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CONTENTS

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EDITORIAL

We publish in this number of the Review a contribution from General Sir William Mac Arthur, who is so well known for his erudite papers and researches in old time diseases. General Mac Arthur has spent many years in delving into old and forgotten manuscripts of the middle ages, and therefore what he says can be taken as highly authoritative. This paper does not, as some may think, take away what many of us feel is a divine call in leprosy, neither does it do despite to anything that is written in Holy Writ. We would remind readers in this connection that in the Old Testament, from where most of the traditional beliefs arise, leprosy comes under the laws and regulations of ceremonial uncleanness. These regulations were divided into those which dealt with what might be called temporary uncleanness, and the rite of washing was all that was necessary to re-establish communion. There were on the other hand certain permanent blemishes listed under the law pertaining to leprosy, which resulted in the dread sentence so often wrongly applied " Unclean, Unclean, without the camp shall be his habitation." We would also draw attention to what we believe is a fact, that disease is a manifestation of a disordered world. Modern medical science is demonstrating more and more conclusively that what are called " psychosomatic factors " have a powerful influence in diseased conditions, and therefore health can no longer be looked upon merely as an adequately functioning body, but the healthy state is that condition in which a whole individual finds himself as a result of the complete integration of his body, mind and spirit. To many the call to heal is a divine call, and those who do leprosy work in the majority of instances do so because in this realm of medicine in particular, the need for reassurance and strengthening by spiritual forces is of the utmost importance. In viewing leprosy from this angle let us remember that, while many cases are healed, those who are casualties in the warfare against the *M. leprae* need honourable mention and care, and it is the particular duty of the Christian church, as well as of all men of goodwill, to bring to those in so great distress comfort and consolation, and when possible all the benefits of modern remedial surgery. Let us not add to their distress of mind by causing such sufferers to feel that they are " lepers." They are victims of a disease which, like poliomyelitis, mutilates at times, and all the forces of rehabilitation, including spiritual and mental, should be brought to their aid to re-establish them as worthy members of the community. Readers will note that the editor has allowed the word " leper " to be retained in this article, for he considers that in the description of leprosy as a

mediæval disease this word is used in its right context. Today all workers are in agreement that this word should be banished from our vocabulary when referring to the leprosy of today, which is a disease like any other disease, contagious in certain forms, chronic in its course, sometimes self-healing, but frequently unless modern therapy (which includes surgical) is carefully applied, mutilating and terrible in its end results. Heroes of warfare are not stigmatised. Let us refrain from labelling these brave casualties in the campaign against disease as " Lepers," for this adds gross insult to injury.

The article by Margaret Barnett and S. R. M. Bushby is most interesting in that it shows that isonicotinic acid hydrazide is active in murine leprosy. Unfortunately evidence at hand does not confirm that it is particularly active in human leprosy, and therefore the time has not yet come to use this new drug on an extensive scale; the sulphone preparations are still the drugs of choice. This work indicates that, while it is of value to use mice infected with M.lepraemurium for trials in estimating the efficacy of drugs likely to be successful in human leprosy, conclusions from these trials, while of great interest, may not altogether be applicable in man. This careful investigation by Margaret Barnett and S. R. M. Bushby well illustrates this.

The article on Leprosy in Scandinavia illustrates that, given an enlightened policy, a keen service, and co-operation on the part of the public, leprosy is a disease which can be controlled, and the control of this disease throughout Scandinavia is one of the greatest triumphs of modern preventative medicine. We are pleased to draw our readers' attention to this work, and to pay homage to workers, past and present, in the Scandinavian countries who have added so greatly to our knowledge of leprosy.

The Medical Secretary has given a summary of his recent West African tour. It is encouraging to read of the success of the Nigeria Leprosy Service. Their methods, the excellency of the research of the workers, and the manifest keenness of the whole Medical Department deserves emulation, and it is hoped that other territories will model their leprosy campaigns along similar lines.

Many will have noted in the New Year's honours that those who have done much to forward the cause of leprosy have been honoured by H.M. The Queen. We would extend to Dr. John Lowe our sincerest congratulations on the conferment of the C.B.E. His outstanding work in the development of oral Dapsone therapy is too well known to need further mention. To Miss Wallich, who has been for nearly thirty years the indefatigable Assistant Secretary of the British Empire Leprosy Relief Association, our warm

good wishes are extended, and hearty congratulations on receiving the M.B.E. It is encouraging to find that a tireless worker who quietly strives behind the scenes also receives recognition.

EDITORIAL NOTE
ON LEPROSY IN SCANDINAVIA

In a recent visit to Scandinavia I had the privilege of visiting Prof. John Reenstierna in Upsala, and Dr. Melsom in Bergen. It may therefore be of interest to readers to have up-to-date information with reference to leprosy in Sweden and Norway. Prof. Reenstierna writes as follows with regard to the present position of leprosy in Sweden:—

"Leprosy came to Sweden by the end of the 13th century. Soon afterwards there existed several small leprosy institutions, called 'spitals,' in this country. The inmates were not numerous.

In the middle ages leprosy was confounded with syphilis. No real statistical reports existed before the end of the 18th century. The largest number of cases known in Sweden was in 1873. It amounted at that time to almost 200. After that there was a steady decrease: 89 cases by the end of 1907 (reported to the 2nd International Leprosy Congress at Bergen in 1909); 37 cases by the end of May, 1923 (3rd Congress, Strasbourg, 1923); 9 cases by the end of 1937 (4th Congress, Cairo, 1938); 5 cases by the end of 1947 (5th Congress, Havana, 1948).

By the end of 1951 the number was 4 cases, all women. Two were Swedish subjects, belonging to the neural form; the other two, Estonian refugees, were of the lepromatous form. Their ages were 77, 69, 64, 44 respectively. The old Swedish leprosarium at Jaervsoe was closed at the end of 1940."

It is gratifying to learn that as a result of measures taken to control leprosy during the last fifty or more years, leprosy can now be said to be practically non-existent in Sweden. Prof. Reenstierna was appointed Inspector of Leprosy for Sweden in 1926, and points out that compulsory segregation did not exist in Sweden. Leprosy has come under control and is now eliminated as a result of humane methods of segregation, in which persons suffering from leprosy were only isolated in institutions on a voluntary basis, and in which home segregation was encouraged, resulting in a minimum of contact of healthy persons, particularly children, with infective cases, emphasising once again that partial segregation with adequate

education of the public is a sufficient guarantee that leprosy will come under control.

Dr. Melsom has kindly given me recent information concerning leprosy in Scandinavia, and has permitted me to reprint an article on "Three New Cases of Leprosy," and also with this has sent recent diagrams showing the rapid elimination of leprosy from Norway.

We take the opportunity once again to acknowledge the work of the great Norwegian leprologists, Hansen, Danielssen and Lie, whose reasonable and sympathetic approach to leprosy has resulted in the conquest of the disease in Norway. It is interesting to note that in 1855 there were almost 3,000 cases of leprosy in Norway, and by 1950 only eleven cases remained. It will be remembered that Dr. Lie contributed an article in *Leprosy Review* some years ago, giving the history and decline of leprosy in Norway. In this article it was mentioned that only those cases of leprosy who were unable to isolate themselves under home segregation were isolated in the leprosy hospital in Bergen. Photographs of the Leprosy Hospital in Bergen, of Hansen's laboratory, and a reproduction of a photograph showing a bust of Dr. Hansen will remind readers of the debt we owe to Scandinavia and to the stalwarts of the nineteenth and early part of the twentieth centuries.

Measures which have been taken in Scandinavia to control leprosy serve as a reminder that similar methods, modified according to existing conditions in areas of high endemicity, should attain their objective, and with the modern therapeutic remedies the elimination of leprosy will be, we feel sure, greatly hastened. In this connection it must be emphasised that, as in Scandinavia, so wherever leprosy is prevalent, reasonable measures of segregation must accompany treatment. We already have instances of the success of partial segregation, leading to the control of the disease, and need only refer to the work in the Eastern Province of Nigeria, the Eastern Province of Ceylon, and certain villages in India, in which the experiment of night segregation was inaugurated.

With reference to my recent visit to Scandinavia, I was privileged to have the opportunity of seeing Prof. Reenstierna's and Dr. Halberg's work on the bacteriology of leprosy and tuberculosis, and we hope to publish a summary of these researches in a forthcoming number of the *Review*. Let us, in the present encouraging phases of leprosy work, maintain our perspective and not forget the brilliant pioneer workers, for the better understanding of their work may lead to still further advances, and hasten the day when this age-long scourge will be controlled and ultimately eliminated.

R. G. COCHRANE.

Entrance to St. Jorgen's Hospital showing plaque presented by the 2nd International Leprosy Congress held in Bergen in 1909.

Armour Hansen's laboratory in St. Jorgen's Hospital, Bergen.

Bust of Armour Hansen in Bergen.

St. Jorgen's Hospital

MEDIÆVAL "LEPROSY" IN THE BRITISH ISLES*

by

LT.-GEN. SIR WILLIAM MAC ARTHUR

It is very difficult to estimate the degree of prevalence of leprosy in these islands in mediæval times. The disease existed: that is beyond question, and the first essential in arriving at some idea of its extent and importance is to understand the language of the times, and try to get inside the minds of those who used it. Surely this is obvious enough. No one would dream of writing seriously about Shakespeare's plays without having made a preliminary study of Elizabethan English and the changes in meaning which words have undergone since the poet's day. He would know, for example, that "comply" meant compliment; "curious" meant full of care; "prevent" meant go before; "niece" could stand for granddaughter; and "harlot" might mean a cheat. Yet many persons gaily take up their pens and write on the history of this disease in the mistaken assumption that the words "leper" and "leprosy," and their equivalents, then meant just what they do in the usage of today.

In English the word "leper" originally signified the disease itself, and not as at present the diseased person. This word, in a variety of related forms, runs through the Aryan languages. The basic meaning is, something that peels off; and for this reason it was early applied to the inner bark of trees. The Latin form of the word was *liber*, and as this bark was used to write on, *liber* came to mean a book, so it is interesting to remember that the modern "library" and "leprosy" are in origin the same word.

In the past, "leprosy" and its equivalents had a multitude of meanings. It was used for the true disease and for every disorder that was formerly supposed to be leprosy. The Greek form of the word was *lepra* (*leprós*, scaly), and was applied by the Greeks themselves to scaling skin diseases of the psoriasis type, and never to leprosy for which they used the word "elephantiasis" because of the thickening and corrugation of the skin. Unfortunately "lepra" was adopted as the classical medical term for leprosy, with the result that, by suggestion of the word itself, a host of skin

*Parts of this discourse are taken from papers published under the speaker's name in *Journal of the R.A.M.C.* and *Irish Historical Studies*.

conditions associated with scales or scabs, which have no connection with real leprosy, were identified as manifestations of this disease. The conception that " lepra " conveyed to the minds of the early English clerics is shown by the Anglo-Saxon word they used to translate it, *hreofla*, that is, scabbiness. The use of the plural, the leprosies, by writers as far apart as Pliny and Lord Macaulay, shows that they, at least, were aware of the comprehensiveness of the term. Again, it was applied to maladies which were not thought to be leprosy, even in the elastic sense once common. The English chronicler Ie Baker who lived through the Black Death, recognised it as bubonic plague and notes its symptoms. Yet when describing the extension of the pestilence into Scotland, he calls it " lepra." So, too, we have in the chronicles " the leprosy that is called small-pox." Also, " leprous " could imply nothing more than infirm, and in the ancient MS known as the Wurtzburg Glosses, Latin terms for weakness and infirmity are translated into Old Irish as " leprosy."

" Leprosy," too, was used for mange and scab in animals—" the cankred mangenesse called the Leprosie "; and for diseases of plants—" Myst and fog . . . make the graine leprous." It was often used to describe a miserable and pitiable state where there was no question of disease of any kind. The Hebrew word *naga* (afflict) in a well-known passage in Isaiah LIII, said to foretell Christ's sufferings on earth, is translated " stricken " in the Authorized Version—" Yet we did esteem him stricken." In keeping with ancient usage, St. Jerome in the Vulgate translated this word by " leprosus," and John Wyclif, a thousand years later, used " leprous " in the same passage. If Jerome and Wyclif were alive today they would agree that the Authorized Version " stricken " expresses exactly the meaning they wished to convey by " leprous "—perhaps the only point on which they would agree! And so far did the sense of these terms expand, that " leprosus," by association of ideas, could stand simply for " beggar."

The Hebrew word *tsaraath* rendered " leprosy " by the translators of the Bible, was clearly a general term embracing a number of different diseases. Whatever it may have conveyed to the ancient Hebrew mind, some of the diagnostic tests given for *tsaraath* would be meaningless if applied to leprosy in the restricted sense of the word today.

