

# LEPROSY REVIEW

The Quarterly Publication of  
THE BRITISH EMPIRE LEPROSY RELIEF ASSOCIATION.

---

VOL. XV. No. 1.

JANUARY, 1944.

---

## Principal Contents:

---

The Effects of Cocoyam  
on Leprosy

Modes of Transmission of  
Leprosy

Incidence of Leprosy in  
Children born at Ngomahuru

The Domestic Fly - a Carrier  
of Leprosy

Reviews

Reports

25 KIDDERPORE AVENUE, LONDON, N.W.3, England

*Price: One Shilling and Sixpence*

*Annual Subscription: Five Shillings*

# LEPROSY REVIEW.

---

---

VOL. XV. No. 1.

JANUARY, 1944.

---

---

## CONTENTS.

	PAGE
An Investigation of the Effects of Cocoyam on Leprosy T. F. DAVEY and C. M. ROSS	3
Modes of Transmission of Leprosy ... .. B. MOISER	12
Incidence of Leprosy in Children born at Ngomahuru ... B. MOISER	12
The Domestic Fly—A Carrier of Leprosy ... J. K. MUKHERJI	13
Abstract of Administrative Reports on the Oji River Leper Settlement and Clinics for the years 1941 and 1942. T. D. F. MONEY	15
Reviews ... ..	18
Colonial Medical Reports ... ..	23

Edited for the British Empire Leprosy Relief Association, 25 Kidderpore Avenue, London, N.W.3, by Sir Leonard Rogers, K.C.S.I., C.I.E., M.D., F.R.S., Hon. Medical Adviser, to whom all communications may be sent. The Association does not accept responsibility for views expressed by the writers.

---

---

## NOTES ON CONTRIBUTORS.

DR. T. F. DAVEY is the Medical Superintendent of the Leper Colony at Uzakoli, S. Nigeria.

DR. C. M. ROSS assists Dr. Davey at the Leper Colony at Uzuakoli.

DR. B. MOISER is the Leprosy Specialist for S. Rhodesia, and is in charge of the Ngomahuru Leprosy Hospital.

DR. J. K. MUKHERJI is Resident Superintendent and Medical Officer of the Leper Home and Hospital, Naini, India.

DR. T. D. F. MONEY is Medical Superintendent of the Oji River Leper Settlement, S. Nigeria.

# 'A V E N Y L' BRAND

2-Myristoxy-mercuri-3-hydroxybenzaldehyde

## *For the treatment of Syphilis in leprous patients*

A lipo-soluble mercury compound which was evolved in the Wellcome Chemical Research Laboratories for the treatment of syphilis in leprous patients, for whom arsphenamine therapy is generally contra-indicated.

It is dissolved in chaulmoogra esters ('Moogrol' <sup>TRADE MARK</sup>) or hydnocarpus oil and given concurrently with the anti-leprotic treatment, causing the minimum of inconvenience to patient and user. Marked clinical improvement and negative Wassermann reaction are produced in the majority of cases.

Tubes of 1 gramme, 7/3, Purchase Tax, 11d. extra



**BURROUGHS WELLCOME & CO**

*(The Wellcome Foundation Ltd)*

**LONDON**

ASSOCIATED HOUSES: NEW YORK · MONTREAL · SYDNEY · CAPE TOWN · BOMBAY · SHANGHAI · BUENOS AIRES

Price 4/-

# LEPROSY

## Diagnosis, Treatment & Prevention

(SIXTH EDITION)

**By E. MUIR, C.I.E., M.D.**

*Published by the Indian Council of the British Empire Leprosy Association. (see Review in Oct. 1938 issue of "Leprosy Review")*

This book has been re-written and now contains 192 pages and 86 illustrations. The book is issued primarily for the use of doctors in India who wish to be put in touch with practical means of dealing with leprosy from both the therapeutic and public health points of view. It is hoped that it will also prove useful in the British Colonies and in other countries where leprosy is endemic. Much of the teaching found in standard text books has been omitted in order to make it possible to condense within a few pages knowledge that is absolutely essential for understanding the nature of the disease, and the lines along which it may be dealt with successfully.

*Can be obtained from the British Empire Leprosy Relief Association  
25 Kidderpore Avenue, London, N.W.3.*

AN INVESTIGATION OF THE EFFECTS OF  
COCOYAM ON LEPROSY

T. F. DAVEY, M.D., M.Sc.

and

C. ROSS, M.B., Ch.B., D.T.M.

It has been suggested by Oberdorffer that a diet rich in cocoyam may be a predisposing agent in infection with leprosy <sup>(1)</sup>. The action of cocoyam in this respect is attributed to a sapotoxin which has a specific action, primarily on the adrenal glands. The suggestion is based on observations made in S.E. Nigeria where it is maintained that the greatest amount of cocoyam is eaten during the months of January to March, and during this time many neural cases of leprosy have a positive result to bacteriological tests for the lepra bacillus.

This suggestion is of considerable importance in South Eastern Nigeria, where the incidence of leprosy is very high, and cocoyam is an important article of diet. The discovery of a relationship between cocoyam and leprosy would simplify the immense problem of leprosy control.

Three main varieties of cocoyam are eaten in Nigeria, namely *Colocasia Antiquorum*, *Xanthosoma Sagittifolium*, and *Xanthosoma Mafaffa*. Africans describe and name several subvarieties of these according to taste, colour, and keeping properties. Only one variety, namely *X. Sagittifolium*, is eaten in large quantities, and in certain parts of the Niger Delta and in the Cameroons under British Mandate it is a staple article of diet. For our purpose we are concerned with the Ibo people, a tribe several millions strong. This tribe has a strong racial susceptibility to leprosy, the incidence of which varies between 10 and 150 per mille. We have never found it less than 10 per mille. Among these people also, cocoyam is extensively cultivated and eaten, but its culture and usage follow old established rules, reference to which will be made later. The existence of a sapotoxin in cocoyam was pointed out by Clark <sup>(2)</sup> and it will be necessary to refer repeatedly to his work.

