	p.	s.	v.s.	v.s.	—	0	m.p.	m.p.i.	s.	s.	v.s.	40	" " "	6·7
v.s.	—	—	—	0	s.	v.s.	—	—	—	0	v.s.	s.	—	—	—	0	" " "	0
v.s.	—	—	—	0	s.	—	—	—	[I] —	0	s.	v.s.	—	—	—	0	Formerly on "Alepol"	0
v.s.	v.v.s.	—	—	0	p.	p.d.	s.	—	—	50	s.	v.s.	—	—	—	0	" " "	8·3
v.s.	v.v.s.	v.v.s.	—	0	p.	p.d.	p.d.	s.	—	75	s.	m.p.	s.	v.s.	—	20	" " "	15·8
v.s.	v.v.s.	—	—	0	s.	s.	v.s.	v.s.	—	0	p.	p.	p.	s.	N8 v.v.s.	60	" " " N8=normal on 8 th day	10·0

TABLE V.

SHOWING RELATION OF P.F. TO HYDROGEN-ION CONCENTRATION.

Fraction of Sodium Hydnocarpate. (*See also Notes on Solutions, p. 69*).	pH 3% Aqueous solution with 0·5% Carbolic Acid. Quinhydrone Electrode. (Brown and Broom's Apparatus.)	*c.c. N/10 Na OH required to neutralise 0·5 gms. in 20 c.c. H_2O to phenolphthalein.*	*P.F. Patients accustomed to "Alepol." (From Table I.)*	*P.F. Patients accustomed to "Hydnocreol." (From Table II.)*	Mean Pain Factor P.F.
C	8·19	1·4	0	6·1	3·1
B	8·40	0·8	18·3	13·4	15·9
G	8·60	1·3			2·8
A	8·75	0·1	5·9†	20·8	13·4
D	8·86	0·45	23·9	22·7	23·3
E*	8·89	0·45	11·7	12·7	12·2
H	8·90	0·8			12·8
F*	8·95	0·5			7·8
J	9·25	0·15			3·3

* Commercial products. † From two series only.

N.B.—Samples A, B, C, D, E are prepared from the same fraction X of the fatty acids from Hydnocarpus Oil. Samples F, G, H, J are further samples separately prepared.

give much pain in treatment, also give pain themselves on injection.

The commercial products tested (E and F) give a comparatively low pain reaction, F being the better product from this standpoint.

The samples C and G which gave slight precipitation and opalescence in solution respectively, gave a very low pain reaction (3·1 and 2·8 respectively). Such slight precipitation and opalescence in the solution, when due to chemical and not biological reasons, does not, therefore, indicate that there will be excessive pain.

Comparative experiments on the addition of glycerine to sodium hydnocarpate solutions to reduce the pain reaction have been made and will be communicated in a following paper.

The author desires to thank Dr. R. G. Cochrane who made this investigation possible and also Dr. T. A. Henry for so kindly supplying the preparations of sodium hydnocarpate and determining their pH values.

He would also specially like to express his thanks to all his friends without whose cheerful and willing co-operation as patients, these tests could not have been carried out.

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Grants for Leprosy Work.

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

SOUTHERN RHODESIA.	£
For special leprosy survey work	200

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.

Leprosy in Korea with Special Reference to the Soonchun Leprosy Colony.

R. M. WILSON.

WHILE there is nothing startling to report yet we are greatly encouraged with the results of treatment and believe that with faith, determination and persistence, most cases in the early stages of the disease will respond to treatment satisfactorily. We have found nothing so good, simple and economical as plain chaulmoogra oil with camphor, 4 to 6 ccs. given subcutaneously twice a week. While this is the chief drug, there are other things of importance, *viz.*, exercise and out-door employment. We find that vegetable gardening is one of the best activities for patients, as there are very few who cannot take some part, even the blind, and it gives out-door exercise, diversion, interest and, what is very important from an economic standpoint, it reduces the expenditure on vegetables. The raising of white rabbits is also a useful occupation and provides the cheapest source of meat. There are several thousand in the colony.