The writings of some mediæval physicians give recognizable accounts of the disease in its more characteristic forms, along with much that is incomprehensible, and even misleading like the weight attached in diagnosis to itching of the skin and cloudiness of the urine. These texts, however, must not be taken as representing the

general standard of knowledge and practice, for we find the famous Gordonius protesting against the wrongful diagnosis of leprosy common then, and protesting, too, in no great hope of reform, for he ends his complaint, " Whoever therefore hath ears, let him heed this, if he will." These texts, such as they are, were not available to the early monks with whom we are most concerned, and the majority of the diagnoses encountered are mere assertions of leprosy, unsupported by any evidence. When clinical details are included in a narrative these often suffice to show that the malady in question was of some other kind. The sad story of Marjorie Bysseth in Elgin is worth re-telling in this connection, for the " leprosy " which she was accused of having
to have been something in the nature of an extensive cellulitis; at any rate, the severe wasting and deformity of the limb had developed within some period of less than a year, an impossibility in leprosy. This unfortunate old woman was charged with witchcraft by certain friars on the grounds that she had repeated her prayers backwards, and had transformed herself into a hare. To her tears and prayers of " Pitie! Pitie! I am guiltless of ye fausse crymes, never sae much as thought of by mie," was added the evidence of a parish official who testified to her known good character. Suddenly the favourable atmosphere of the inquiry changed. A " Leper " came running from the neighbouring lazar-house, and passing through the crowd, he " bared his hand and his haill airm, ye which was wythered and covered over with scurfs, most pyteous to behold, and he said, ' At ye day of Pentecost last past, thys womyan did give unto me ane shell of oyntment, with ye which I annoynted my hand to cure ane imposthume [swelling] which had cum over it, and beholde, from that day furthe untyll thys it hath shrunk and wythered as you see it now ' . . . But ye said Marjory Bysseth cried pyteously, that God had forsaken her, that she meanyed gude only and not evil." But all this availed her nothing, since she had smitten a man with " leprosy." Thereupon the poor old creature was dragged " amid mony tears and cryes to ye pool . . . and soe they plonge her in ye water. And quhen as she went down in ye water, there was ane gret shoute; but as she rose agayne and raised up her arms, as gif [if] she wod have cum up, there was silence for ane space, when agane she gaed doune with ane bubblinge noise, and they shouted finallie—' to Sathan's kyngdome she hath gane,' and forthwith went their wayes."

To add to the confusion, the extent and importance of the disease were exaggerated out of measure by ecclesiastical example and precept. The fifty references to " leprosy " in the Bible, the

common employment in religious exhortations of the words leper and leprosy as meaning sinners and sinfulness,
in mind, with the result that imaginary lepers started up from the pages of Holy Writ. The patriarch Job was pronounced a leper because of the swellings that afflicted him. The beggar who lay at the rich man's gate was similarly diagnosed,
record does not even mention leprosy, and the Vulgate, the only text then in use, *"ulceribus plenus,"* full
of sores; but to the obsessed mediæval mind this suggested leprosy only. So the beggar's name,
more than "Without help,
disease, and still survives as in lazar and lazar house. Lazarus of Bethany, the brother of Mary and Martha,
leper, and became a patron saint of these stricken creatures by a series of gradations which shows the height to which imagination can soar. It is recorded that Jesus cried with a loud voice, "Lazarus come forth"; and as Lazarus signifies "leper," what stronger evidence of his disease could anyone require! Yet in face of all these extravagances,
leprosy made by men who could reason in this illogical fashion, are accepted as if purged and snuffed of ambiguity and equivalent to the precise usage of today.

When we come to the subject of leper houses we find the same misunderstanding and exaggeration. During the 1100's there was a great outburst of sympathy and pity for lepers, encouraged by clerical influence. The Church taught that these unhappy people were Christ's Poor, kin to the beggar who was carried by the angels into Abraham's bosom. In their zeal, many persons interpreted Jerome's "leprosus" in the literal sense of the word, and believed that Christ on earth had gone to His death as a leper, so that noble ladies in a kind of religious fervour would wash the feet of lepers and embrace their diseased bodies. It is some consolation to us to reflect that in many instances these devotees ran no greater risk than that of contracting scabies. As a result of this crusade, leper houses were founded up and down the country. Some of those who endowed them were inspired solely by love of God and of their fellow-men; others who, like Falstaff, had heard the chimes at midnight in their youth, thought that it might be well to have something on the credit side in the Recording Angel's account. The houses were mostly small establishments with the religious aspect taking precedence of the nosocomial, for some required that a married applicant for admission must separate formally from his wife, or even that she should become a nun. Each house had its own rule, and vows of obedience were imposed

on the entrants. They had to conform to certain laws of behaviour and wear whatever dress was prescribed, not because they were lepers but because they were in a manner professed brethren. This movement brought relief and comfort to many sufferers among whom there must have been some uncertain proportion of true cases. It is sad to know that they were not always as grateful to their benefactors as might be expected, for it is recorded, for example, that the inmates of the Kingston leper house rose in revolt, demolished the building, and took to the roads.

The disappearance of leprosy in Britain is often attributed to the enforcement of " absolute and strict segregation." There is much evidence to show the unreality of this alleged " absolute and strict segregation." The custom of reading the burial service over a leper, regarding him as one dead and deprived of all civil rights, was not in force in England. Chaucer when stressing the confirmed tippling habits of one of his characters, says that he knows all the taverns of the town better than any lazar or beggar does. There is no contemporary evidence that what are nowadays called " leper squint-windows " had anything to do with leprosy. The idea is wholly modern and I have found no suggestion of it which dates back more than a hundred years. It appears to have arisen from the misinterpretation of an old picture. Authorities on ancient architecture believe that these squint-windows might serve several purposes according to circumstances. Some gave ordinary worshippers a view of the altar who else would have been cut off by some architectural obstruction; others served for hearing confessions; and others, again, enabled an anchorite to witness the service while still keeping to his vows of seclusion.

We often see accounts of what are called English leper laws. These are mostly excerpts from the rules drawn up to control the occupants of one or other of the leper houses, some of which included directions designed to protect the local population from the risk of infection. Such rules, however, had no more general force than rules for patients in one of our own hospitals would have at the present time. No one could be forced into a leper house against his will. So far as I am aware, the only measure in statutory law directed against lepers was that which enabled a writ *De Leproso Amovendo* to be issued. This had a limited application, as follows: " The Writ *de Leproso amovendo* lieth, where a Man is a Lazar or a Leper, and is dwelling in any Town, and he will come into the Church, or amongst his Neighbours where they are assembled, to talk with them, to their Annoyance and Disturbance—then he or they may sue forth that Writ for to remove him from their Company. But it seemeth, if a Man be a Leper or a Lazar, and will keep

himself within his House, and will not converse with his Neighbours, then he shall not be moved out of his House."

The rules of Sherburn leper house expressly permitted the inmates to receive their friends, and those visitors who came from a distance could remain for the night. It is illuminating to read in these same rules that a mutinous leper, whose contumacity yielded neither to flogging nor to a diet of bread and water, would receive the final penalty of—*expulsion!* Similar rules were in force in other institutions, and a long account has survived of the expulsion of a leper from the Ilford house because he had imported a woman of light character under the pretence that she was his sister. (This is hardly the modern conception of "absolute and strict segregation," whether as regards the leper, the friendly lady, or the townsfolk of Ilford.) In some places lepers had a right to help themselves to food displayed in the market place, and in Shrewsbury they could take a handful of corn from any sack offered for sale. Moreover, they could refuse to enter a lazar house, and in 1344 it is recorded that the revenues of St. Julian's, in St. Albans, are too large for its needs, for in general there are no more than three inmates, sometimes two, and occasionally only one, because of the difficulty of finding lepers "willing" to lead a restricted life.

The old nursery rhyme "Hark! Hark! the dogs do bark, The beggars are coming to town" was once something more than a meaningless jingle, for an unending war was waged by the authorities against the beggars whose lawlessness and tumult were a perpetual threat to peaceable folk. Lepers, however, had a right to beg, a privilege ordinarily denied to most others under the heavy penalties of whipping, branding and even death. This valuable concession must have given great encouragement to imposters, for an imputation of leprosy provided the easiest means of livelihood then available to rogues and vagabonds. In 1346 Edward III issued an edict expelling all the lepers residing in London. Its wording shows that these people had been accustomed to roam about as they pleased; indeed, one declared reason for the measure is that they had endeavoured to contaminate others, "that so, to their own wretched solace, they may have the more fellows in suffering." We may believe this, if we will. Even if there was nothing more behind the order than the professed concern for the public health, the departure of this body of professional beggars—lepers, genuine, supposed, or pretended—freed the citizens of London from an intolerable nuisance, although, as it proved, the relief was only of temporary duration.

Industrious people have collected an imposing figure, 283, as

the number of leper houses in England. If it is assumed that at any period there was this number in active operation, each maintaining its specified complement of inmates, we should be far astray from the truth. Some of these alleged lazar houses are names only, mentioned once in a single bequest in a will, with nothing known about their original destination or after-history, nor even if the institution were ever more than some temporary expedient. Others are graded as leper hospitals merely because of a statement to this effect made by a visiting antiquary long after the institution had ceased to exist. Some, like St. John's, Aylesbury, were nothing more than alms-houses. In others, lepers and paupers had an equal right to admission. Thus, for example, Mary Magdalen's, Ripon, was endowed for eighteen persons, either leprous or destitute; and St. Bartholomew's, Oxford, for two healthy inmates, and six leprous or infirm. There were no lepers in either of these when visited by the King's Commissioners in 1341. Foundations established specifically for lepers might be transferred to other purposes. St. James's, Canterbury, endowed for twenty-five leprous women, was found by the King's Commissioners in 1341 to be occupied by twenty-five women glowing with health. Sherburn, founded for 65 lepers, in 1434 could produce only thirteen poor men, and no lepers; accommodation for two lepers was provided at this stage, but it was not taken up because " ther cowlde not so many Laiseris be found in that part of England." Romney leper house in 1363 is reported as " derelict and totally desolate " chiefly because " for long times past " no lepers could be discovered; it was repaired and put to other uses.

No account of these institutions in the British Islands could omit the most widely known of them all, " the Leper Hospitals of Armagh." Armagh, the ecclesiastical capital of Ireland, has enjoyed high fame ever since Queen Macha of the Golden Hair reigned there centuries before Christ. To students of medical history, however, the place is familiar as the site of these hospitals which are said to have gone up in flames when the city was sacked by Arlaf king of the Danes in 869 A.D. They are renowned because of their antiquity and because their existence is cited so often as evidence of the then prevalence of the disease. Being anxious to learn something more about these hospitals, I took the obvious course of looking up all the Celtic chronicles in which this sack of Armagh is recorded. To my surprise there was nothing about hospitals or lepers in any of them. Then I began at the modern end and worked backwards, and in the end traced the story to its beginnings. It arose from two mis-translations. First, an incompetent Celtic scholar in making a Latin translation of one of the

chronicles I have referred to,
which means " oratories," a dative plural. Guessing at its meaning he guessed wrong, and translated it by the late Latin term *nosocomiis*, hospitals. Next, a later writer in translating this Latin passage into English, for some unknown reason explained *nosocomiis* by " leper houses "! And so began the story of the Leper Hospitals of Armagh, which were never anything more than fantasies of the imagination.

Various notabilities of the past are said to have been victims of this disease,
Robert the Bruce,
leper. To begin with,
the Scottish historical writers of Bruce's day makes any mention of this infirmity. The story began on the other side of the Border. In early June,
pied part of the country until the end of August,
re-crossed the Border,
invaders in person,
Douglas. At the same time he disappeared from the Scottish Court. Bruce's known ill health,
tirement from public life,
as an explanation to someone wholly ignorant of the circumstances. The earliest imputation of the disease in this connection which I have traced is found in the Lanercost Chronicle,
attributed to a nameless Franciscan monk of Carlisle. Here it is asserted that Bruce's unprecedented actions were due to his having become a leper; and the assertion,
death less than two years later. Bruce's absence from the field and from the Court was not due to leprosy or any other disease, but because he had gone on a secret mission to arrange for an invasion of Ireland, with the active help of the Ulstermen. An " Indenture," which still exists,
Robert the Bruce and Henry de Maundeville,
arranging for the provisioning of the Scottish army; and the seals of both were affixed to the document at Glendun,
12th July, 1327—the mid-point of the Scots' campaign in England. Bruce's plan for an invasion failed because of some unspecified " breach of agreement " on the part of the Ulstermen. He returned to Scotland,
he carried fire and sword far into England so that the terror stricken population offered to pay an indemnity if he would call off his followers and return home. A notable military ascendency of a force led by a leper within some eighteen months of his death!

Bruce did not go into retirement but continued to direct the

affairs of his kingdom. No one shunned his company. He attended Parliament in great state and crowned—with his own hands— his son and Princess Joan,
was thought to spread infection by his breath and touch. Within three weeks of his death he was still conducting State business in public. When the end was near,
were summoned to Cardross,
Robert the Bruce peacefully " trespassed out of this uncertain life." This was not the deathbed of one smitten with what the age called " the foul contagion of leprosy."*

Beyond any other man, Bruce lived under a burden of sacerdotal malediction. Again and again he was excommunicated. Yet for more than twenty years he continued to challenge and defy the Holy See. When it was attempted to publish a Bull in Scotland over Bruce's head,
was attacked,
Thereupon it was proclaimed that in every Mass,
days and holy days,
municate; his lands and the lands of all his adherents were placed under ecclesiastical interdict; and the children of all his adherents to the second generation declared incapable of holding any ecclesiastical office or benefice.

The dignitaries who pronounced these awful sentences concerned themselves only with spiritual affairs. It is clear that this was not the view of ordinary folk,
some material sign of the Divine displeasure. But the fiercer the denunciations,
cause flourish. What a triumph it would have been to point at one who " showed such contempt for the Keys of Holy Mother Church," But there is
no contemporary suggestion of the disease except in the fancy of an obscure monk writing his chronicle in a cell in Carlisle. I will not waste time in referring to the same allegation in the pages of later chroniclers,
These scribes had no personal knowledge of the matter,
content,
tion whatever a predecessor had written down. Bruce's enemies, English and Scots,
tongue to—the Usurper,
spate of calumny there is no whisper of the one epithet that would have outweighed all the rest—the Leper.

*Hemingburgh's chronicle can hardly be regarded as a contemporary record on this point, for the relative portion seems to have been added by a later hand; the story was probably taken from the Lanercost text.

This story typifies much that passes as historical evidence on the whole question of leprosy in the past.