In order to prove the truth of Oberdorffer's suggestion it would be necessary to establish two facts.

(1). The sapotoxin must be actually eaten as such. Its presence must be demonstrated in the parts of the cocoyam normally used for food, it must not be destroyed by normal methods of preparation, and if it is present only at certain seasons, those

seasons must correspond with the times of the year when cocoyam is eaten.

(2). The sapotoxin must have a specific action on the human subject.

The study of the second of these two subjects abounds in difficulties. It would be almost impossible to subject a sufficiently large group of non-lepers to the degree of control and observation required over a sufficient period of time in order to obtain conclusive results. On the other hand, if the sapotoxin has a specific predisposing action, it should also have a deleterious action on people already suffering from leprosy, particularly people whose resistance to the disease is low. The suggestion was indeed based in the first place on the observation of cases of leprosy. This paper reports the results of feeding

Settiement with excess of cocoyam. Children were chosen as their resistance to leprosy is notoriously low. Many of them were unsatisfactory cases from the standpoint of successful treatment, many were at puberty and thus the best soil was provided for demonstrating any deleterious effect of sapotoxin.

#### Twenty-e

the main types of leprosy (Group 1). An equal number of controls was also chosen (Group 2), comparable in age, type and extent of the disease with those of Group 1. All the children in both groups were subjected to detailed observation from one cocoyam season to the next, and their progress was followed throughout the year until the cycle was completed.

From March 1st 1940 when the experiment was commenced, until June 30th 1940, the children in Group 1 in addition to their normal diet were given massive doses of cocoyam daily, the average daily amo

this time the children concerned consumed no less than 2 cwt. of prepared cocoyam each. We were forced to stop the supply at the end of June as the cocoyam season is then over, and the tubers are almost unobtainable. Throughout this period no leprosy treatment whatever was given, the children in both groups were examined daily, weights were recorded weekly, the sedimentation test was carried out fortnightly and thorough bacteriological tests were carried out at least monthly. A record was also kept of everything the children ate apart from the cocoyam provided. No cocoyam was given to the children in Group 2, but records of diet and medical observation and tests were carried out as for Group 1. These were continued in both groups until March 1st 1941. A detailed record was thus obtained of the progress of the children

in both Groups over a period of one year, the only difference between the groups being that those in Group I received massive doses of cocoyam for four months of the year.

The results of the test are presented in Table I.

TABLE I

GROUP I (Cocoyam given).

No.	Age	Type of Leprosy	Weight of Increase Mar.-June (pounds)	SED. INDEX		PROGRESS OF LEPROSY		
				Mar.-June	June	Mar.-June	July-Oct.	Nov.-Feb.
1.	14	Nt.1	5½	10	5	Improved	New macules	Improved
2.	7	Nt.1	4½	42	54	Stationary	New macules	Much improved
3.	12	Ns.1	2½	65	51	Stationary	Stationary	Stationary
4.	12	Ns.1	2½	46	38	Improved	Improved	Improved
5.	14	Nt.2	5	41	44	Stationary	New macules	Stationary
6.	15	Nt.2	4½	65	43	Improved	Improved	Much improved
7.	8	Nt.2	8½	31	51	Stationary	Stationary	Slightly improved
8.	9	Nt.2	6½	49	41	Stationary	Stationary	Slightly improved
9.	12	Nt.2	1½	64	61	Stationary	Stationary	Stationary
10.	11	Ns.2	3½	39	41	Stationary	New macules	Stationary
11.	15	Ns.2	7½	42	46	Stationary	Stationary	Slightly improved
12.	14	Ns.2	2½	54	52	Improved	Stationary	Stationary
13.	12	Ns.2	5½	46	46	Improved	Improved	Much improved
14.	10	Ns.2	6½	50	50	Stationary	Stationary	Improved
15.	14	Ns.2	2	58	59	Stationary	Stationary	Slightly improved
16.	5	Ns.2	2½	54	53	Stationary	Stationary	New macules
17.	14	Ns.2	7½	49	33	Improved	Improved	Much improved
18.	12	L.1N.1	7	54	56	Stationary	New macules	Stationary
19.	15	L.1N.2	7	73	49	Improved	New macules	Stationary
20.	14	L.1N.2	6½	62	49	Stationary	Stationary	Stationary
21.	14	L.1N.2	2	48	58	Stationary	New macules	Stationary
22.	12	L.1N.2	4½	63	59	Stationary	New macules	Stationary
23.	11	L.2N.1	2½	63	60	Improved	Improved	Improved
24.	10	L.2N.1	2½	57	56	Stationary	Stationary	Stationary
25.	14	L.2N.2	6½	62	53	Stationary	New macules	Stationary
26.	17	L.2N.3	7½	60	66	Stationary	Improved	Slightly improved
27.	9	L.2 Loss	2½	60	53	Stationary	Worse	Worse
28.	12	L.2	1½	64	74	Stationary	Stationary	Stationary