Ultra violet rays are proving of benefit in the treatment, so we take advantage of the sun's rays. Our patients wear short sleeves, take off their shirts while at work, and start the exposure early in the spring. Other activities are tennis and football for the pupils in school, carpentry, tin and blacksmith shops and various forms of home industries. The busier the patients are the better. However, it is not easy to persuade 750 Koreans to work when there is a good, hot floor near by. In the past, sufferers in certain places made long and strenuous trips to temples and high places to appease the spirits and after a few months were found to have improved. The real benefit from such a journey was from the exercise and activity. Exercise and life in the open is a most important aid in treatment.

Another very important point which has been stressed by others is that complicating disease should be given prompt treatment. Chief among these is syphilis, tuberculosis, nephritis and hookworm. We give each syphilitic case ½ gr. salyc. mercury dissolved in the chaulmoogra oil and in this way combine the injections. Care of the teeth and extractions of carious ones are important.

Finding the acid fast bacilli in the sputum of leprosy patients does not mean that they are necessarily tubercular,

for frequently the mycobacterium lepræ will be found in the sputum as a result of ulceration of the respiratory tract. Before making a diagnosis one should consider the pulse, temperature and physical signs. We have isolated such cases on this evidence alone, only to see them increase in weight and improve rapidly on suitable diet.

Among our 750 cases, 21 of them are blind, and 92 (12 per cent.) have some eye complication or weakness. Our patients feel sure that the esters were injurious to the eyes, but I cannot agree with this. One hundred and thirteen of the patients received chaulmoogra by mouth and six hundred and seven by injection. They are excused from injection only if some complication arises or for some other good reason. Treatment by injection is, of course, the best and most economical method. Unless taken in large doses, the oral route is not as effective as injections. During the year, we had 30 abscesses and that is 30 too many. We now boil the needles in linseed oil which is an improvement. Twenty cases had lepra reaction or fever. Often patients will pick up and make rapid improvement after such reactions, though, occasionally, there is retrogression. Four hundred and fifty of our cases are leading an active life and 270 are, more or less, helpless owing to their infirmities We obtain our oil in 50-gallon tanks from Bangkok, Siam. The tank is placed on a charcoal fire to melt the oil, filtered through a few layers of gauze and drawn off into pound bottles which are put into an autoclave or water bath, when the 5 grams of camphor are added. Iodine is applied before and after each injection.

In the Philippines, where 2,818 injections of the esters were given, 70 per cent. made complaints of pain, dizziness, fever, headache, cough, etc. It is almost impossible to persuade our patients to take the esters. Recently the Government gave a supply of the esters to a beggar settlement situated near us and they refused to take the esters, even though in doing so they would have no treatment at all. However, some of the big institutions continue to use the esters with good results.

On a recent trip to Tokyo, I visited the Zensei Byo-in settlement, 20 miles from the heart of the city, where 1,000 cases are housed in one of the best institutions I have seen. They have a staff of six doctors, under the very able leprologist, Dr. Mitsuda. They carry on many splendid activities and are doing a high grade of work. Practically every form of leprosy tissue is demonstrated in both gross and microscopic form, also wax figures showing all shades

and conditions of the disease. The patients have gardens and shops and print a paper, and in every way it is an active and wideawake place. There are 15 Koreans among those cases who are fortunate enough to be in such a fine institution.