I hope that I have said enough to support my contention that no assertion of leprosy in old times can be accepted as indicating an infection with Hansen's bacillus in the absence of clinical details sufficient to point the diagnosis. General descriptive terms are not enough. For example, when we find an account of some person cited by name as the victim of " terrible and manifest leprosy," we might be tempted to relax this rule and accept the case as probably one of the genuine disease. And we should be wrong, because on reading further we find that after a given period of time the sufferer was cured and the skin restored to its normal state; so whatever the nature of the " terrible and manifest leprosy " it was not the disease called by that name today.

A notable champion of the literalists was Sir James Simpson, the writer largely responsible for spreading abroad the fable of Bruce's leprosy. He quoted from old texts a number of examples of the use of the word " elephantuosi " as an alternative of the word "leprosi," and declared that this is a striking confirmation of his opinion that those called lepers in the Middle Ages undoubtedly suffered from elephantiasis of the Græeks (or elephantia), that is, true leprosy. Alas for this verbal evidence, for in Blundevil's *Order of curing Horses diseases* the chapter on mange in these animals is headed: " The Leprosie or universall manginesse called of the old writers *Elephantia*"!

During the 1300's and 1400's it is recorded, as mentioned already, that a number of leper houses either fell short of their authorized establishment of inmates, or were altogether empty. Leprosy was diminishing over this period, mainly, I believe, because of the rising standard of living. None the less it is possible that in the institutions so affected, stricter tests of diagnosis were being imposed, with the result that many sufferers from other diseases were excluded who under the usual loose system of assessment would have been accepted as lepers.

In some special instances the authorities went to great pains in reviewing a diagnosis of leprosy that had been made. Thus, Johanna Nightyngale of Brentwood was accused of the foul infection of leprosy, and served with the writ *De Leproso Amovendo*. Johanna was made of stern stuff; she refused to depart from the company of her neighbours as ordered, and appealed to Edward IV. Under the King's warrant she was examined by a commission, including physicians of skill, and pronounced to be free from any blemish of leprosy.

Similarly Peter de Nutle, formerly Mayor of Winchester, was

forced to leave the city because of his supposed leprosy. He appealed, and by royal order was examined by experienced physicians who certified that he was infected in no part of his body; and the sheriff of Hampshire was directed to make a proclamation to this effect.

Clearly such a cumbersome and costly process of law could be invoked only in a few most exceptional instances; and in general the diagnosis was made by monks, parish officials, or even watchmen at the gates of a town. If these functionaries were to carry out a leper hunt in English hospitals today they would not come away empty handed, though one condition which I believe accounted for some considerable part of mediæval leprosy would be missing—the extensive ulcerations of advanced scurvy. All the same they would find cases of intractable skin diseases, cutaneous ulcerations, and deformities, which would fit in with their conception of leprosy. If any of these had limited his studies to the medical treatise by John de Mirfeld of St. Bartholomew's Hospital, he might add to the haul by applying the simple and only test for "leprosy" given in that text—offensive sweating from the armpits.

In spite of all the uncertainty involved, some guess at the actual prevalence of leprosy in old times might be expected here. In this connection I cannot do better than quote the opinion stated by Creighton in Traill's *Social Life in England*, for I consider it a reasonable estimate of the extent of the disease at its worst. He says: "There might have been a leper in a village here and there, one or two in a market town, a dozen or more in a city, a score or so in a whole diocese." When a certain distinguished historian declared that in mediæval England leprosy was a more terrible scourge than bubonic plague, he was talking arrant nonsense.

On one occasion when visiting an independent tropical country I was shown a building called a leper hospital. It was a ramshackle structure with nothing to justify this grandiloquent description, and indeed little better than a shelter for diseased beggars. How the diagnoses had been arrived at in the first place I could not discover, owing to language difficulties. On making an examination—admittedly far from exhaustive—of about a dozen of the occupants, I found only two who showed any signs suggestive to my mind of leprosy. Some of the remainder were suffering from what seemed to be crusted scabies of long standing. Others I should have liked to subject to a course of that old and trusty standby, iodide of potash. I doubt, though, if a cure would have been welcomed by many of these "lepers," with a consequent loss of a congenial and assured means of livelihood. If it were possible for

the inmates of one of the old English leper houses to find a breach in Eternity and come back once more into Time, I believe that a proper investigation of their maladies would disclose something of the nature I have just described—a small minority of true cases of leprosy among a crowd of sufferers from repellant forms of disease of many another kind.

Those persons who choose to adhere to the literalist interpretation of words like " leper " and " leprosy " in old usage, ought to be consistent in their practice. They should maintain, therefore, that the Black Death was leprosy because Gilbert le Baker called it " lepra "; that the Old Testament prophecy (Isaiah LIII) foretold that the Christ would be afflicted with leprosy because He was called " leprosus "; and that the leperous distilment that Hamlet's uncle poured into the king of Denmark's ear was in reality an infusion of *Mycobacterium leprae*.

THE ACTIVITY OF ISO-NICOTINIC ACID HYDRAZIDE IN MURINE LEPROSY

MARGARET BARNETT AND S. R. M. BUSHBY

The chemotherapeutic activity of *iso*-nicotinic acid hydrazide (INAH) in an experimental infection of mice with *Mycobacterium lepraemurium* has been compared with that of the two sulphones, 4:4'-diaminodiphenylsulphone (DDS) and its disubstituted derivative, sulphetrone, and that of streptomycin and *p*-acetylaminobenzaldehyde thiosemicarbazone (T.B.1./698).

This organism has been used by other workers for assessing the anti-leprotic activity of the antitubercular drugs, but the conditions of the tests have varied. Chaussinand, Paris and Crouge (1948) found that streptomycin had no effect on the subcutaneous leproma in rats, and Carpenter, Stokinger, Suhrland and Ackerman (1949) found that whilst promin produced slight suppression of the same type of lesion, diasone and streptomycin, were without effect but the streptomycin was only used late in the disease. Levaditi and Chaigneau-Erhard (1951), using mice infected intracerebrally and basing the effect of treatment on the number of organisms in the lesions of the meninges after 77 days, found that DDS was superior

to streptomycin, but the latter was superior to *p*-aminosalicylic acid (PAS). The differences, however, were not large and only single doses of the drugs were given subcutaneously each day. Grunberg and Schnitzer (1951), using mice infected intraperitoneally, found that streptomycin, PAS and DDS had no significant effect on the number of organisms present in the intraperitoneal lesions, but promin and T.B.1/698 had some discernible effect. The experiment lasted only 28 days. We have also used in unpublished experiments the size and degree of infection of the leproma produced subcutaneously in white rats as a measure of the activity of streptomycin and the sulphones. These experiments lasted five months and only streptomycin had a discernable, but small effect.

In the present experiment we used white mice (Schofield) infected intravenously with a mouse-passaged strain of *Myco. lepraemurium* obtained originally from the leproma of an infected rat, kindly given by Dr. Gönnert. In these mice, the lesions became widespread, with the organisms mainly within histiocytes. During the first month of the infection, few if any organisms could be found in the viscera and skin, but after this period they became progressively more numerous. By the fifth month the tissues contained very many organisms and deaths began to occur in the untreated animals. The disease was very chronic and some mice may survive eight months or more in spite of the presence of innumerable organisms.

In this experiment, groups of ten mice were injected into the tail vein with 0.5 ml of a suspension of the spleen and liver from a heavily infected mouse. The organs were cut into small pieces, pulped by manual shaking with glass beads for two or three minutes, suspended in Dubos medium to give a volume of 20 ml, centrifuged for 2 minutes at 2000 r.p.m. to remove the coarser particles, and the supernatant fluid diluted 1:20 with Dubos medium. This suspension contains approximately 100 million organisms per ml. Grunberg and Schnitzer (1951) found the intravenous route unsatisfactory because a large percentage of the animals died after injection of 0.1 ml of a 10^{-1} dilution of rat leproma, but we find that no deaths occur from injection of the infected mouse tissue provided it is diluted 1:200; with less dilute suspensions convulsions and death may occur.

Treatment was started on the day of infection, and in the case of the oral drugs which were given in the diet, it was continued daily till the end of the experiment. The streptomycin was administered subcutaneously at 9 a.m. and 5 p.m., except on Saturdays when the 5 p.m. dose was omitted and on Sundays when no drug was given. The doses selected for this experiment were

the maximum doses that previous experience had shown the mice could tolerate. The oral doses given in Chart 1 are the amounts that the mice received provided they eat 5 g. of food. (Controlled experiments showed however, that in fact the mice eat quantities ranging from 3 to 8 g.). On the 140th, 147th, and 160th day of the experiment one of the control untreated mice died, and on the 180th day the experiment was terminated.

Post-mortem examinations were made on all the animals, but apart from some enlargement of the lungs, liver and spleen, which in some animals contained small visible lepromata, there were no gross macroscopic changes. The effect of treatment was assessed by the degree of enlargement of the spleen, by histological examination of the liver, spleen and skin, and by the number of organisms present in smears of the liver and spleen.

ENLARGEMENT OF THE SPLEEN.

The effect of treatment on the enlargement of the spleen was measured by comparing the mean estimate of area of the spleens of each group, the individual areas being calculated by multiplying the average width by the average length of the organ. The estimate for the control group excluded the spleens of the three animals which died before the end of the experiment.

Statistical analysis of the results, given in Table I showed that the spleens of the animals treated with INAH were significantly smaller than those of any of the other groups. Treatment with streptomycin and T.B.1/698 had a definite effect for the spleens of both groups were smaller than those of the untreated animals. Neither of the sulphones had a significant effect.

HISTOLOGY.

In the livers of the control animals the lesions were of variable size but with a distribution suggesting that they started from around the veins, but there was much individual variation in the extent of the disease. The spleens showed gross involvement of the pulp and folicles. In the skin dense masses of large histiocytes, packed with organisms, were present in the corium and panniculus adiposus.

INAH had a very definite effect. Although there were a few enlarged histiocytes around some of the veins of the liver very few contained bacilli, and in the spleen there was no disorganisation of the tissue except for a few enlarged histiocytes. There was no evidence of infection of the skin.

In the tissues of the streptomycin-treated animals the number of bacilli was much reduced as compared with the controls, except in one animal where they were numerous. In the liver the few organ-

isms present were mainly in histiocytes within the parenchyma, but in the skin there were small growing lepromata in the supra-pannicular corium and among the hair follicles.

Treatment with thiosemicarbazone had apparently changed the character of the disease for the lesions in the liver consisted mainly of many small foci of phagocytosed bacilli in the parenchyma, with little perivenous infiltration, and the lesions in the skin were much smaller than in those of the control animals. The involvement of the spleens was definitely less than in those of the controls.

The tissues of the animals treated with the sulphones were so similar in appearance to some of the untreated animals that it was difficult to assess the effect of the drug, but in general the involvement of the organs appeared to be less than in the controls.

SMEARS.

Smears were made from the cut surface of the livers and spleens and stained by the Ziehl-Neelsen method counterstaining with methylene blue. The organisms were present either singly or in globular masses and although we are referring to the latter as "globi" the majority were obviously intracellular clumps and therefore not typical of the globi of Neisser. The single organisms were extracellular but were obviously derived from cells broken during the making of the films as there were few extracellular organisms in the sections. The free bacilli and the globi were counted in fields containing approximately 200 spleen cells or 20 liver cells and grouped according to the classification given in chart No. 1. The chart shows the distribution within these groups of the tissues of the mice given the various treatments.

The pronounced inhibitory action of INAH and streptomycin on the multiplication of the organisms is striking. The thiosemicarbazone has apparently had some effect, but the sulphones have had little or none.

DISCUSSION.

In this experiment, INAH has almost completely inhibited the multiplication of *Myco. lepraemurium*, but similar activity, although somewhat less is shown by streptomycin and T.B.1/698, both of which have proved to be almost completely inactive in experiments by other workers. These differences with streptomycin and T.B.1/698 may be due to conditions of the experiments especially in the manner of timing and giving the drugs. In the present experiment the oral drugs were given in the diet, and the streptomycin was injected twice daily, thus ensuring almost constant bacteriostatic blood concentrations.

Although mice heavily infected with tubercle bacilli have

proved satisfactory for screening antitubercular drugs,
using *Myco. lepraemurium* for forecasting the chemotherapeutic activity of drugs in human leprosy may be doubted. The antitubercular test uses the organisms responsible for the human disease, but the relationship between *Myco. leprae* and *Myco. lepraemurium* is still undecided. Nevertheless, the two organisms have much in common; both are acid-fast, neither has been grown with certainty on artificial media and both cause an essentially intracellular infection in their natural host, and Wilson and Miles, (1947) go so far as to state that " more recent observations suggest that some cases at least of human leprosy are caused by the rat leprosy bacillus." Mukerji (1951) however noted differences between the two organisms in acid-fastness and morphology after irradiation with ultraviolet light.

In this present experiment the sulphones showed only very doubtful activity, suggesting that either the test does not accurately forecast activity in human leprosy, or only that the sulphones are less active than either INAH,
carbazone. Most leprologists consider the sulphones to be the most useful antileprotic drugs at present available, but their choice of drug must necessarily depend a great deal on cheapness,
low toxicity, and the ease of administration of the drugs.