## GROUP 2 (No cocoyam given).

No.	Age	Type of Leprosy	Weight Increase Mar.-June (pounds)	SED. INDEX Mar.-June		PROGRESS OF LEPROSY		
						Mar.-June	July-Oct.	Nov.-Feb.
29.	13	Nt.1	4½	39	32	Slightly improved	Improved	Improved
30.	6	Nt.1	3½	40	62	Stationary	Stationary	Stationary
31.	4	Ns.1	Loss 1½	33	31	Stationary	Slightly improved	Slightly improved
32.	11	Ns.1	4½	44	40	New macules	Stationary	Improved
33.	12	Ns.2	1½	34	40	Improved	Improved	Improved
34.	15	Nt.2	Loss 2½	60	69	Stationary	Worse	Worse
35.	9	Nt.2	4	56	57	Stationary	New macules	Stationary
36.	8	Ns.2	3	61	62	Slightly improved	Stationary	Stationary
37.	15	Nt.3	2½	31	31	Improved	Stationary	New macules
38.	11	Ns.2	Loss 1½	38	29	New macules	Stationary	Stationary
39.	14	Ns.2	5½	57	39	New macules	Stationary	Away
40.	13	Ns.2	Loss 2	50	44	Improved	New macules	Stationary
41.	11	Ns.2	Loss 3½	60	62	Stationary	New macules	Improved
42.	9	Ns.2	½	39	46	Slightly improved	New macules	Improved
43.	12	Ns.2	4	45	42	Improved	Improved	Improved
44.	5	Ns.2	1½	37	42	Improved	Slightly improved	Improved
45.	15	Ns.2	Loss 2½	18	69	Stationary	New macules	Improved
46.	13	L.1N.3	3	64	58	Stationary	New macules	Stationary
47.	9	L.1.N.1	Ls1½	58	37	Stationary	Stationary	New macules
48.	12	L.1.N.2	Ls1½	65	64	Improved	Stationary	New macules
49.	11	L.1N.1	3½	65	68	Stationary	New macules	Stationary
50.	14	L.1N.2	3	61	55	Stationary	New macules	Improved
51.	11	L.2.	Loss 3½	45	58	Worse	Stationary	Improved
52.	10	L.2N1	nil	41	44	Stationary	Stationary	Stationary
53.	14	L.2N.1	8½	58	63	Stationary	Stationary	Worse
54.	15	L.2	3½	47	34	Stationary	Stationary	Stationary
55.	8	L.2	2	56	59	Stationary	Stat	Stationary
56.	15	L.2		41	39	Stationary	Stationary	Stationary

The Cairo classification of leprosy is used, the Sedimentation Index is recorded as obtained in March and June, and the periodic progress of leprosy as based on clinical appearances and bacteriological findings is indicated. The general high level of the Sedimentation Index gives a clue to the unsatisfactory type of case chosen for the test, so that every possible opportunity was given for the toxic effects of the sapotoxin to evidence themselves.

It is clear that children in Group 1 suffered from no ill effects from the cocoyam provided, their progress indeed comparing favourably with that of Group 2, the children of which were given no cocoyam.

#### DISCUSSION.

There are several possible fallacies in this experiment and it is necessary to deal with these singly.

##### 1. *The type of cocoyam used.*

The variety of cocoyam used in the test is known by the Ibo name of Nkasi, and is the only type used throughout S.E. Nigeria to any large extent. It is a variety of *Xanthosoma Sagittifolium*.

##### 2. *The method of preparation.*

There are only two methods of preparation in common use.

(a) The cocoyam is boiled and then pounded in a mortar, when it is called fufu. This is the usual method and was used by us in the test. (b) When a hurried meal is required, the cocoyam may be thrust into the fire and roasted.

In his experiments with animals, Clark used raw cocoyam and it may be suggested that the sapotoxin is heat liable and the method of preparation we adopted destroyed the sapotoxin, thus producing negative results.

If the sapotoxin is unstable to heat, it can immediately be stated that its importance is negligible, for we have questioned 400 Africans as to their methods of preparing and eating cocoyam and not one single individual stated that he ever ate cocoyam in the uncooked state. When describing toxic symptoms in human beings Clark apparently assumes that the tubers were eaten in the usual African way, namely after cooking. It is of interest to note that every one of the children of Group 1 ate per week far more cocoyam than that consumed by the case of fatal poisoning recorded by Clark.

There remains one possible way in which improperly cooked cocoyam may actually find its way into the diet. It was acknowledged that a careless person, in particular a child, may occasionally remove a roasted cocoyam from the fire before it is properly



cooked, but it was also pointed out that the uncooked tubers have an unpleasant taste.

### 3. *Seasonal Variation in Sapotoxin Content.*

According to Clark, the toxicity of 'cocoyam in Nigeria is maximal in December and minimal in February. In South Eastern Nigeria the amount of cocoyam eaten in December is small, so that for practical purposes this observation loses much of its importance. The season during which cocoyam is eaten follows a settled routine and bears a definite relationship to another food-plant, namely the yam (*Dioscorea*). Yams are everywhere esteemed as the finest food. It is interesting to note that among the Ibos, yams are a man's crop, planted and tended almost exclusively by men. The culture of the rather despised cocoyam is relegated to women, and cocoyam is valued as food only when yams are scarce. The corms of cocoyam are planted from May onwards, and the harvest begins in December. Very little cocoyam is eaten in December however because the yam harvest is still at its zenith, and yams are preferred. Yams remain plentiful until the end of February, when the yam planting season begins. From this time yams become increasingly scarce and expensive and it is then that the cocoyam comes into its own. From April until June it is a staple article of diet. These facts are well illustrated in Table 2 which shows the prices of cocoyam and yam throughout the year at Umuahia market, one of the most important markets in the area. Figures are given for both 1939 and 1940.

TABLE 2  
PRICE IN PENCE PER CWT.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939												
Yam	14	14	28	29	35	37	24	18	9	20	12½	16
Coco												
yam		7	8½	14	12	11	10	11	unobtainable			
1940												
Yam	22	31	31	44	56	37	36	21	23	19	20	26
Coco												
yam	8½	8½	17	17	21	22	unobtainable					

The most important feature of this table is that from September until December in each year, cocoyams were unobtainable, and it may be taken for granted that the amount eaten in December is negligible. Undue attention should not be paid to the fact that yams are consistently dearer than cocoyams. It should be borne in mind that throughout the area fully 90 per cent of the population are small farmers, all growing yams, and yams are only

offered for sale in the market when in excess of a man's requirements. As the demand is usually in excess of the supply, they command a good price, but even though cocoyams are cheaper yams remain the more important article of food until the planting season begins.