During our meeting in Tokyo, the Government officials reported their plans for the eradication of leprosy from the empire in the next 30 years. Much enthusiasm is being aroused, and I feel that there is a brighter day ahead for those suffering from leprosy. I believe far more rapid progress will be made if sufferers from leprosy were under strictly medical men rather than the police, who often do not understand the situation and are very fearful of contact with the disease. There is such a fear that it is almost impossible to help clinics or give patients treatment outside of the four leprosy institutions. Splendid work is being done in the Philippines and in India by doctors at outpatient clinics and hospitals, and any who can do so are encouraged to give treatment to those suffering from the disease. In this country, however, in practically every town and village, the doctors are so fearful of attracting a few cases to their dispensaries that treatment cannot be obtained. Consequently, hundreds of cases of leprosy travel from one place to another seeking care and relief, only to be driven away. I have tried in several places to start clinics, but have been unsuccessful on account of the fear of attracting cases to the district.

In Bihar, India, last year, 5,923 cases were treated in outpatient clinics at a very small cost and with good results. In India, many of the doctors are given a special course of training concerning the disease and this encourages them to treat the cases which come to them. Only a little over 2,000 of the probably 20,000 sufferers in Korea are receiving treatment, and many of these are blind, non-infectious arrested cases beyond hope of a cure. The other 18,000 cases, however, in the earlier stages of the disease, are unattended and are spreading the infection.

As the Japanese Government has shown itself in the past to be efficient and active in dealing with sanitary questions, no doubt the problem of leprosy will be taken in hand and dealt with efficiently in the near future.

INDIAN SECTION.

A Note on the Treatment of Some Common Leprous Lesions of the Ear, Nose and Throat.

G. R. RAO.

(*Reprinted from "The Superintendent."*)

MY object in writing this short note is to place before readers my own experience with some lines of treatment adopted by me in dealing with these lesions, so that it may serve to stimulate interest in this subject. Our knowledge of the leprous lesions of the ear, nose and throat, is still far from complete. We have no standard lines of treatment to deal with these lesions which, if left untreated, lead to various disfiguring deformities. This, then, is my only apology for writing this note.

Lesions of the Ear—External Ear—The Pinna.

Two types of lesions are common :—(1) anæsthesia, hyperesthesia or paræsthesia, either singly or in combination, generally met with in nerve type of cases, and (2) nodules or diffuse infiltrations—in skin type of cases. When sensory disturbances are present, thickening with or without pain or tenderness of either the great auricular nerve, auriculo-temporal nerve, or posterior auricular nerve or of any two of these, can be found ; the areas of the pinna supplied by the affected nerve or nerves manifesting the sensory disturbances. Such lesions of the pinna are very easily overlooked as the patients never complain of them. In suspected early cases of leprosy, the pinna should be examined for signs of sensory disturbances, whether such manifestations are present or absent elsewhere.

Treatment.

Painting an aqueous solution of trichloracetic acid, strength 1 in 5, once in 10 days, is the local treatment generally adopted. This, undoubtedly, serves to clear up the anæsthesia. But, in cases in which marked thickening of any of the nerves supplying the pinna is found, a nerve stretching operation under local anæsthesia, of the affected nerve, affords remarkable relief.

Nodules and Diffuse Infiltrations of the Pinna.

These lesions begin to appear when the disease advances from the nerve type to the cutaneous type and they are due to the direct presence of M-lepræ. It is noteworthy that

these lesions involve only the skin and the subcutaneous tissues, especially of the margins and the lobule, the cartilage of the pinna practically never being involved. This comparative freedom of the cartilage from leprous infiltration is the basis on which the surgical treatment of the nodules is based.

Treatment.

If the nodules are small or the infiltration is not very extensive, painting once in 10 days with an aqueous solution of trichloracetic acid (strength 1 in 3 or even 1 in 1, depending upon the tolerance of the affected skin) is enough. Or, better still, an intradermal injection into the lesions of ½ per cent. iodised ethyl esters of the hydnocarpus wightiana, using the special intradermal needles, serves a double purpose, viz., local counter irritation and direct action upon the M-lepræ, plus a systemic effect.

If the nodules are large and involve the whole ear margin or if the infiltration is considerable and extends throughout the margin, excision of all the excrescences, using a special curved forceps or clamp, is the best method of treatment. As most of the leprosy workers are familiar with this excision operation it is unnecessary to detail it here.