The high activity shown by streptomycin is perhaps unexpected for although the antibiotic has been available sufficiently long for its antileprotic value to be assessed in man it has not become widely used. High cost and toxicity when used over long periods have undoubtedly been restricting factors, but there is evidence that streptomycin is more active than the sulphones in the human disease. Faget and Erickson (1948) reported favourable initial responses to streptomycin,
to the development of resistance. Erickson (1951) has however, more recently decided that its action is more rapid than that of the sulphones. Saenz (1952) considers it to be as effective as the sulphones,
opinion he considers that in practice it may precipitate an acute exacerbation of the disease as well as an erythema nodosum leprosum. Both of these sequelae may be manifestations of the high activity of streptomycin for Cochrane considers them to be related to the Herxheimer reaction. Nevertheless these reports do not suggest that the difference in activity of streptomycin and the sulphones in human leprosy is as marked as is shown in our experimental infection. This may be due to the poor penetration of cells, shown by Mackaness (1952), for Tzanck and Basset (1950) interpreted their experiences with streptomycin in leprosy as indicating

that the antibiotic is effective only against extracellular bacilli. In our experiment treatment not only started at the time of infection when the organisms were extracellular, but very much higher blood concentrations of streptomycin were present in the animals than is possible in man.

There is also evidence that the high experimental antileprotic activity of the thiosemicarbazone applies to the human disease. Ryrie (1950) considered them more rapid in action than the sulphones although Cochrane (1951) was unable to confirm this observation. Keil (1951) however in a review of the use of T.B.1/698, concludes that it has a greater effect in a shorter time than the sulphones, but it is more expensive and the side effects more unpleasant. More recently, Lowe (1952) has decided that T.B.1/698 is at least as active as the sulphones, and Gil (1952) considers that the clinical response is often more impressive than that of the sulphones, although the decrease in the number of organisms in nasal scraping is slower. This latter observation is of interest especially in view of the change produced by T.B.1/698 in the character of the disease in our experiment.

As the results of this experiment are consistent with clinical experiences so far, it is highly probable that drugs which are active against *Myco. lepraemurium* are also active against *Myco. leprae.* INAH therefore should possess very high antileprotic activity, and the fact that it readily penetrates cells as shown by Mackaness and Smith (1952) is very much in its favour. So far there are only preliminary reports from clinical trials in human leprosy and in these the opinions of the effects varies; Gil (1952) states that no other drug produces such rapid changes in the morphology of the organisms, and Latapi and Rubio (1952) found favourable effects on skin nodules and nasal lesions in 13 of 14 cases, but Lowe (1952) concludes from the results of treatment of 27 patients for periods of 14 to 23 weeks that INAH is possibly of slight benefit but its action is much less than that of the sulphones or thiosemicarbazone. The antileprotic value of INAH in the human disease is therefore still in doubt, but it is only a question of time before the answer will be known for, unlike streptomycin or T.B.1/698, INAH is inexpensive, relatively non-toxic and easily administered.

In this experiment INAH has shown greater activity than streptomycin and if the precipitation of acute exacerbation of the disease and of erythema nodosum leprosum by streptomycin are due to high antileprotic activity, then such sequelae may be expected to be even more frequent with INAH. Even more serious, however, are the suggestions that streptomycin fails in human leprosy because of the development of resistance, for experience

with INAH in tuberculosis shows that this phenomenon occurs equally as rapidly with INAH as with streptomycin. Except for the one mouse containing large numbers of organisms in the streptomycin-treated group, there was, however, no suggestion of resistance developing in either the streptomycin or INAH-treated animals, but an endeavour is being made to assess the ability of *Myco. lepraemurium* to develop resistance by examining the surviving organisms present in the treated mice of this experiment.

The antibacterial activity of INAH has so far proved to be remarkably specific for *Mycobacterium tuberculosis*, but the result of this experiment shows that it undoubtedly extends to other pathogenic species of the genus, *Mycobacterium*.

SUMMARY

In mice infected intravenously with *Myco. lepraemurium*, INAH has almost completely suppressed the infection. Streptomycin was almost as effective, and T.B.1/698 somewhat less effective but the two sulphones had only a doubtful effect on the development of the disease.

Evidence is presented for assuming that the activity shown against this organism also applies to *Myco. leprae*.

We are indebted to Dr. David Trevan for the histological examinations, and to Mr. P. A. Young for the statistical analysis.

TABLE I.

Treatment group	Mean Surface areas + Std. error $(cm)^2$	Significance of comparison with group:					
		1	2	3	4	5	6
1. INAH	1.12 ± 0.079		+	+	+	+	+
2. Streptomycin	1.50 ± 0.161	—		=	+	+	+
3. T.B.1/698	1.50 ± 0.114	—	=		+	+	+
4. Sulphetrone	2.43 ± 0.256	—	—	—		=	=
5. Untreated	2.73 ± 0.213	—	—	—	=		=
6. DDS	2.75 ± 0.238	—	—	—	=	=	

+ = superior effect (P = <0.05)
— = inferior effect (P = <0.05)
= = similar effect (P = >0.35)

Table I. Statistical analysis of the surface areas of the spleens from each group of mice. The body of the table indicates the significance of the difference between pairs of treatment ("t" test).

DRUG	ROUTE	DAILY DOSE mg./mouse	GROUP 7	6	5	4	3	2	1
I.N.A.H.	Diet	2						○○○○ ○○○○ ●●●● ●	○○ ●●● ●●
Streptomycin	S.C	2×1			●	○	○ ●●●	○○○ ○○○ ●●● ●●●	○○
T.B.1/698	Diet	10		○		●●● ●●	○○○ ○○○ ●●● ●●	○○○	
Sulphetrone	Diet	100	●	●●	○○ ●	○○○ ○○○ ●●● ●	○○ ●●		
D.D.S.	Diet	2·5	○ ●●	○○○ ●●	●●● ●	○ ○○○	○○ ●●		
Controls	—	—	○	○○ ○○○ ●●● ●●●	○ ●●	○○○ ●●			

Liver ○ Spleen ●

CHART 1.

Distribution of the liver and spleen smears within groups, based on the number of *Myco. lepraemurium* and globi per field.

Group 1. — <0.1 organisms.
Group 2. — 0.1 to 2 organisms.
Group 3. — 2 to 30 organisms and <0.1 globus.
Group 4. — 30 to 300 organisms and 0.1 to 1.0 globus.
Group 5. — 30 to 300 organisms and 1 to 2 globi.
Group 6. — >300 organisms and 2-5 globi.
Group 7. — >300 organisms and >5 globi.

Each open circle represents the liver and each black circle represents the spleen of one animal.

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THREE NEW CASES OF LEPROSY IN NORWAY

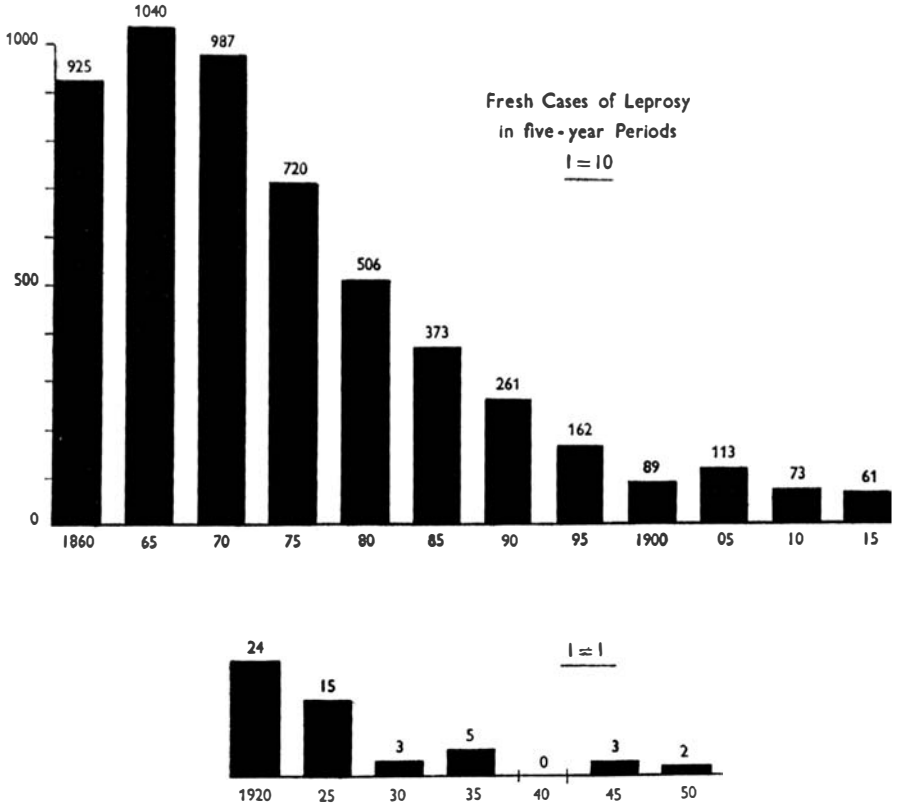
REIDAR SCHOYEN MELSOM.

Leprosy has existed in Norway from the oldest times. It is an open question whether this disease was introduced by the first human beings who colonised the country by immigration from the South and East thousands of years ago, or did not reach Norway till there was free communication with Western Europe in the bronze age and later. The disease evidently existed in Norway in prehistoric times, as witnessed by its mention in our oldest laws, and the variety of names given to it in old Norwegian. The disease increased greatly in Norway in connexion with the crusades as well as in Western Europe. It was during this period that our old leprosaria were founded. As in Western Europe, the disease regressed in the 16th and 17th centuries, but in contrast to what happened in western Europe, it increased again in the 18th and 19th centuries. The cause of this atypical behaviour of the disease is not known, but I am inclined to trace it to special conditions on the West coast of Norway, where housing conditions were worse than elsewhere in the country, and where there were great fisheries entailing close contacts of the fishermen during certain periods.

In the middle of the previous century, leprosy was endemic on the West coast of Norway from Lindesnes to Varanger, whereas it was practically unknown in the East of Norway inland, and on the South coast. It represented such a serious medical problem that radical measures had to be taken against it. Between 1850 and 1860, several new, large leprosaria were founded and one of the old leprosaria was enlarged and modernised by the public authorities. Further, the first law concerning health commissions was adopted, being applicable at first only to those districts in which leprosy existed, and referring only to this disease.

Owing to these measures and assuredly also because of a general improvement in hygiene, and perhaps most of all on account of better housing conditions, there has been a marked regression of the disease in the course of the last hundred years. In relation to the number of inhabitants, there are today far fewer cases of leprosy in Norway than in the U.S.A. for example, and in this respect we are just as well off as the rest of Western Europe with the exception of Denmark,—the only country in the world without a single case of leprosy. But even though the disease has regressed markedly, we still have a total of 11 cases, and from year to year

new cases continue to crop up. In the first place, we are not quite finished with the epidemic of the previous century. The disease runs a very chronic course and has a very long incubation period. Now and again cases appear which must be traced to our old infection. Since 1930, we have had 9 such cases. We also have a small number of new infections introduced by seamen returning home infected. Since 1930, we have had 3 such cases.



The disease is without doubt infectious, but the degree of infectiousness is very slight. Some leprologists have insisted that infection does not occur in adult life. This teaching is disproved, among other things, by the three above-mentioned seamen. On the other hand, the same state of affairs shows that the susceptibility of adults to the disease is very slight, for it is certain that hundreds of Norwegian seamen have been exposed in the past to quite massive infection (in bars and brothels in tropical harbours).

In less than one year we have observed 3 new cases of leprosy in siblings,—2 men and a woman. There has been much leprosy in their family, and their mother as well as two grandmothers

suffered from the disease. The family is healthy. Of their 10 children, 3 died when young, and 4 are still alive and well.

In 1931 the mother was admitted to the leprosy hospital in Bergen suffering from quite advanced lepra tuberosa. She died in 1933 of a disease of the biliary tract. The following is a short account of these 3 new cases:

A man, S.M., born on October 9th, 1925, was admitted to the leprosy hospital on January 10th, 1951, presenting lesions of the skin and the peripheral nervous system. The skin of his face presented patches of a light brown colour without definite maculae. Owing to slight facial paralysis on the left side, he could not shut his left eye completely, and the left corner of his mouth was drawn somewhat up. The left side of his face presented definite hypoanaesthesia of all the sensory qualities. There was no loss of cilia or of supercilia.

There was a maculo-papular rash on the trunk and limbs. Yellowish-brown patches, to some extent quite sharply defined, merged into larger, confluent areas which were scattered in an irregular fashion over his arms. These patches showed no definite infiltration and were not raised. There were several such patches on the trunk, both in front and behind. On the legs there were large, confluent patches of the same appearance and character as those already described. About 10 cm. above the inguinal region, these patches stood out sharply defined against the normal skin. On the anterior aspect of both thighs was an irregular, whitish area of scarring. Scattered over thighs and legs were numerous nodules up to the size of a pea, being sharply defined, firmly elastic, and of a brownish-red colour.