Oberdorffer states that the greatest amount of cocoyam is eaten between January and March. We are unable to agree with this statement and our opinion is approved by every African we have questioned. Although cocoyam is certainly eaten during the months of January to March, far more is eaten from April onwards when yams are scarce. It was for this reason that we selected the months of March to June for our experiment.

*Seasonal variation in the appearances of leprosy.*

During the months of June, July and August, both yams and cocoyams are scarce, any that are obtainable being of inferior quality. The yam harvest commences towards the end of August when yams again become plentiful. In former times the months of June, July and early August were a definite famine period, maize being the only available crop. The introduction of cassava, itself a toxic food, relieved the situation, but even to-day Africans acknowledge that diet is unsatisfactory during this period. To a rural population living at poverty level, an increase in the price of staple foods means that less money can be spent on meat, fish and other luxuries, and for many people the diet is both poor and unbalanced during the months concerned. It also happens that this period follows that in which most cocoyam is eaten. During the same months the rainy season reaches its height, mosquitoes and in consequence, malaria, are prevalent, while respiratory affections are common, and there seems little doubt that there is a general lowering of resistance to infection at this time. It follows that from June to mid August conditions are provided annually which are favourable to infection with leprosy, the visible signs of which should appear in succeeding months. It is interesting to notice that 26 of the 56 children observed exhibited either lepra reaction or new macules during the year of observation, and these appeared as follows:

Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
2	nil	nil	3	2	5	4	6	3	2	1	nil

There were 11 cases in Group 1, 15 in Group 2, while two of the children had fresh crops of macules in both March and October.

These findings are of interest when compared with those of

Lowe <sup>(3)</sup> but we do not attach any importance to them as it will be necessary to observe a far larger group before any conclusion of value can be reached.

*Diet of the children observed.*

If we had intended to carry out a test under true laboratory conditions, it would have been necessary to provide all the children with a controlled diet, those in Group 2 having no cocoyam whatever. This was not our intention. The results of tests made on laboratory animals living in unnatural conditions and fed on an artificial diet may prove fallacious when applied to human beings. The ill effects of the sapotoxin in cocoyam are of small account unless they are exerted under actual living conditions. The purpose of our test was to provide such conditions in the case of Group 2, and grossly exaggerate them as far as cocoyam was concerned in the case of Group 1. We therefore did not attempt the impossible task of rigidly controlling the diet of the children in Group 2. Any such attempt would indeed have vitiated the test. For part of the period of the test, yams are unobtainable, and the only alternatives in real life to the average African are cocoyams and cassava. Cassava is itself a toxic food, and a diet consisting entirely of cassava would have produced toxic effects similar to those of cocoyam. We therefore contented ourselves with keeping as accurate a record as possible of the diet of all the children, leaving them to their own devices as far as actual meals were concerned. It was inevitable that a varying amount of cocoyam found its ways into the diet. The amount varied from one child to another, several of them eating very small amounts and living mainly on cassava, but after reviewing the progress of the children in relation to their diets, we cannot trace any relationship between the amount of cocoyam eaten and the progress of leprosy observed by us during the period of the test.

*The sapotoxin.*

Clark states that the sapotoxin is a glucoside, the toxic effects of which are directly mainly to the kidneys, adrenals and liver. Symptoms are produced when cocoyam is eaten in large quantities over a period, and include lethargy, albuminuria and abdominal distention. These effects are counteracted by foods containing cholesterol, cystine, or sulphur in organic combination, e.g., animal protein, meat, fish, game, etc., palm oil, yeast. The diet of Ibos, particularly of the poorer classes is deficient in animal protein, but includes palm oil and yeast, the latter being contained in palm wine, the universal beverage. There is no doubt that fresh

palm wine counteracts the toxic effects of cassava which resemble those attributed to cocoyam. The diet of all the children included a certain amount of these foods.

Although we do not consider the results of our test merely conclusive, we can state that after providing and exaggerating those conditions of life favourable to the exhibition of specific toxic effects by the sapotoxin of cocoyam, we could not trace any deleterious effects on leprosy for which it could have been responsible.

South Eastern Nigeria presents to-day a sorry picture to the leprologist, for almost every known agent predisposing to infection with leprosy is in operation. A dense population, but recently brought into contact with civilisation, overcrowding, ignorance, primitive sanitary conditions, poverty, an unbalanced diet, diseases such as yaws, malaria, helminth infections, anaemia, all these factors are not only present, but almost universal, and it is small wonder that their combined effects produce an incidence of leprosy almost unparalleled in the world. It is possible that the sapotoxin of cocoyam also plays its part, but its action is not specific, and it is but one among a host of factors, many of which are obvious and remediable.

Our thanks are due to the Agricultural Officer, Umuahia, who provided us with the data presented in Table 2, and the hundreds of Africans who supplied us with information.

#### SUMMARY.

1. In order to investigate the action of the sapotoxin of cocoyam on leprosy, and thereby estimate its importance as a predisposing agent in infection with leprosy, a group of children suffering from leprosy were fed with massive doses of cocoyam. Cases with low resistance were selected in order to provide conditions most suitable for the exhibition of the toxic effects of the sapotoxin. The children, together with an equal number of controls, were subjected to detailed observation for one year.
2. No deleterious effects whatever could be observed.
3. Possible fallacies are dealt with and a wider discussion on questions of diet and seasonal variations of appearances of leprosy leads to the conclusion that although the sapotoxin may possibly exert some slight toxic effect in actual living condition, this action is not specific and the sapotoxin is but one among many factors predisposing to infection with leprosy in Nigeria.

- (1). Oberdoerffer, N. J. An investigation into the predisposing factors of leprosy in South Nigeria. Arch. f. Schiff-u. Tropen-Hyg. 42 (1938), 367-372.