Auditory Canal.

Leprosy *per se* does not affect the auditory canal.

Middle Ear and Internal Ear.

A close study of the literature on leprosy does not reveal any instance of the direct involvement of either the middle or the internal ear. The middle ear may be involved by a spread from the nose, through the eustachean tubes, and it is not very uncommon to find case of eustachean deafness among B_2 and B_3 cases. But when one considers the number and severity of the lesions of the nasal cavities in B_2 and B_3 cases, at least, and the ease with which the leprous infiltration can extend through the eustachean tube to the middle ear, it is rather surprising that cases of eustachean deafness and other middle ear affections are not more frequent.

Nose.

Almost all the types of skin lesions are met with in the nose. Thus: externally, anæsthetic, hyperesthetic or paræsthetic areas, hypopigmented patches, erythematous patches and nodules may be present either singly or in combination. Internally, the nasal mucous membrane may show either anæsthesia or hyperesthesia and corresponding

to the hypopigmented patches with parakeratosis of the skin, there may be dry rhinitis with scabs. In the cutaneous type of case nodules or infiltration of the nasal cavities may be present. These nodules may break down forming ulcers. Such ulcers, by virtue of their concealed situation in a highly septic cavity such as the nose, take a long time to heal and are very difficult to deal with. The nasal septum may be destroyed by the ulcerative process that accompanies the breaking down of nodules or in the secondary nerve stage by absorption or necrosis. In cases with an underlying syphilitic taint, the nasal bones are also absorbed, but in non-syphilitic cases, the nasal bones generally escape and it is the septum which is destroyed. In any case, a flattened nose results.

Dirty, disabled cases with ulcers in the nose generally suffer from myiasis also, the flies being attracted by the foul odour and discharge from the affected nasal cavities.

In cases in which lesions of the face preponderate, severe lesions inside the nose are usually seen. I have seen cases in which the turbinated bones have been destroyed, the maxillary antrums and nasal cavities communicating with each other and forming a big cavity. Destroyed nasal septum is a very common lesion in B_2A_2, B_3 and B_3A_2 cases. Large nodules in the nasal cavities may swell during reactions and cause obstruction to respiration.

Nose-Pharynx.

Nodules and ulcers are the commonest lesions in this region. Ulcers sometimes cause an erosion of a small neighbouring vessel, giving rise to epistaxis, which may be difficult to treat.

Treatment.

A thorough examination of the nasal cavities with a good speculum is the first essential. I use a small, compact and cheap, ear, nose and throat outfit, supplied by the Medical Supply Association Ltd., of London, and I find it so very useful that I have no hesitation in recommending it to all leprosy workers, specially to those who have to deal with large numbers of advanced skin cases.

For Dry Rhinitis with Scabs.

Irrigation of the nose with warm boracic lotion, 1 in 80, and thorough drying of the nasal cavities with a clean, cotton swab, followed by the instillation of a few drops of iodised glycerine (tr. iodine 1 part, and glycerine 2 parts), once a day will generally suffice. This may be combined with

the painting inside of either 1 per cent. creosoted hydnocarpus oil or ½ per cent. iodised or 1 per cent. creosoted ethyl esters of the same oil.

For Nodules and Ulcers.

Irrigation with warm, 1 in 80 boracic lotion, drying with a cotton swab, and spraying in of a 5 per cent. aqueous solution of chromic acid, using either the "Glaseptic Nebuliser" (P. D. & Co.'s) or the cheaper German apparatus "Triplex," will generally be enough. The chromic acid acts as a mild irritant antiseptic, slightly increases the serous discharge from the ulcers and combining with the inspissated serous discharge, forms a protective coagulum which when dried up, forms a scab. Thus, after spraying the chromic acid solution, on the second day, a big scab will be seen covering the ulcers. This scab, as it dries up further, causes an itching sensation to relieve which, patients generally scratch their noses and try to remove the scabs. It is very important that patients should *not* do this as by disturbing the scab the healing of the ulcers is hindered. At this stage, to relieve the itching sensation and to soften the scab, so that it may come out in bits by itself along with the nasal discharges, I generally spray in, the iodised glycerine solution mentioned already. The glycerine soaks the scab and softens it, and the iodine acts as an antiseptic.