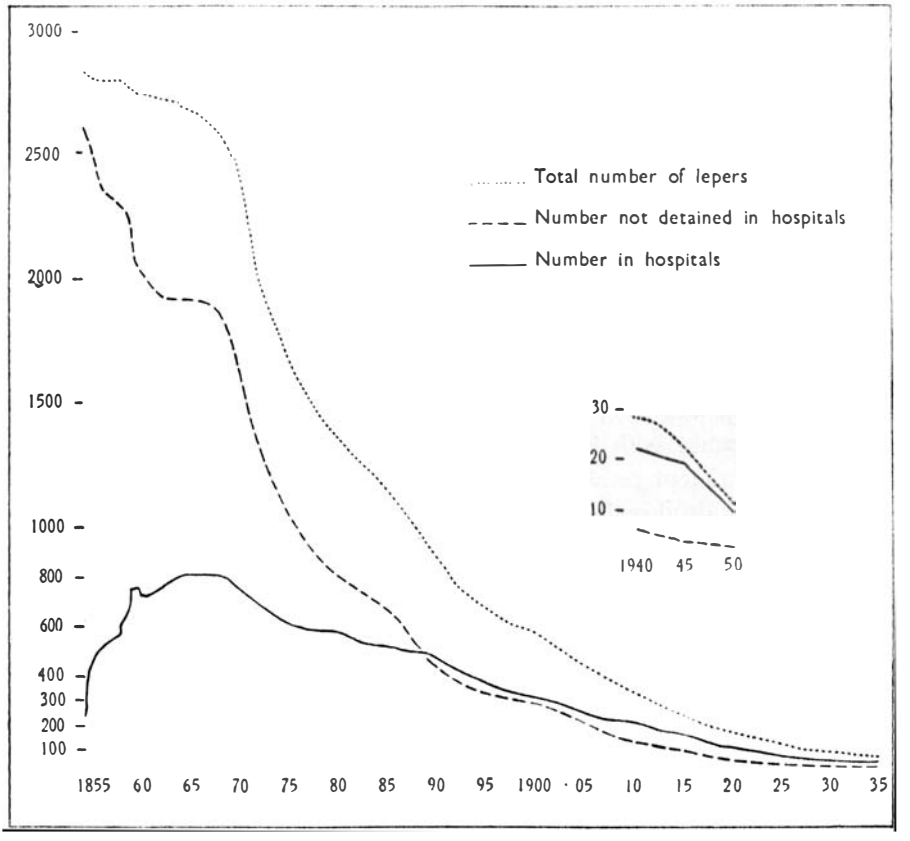
The appearance of his hands was very striking, with marked symmetrical atrophy of the muscles, most evident in the thenar and hypothenar areas. There was a slight flexion contracture of the fingers. There was marked hypoasthesia for *all* the sensory qualities, from the fingers to the middle of the upper arms. His legs also presented definite sensory disturbances of the same character, from his toes to the middle of his thighs. The reduction of sensation in his skin did not seem to be more marked over the patches of rash than over the rest of his limbs. He said that skin sensation was practically intact in the patches on the trunk of his body.

Both the ulnar nerves were tender on pressure, as were also both peroneal nerves at the point where they appeared near the head of the fibula. Both forearms showed scars from burns.

Numerous leprosy bacilli were found in the secretion from his nose.

Biopsy of a nodule showed the typical picture of lepra tuberosa with numerous leprosy bacilli, both diffusely scattered and in typical globules.

A woman, M.M., born on September 28th, 1923, was admitted to the leprosy hospital on January 3rd, 1951. She was a couple of years older than her brother, and she presented a milder degree



of the same clinical picture. She also suffered from marked, symmetrical atrophy of the muscles of her hands and a slight flexion contracture of her fingers with loss of sensation almost to her shoulders. Her big toe was thickened and discoloured a bluish-red. Under the ball of her big toe was a scar from a perforating ulcer. Loss of sensation extended up to the middle of both feet. The left ulnar nerve was thickened and tender on palpation. She, too, presented scars from burns of her forearms. On the extensor aspect of her upper arms were several small cutaneous and subcutaneous brown nodules. One of them was larger than the others and was

more reddish-brown in colour. The typical picture of a leproma was found on biopsy. On the dorsum of the right foot was a small, diffusely limited infiltration with a brown discolouration. On her left leg there was a small bluish-red infiltration. Apart from these findings there was no rash.

A few leprosy bacilli were found in the secretion from her nose.

It was easy to diagnose leprosy in both these cases as soon as this possibility occurred to us. The symmetrical involvement of both motor and sensory peripheral nerves in association with demonstrable thickening and tenderness of peripheral nerve trunks is pathognomonic of leprosy. The young man's maculo- papular rash was also very characteristic of this disease. The only possible alternative diagnosis was mycosis fungoides, but its histology is quite different. Whenever possible, the diagnosis of leprosy should always be verified by the demonstration of leprosy bacilli.

A man, G.M., born on January 18th, 1913, was admitted to the leprosy hospital on September 1st, 1951, suffering from a papular rash on trunk and limbs. Numerous nodules, some cutaneous and others subcutaneous, ranged from the size of a pin's head to that of a pea. The cutaneous nodules were sharply defined, firmly elastic, and of a brownish-red colour. The subcutaneous nodules were more diffusely limited and presented a bluish-red colour. A typical leproma was found on biopsy.

There was a suspicion of a slight bilateral atrophy of the thenar area without any muscle atrophy elsewhere. His hands, forearms and feet up to the knees showed definite loss of sensation which was most marked for cold and heat, less so for touch and not existing for pain. Both forearms showed scarring after several burns.

This patient was at sea when the disease was discovered in his brother and sister. I notified his ship's doctor who let several leprologists in the Pacific examine him. None however made a definite diagnosis.

The behaviour of the disease showed many features in common in these three patients, all of whom must have been infected by their mother more than 20 years ago. The first patient, S.M., noticed in 1940 that his hands had become remarkably thin. He consulted a nerve specialist who diagnosed a peripheral nerve lesion and prescribed electrical treatment. In the summer of 1950 the rash began to appear, but he did not attach much importance to it.

The second patient, M.M., stated that her hands had been thin as long as she could remember. In 1949 she developed, under the ball of her left big toe, a perforating ulcer which was excised by a surgeon with transplantation of skin. When, however, the ulcer relapsed in the autumn of 1950, she was referred to me.

The third patient, G.M., noticed that during the post-war years he was liable to develop sores from burns on his forearms. He believed that the rash began to develop during the spring of 1951.

In these three cases it is quite certain that the disease must have begun with involvement of the peripheral nerves, and a peripheral nerve lesion was the diagnosis in 1940 of a neurologist in the case of the youngest patient, S.M. All three patients presented several scars, some of them quite large, on their forearms after burns. The four healthy siblings did not show this condition. In all three cases a tuberous leprosy had developed in the course of 1950-51, 20 years after the last possibility of infection.

These case records illustrate well, among other things, the markedly chronic course run by the disease. There is no other disease with so long an incubation period and protracted course. As already pointed out, 4 of the 7 surviving siblings are healthy. One of the healthy siblings and one of the infected ones were non-identical twins. The father is healthy. This family tragedy shows that the infection usually occurs in childhood even when the disease becomes manifest in adult life. A prolonged and massive exposure is necessary for infection to occur, and even under such conditions not one half of the siblings in this particular family developed leprosy.

It seems natural to assume that the development of leprosy depends on:

(1) Massive exposure to infection,
(2) Great reduction of resistance at the same time as, or directly after, such exposure while the bacteria are vegitating in the organism.

Both these two conditions probably existed in this family, the children being assuredly exposed to infection for several years, during which they had had periods of much reduced resistance due to intercurrent infectious disease or poor nutrition.

As a supplement to these three cases, I would like quite briefly to record a fourth case which presented considerable difficulties with regard to differential diagnosis:

A man, aged 77, came from the north of Norway (Nordland), and was admitted to the leprosy hospital in the summer of 1945. He did not know of any case of leprosy in his family or in the neighbourhood. Some 5-6 years before admission to hospital he had noticed loss of sensation in his hands. Flexion contractures of his fingers developed gradually, and he was treated in hospital on several occasions for persistent sores on his hands. In the summer of 1944 he was admitted to the Riks-hospital under the suspicion of leprosy On examination at the Skin and Neurological

Departments, the choice of diagnosis between leprosy and syringomyelia was left undecided, though the latter diagnosis was regarded as the most likely.

When I examined the patient in the spring of 1945, I observed a definite symmetrical atrophy of the muscles of his hands and loss of sensation for all the sensory qualities over both his hands to the middle of his forearms. He also presented a peroneus palsy on the right side and bilateral loss of sensation from his toes to a point half way up his legs below the knees. On the clinical evidence I diagnosed a typical maculo-anæsthetic leprosy. In the hope of verifying this diagnosis, I secured the excision of a small section of his left ulner nerve. I had hoped to find histological evidence of scarring which would do much to confirm the diagnosis of leprosy. What I did find were typical leprosy bacilli.

I have reported these cases to recall to mind that cases of leprosy can still crop up in Norway. Medical officers of health in particular, with archives giving information about families in which leprosy has occurred earlier, should keep this possibility in mind. Further, we import the disease occasionally with seamen who have become infected when sailing in the tropics. The diagnosis of leprosy should be kept in mind when we are confronted by obscure cases of disease of the skin and nervous system.

REPORT ON VISIT TO NIGERIA
15th March to 1st May, 1952

R. G. COCHRANE

INTRODUCTION.

My recent visit in the interests of the British Empire Leprosy Relief Association to Nigeria was one of very great profit, and, thanks to the kindness of all those whom I met, I was able, I feel, to get a very fair insight into the general leprosy situation in the country.

In a tour of this nature it is impossible to give a detailed report; but in publishing this account I have endeavoured to give a general picture of the leprosy situation in Nigeria at the time of my visit. I have also tried to assess, as far as possible, the present position of sulphone therapy in Nigeria, and give some account of the results

as I have seen them. Further, I have attempted to indicate how far I consider that leprosy in Nigeria can now be considered a controllable disease. In order to endeavour to give as clear an account of the leprosy work as I am able, I shall deal with each Region separately, but I shall not describe in detail my visits to each institution, lest this account become too long.

I left London by the B.O.A.C. Speedbird Service, Hermes, on 15th March, arriving Lagos the next day. When in Lagos I stayed with Dr. and Mrs. McLetchie. Dr. McLetchie was in the Director of Medical Services's office, and is in charge of the Department of Rural Work.

Under the new Constitution the Territory of Nigeria is divided into Eastern, Western and Northern Regions. Each Region has its own Parliament, with its own Ministers, and is, in many ways, autonomous. The Federal Capital is in Lagos, but certainly as far as the Medical Organisation is concerned, the Headquarters at Lagos have only advisory powers, and few, if any, mandatory ones. This of course means that while the Leprosy Service in Nigeria, now under Dr. T. F. Davey, O.B.E., is responsible for organising anti-leprosy work throughout the State, each Regional Director of Medical Services can decide on the way he himself proposes to organise the leprosy campaign. While this makes the task of the Centre much more difficult in one way, nevertheless it does ensure (and this is important as far as leprosy is concerned) that general principles, laid down by the Headquarters of the Leprosy Service, are modified according to local conditions.

The Eastern Region is, for reasons which will appear, much the most advanced in the matter of Leprosy Control; so one must guard against a natural tendency to draw general conclusions based on experience in that region, which may not apply in detail to other regions. The medical authorities realise this, but it is very difficult, in the matter of propaganda, to prevent statements being made which apply admirably to Eastern Nigeria, particularly to the fine work in and around Uzuakoli, but which need modifying when applied to other regions where development is less advanced.

The headquarters of the whole of the Nigeria Service is stationed at Oji River, under the direction of Dr. T. F. Davey. I may say at this point, that this Service is a model of its kind, and the work of Dr. R. H. Bland, who developed the Service up to its present state of efficiency, is worthy of all praise. Dr. Davey is, as is known, a leprologist with very great experience, and the Government is fortunate in having him to succeed Dr. Bland. There are, however, the usual difficulties which inevitably slow down the machine of progress, viz. (1) Finance, (2) Personnel.

With regard to the financial aspect, the Colonial Development Fund set aside a sum of money for the development of the anti-leprosy campaign over five years. A budget was made to cover this period, but unfortunately the economic situation has not kept pace with the expansion of the Service, and what appeared to be ample provision three years ago is now found inadequate. Further, it was expected that at the end of the five year period the financing of the leprosy campaign could be undertaken through local services; but unfortunately, again owing to the world economic situation, this will not be possible. of achievement within the originally calculated period.

With regard to personnel, conditions are much more grave. At the present time there are four Area Superintendents, three of whom have medical colleagues. When it is realised that not only are these Area Superintendents responsible for institutions which accommodate, in some instances, nearly 1,000 patients, but they also have to supervise segregation centres, which means the arranging of treatment and medical facilities for a population of 10,000 or more persons suffering from leprosy, the difficulty of the task is apparent. Such a situation inevitably results in the non-medical personnel of the Service having to assume a considerable burden of responsibility.

With regard to the mission institutions, the state of affairs in this respect is, if anything, more serious. As an example let us review the medical resources of the large Leprosy Colony at Itu. There were at the time of my visit between 2,000 and 3,000 patients in charge of one doctor, who also has responsibility for a general hospital. Admittedly, Dr. A. B. Macdonald, C.B.E. has so organised the work that in effect the Medical Officer undertakes his task in the way a general practitioner would approach a large practice; that is, he attends to those who report ill, and keeps the routine work running by means of a nursing sister and semi-trained staff. Nevertheless, the full potentialities of the situation cannot be developed, and under present conditions of recruitment, and the financial resources of the missions, there seems little possibility of an increase in staff.

Meanwhile the more effective sulphone therapy—particularly the more economic parent sulphone—has been introduced. One result of this is a general increase of optimism, and the hope that Dapsone (D.D.S.) will prove the answer to the problem. But this new therapeutic triumph, while undoubtedly making our task much easier of accomplishment, must, if we are to make the most of the new situation, call for strengthening of the medical staff in leprosy institutions.

A still graver situation than before may arise if it is felt that the main task is now to increase the availability of Dapsone without a commensurate increase of other medical facilities—particularly staff—so that all active cases shall receive the personal care they deserve. It would be dangerous if a general impression were created that all that is needed is to train as many non-medical personnel (including an increasing proportion of African recruits) as may be required to ensure that there will be no difficulty in everybody getting DDS in as short a time as possible. While this is a desirable objective to pursue, let us be careful in so doing not to cause medical men to consider leprosy a speciality not worth their attention, because there is not enough specialist work of a detailed nature to undertake. If this happened conditions would deteriorate, to the permanent detriment of the work and the undoing of much of the fine achievements already attained.