- (2) Clark, A. A report on the effects of certain poisons contained in foodplants of West Africa upon the health of the native races. *Jour. Trop. Med & Hyg*, 39 (1936), 285-295.
- (3). Lowe, J., and Chatterji, S. N. Seasonal variations in leprosy in Calcutta. *Internat. Jour. of Leprosy*, 7 (1939), 137-148.

[It is regretted that war conditions have considerably delayed the publication of this article.—The Authors.]

## MODES OF TRANSMISSION OF LEPROSY

BERNARD MOISER, M.B. (Lond.), M.R.C.S., L.R.C.P., D.P.H.

A good deal of evidence accumulated in all parts of the world supports the view that leprosy is a house disease. Many instances have occurred where a succession of patients have come from the same kraal, and from the same house, extending over a period of some years, so that it would appear that infection, in some form or other, remains in the house after the patient has been removed to hospital.

The great majority of patients that have been admitted to Ngomahuru during the past 14 years have come from small kraals in the Native reserves of S. Rhodesia. I have suggested that all such huts should be burnt down as soon as possible after removal of the patient, or patients.

One Native Commissioner has expressed his opinion to me that the Natives themselves would not be likely to raise any objection.

Some years ago I raised the question of beer drinks as a possible mode of transmission of the disease, and I have also suggested that it would be helpful if a further warning were sent round to Chiefs not to allow lepers to attend beer drinks.

## INCIDENCE OF LEPROSY IN CHILDREN BORN AT NGOMAHURU, S. RHODESIA

BERNARD MOISER, M.B. (Lond.), M.R.C.S., L.R.C.P., D.P.H.

During the past few months, I have been examining children, born at Ngomahuru, for signs of the disease.

All had been breast fed at Ngomahuru by the mothers for one

year after birth, without any special precautions having been taken, and had then been sent away to healthy relatives or friends, after weaning, which was carried out gradually before the year was finished. Their ages ranged from 16 years downwards. Of 42 children so examined, only one (twin) has developed the disease, whilst 2 others have suspicious signs not supported by microscope findings.

It thus appears to be a fairly safe practice to allow children to be brought up by their mothers for a year, though there can be no doubt that the ideal is to separate the child from the mother at birth, to be breast-fed by a wet nurse. But this practice is abhorrent to the native women of this country and it has been found quite impossible to persuade a woman to breast-feed another's child.

It is equally impossible to induce the mother to allow the child to be bottle fed.

## THE DOMESTIC FLY—A CARRIER OF LEPROSY

J. K. MUKHERJI, L.C.P. & S. (Bombay)

It is generally observed that the domestic fly, with its promiscuous habits, is fond of alighting on open wounds. They feed on the secretions from these wounds and carry millions of organisms on their feet and mouth parts, and drop their faeces wherever they alight. It has always been in my mind to dissect out the intestines of these flies and examine their contents to find out whether they ingest lepra bacillus from open wounds of highly lepromatous cases or not. Accordingly the following experiments were carried out in our clinical laboratory.

Flies were allowed to alight on open wounds of a highly lepromatous case. They were then caught and scrupulously cleaned first in weak lysol lotion then in plain water. After this preliminary clean up, they were put in a wide glass test tube, the mouth of which was plugged lightly with a ball of cotton wool to prevent them from flying away.

*Experiment No. 1.* A couple of flies were taken from the lot before they were put in the test tube, their head and mouth parts

were pressed over clean slides and smears made, slides were then stained by Ziel-Nelsen method and examined under microscope.

*Observation.* Numerous acid fast bacilli were seen in every field.

*Experiment No. 2.* About six hours after, a couple of flies were taken out from the test tube and each one was fixed on a card board with a pin, stomach and intestines were dissected out, smears made from the contents on glass slides were stained and examined as in Experiment No. 1.

*Observation.* Numerous acid fast bacilli were found in every field.

*Experiment No. 3.* Similar experiment was done after 24 hours.

*Observation.* Same as in Experiment No. 1 and 2.

*Experiment No. 4.* Smears made from the faeces deposited by flies on the sides of the test tube were stained and examined.

*Observation.* Numerous acid fast bacilli were found in every field.

*Experiment No. 5.* Smears made from the contents of digestive system of flies caught in the consulting room, which is a separate block but close to the hospital wards, were stained and examined.

*Observation.* A few acid fast bacilli were found.

*Experiment No. 6.* Smears made from the contents of the digestive system of flies caught in the Resident Medical Officers Bungalow situated about half a furlong away from the Leper Home, were also stained and examined as above.

*Observation.* No acid fast bacilli were found in any field.

#### COMMENTS

1. The house fly ingests lepra bacilli and passes them on in the faecal deposits.
2. It is quite possible that the domestic fly is a carrier of leprosy.
3. How long lepra bacilli can remain in the digestive tract of a domestic fly needs investigation.

## ABSTRACT OF ADMINISTRATIVE REPORTS ON THE OJI RIVER LEPER SETTLEMENT AND CLINICS FOR THE YEARS 1941 & 1942

DR. T. D. F. MONEY

These reports, which have only recently been received, deal mainly with administrative matters. Their principal points can be summarised as follows:

The principles on which the campaign against leprosy is based are:—Firstly, the offer of treatment to all suitable patients who ask for it, the limitations of the areas in which it can be provided being dependent on financial resources. About three-fifths of the worst affected areas of the Onitsha Province are now within reach of a treatment centre. Secondly, children being specially susceptible require to be protected from contact with highly infectious leprosy cases. Thirdly, the support of public opinion by means of addresses before Native Administrations and Church leaders. Fourthly, whenever possible those under treatment are trained to assist, under supervision, in giving treatments, keeping records, nursing and laboratory work. They now number about one hundred. Fifthly, the fullest use of this trained African staff is made to relieve the small number of Europeans available. During the last five years a trained African staff has thus been built up, with the help of the Church Missionary Society which bears the whole cost of educating and employing the indigenous staff. They enable the usefulness of the small European staff to be extended and make for more efficient working during the leave periods of the latter, and their employment also reduces expense. The settlement, which is the base of the whole work, is isolated in the jungle and transport is difficult.