Chromic acid spraying will have to be repeated again as the scabs come away leaving behind partially-healed ulcers. Alternate spraying in of chromic acid solution and iodised glycerine will have to be carried out until all the ulcers heal.

During reactions, as already stated, the swollen and engorged nodules in the nasal cavities and in the naso-pharynx may cause obstruction to respiration. In such cases, to relieve the obstruction, I use the following solution (by spray) which I call for convenience "Ephedrine Co. Spray."

Ephedrine Co.—

℞ Ephedrine, 3 per cent. sol in aqua dist.
Adrenalin, 1 in 1,000 (P. D. & Co.'s).
Atropine sulph, 1 per cent. solution in N. saline. Equal parts of each.

Sometimes, as already mentioned, owing to the erosion of a small artery in the naso-pharynx or to some other cause, intractable epistaxis results. In such cases, "Hæmoplastin" (P. D. & Co.'s) applied to the posterior nares

with a pledget of cotton wool, soaked in it, gives remarkable relief. To be effective, the plugging should be fairly tight. If hæmoplastin is not available, the following cheaper " hæmostatic mixture " might be tried.

Hæmostatic Mixture--

℞ Ephedrine hydrochlor, grs. 5.
Adrenalin, 1 in 1,000 oz. 1 (P. D. & Co.).
Tr. ferri perchlor. fort oz. 1.
Ext. Hammamelis liqd. ad oz. ½.

Naso-pharynx and Pharynx.

Nodules and ulcers are the commonest lesions in these regions and the principles of treatment of these lesions are the same as described before.

The Palate, Fauces and Tonsils.

The hard palate may show sometimes dry, pale and blanched areas roughly corresponding to the depigmented areas on the skin, specially in nerve cases with predominant facial lesions. In cutaneous cases, the hard palate frequently shows small nodules or infiltrated spots and the soft palate, fairly large-sized nodules. These nodules break down and the resulting ulcers render mastication and deglutition painful. When these ulcers heal, they leave behind dark and deeply pigmented scars. In severe cases, the entire soft palate may be destroyed by the ulcers. Perforation of the hard palate is rare among uncomplicated cases, and those that show this lesion usually have an underlying syphilitic taint.

Nodules and ulcers are the commonest lesions on the fauces and the tonsils, and these cause acute dysphagia specially during reactions. The pillars of the fauces may be destroyed by the ulcerative process and the resulting scar tissue may cause a " Stenosis " of the pharyngeal orifice.

Treatment.

The principles of treatment of these lesions are the same as described before, except that these lesions when sprayed with chromic acid solution do not give rise to hard crust formation, as in the nose, and as such require no iodised glycerine application after the chromic.

Tongue.

Nodules and ulcers are the commonest lesions in advanced cutaneous cases (B2 and B3). During reactions, these nodules become swollen and painful, and invariably they break down into ulcers. These ulcers may be so

painful as to render the taking in of any solid food absolutely impossible. I have had two such cases under my care at Cuttack who had to be fed through the nose. In nerve cases with predominant facial lesions, the lingual nerve is sometimes affected, giving rise to loss of the sense of taste. Sometimes, instead of definite nodules, there may be a diffuse infiltration of the dorsum and the margin of the tongue, which condition may be termed " leprous macroglossia."

Treatment.

Gargling, with warm boracic lotion, 1 in 80, or weak Condy's, followed by the application of glycerinum boracic to the ulcers on the tongue, to be continued, until they become less painful. Then, the chromic acid solution, referred to before, may be painted on the tongue. During the acute stage, when the pain is very severe, chromic acid is not tolerated by some patients and, therefore, some bland application has to be tried. For nodules also, repeated application of the chromic acid solution, after gargling, will be enough. As elsewhere, so on the tongue, healed ulcers leave behind dark pigmented scars.