It is unfortunate that, owing to the urgency of the situation and lack of sufficient personnel, there is at present no systematic and comprehensive course for medical men taking up leprosy. Leprosy Inspectors, however, receive regular courses of instruction. Dr. Davey is fully aware of the shortage of medical recruits to this Service, and has under consideration the training of medical men. I am of opinion that whenever medical men are recruited for leprosy work, they should first be given a short but intensive course of instruction in this country, so that they would have a basic knowledge before they start their duties in West Africa or elsewhere. Before being given independent responsibility officers might be sent for three months' intensive training to whatever institution the Director of Leprosy Control considered best. If possible their first posting should be to one of the better staffed institutions, where they can work with senior officers of the Leprosy Service. During this time they should be receiving further systematic instruction. Thus it will be evident to doctors that leprosy is a subject of intense medical interest, and a speciality as worthwhile entering as tuberculosis, malaria, or any other speciality. Until sufficient medical men are found with enthusiasm to take up this work, given a vision of the vast opportunities, this acute staff problem, as far as leprosy is concerned, will remain unrelieved.

I shall now briefly refer to my visits to the various areas in the country, Eastern, Western and Northern, and endeavour to give some idea of the situation in each area.

EASTERN REGION. OWERRI PROVINCE.

I stayed in Lagos from March 16th to 18th. On the 18th I was able to secure a seat on a charter plane to Enugu, where I met

Dr. Bland, and he introduced me to the Hon. Minister for Health for the Eastern Region. I stopped one night at the Headquarters of the Nigeria Leprosy Service, and proceeded the next day to Uzuakoli by kitcar.

As is known, the Uzuakoli Leprosy Institution was started 20 years ago, and Dr. Brown, who is now Leprologist for Uganda, organised the work in those early days. Dr. T. F. Davey took over the Superintendency under the Methodist Missionary Society in 1936, and under his leadership great advances have been made. It was largely his organisation of the " Clan " system of segregation that resulted in the relatively rapid control of leprosy in the Owerri Province. The activities at Uzuakoli are divided into—

(1) The research Unit, under Dr. J. Lowe.

(2) The work and activities of the Medical Superintendent.

1. *The Research Unit, under Dr. John Lowe, C.B.E., M.R.C.P.*

This unit is well organised and is undertaking detailed research in all practical aspects of leprosy and its control. It would greatly strengthen the training side of the work if facilities for histopathological investigation and clinical photography were available. These facilities have not been developed owing to the serious shortage of staff. Nevertheless, despite this difficulty, the therapeutic research work has been outstanding; and Dr. Lowe is fortunate in having the services of a keen, well trained technician in Miss McNalty, for this ensures adequate organisation and control of the bacteriological examinations.

I do not need to enter into detail with reference to this unit, for its organisation and history are well known. It may be said here, as in all work in Nigeria, is shown the chief function of BELRA in the field, and the natural development of its policy. In the commencement of the work BELRA was fortunate in recruiting Dr. Lowe, who had recently retired from India. Later on the Nigeria Leprosy Service developed and the Government was able, through the Colonial Development Research Fund, to take over more responsibility for leprosy. Dr. Lowe's unit has become, as it should, an integral part of the Service. BELRA is essentially a " bridge builder," supplying money for staff and activities until such time as the Government is able to undertake the work. It can be said quite definitely that without BELRA's initial and continued help in recruiting and paying key personnel, the Nigeria Leprosy Service would have been seriously handicapped. If justification were needed for BELRA'S activities, there is ample evidence of this in the development of the Nigeria Leprosy Service.

There are two other aspects of the work which are of interest.

In view of previous statements that there was a special variety of pale macule in Nigeria, I discussed the matter with Dr. Lowe and, from an examination of the macules seen in Uzuakoli, and biopsy study of material from elsewhere, it appears to me that the macules are not essentially different from those seen in India. There are certain basic clinical types in leprosy, and these are the same throughout the world. Confusion is caused by the relatively greater number of certain types of lesions over others in different parts of the world.

I was extremely interested to see the work on B.C.G. and lepromin in which Dr. Lowe is engaged. This work is of very important immunological significance, and should give great assistance in our concepts of leprosy prevention.

With regard to therapeutic investigation it might be mentioned that further work on the Thiosemicarbazones indicates that (1) in this part of Nigeria the serious condition of agranulocytosis may be precipitated by this therapy. (An article by Dr. Lowe on this subject appeared in the July-Oct. 1952 issue of *Leprosy Review*).

(2) There has been no evidence that the Thiosemicarbazones can be given less often than daily, and therefore they can only be used as a second line of therapy.

Dr. Lowe has commenced studies on the new anti-tuberculosis drug, Isonicotinic Acid Hydrazide. A recent report has appeared in the *Lancet* in which Dr. Lowe concludes that this drug does not appear to be as effective in leprosy as the sulphones.

2. *The work and activities of the Area Superintendent.*

Space does not allow me to discuss in detail all aspects of the work, and therefore I shall confine my report to the curative and preventive activities in connection with this large settlement.

In general discussions with Dr. Basil Nicholson, the Area Superintendent, several points of interest arose. Firstly, it should be pointed out that the segregation policy, which was inaugurated by Dr. Davey some fifteen or twenty years ago, has been so successful that the non-lepromatous cases in this area are as high as 90 per cent of the total cases, and the child rate is probably less than 5 per cent. It is interesting to note that this satisfactory state of affairs had been largely reached before sulphone therapy had been organised on a large scale, and that the segregation enforced was not absolutely rigid; therefore the chances of infection by the open case have been considerably reduced, and the epidemic of leprosy brought under control. One centre in the Bende division has actually been closed, as leprosy is now of no further significance.

This work supports three important contentions. First, as Sir

Leonard Rogers and Dr. Muir have contended, leprosy cannot be controlled by absolute, compulsory segregation, for it causes the infective case to go into hiding. Secondly, it gives powerful evidence of the fact that partial segregation in the form of night segregation will control the disease. Thirdly, the evidence shown by this experiment supports the assertion that it is the open and infective case which is the chief public health problem, and the closed case is of much less, if any, significance. I have maintained for many years that if the open case of leprosy could be prevented from coming into night contact with healthy persons, particularly children, it should be possible to control leprosy in a community. It was very encouraging to see this achieved in the Uzuakoli area.*

The work of the Area Superintendent consists of the general medical work of the colony, the supervision and treatment of patients in the segregation units, and out-patients, as well as the over-all responsibility for the direction of leprosy work in his district. It would be tedious and unnecessary to describe in detail the multitudinous aspects of the work, and therefore I shall briefly refer to the various activities in and around the institution.

Medical. As can be expected, there is a considerable quantity of general medical work to be done. In view of the great number of cases, the organisation into "Clans," and the numerous out-stations, it is only possible to undertake a limited amount of work. In this connection it may be said that materials for dressings, especially at out-stations, were very limited. In consequence of the pressure of work and a limited staff, it is only natural that in the specific treatment the authorities turn to a regimen which is easy to administer and is cheap. Hence the widespread use of oral DDS therapy. Except for areas with a relatively high lepromatous rate, the toxic manifestations have been minimal. Even under the bi-weekly regimen of 300—400 mgms. there have been some cases of toxic side effects, but in this area they appear to be negligible.

The system with reference to Dapsone (DDS) treatment is similar in all the areas. The pills are distributed by a Leprosy Inspector, who notes down the dose given in a book provided for the purpose, and this book is checked from time to time. There is always the possibility of a black market in DDS pills because no system of checking can prevent this. This danger is fully realised by the authorities. Each individual Leprosy Inspector has a stock of tablets for 2—3 weeks, and the Senior District Leprosy Inspector

* These results in the Eastern Province of Nigeria give strong support to Sir Leonard Rogers' contention that leprosy would ultimately come under control if treatment were combined with adequate examination of contacts—See Cameron Prize Lecture. *Edin. Med. Jl.* Vol. 37 (1930) p.1.

keeps a larger stock to distribute to the individual inspectors in charge of each segregation unit. In addition to the doctors, the Welfare Officers also act as a check. Supervision is as close as possible under the circumstances.

The results of sulphone therapy have been excellent, but it must be noted that many of the cases given treatment were not lepromatous, others belonged to that variety which tends to regress in the ordinary course of the disease. Nevertheless, I believe it is a wise policy to continue treatment for at least a year, so that the chances of a relapse may be lessened. In discussing this matter with Dr. Lowe and Dr. Nicholson, and seeing the type of cases which were generally discharged, it seems to me that it is fair to conclude

(1) It takes 3—5 years for a lepromatous case to become negative and possible of discharge;

(2) As a result of sulphone therapy greater confidence has been created and, therefore, many mild or indeterminate cases have been sent away. Some of these in my experience would either not have been admitted to an institution in India, or would have been discharged earlier.

(3) Again, because of greater confidence in treatment, patients with residual macules are being discharged where, previous to sulphone therapy, they would have been kept in the institution.

These statements are not in any way prejudicial to sulphone therapy, for it has been demonstrated, and this work confirms this, that the sulphones are the most effective anti-leprosy drugs we possess and, used under adequate conditions, will render the majority of cases negative in a period of 3—5 years. The type of cases, the organisation, and the attitude of the people are so favourable in this area, that there does not seem any reason why, within a measurable period of time, leprosy in Owerri Province should not, if it has not already done so, cease to be a serious problem. It is interesting to note that of Davey's original lepromatous cases, 98% become negative in a 4—6 year period. It is difficult, however, to draw general conclusions on this, because not only does the epidemic of leprosy vary in different areas, but the response to sulphone therapy varies also. In this connection it may be stated that in areas such as Ogoja and Ossiomo, where leprosy is seen in the much more severe lepromatous form, the discharge rate is considerably lower.

Mention at this point should be made of relapses. It has been pointed out here, as well as elsewhere, that the case which tends to relapse is the tuberculoid case, and as yet in Nigeria there have been no

lepromatous relapses. It would be expected that the tuberculoid cases would show an earlier relapse rate, because when the *M. leprae* in the tissues begin to show activity, there is an immediate tissue response, resulting in the clinical condition known as tuberculoid leprosy, whereas in lepromatous leprosy the tissues show no reaction to the presence of bacilli, and therefore it may be years before a relapse is detected.

Segregation Centres.

While in Uzuakoli I visited several segregation centres. These are in reality simply colonies for the segregation of active cases of leprosy. They are supervised by the Area Superintendent, or a Medical Officer, and the Leprosy Control Officers. These latter are BELRA-Toc H workers, now mostly taken over by the Government. The day-to-day work of the centres is under the direct control of a Leprosy Inspector and a clinic nurse. I was very impressed with this work and, considering the paucity of staff and difficulties of supervision because of the inability to visit the centres frequently enough, they were attaining their objective—the control of leprosy—remarkably well in this part of Nigeria. In these visits two conclusions were arrived at—

(1) The success of the Anti-Leprosy Campaign was due to (a) The enthusiasm of the people to see that active, and especially infective, cases were segregated, and (b) The development of segregation camps to such a high degree that in the Owerri Province the majority of cases, particularly the infective ones, were in segregation units. This splendid achievement was the result of the early work of Davey and the excellent group of medical men, headed by the officer in charge of leprosy control —in fact the work here is a model of its kind.

(2) The introduction of the sulphones was by no means the direct cause of the control of leprosy in this area. Two things took place when sulphone therapy was introduced on a wide scale— (a) It gave great hope to cases of leprosy and convinced them that by this means they could get better; (b) It gave confidence to the Leprosy Service to discharge patients whom they were not previously sure could be discharged. In other words, the sulphones were introduced into an area in which leprosy, by means of segregation units, was already coming under control, and this process was thereby hastened to the great benefit of the people of the district.

I was convinced of another matter. If it had not been for the

modification of DDS therapy by lowering the dosage, and giving the tablets twice a week instead of daily, it would have been difficult to continue oral DDS as an out-patient treatment. As I shall indicate, in the less developed areas, and where the advanced lepromatous cases are more numerous, intolerance to DDS therapy is not negligible.

From Uzuakoli I motored to the new institution in the Rivers Province at Isoba. During this journey I had the opportunity of discussing the situation with one of the BELRA workers. It was interesting to get the point of view of a layman. The work at Isoba is new and Dr. Seal has a difficult task, particularly as some of the worse affected areas lie amidst the river creeks, and are very inaccessible. The institution itself is developing into a very fine one, and will do an increasingly effective piece of work.

From Isoba I went to the large leprosy colony at Itu. It is quite impossible to give an adequate description of this hive of industry. The whole colony bore the stamp of those indefatigable workers, Dr. and Mrs. A. B. Macdonald. It was, however, very obvious that unless the staffing problems are solved the excellent work of the past years would seriously suffer.

The staff at Itu has, since my visit, been strengthened by the recruitment of another nursing sister. The future development of this colony will be followed with great interest, for I believe the colony has a great contribution to make towards the control of leprosy in Nigeria.

The part BELRA has played in the development of leprosy work in Nigeria is well illustrated by the fact that five of the nine workers at Itu at the time of my visit were BELRA workers, and it can be stated that without this help Itu could not have been maintained. The help of BELRA has been generously acknowledged.

From Itu I went to Oji River, arriving at Oji on 3rd April. While at Oji River I was able to visit several segregation units. Again I was struck by the relative mildness of the leprosy lesion, and the low incidence of lepromatous cases. It is in this area that Dapsone treatment has been used in the most extensive manner. While it is admitted that there is probably some mis-use of DDS, Dr. Garrett believes this is not serious, and that the people are learning the dangers of taking too large a dose.