*Development of Methods over the last Five Years.* A European Clinic Officer, with his African Assistants, visits each of the five divisions every week. The Therapeutic Section gives intramuscular and intradermal injections, together with general treatment and dressings to those requiring them; the Clerks deal with the treatment records of the hundreds of cases attending the clinic, and the Diagnostic Section makes the clinical records both of new cases and of those undergoing re-examination after treatment, and prepares specimens from all cases for bacteriological examination.



In view of the very large number of cases to be treated, oral treatment with hydnocarpus oil is being used for patients whose disease has ceased to be active preparatory to their discharge. In 1941 a Preventive Workers Section was formed from the African staff to deal with the dangerously infective type of cases discovered through the offer of treatment. A pair of such workers visit the infective cases in their homes. The only form of segregation possible under the circumstances, with special attention to the protection of children from contact with them.

At the settlement itself accommodation has been provided for patients coming from long distances for examination, and other administrative improvements have been made. The records of patients number over 14,000 and their registration is complicated by some of them not always using the same of several names. A Statistical Section has been established to abstract the records.

*Education.* The industrial school has been extended and technical training is given in the nurses school. Education of the patients gives those discharged an interest in the problem of leprosy which enables them to be employed in village anti-leprosy work; those who enter as children and remain for some years are most influenced. The Education Department of the Government has given a helpful grant, but the appointment of a non-patient trained teacher would be of great value.

*Agriculture and Industries.* In addition to the communal farms, brick making and other industries have been organised with unpaid patients' work, except for overtime; the net gain on these operations in 1940-41 was £28 19s. 5½d. The great majority of the patients in the Settlement support themselves on their private farms and contribute a portion of their time in unpaid work in the settlement.

*Finance.* The estimates for the year 1939-40 were :—From the Native Administration £1,000, from the B.E.L.R.A. Nigeria Branch £1,000, miscellaneous £40, making a total of £2,040, and the financial arrangements were practically the same in the following financial year. The African Settlement Staff was financed by the Church Missionary Society at an estimated cost of £404. The teachers in the African Staff school were separately provided for.

Owing to shortage of European staff African Clinic Supervisors, sisters and nurses trained in the Settlement carry on much of the work at clinics, under the direction of a medical officer, who visits the clinics once a fortnight. Preventive workers visit the

patients' houses and advise on the segregation of infective cases. The patients now pay 10/- on admission to the settlement towards the construction and maintenance of patients' houses, and they guarantee their support during the first year until their farms come into production, and contribute some labour in the settlement. In 1942 a trained teacher was appointed and more patient teachers have been appointed in view of the increasing number of children in the settlement.

The following tables summarise the great amount of work that is being carried on in the Settlement and its surrounding clinics:—

## STATISTICS

## A. SETTLEMENT.

				To or on 31.12.40	To or on 31.12.41	To or on 31.12.42
1. <i>Patients resident.</i>						
Adult males ...	...	...	...	291	370	577
Adult females ...	...	...	...	103	131	186
Male children ...	...	...	...	64	92	149
Female children ...	...	...	...	33	46	73
TOTAL				491	639	985
2. <i>Hospital.</i>						
Admission, Settlement Patients					194	241
" Clinic patients ...					41	55
" All cases ...				221	235	296
Patient days in hospital ...				11342	10486	12211
Average stay per patient ...				51	45	41
Deaths ...				Not enumerated	8	63
Operations (major) ...				21	43	16
" (minor) ...				Not enumerated	40	78
3. <i>Babies' Home</i> (for infants of infectious mothers) ...				9	6	8
4. <i>Laboratory.</i>						
Bacteriological (smear) examinations ...				8695	8379	14983
Other examinations ...				343	329	577
TOTAL				9038	8708	15560
5. <i>Dispensary.</i>						
Hydnocarpus Oil prepared and issued in sterile containers ...				2051 pts.	2240 pts.	2361 pts.

## B. CLINICS.

1. *Patients Registered, 1941.*

	Out-patients on treatment.	Out-patients under Observation.	Out-patients for Diagnosis.	Total on 31.12.41.	Total on 31.12.40.
Totals	10,719	2,502	428	13,649	9,506

2. *Clinic Attendances, 1942.*

	Out-patients on treatment.	Out-patients under Observation.	Out-patients for Diagnosis.	Average weekly Attendance.	1942 Total Attendances	1941 Total Attendances.	1940 Total Attendances.
Totals	200,372	1,840	2,870	4,100	205,082	224,406	158,336

## C. TREATMENT GIVEN. 1942.

	Intramuscular Injection.	Intradermal Injection.	Other Treatment.	TOTAL.
Totals	230,125	61,616	52,279	344,020

## REVIEWS

**Leprosy in India.** Vol. XV, No. 2, April, 1943.

Dharmendra and S. S. Jaikaria, p. 40, report tests of the various antigens made in the leprosy laboratory of the Calcutta School of Tropical Medicine, on persons who have not been in contact with leprosy cases, with a view to finding a diagnostic agent which will give uniformly negative results in such non-contacts and positive ones in early neural cases which are most in need of early diagnosis. For this purpose the tests on healthy non-contacts were carried out in the Punjab plains, where the incidence of the disease is extremely low. None of the antigens tested proved to be completely specific for leprosy, but nucleo-protein extracted from the bacilli by the phosphate-buffer method gave only 5 per cent of reactions in Punjab people when the dose injected did not exceed 0.002 mgm., which dose gives positive reactions in most neural leprosy patients.