Larynx and Epiglottis.

Nodules and infiltrations, followed by ulcers, are the usual lesions affecting the larynx and the epiglottis, in highly advanced cutaneous cases (B3) and (B3-A2). As usual, these nodules, during reactions, become swollen and cause acute dysphagia and sometimes temporary aphonia, too. It is noteworthy that these nodules and infiltrations involve only the false vocal cords, the true vocal cords generally escaping.

Treatment.

For laryngeal nodules, " Ephedrine Co." spray, followed by 5 per cent. chromic acid solution spray once a day, or if necessary, even twice a day, might be tried. Frequent use of the Ephedrine Co. spray during reactions reduces congestion of the larynx and may help to avoid a tracheotomy. If swollen epiglottis obstructs respiration and does not yield to repeated Ephedrine Co. sprays, then scarification of the epiglottis and the surrounding tissues may be tried. But, if no relief is obtained, even then tracheotomy or laryngotomy must be done to save life.

REFERENCES.

(1) " Leprosy," by Sir Leonard Rogers and E. Muir, 1925.
(2) " Tropical Diseases Bulletins," special Leprosy numbers.
(3) " Leprosy Notes and Reviews," by B. E. L. R. A., London.

Literature.

The following publications can now be obtained from the Association :—

The Empire's Open Sore. Annual Report for 1931.

Leprosy Review, Vol. III, No. 1. January, 1932. Issued quarterly by the Association. Price 2s.

Leprosy, Summary of Recent Work, No. 24.

Leprosy in India, Vol. IV, No. 1. January, 1932. Issued quarterly by the Indian Council of the Association.

Reviews and Notices of Books.

Handbook of Tropical Fevers. Jewell and Kauntze. Baillière, Tindall and Cox. 1932. (Pp. 448, 92 figures. 16s.)

The number of books on tropical diseases is growing every year, and one wonders whether there is room for yet another. Drs. Jewell and Kauntze have issued a handbook on tropical fevers which they claim to have written as " suitable for handy reference for practitioners in the tropics, and for medical men in more temperate climates who may be called upon to treat tropical fevers in patients who have been abroad. We have endeavoured to make the chapters as practical as possible, and in particular we have been careful to emphasise a fact so often lost sight of in these days, that the results of clinical examination are of the utmost importance in diagnosis, and cannot be superseded by laboratory tests."

With this object in view we have read the book with very great interest. The authors have succeeded in their aim to a large extent. This book appears to contain a very well balanced account of the main diseases in the tropics which produce fever.

We are naturally most interested in the chapter dealing with leprosy. There are few accounts which give the practitioner a really well balanced view of the disease, and Drs. Jewell and Kauntze have presented a reasoned account of the disease which should be of very great help to those practising in the tropics. Unfortunately, as is so often the case today, by the time a book is written, parts of it become out of date, and in this connection in the treatment of leprosy more stress is laid on the intramuscular and subcutaneous methods of injection, which were chiefly in vogue up to a year or so back. The book was in the press by the time the intradermal method was widely advocated, and unfortunately it has only been possible to add a footnote. In future editions this will undoubtedly be remedied. Under the Description of Drugs used in Leprosy the usual confusion is seen with regard to definitions. Chaulmoogra oil is the popular name for remedies generally used in leprosy. Even in the old days we believe that most of the so-called chaulmoogra oil was really hydnocarpus oil, and it is time that the former word was dropped out of our vocabulary altogether.

The illustrations in the book are on the whole fairly satisfactory, except the examples in the section on leprosy. There are much better illustrations available, and we suggest that a good deal of improvement could be made in this section.

All those working in the tropics, who wish for a convenient and practical handbook on tropical fevers, could not do better than peruse this volume.

R. G. C.