Oji River Settlement has nearly 1,000 patients, and the lay leprosy workers are of the greatest assistance in organising the general and welfare work. The children's work needs particular mention. Mr. and Mrs. Savory have developed this side of the work to a high degree of efficiency. They have a separate children's home, and do not allow, as is sometimes the custom, children to be

farmed out to adults, for they contend that this practice is open to abuse and is detrimental to the full development of the child.

I had an interesting discussion with Dr. Garrett with reference to the toxicity of DDS. While it is admitted that the toxic manifestations on the previous daily regimen were relatively high, and that with DDS given twice weekly this has been very largely eliminated, yet in a small proportion of cases toxic symptoms still arise. It was interesting to note that a mental ward was under construction, and that the psychosis rate was in the neighbourhood of 0.3% of all cases treated.* It is stated that this rate is no higher than that of the normal population, and that DDS will only cause psychosis in the unstable person. In this connection it is also contended, with some justification, that even though it is admitted that an occasional death is caused as a result of toxicity from DDS, the number of patients that are saved either from death, or an even worse fate, amply justifies the use of a remedy which is practical to give and inexpensive enough to use for widespread treatment.

I was most impressed by the work at Oji River and, despite the enormous handicap of limited medical assistance, the work in this institution was of high grade, particularly the operative side.

On 7th April I left by lorry for Ogoja. I was particularly interested in visiting this institution because of previous reports of Dr. Barnes regarding the difficulty in the administration of DDS. On the way I visited the Emene clinic, some of the buildings of which need repair rather badly. The Leprosy Inspector stated that he had only had one case of sulphone dermatitis and one case of psychosis, and this was some months previously.

The work at Ogoja under Dr. Freeman is of a high order. This institution is fortunate in being administered by a Catholic Order, who send out trained medical workers, nurses and doctors. This means that all the Sisters in this hospital are trained.

In this institution both Sulphetrone parenterally and DDS were being used. There have been no toxic signs with Sulphetrone and, apart from some pain on injection, it seemed to be causing no trouble. On the lower dosages, and more gradual building up of the dose, the difficulty with DDS had been largely reduced. The distribution of DDS was under the direct control of the doctor or sisters. Despite this, one patient decided to store the tablets—having pretended to swallow them—until he collected eight 100

* The most recent information we have indicates that this ward has now been completed, but no further cases of sulphone psychosis have arisen. In view of the large number of patients under treatment, a ward of this nature is a necessity for, as already mentioned, the psychosis rate in the African, apart from therapy, is sufficiently high to warrant expenditure on such a ward.—Editor.

mgm. tablets, and took these in one dose. Unfortunately he did not live. This is a salutary reminder that abuse of the tablets may tend to bring serious results. In the segregation units no DDS is given to out-patients, and the dose of in-patients is only increased once a month, and if a patient misses getting his tablets three times in the month, the increase in dosage is then delayed.

I visited the segregation unit at Obuda, on the borders of the Benin Province. One very advanced leproma showed signs of toxicity—anaemia—but probably his leprosy condition had already resulted in considerable depression of the haemoglobin value in his blood. I was told of a village—Bibi—where the incidence of leprosy was considerable, and it was stated that on the border of the Cameroon country there was much leprosy. In this area the leproma rate is very high (30%-40%).

On my way back to Oji River I stopped at Abba Kaliki, where there is developing, under the charge of a medical Catholic Sister, a very good institution. In this institution one case of psychosis and one severe dermatitis had been seen within the last few months.

It is obvious that the conditions in this area of Ogoja Province are far from satisfactory, owing to the paucity of staff. A certain number of cases are, however, being discharged and, because of the difficulty of personnel and the lack of funds, it seems impossible to expect more.

I left Ogoja on Saturday, 12th April, and, after visiting Abba Kaliki, arrived at Oji River about 5 p.m. the same evening. This afforded me an opportunity of discussing many points with Dr. T. F. Davey. I appreciated this chance and came to understand something of the tremendous difficulty of building up the leprosy campaign to its present stage, and of the hard task which still lies before the Leprosy Service.

I left for Ossiomo on Sunday, arriving in the evening. The situation in this part of Nigeria is much more serious than elsewhere, and seems to be more urgent even than that at Ogoja. The institution is well organised, and Dr. Lengauer, the Area Superintendent, impressed me as a careful worker who was overwhelmed with the problem in this area. The lepromatous rate was again high (30%-40%) and the finances available were limited; so much so that not only lepromatous cases could not be admitted, but between this year and last the number of patients had to be reduced by one hundred.

Because of the high rate of lepromatous cases Dr. Lengauer has to proceed very carefully with Dapsone treatment, and the following figures were worked out from the record cards. Of all the cases in the institution 1.2% had shown psychosis on an average of

2.5 tablets twice a week (250 mgm); 0.26% dermatitis on an average of 3 tablets a week; 0.64% hepatitis on an average of 2 tablets twice a week; and 1.5% albumen in the urine on an average of 2.2 tablets twice a week. Of all cases in the institution 3%-5% showed an increase of urobilin in the urine. This, Dr. Lengauer indicated, was a precursor of liver damage, and if it were not taken seriously, or if the patient received, accidentally or illicitly, further Dapsone treatment, disaster might follow.

The following symptoms had to be carefully noted. Discomfort over the hepatic area, nausea, failing appetite, or merely that patients stated they ' did not feel well.' On such complaints being made Dr. Lengauer insists that Dapsone must be stopped, for serious toxic signs may follow continuance of treatment. I saw one patient who was very seriously ill and has since died, his was the second recent death. With regard to psychosis, all recovered except one in whom mental instability appeared to be permanent, but in all probability this patient was always a potential psychotic.

Dr. Lengauer had a series of cases on aqueous sulphetrone supplied by BELRA, which had shown no serious toxic signs.

Dr. Garrett of Oji River also has had an occasional case of permanent mental upset. Admittedly, this is a price one may have to pay, and also it appears that the potential psychosis rate in the African is relatively high. I do not wish in any way to indicate that Dapsone toxicity is of necessity of serious import. It is a fact, however, that in this area even on small dosages, toxicity does occasionally occur, and this is apparently the general experience in areas where the number of advanced lepromatous cases is greater and dietetic conditions are poor. This state of affairs needs careful investigation. For these reasons it is wise to have an alternative treatment available, e.g. aqueous sulphetrone.

The tuberculosis rate seems to be relatively high, and in this institution, Dr. Lengauer says, there are at present 24 active cases.

I visited one of the outstations (Ugboha). The lepromatous rate seemed to be nearly 50%. Six per cent of the cases in this area suffered from sulphone dermatitis, despite careful dosage. Only the fringe of the leprosy problem has been touched in this district, and the work seems to be in urgent need of strengthening.

The general work was of a high order and BELRA's help has proved vital, for without it, particularly in the early days, it would have been impossible to have started Ossiomo. I was greatly struck with the children's work and all help in this direction from BELRA is well worth giving.

My visit to Ossiomo concluded my tour in the South. I came away with a feeling of profound regard for those working in this

part of Nigeria. The whole system, under the leadership first of Dr. Bland and then of Dr. Davey, is a model which could well be copied, and illustrated what can be done for leprosy. It is no mean achievement to have controlled leprosy very largely in the Owerri and Onitsha Provinces, and with the sulphones now available, combined with intelligent use of segregation, in the course of time the same results will be seen elsewhere. Success will be achieved provided the handicaps of finance and personnel are overcome.

NORTHERN NIGERIA.

On my way North, I spent a weekend at Ibadan and stayed with Dr. Pottinger, the D.M.S. of the Western Region. This afforded me the opportunity to discuss matters of mutual interest, and to see the new University Medical College at Ibadan. It was most interesting to see something of the difficulties in organising a complete graduate Medical College, for many of the problems were similar to those which I had to face in Vellore in undertaking the same task.

The institutions visited in Northern Nigeria, where Dr. C. M. Ross has recently taken charge, were as follows:—

(a) The Albarka Fellowship.
(b) Seventh Day Adventist Mission station some 100 miles from Jos.
(c) Sudan United Mission at Jos.
(d) Sudan United Mission at Aloici.
(d) Sudan Interior Mission at Kano.
(f) Sudan Interior Mission at Sokoto.
(g) C.M.S.—BELRA at Zaria.

Because of the relative indifference of the population in Northern Nigeria, it will take a considerable time to bring the population to the point of accepting local segregation. This, therefore, means that institutional work in the area needs to be strengthened. I believe Dr. Ross's conditions for encouraging this work and giving grants are essentially sound. They are as follows—

1. Until such time as rural segregation units are established settlements must give priority to open cases.
2. Doctors and nursing sisters must give their full time to leprosy.
3. Children must be segregated from infective parents. The question of village segregation is much more difficult than in the South, and it will take some years before such centres are established.

It is only possible to give a brief account of my visit to the

Northern Region institutions. The Albarka Fellowship institution holds great promise. Of the 106 patients, 30% were lepromatous, and it was felt, owing to the relatively high lepromatous rate, that first priority should be given to these cases. Dapsone had only just been started and it was therefore too early to estimate the tolerance of patients in this area to this drug.

I was deeply grateful to Dr. Ross for his great kindness in accompanying me on this tour. We proceeded to Jos and on the way visited a Seventh Day Adventist station. Dr. Hyde, who is a son of a missionary and speaks not only Hausa but also the local language, has just started a small colony. I was able to discuss principles of diagnosis and treatment with him. Again the lepromatous rate appeared to be high.

While in this area we made Jos Hill Station Hotel our headquarters and motored from there to Vom and Aloici. We visited Dr. Barnden's institution near Vom. There were 100 cases, more than 30% of which were lepromas. I was informed that there had been a few cases of psychosis, one of whom committed suicide. I was assured that the dose of Dapsone was not more than 400 mgm twice a week as a maximum. It is difficult to explain this occurrence, but I emphasised the need of care in stepping up the dosage of Dapsone. In addition to these cases, there was one case of dermatitis.

From Vom we proceeded to Mongu, where Dr. and Mrs. Keller of the S.U.M. are working. There were about 110 patients, of whom 50% were lepromas. Apart from the usual reactions, and one mild dermatitis, no untoward reactions appeared. Dapsone (DDS) has been in use for eight months.

We left Jos at 9 a.m. and motored to Zaria. Unfortunately, when we arrived both Dr. Smylie, of the C.M.S., and Mr. Birnbaum, the BELRA Manager, were not able to be present. Later Dr. Smylie arrived and we arranged to visit the leprosy institution at Giwa on our way to Kano. We had meanwhile a rapid tour of the Zaria institution.

Miss Hardaker the BELRA Nursing Sister was present and is an extremely hard worker. Her hospital, theatre and wards for sick patients were kept scrupulously clean.

We left Kaduna on 28.4.52 and motored to Kano, visiting as stated, Giwa on the way. While at Kano Dr. Helser made arrangements to fly us to Sokoto where we saw the Leprosy Hospital. Both Dr. Grant at Sokoto, and Dr. Dreisbach at Kano—Dr. Dreisbach was on furlough and Dr. Webber was acting for him—had excellent institutions. These institutions are equipped for first-class work and, with well-equipped laboratories and operating units, could do

an increasingly excellent service. Every effort should be made to encourage both Dr. Grant and Dr. Dreisbach to maintain the work at a high level. It was interesting to note that both at Sokoto and at Kano aqueous sulphetrone was being used. At Kano pain on injection was mentioned as one of the difficulties. This was due, I believe, to the fact that the injections were given by the intramuscular route. I gave a number of patients their injections of sulphetrone subcutaneously, and there was little or no pain. I am of opinion that this latter route is the better, and if the solution is injected slowly the pain factor should be negligible.

At Sokoto, with Dapsone, there have occurred three cases of psychosis (0.7%), three cases of dermatitis (0.7%), one of hepatitis, and one death from hepatic toxemia. There has been no evidence of toxicity with parenteral sulphetrone. It is admitted that psychosis may have been in previously unstable individuals, and hepatitis, including the death, may have been in persons with already grossly damaged livers; but the interesting fact is that none of these results were seen with aqueous sulphetrone. I am not advocating the switching over to aqueous sulphetrone, but it appears that it would be well to use this as an alternative treatment.

The institution outside Kano is also first-class. The staff is greater and, in addition, there is an American missionary who is a fully trained technician. The institution would be excellent as a basic training centre. I was interested to hear that the Government of Northern Nigeria have recruited an orthopaedic surgeon, and it is hoped that in due course orthopaedic work will be possible.

I can only give the briefest of impressions of this fine work, and I feel that with institutions of this nature, and the gradual development of out-patient centres, the advance in N. Nigeria will be as significant in the years to come as in the South. More financial aid is needed to achieve this desirable end. Doctors need help and encouragement, so that leprosy in all its aspects will be adequately studied by the enthusiastic medical staff of these institutions.

The most reasonable approach to leprosy in the North would appear to be to concentrate on central leprosy sanatoria equipped for specialised work, e.g. orthopædic surgery, admitting particularly the infective cases. In addition to this as many local segregation units as possible should be established. Out-patient clinics could be attached to these institutions, and at Government hospitals, where controlled treatment might be available.

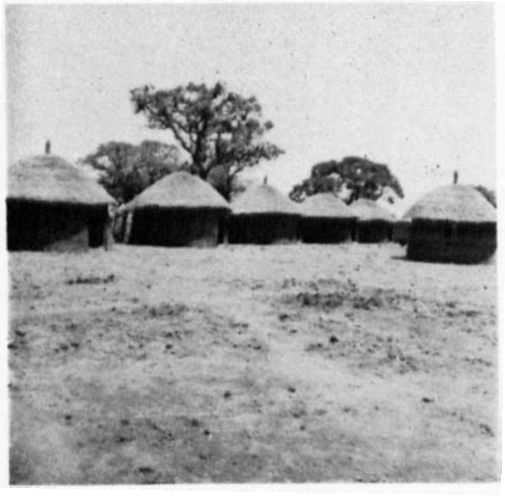
I was deeply impressed with the growing opportunities in Northern Nigeria, and with the excellence of the work of the Missions in this area.