**Leprosy in India.** Vol. XV, No. 3, July, 1943.

Dharmendra and J. Lowe (pp. 82-90) summarise the practical points that have emerged from their prolonged studies of the lepromin reaction thus—:

- (1) Of the lepromatous cases, 90% gave negative results, 10% weak positive, and none strong positive. The positive results were commoner in cases which showed clinical and/or histological abnormality, but were not confined to them.
- (2) Of 'doubtful' cases, 40% gave positive results, four-fifths of these being weak positive. A correlation of the results with the histological findings in these cases which were either definitely tuberculoid or else showed a tuberculoid element in histology. No 'doubtful' cases which on histological examination showed only lepromatous changes gave more than a weak lepromin reaction, and even such reactions were very few.
- (3) In cases classified as 'neuro-anaesthetic' the incidence and the degree of positive results were high.
- (4) In the 'neuro-macular' cases there was a high incidence of positive results, the incidence and degree of positive reaction increasing from 'simple' through 'tuberculoid not major' to 'major tuberculoid.' Of 'simple' cases, 20% gave negative results, 34 % weak positive, and 44%, moderate or strong positive; whereas of the 'major tuberculoid' cases none gave negative results, 16% weak positive, and 84% moderate or strong positive. In cases classified as 'tuberculoid not major,' the figures were intermediate.

D. N. Bose (p. 91) deals in a short note with six cases of severe joint pains not amenable to the usual remedies, including potassium antimony tartrate. Calcium gluconate, 3 to 5 c.c. of a 10% solution, was then mixed with 1 to 2 c.c. of a 2% solution of potassium antimony tartrate, and the combination injected intravenously with remarkable effects in relieving the pains in all the patients after three injections had been given at intervals of two days. The doses of the two solutions may be varied according to the age and condition of the patient.

**The International Journal of Leprosy, 1942. December, Vol. 10.**

G. M. Saunders (pp. 1-19) records *An Account of Leprosy in the Virgin Islands of the United States*. The inhabitants are mostly poor negroes, among whom a survey added considerably to the 930 cases reported in 1941-1930. The incidence was 4.9 in males and 5.2 per mille in females, and about 70% of the cases at present are of the neural type. The disease appears to be on the decrease with improvement in economic conditions.

G. M. Saunders and R. S. Guinto (pp. 20-37) report on *A Field Study of Leprosy in the Virgin Islands of the United States*. As a result of this more detailed inquiry it was found that the rate in St. Thomas Island of 1-1.5 per mille is ten times lower than that of St. Croix with 10-14 per mille. This is attributed to the better diet, health and sanitation of St. Thomas Island. A comparatively high incidence in persons over 50 years of age indicates a decline of the disease. The Negroes suffer most and the two sexes are attacked about equally. In nearly 70% of patients under 20 years of age a history of contact with another case was obtained.

G. M. Saunders and H. K. U. Giffin report on *The Skin Lesions of Neural Leprosy in the Virgin Islands of the United States* (pp. 38-50). Microscopical examinations were made in 30 cases of neural leprosy in 23 of which definite tuberculoid lesions were found; an unusually large proportion. In none of them were lepra bacilli found and 5 of 7 cases first seen in 1934 showed no visible signs of leprosy in 1940; this is in accordance with the tendency of such mild cases to recover spontaneously.

P. H. Kean and M. E. Childress record *A Summary of 103 Autopsies on Leprosy Patients on the Isthmus of Panama* (pp. 51-59). These post-mortems were carried out in 1904-41 and in most of them microscopical examinations were also performed. An analysis showed 24 to be attributable to tuberculosis, 22 to nephritis, 15 to leprosy, 10 to heart disease, 4 to cancer and 2 to 3 of them to eight other diseases. There was also a high incidence of cirrhosis of the liver and gallstones. The naso-pharynx was most affected as compared with the larynx and trachea in tuberculosis.

J. A. Doull and E. E. Bryan (pp. 60) have estimated the *Natural Antitoxin in the Blood of Leprosy patients in Puerto Rico*. They found such substantial amounts in 22 cases at various stages of the disease as to indicate no such deficiency as would point to the value of diphtheria antitoxin treatment.

S. Schujman and R. Mercau report (pp. 61-67) on *Treatment of Leprosy with Diphtheria Toxoid* in 10 lepromatous and 1 tuberculoid cases with frequent clinical and bacteriological examinations over a period of five months. No case showed any improvement and 8 of them became evidently worse, with the appearance of new lesions and increased number of lepra bacilli.

G. H. Faget and F. A. Johansen (pp. 68-78) also report on *The Diphtheria Toxoid Treatment of Leprosy*. This is a detailed report of a carefully controlled trial at the Carville Leprosarium, U.S.A. They could obtain no evidence that the diphtheria toxoid neutralised the toxins of leprosy and the control cases did better than those treated with diphtheria toxoid. The staff of this great institution unanimously concluded that "diphtheria toxoid is productive of no good and is fraught with danger to the patient."

C. M. Carpenter, H. Ackerman and N. J. Ashenburg also write on *The Failure of Diphtheria Toxoid to Influence the Course of Experimental Murine Leprosy* (pp. 79-82). White mice were infected by the injection of murine leprosy bacilli, but neither early nor late injections of diphtheria toxoid had the slightest effect on the course of the disease. All recent work therefore clearly indicates that the diphtheria toxoid treatment has no pathological or clinical basis and does more harm than good.

**The Histamine Test.** V. Pardo-Cestello and F. R. Tiant (*Arch. Dermat. & Syph.* 1943, Vol. 47, p. 826) point out that the normal reaction of the skin to the histamine test is negative when applied to anaesthetic areas of the skin in nerve leprosy. The intradermal injection of a 1 in 1000 solution of histamine phosphate is followed by the immediate appearance at the site of injection of a purpuric spot, followed by an erythematous areola several centimetres in diameter and these appearances persist for 20 to 45 minutes. On injecting an anaesthetic patch a wheel appears but no erythema, so that with the injection of 0.1 c.c. on the border of an anaesthetic patch the erythema stops abruptly at its margin. On the other hand in such sensory paralysis as syringo-myelia the reaction is normal. They therefore found the histamine test of diagnostic value in nerve leprosy cases.