In closing this report I should like to express my deep and

NORTHERN NIGERIA

Dr. Ross with a group of village officials at Giwa, near Zaria.

Ward at S.I.M. Leprosy Institution, Kano



Giwa Segregation Unit.

Babies' creche, Leprosy Institution, Kano

SOUTHERN NIGERIA

Segregation Centre near Isoba, Rivers Province, S. Nigeria.

Hospital at Ogoja.

Patients' houses at Itu.

Patients' houses at Ogoja.

sincere thanks to all who made this tour so pleasant and profitable. I should particularly like to record my thanks for the excellent way in which Dr. Davey and then Dr. Ross arranged my itinerary. The whole programme was completed without a hitch. To the Director of Medical Services, and to Dr. Bland, and to all who guided and assisted me, I am profoundly grateful.

REVIEWS.

Lowe, John. *Isoniazid in Leprosy.* Lancet **263** (1952) No. 6743. p. 1012-1013.

Twenty patients with uncomplicated leprosy (10 lepromatous and 10 tuberculoid) were treated for $5\frac{1}{2}$ months with Isoniazid commencing with 50 mgm and increasing to 150 mgm daily. Owing to the poor response the dosage was later increased in some cases to 300 mgm daily. No significant improvement took place. Neither was any improvement seen in 7 cases suffering from complications following sulphone or thiosemicarbazone treatment apart from what would apply simply to the withdrawal of the drug: Isoniazid is possibly of slight benefit to leprosy but its action is much less than sulphones or thiosemicarbazone in comparable cases.

G. O. TEICHMANN.

Cochrane, R. G. *The influence of recent advances in leprosy on present day conceptions of the disease in relation to its diagnosis, treatment and prevention.* Edinburgh Med. Journal **59** (1952) 509—

The writer states that by means of the Fite-Farraco method of staining bacilli in the tissues and the Khanolkar method of concentrating bacilli from the tissues it was now possible to find *M. leprae* in every active case of leprosy. This raises again in acute form the question of the infectivity of the so-called non-infective form of leprosy. However he personally believed that this does not alter the generally accepted view that leprosy is only infective in those cases where bacilli can be discovered by standard methods of examination.

The writer then emphasised the importance of tissue immunity in leprosy and its effect on prognosis and gave a modification of the pan-American classification dividing all leprosy cases into Lepromin positive; Lepromin Variable and Lepromin Negative with their various subdivisions.

After dealing with the sulphone treatment of leprosy he discussed the 3 types of reaction found in leprosy—(1) Violent reactions found in tuberculoid leprosy due to tissue response which hastens recovery; (2) Erythema nodosum or acute lepra reactions which is held to be an allergic phenomenon but the antigen—bacillary products—is no longer confined to the tissues, but is circulating and as a result of rapid multiplication of *M. leprae* and its equally rapid destruction a hypersensitisation arises with high fever and erythema nodosum lesions are seen; and (3) Subacute or chronic lepra reactions in which there is a rapid multiplication of bacilli without corresponding destruction.

Dealing with the control of leprosy the writer holds that it is necessary to separate infective cases from healthy persons especially children. Although sulphone treatment is a powerful aid in reducing infection it was not sufficient in itself. G. O. TEICHMANN.

Lowe, John. *ACTH & Cortisone in treatment of complications of leprosy.* Brit. Med. Jour. No. 4787 (1952) p. 746-749.

As some complications of leprosy are difficult to treat and may be precipitated or aggravated by chemotherapy, and as there are certain resemblances between these complications and those conditions alleviated by ACTH and Cortisone, a trial of these hormones was made on 38 cases in Nigeria. Owing to the rigid economy required the full doses recommended could not be given. However, full doses, i.e. 50 mgms of ACTH six hourly, or of cortisone 100 mgm 12 hourly, were given for 2-3 days followed by smaller doses for 2 days as a single course.

The author summarises his results as follows:—

"While the acute manifestations of leprosy can be very readily controlled by hormone treatment, there is a grave danger of aggravating the underlying disease, particularly in those receiving repeated short courses of treatment, and even of aggravating the particular symptoms to alleviate which the hormone has been given. Thus early results are good, and the late results too often bad. Attempts to minimise the bad late results by modified dosage and by energetic chemotherapy during hormone treatment have met with little success. Nevertheless in 2 complications of leprosy and its treatment, both of them serious, the results are striking and are usually attained with such small doses that hormone treatment is fully justified. These 2 complications are (1) Sulphone sensitivity with drug fever, dermatitis and hepatitis; and (2) Acute and subacute leprous eye inflammation, in which condition the local use of cortisone appears to be effective and safe and is to be preferred to injection. Apart from these two conditions the use of hormone treatment of leprosy is usually contraindicated."

G. O. TEICHMANN.

Cochrane, R. G. *The Chemotherapy of Leprosy.* Brit. Med. Jour. No. 4796 (1952) p. 1220-1223.

This paper summarising the past and present treatment of leprosy was read at the B.M.A. meetings in Dublin. After a short

summary of the use of chaulmoogra oil the writer discusses the mode of action of the three forms of sulphones—basal, mono— and disubstituted forms—at present in use. Whereas Lowe holds that all forms are broken down either in solution or in the body to the parent DDS before becoming therapeutically effective, the writer believes that there is not sufficient DDS present in 50% sol. of Solapsone (Sulphetrone) when given parenterally to account for the remarkable improvement that takes place in leprosy. He admits the possibility, as suggested by Payne, that a monosubstituted derivative may be produced in the body which explains the effectiveness and lack of toxicity of solapsone when given parenterally. On the whole he considers it is safer to give either the mono- or di-substituted forms parenterally in preference to DDS owing to the toxicity of the latter.

Dealing with the criteria of cure the writer says that there appear to be 4 stages in the progress of the disease to clinical cure:— (1) A change in the morphology of *M. Leprae.* (2) a phase in which *M. Leprae* is stimulated into activity. (3) a phase when the bacilli begin to diminish and presumably reproductive capacity is affected and (4) when *M. Leprae* cease to multiply the process of disintegration continues until the bacilli are reduced to acid-fast dust, and the macrophages dispose—in the large majority of cases —of these degenerate forms, thus curing the disease. He holds that these granular forms, often found in the small nerves of the skin may be a resistant phase of *M. Leprae* and a potential source from which relapse can take place. As long as sulphones are given these cannot develop, but if treatment is stopped the prelepromatous stage of leprosy may re-develop and so we may have to wait 10-15 years before concluding that the " cure " is permanent.

G. O. TEICHMANN.

Leprosy in India. Vol. 24, 1 (January, 1952).

Recent Advances in the Treatment of Leprosy by Dharmendra. This is a short, but succinct, review of the modern treatment of leprosy with sulphones. For parenteral administration 50 per cent watery solution of sulphetrone or novotrone (the Indian equivalent) is recommended. For oral use DDS is preferred. In view of the tendency to relapse, small doses of sulphone drugs should be continued for a long period.

The work on streptomycin is mentioned, but " apart from the question of toxicity, the high cost of the drug will limit its use in most countries where leprosy is prevalent." The work done on aureomycine, para-amino-salicylic acid and cepharanthin is shortly mentioned, but none of these are recommended.

Regarding thiosemicarbazone the author says: " It is still too soon to assess the value of the drug in leprosy, but from the results obtained so far it can be said that it appears to be of definite use in the treatment of leprosy. However it is not free from toxicity . . . since in certain cases even a small dose of 25 mg. or less results in the production of a febrile reaction which may be accompanied by iritis and fresh crops of nodules. A special feature of improvement found in some of the cases with marked sensory disturbance, has been the partial return of sensation in the affected parts."

E. MUIR.

Leprosy in India. Vol. 24, No. 2, (April, 1952).

A method of Concentration of Acid-Fast Bacilli in Skin Biopsies from Leprosy Patients.

The method used is to take from a selected area a biopsy of 5 x 3 x 5 mm. Soak for 4 to 8 hours in 1 per cent acetic acid. After removing the epithelium, drop the remainder into a homogenizer tube containing 3 c.c. of 1 per cent acetic acid, and crush at about 2000 r.p.m. with an electrically operated glass crusher for 5 to 10 minutes. The resulting emulsion is shaken up with 20 drops of a petroleum-ether—sulphuric-ether mixture (1 in 10). The disk which forms on the surface contains the bacilli.

Eight drops removed with a 3 mm. platinum loop is spread out on a slide over an area of 2 x 2 cm. The slide is dried in an incubator, fixed for 15 minutes in Carnoy's fixative, and stained with a slight modification of the Ziehl Neelsen method.

In 50 cases, in 36 of which no bacilli could be found by ordinary methods and only a few in 14, bacilli could be found by this method, and in some there were considerable numbers. Sixteen cases from the cancer hospital furnished negative controls. Photomicrographs of one case show the difference as between this and the usual method of examination. E. MUIR.

CORRESPONDENCE

To the Editor of " Leprosy Review."

Sir:

The report of Dr. R. G. Cochrane, on his South American journey, published in the Vol. 23, n.2, April, 1952, page 63, deserves some comments.

I went with my car to Galeao Air Port, Governor Island, expressly to take Dr. Cochrane to the city. On the way we stopped

at the Instituto Oswaldo Cruz where he " spent two hours " visiting the Institute. In my laboratory he spent a very short time, mostly reading the documents regarding the sad affair of Dr. Soule and the Michigan University. Secondly he gave a glance at my leprosy cultures and my Rhesus monkeys inoculated with the same. He did not spend two hours discussing my experiments with me. I saw immediately that he had " parti-pris " upon such experiments. Now he says that his personal opinion is against my point of view.

Dr. Cochrane has little experience in the bacteriology of leprosy and his opinion is not valuable.

My experience dates from 1927. To obtain a pure culture of an acid-fast bacillus from leprosy material is a very difficult task, but I got, in 25 years, a few good strains. Only after such experience had I the courage to say that I had isolated two strains of *Mycobacterium leprae hominis* (See Memorias do Instituto Oswaldo Cruz, 1950, vol. 48:51 to 99 and from 101 to 112). Immunological experiments with cultures can never be comparable with the lepromin-test. That is quite comprehensible: lepromin is a suspension of Hansen's bacillus with all antibodies produced by the infected human organism. This matter is a subject for a long forensic discussion.

In Buenos Aires when I read my paper upon inoculation of Rhesus monkeys with my cultures, Dr. Cochrane joined in the discussion comparing his results with mine. Dr. Cochrane et al (Int. J. Lep., 7:377/81) inserted into the mesentery of monkeys (*M. sinicus*) a nodule taken from a case of leprosy." In their first conclusion they said: " There appears to be a possibility of infecting a monkey by performing preliminary splenectomy and embedding a nodule in the peritoneum . . . ." In their second note, Cochrane et al (Int. J. Lep., 12:88/97) they annulled their first success. In their third note: " Inoculation of monkeys with human leprosy material " (pp. 98/100) they said . . . " a rhesus monkey was splenectomised on November 25th, 1940, and infected in the usual fashion " (p. 99).

Such experiments are quite different from mine, and then not comparable. I infected and obtained in the glabrous skin (face) of Rhesus monkeys inoculated with some of my leprosy cultures, lesions in which the histology is similar to human lepromata. I obtained also passage of the infection through a series of Rhesus monkeys (Dr. Cochrane saw No. six), always with re-isolation of the inoculated bacilli.

Yours faithfully,

(Dr.) H. C. de Souza-Araujo.

Rio de Janeiro, 31st December, 1952.

HER MAJESTY'S COLONIAL SERVICE
LEPROSY SERVICE IN NIGERIA

Medical Officer required for the administration of preventive medical services and the clinical work of curative medicine in relation to leprosy. The selected officer would not deal with leprosy only but would also have the general medical and surgical care of leprosy patients. He would be stationed at a Settlement with properly equipped hospital (with Nursing Sister) and laboratory. The work also includes the supervision of leprosy segregation villages and treatment centres within a radius of 100 miles; making epidemiological investigations; and teaching African Staff. Clinical research work is encouraged. The officer will normally have professional colleagues and live in a European community.

Appointment may be made as follows:—

(a) on 3 years probation for permanent and pensionable employment in tthe Colonial Medical Service, with retiring age of between 45 and 55. Pensions are at the rate of 1/600th of final pensionable emoluments for each completed month of reckonable service.

(b) from the National Health Service.

Candidates may resign from the National Health Service but retain their superannuation rights during their time in Nigeria (up to six years) and receive a resettlement grant of 20% of the aggregate of their Colonial salary on leaving Nigeria at the end of their engagements.

or (c) on short term contract with inclusive salary of from £1,164 per annum rising to £2,150 per annum; on completion of contract a gratuity is paid at the rate of £37 10s. 0d. for each completed period of 3 months service (including leave).

Officers appointed under (a) or (c) are required to contribute to a Widows' and Orphans' Pension Scheme.

Salaries for officers appointed under (a) or (b) range from £1,010 to £1,850 per annum. Starting salary in all cases depends on age, experience and war service.

Quarters are provided at low rents. Free passages for officer and his wife and assisted passages for up to two children under the age of 16. Income tax at local rates. Normal tour of service is 18 months. Generous home leave. Candidates must hold medical qualifications registrable in the United Kingdom. Application forms can be obtained from the Director of Recruitment (Colonial Service), Colonial Office, Sanctuary Buildings, Great Smith Street, London, S.W.1. (quoting reference CSE 60/14/01).