**Report on Leprosy and its Control in India.** A committee of the Government of India Central Advisory Board of Health, which included Drs. Cochrane, Lowe and Dharmendra, have issued a long report with the following conclusions after considering the agencies at present at work in India, including in-patient institutions and out-patient clinics. They recognise the great advances that have resulted during the last two decades from the improved treatment worked out in Calcutta, but find that the large-scale out-patient treatment at numerous clinics is not able to solve the

leprosy problem, although it has greatly assisted the valuable surveys and epidemiological inquiries of recent years, without, however, removing the necessity for isolating the more infective cases. Only one Indian province as yet possesses a modern institution for the isolation of such cases, and at least one such should be provided for each of the nine provinces of India, with a staff allowing for teaching and for epidemiological and treatment research. Home isolation of infective cases has not as yet proved to be of much value. The necessity of protecting children from infection is now generally recognised. In addition to the leprosy research at the Calcutta School of Tropical Medicine a rural in-patient institution is required, and also a new leprosy act.

**Sulfanilamide in the Treatment of Leprosy.** By G. H. Faget F. A. Johansen and H. Ross. *Public Health Report*, 1942. Vol. 57, p. 1892. This is a carefully controlled trial of this potent drug in lepromatous cases chiefly. The doses used produced an average blood concentration of the remedy of 9 mg. with the production of febrile reactions in 7 of 8 cases. With blood concentrations of 5 mg. 6 of 11 cases also showed high fever necessitating stopping the drug; two were seriously ill but recovered. Some anaemia was produced in all and leucocytosis in many of the cases; so they conclude that the drug is not a curative remedy for leprosy, but it is useful for complicating secondary infections.

**The Fate of Culsion Patients Presented to the Local Negative Examining Committee from 1922 to 1938.** By J. Manalang. *Jl. Philippine Med. Assoc.*, 1940, Vol. 20, p. 193. This is a report on leprosy patients who have become bacteriologically negative at the great Culsion leprosy settlement of the Philippine Islands. The psychological condition of the patients during the period of up to two years of repeated bacteriological examinations before they are released is first dealt with. In the last three earlier periods of such releases the relapses and readmissions varied between 9.2 and 8.2 per cent. In the present long series no less than 4,627 patients were under observation, or 17 per cent of the total Culsion admissions; of these 2,457 or 53.1 per cent, were discharged or released under parole as negative and 28 more had been transferred or escaped observation. The deaths among them numbered 513, or 11.9 per cent, and the remaining 1,625, or 35.2 per cent, are still under observation by the release committee. One-third of the released patients were set free after from six months to two years

of observation, and the remainder only after longer periods. Considering the advanced conditions of so many of the Culion cases these results are encouraging.

## COLONIAL MEDICAL REPORTS

### **Annual Report of the Tanganyika Territory Medical Department for 1942.**

Marked progress has been made in the reorganization of the Mwakete Settlement at Tukuyu under the supervision of Mr. W. A. Lambert, a lay worker sent out by the British Empire Leprosy Relief Association. Systematic treatment and records have been instituted regarding the 905 patients, 2,400 acres are under cultivation, fruit trees have been planted in large numbers and nurseries of hynocarpus and oil palm trees established. There are 440 head of cattle, goats and pigs on the estate and industries and handicrafts have been established. A new dispensary has been built and roads maintained, almost entirely by the labours of the patients, and a school has been opened. The three years hard work of Mr. Lambert is much appreciated by the Administration and the Native Authorities.

### **Annual Report of the Medical Department of Uganda for 1942.**

At the Government hospitals and dispensaries 434 leprosy patients have attended for treatment. In addition the Church Missionary Society look after 558 children at the Kumi Home, 385 at the Bunyonyi Colony, Kigezi, and 503 resident patients at Ongino in the Teso district, and the Roman Catholics care for 183 at their Buluba settlement, Busoga, and 240 at their Nyenga Colony in Mengo.

### **Report of the Sudan Medical Service for the Year 1941.**

A table is given showing that 1,967 cases of leprosy were under treatment and 4,615 more were under observation only in the



Sudan. A very large proportion of the total were met with in Equitorial Province with 4,192, and in the Kordofan Province with 2,062, out of a grand total of 6,582 cases. The Blue Nile Province with 171 was the only other area with over 52 cases.

#### **Report of the Gold Coast Colony Medical Department for 1942.**

The only information in this report is the statement that 733 in-patients and 488 out-patient leprosy cases were treated during 1942. With the exception of the Ho settlement, with 396 cases treated with complete arrest in 30 and improvement in 142, the other three leper settlements are little more than refuges where only drug therapy is given. There are no indications in this report of any serious attempt of the Gold Coast authorities to implement the recommendations made by Dr. E. Muir as the result of his visit to the Gold Coast Colony before the present war.

---

***Throughout the world  
the name of***

**SMITH STANISTREET**

is known in connection with the  
treatment of

**LEPROSY**

Smith Stanistreet were the original Manufacturers  
in collaboration with Sir Leonard Rogers of the  
Ester products of Chaulmoogra and Hydnocarpus  
oils and are still the leading manufacturers of  
preparations as prescribed by

**THE SCHOOL OF TROPICAL MEDICINE  
FOR  
THE TREATMENT OF LEPROSY**

Sodium Hydnocarpate, Sodium Morrhuate

***E.C.C.O.***

Hydnestryle

Hydnocreol

**SMITH STANISTREET & CO. LTD.  
CALCUTTA**

**ESTABLISHED IN INDIA IN 1821**