

REVIEWS AND ABSTRACTS.

Immunity in Leprosy. Dr. A. Rotberg publishes an article in *Revista Brasileira de Leprologia* (Vol. V, p.45) on this subject and discusses immunity under epidemiology, pathogenesis and classification. He bases his observations on 1,529 cases in which he performed the "lepromin test." He reviews and analyses the previous literature on this test which has also been called the Mitsuda Reaction (after its originator) and the Leprolin Test. The author uses the name "lepromin," as the material is composed of a sterile suspension of leproma; the term "leprolin" might wrongly give the idea that the test is of the same nature as the tuberculin test.

The intradermal injection of lepromin produces in positive cases a nodule of the skin at the point of inoculation, reaching its maximum size about the end of the third week. If this nodule is less than 0.5 cm. in diameter the author counts it negative. He regards a positive result as a sign of allergy and resistance to leprosy, and a negative as a sign of anergy and susceptibility to Hansen's bacillus.

His hypothesis supposes a natural factor (factor N) which is inherited by some children but not by others. The individual inheriting factor N will, after contact with Hansen's bacillus, develop allergy; the individual without this factor remains anergic on contact with the bacillus, this latter group including all the bacillary or open cases of leprosy.

This hypothesis is based upon four observations :

(a) Lepromin Test positive (LT+) results in healthy children of lepers increase with their age, 5.7% being positive in the 0-3 age periods, 25.7% in the 4-6, 41.7% in the 7-9, 61.4% in the 10-12. 60.8% in the 13-15, 74.3% in those of 16 years and over. [It would be interesting to make a similar survey in a community where there is no chance of contact with leprosy.]

(b) LT+ cases are not found in non-endemic countries. [The evidence for this assumption is rather slender as it is based on the supposition that the positives found by Cummins and Williams in England, by Dubois in Belgium and by Boncinelli in Italy, would have been negative according to the author's standard.]

(c) LT+ results are obtained even in greatly debilitated leprosy cases. [It would be interesting to know if they continue LT+ in patients who remain debilitated over a long period.]

(d) Lepers with tuberculoid lesions, who almost always give LT+ results, do not develop lepromatous lesions, and patients with the latter type of lesion are almost always LT-. [This

non-transformation from one type to another is not upheld by some of the most experienced leprologists. However it is important that extensive tests be made to show whether LT+ cases change into LT-, whatever their clinical classification.]

In counting a positive lepromin case as allergic the author is at a loss to account for "lepra reaction," which has generally been counted of an allergic nature. Only six of his 220 cases with lepra reaction gave a positive lepromin test.

The author proposes to use the lepromin test in distinguishing and classifying cases. After dividing all cases into cutaneous and neural, the latter term being reserved for those with no signs of disease in the skin, he subdivides cutaneous cases according to the type of lesion (lepromatous, maculo-lepromatous, diffuse), the type of macule (erythematous, hypopigmented, involuted, tuberculoid or scarred), according to whether the macules are bacteriologically positive or not (+ or -); lastly they are divided into allergic or anergic cases according as they give positive or negative lepromin tests.

[The importance of this last item in the classification is the comparatively greater resistance to the disease found in allergic cases. Its importance will be considerably increased if it is a fact (as is held by the author) that this allergic condition is not lost, even though the patient becomes debilitated, and that he can never become a lepromatous or open infectious case.

Many unsuccessful attempts have been made to discover a specific diagnostic test for leprosy. From the prophylactic point of view, what is much more important than a diagnostic test is one which will show the resistance of the patient to the disease. Rotberg's contentions are that only a minimum of children are born without the N factor, that is to say with inability to develop immunity to leprosy whenever they are infected with it; and those who have acquired immunity, as shown by a positive lepromin test, retain that positivity and immunity through life, and are unable to become open cases. If these contentions are confirmed then prophylaxis becomes a very much simpler matter. Concentrate on the anergic population, as shown by negative lepromin tests, segregate the comparatively few anergic lepers from the rest of the anergic population, and the disease will cease to spread and will gradually die out. In assessing the anergic non-lepers the test would have to be repeated as, according to the author, allergy and immunity only develop after a first contact with Hansen's bacillus.

The following are some questions raised by the author's hypothesis, which await investigation :

(a) Using the same material, technique and method of reading

- as the author, are lepromin-positive subjects found in countries where there is no chance of contact with the disease?
- (b) In a community not subjected to leprosy contact, does the lepromin-positive population increase from birth onwards in successive age groups?
- (c) Does a lepromin-positive case ever become negative; as a result of debility or other unfavourable circumstance, is he not liable to develop lepromatous lesions and become lepromin negative?

If the answer to these three questions is in the negative, and if the findings of the author are confirmed, then we shall have in our hands a most valuable means of simplifying leprosy treatment and prophylaxis.]

Positive Inoculation of Human Leprosy in a Hamster. Inoculation Negative in other Rodents. Archives de l'Institut Pasteur de Tunis, Vol. 27, No. 4, Dec. 1938, p. 327-340, by Etienne Burnet.

The author describes previous attempts to inoculate rodents, and especially the work of P. Jordan, who claims to have inoculated a white rat successfully, and that of S. Adler, who inoculated Syrian hamsters with human leprosy and demonstrated his results at the International Leprosy Congress. He describes his own experiment as follows.

In January, 1938, he inserted a fragment of leproma taken from an active skin lesion between the skin and muscle in three normal hamsters and in three hamsters immediately after splenectomy. On the 11th of May they were re-inoculated through a fine trochar on the other side of the abdomen. In only one of these animals, namely one of the unsplenectomised, was the inoculation successful when they were sacrificed on the 9th of September, 1938, 220 days after the first inoculation.

The following signs of positive inoculation are given:—subcutaneous leproma at the points of inoculation; large numbers of bacilli in the spleen, liver, kidneys, axillary and inguinal lymph nodes, and in an abscess of the testicle. Dr. Burnet discusses the possible objections that might be raised to considering this experiment positive.

Objection 1. That the subcutaneous leproma only showed multiplication of lepra bacilli in the inoculated tissue such as is observed in a fragment of leproma deposited on culture medium. The answer to this objection is that the development of leproma would have been immediate, whereas in this case it was delayed; and the leproma has not been autolysed, it resembles the small lepromatous mass which we have seen develop in rats inoculated with rat leprosy. Also in five other hamsters of the same age,

inoculated on the same day, in the same manner, and with the same material, nothing developed.

Objection 2. The bacilli seen in the liver, spleen and lymph nodes might have been mechanically gathered together by the lymph stream, or by phagocytic cells and does not prove active inoculation. In answer to this objection, he cites the other animals in which there was no sign of any bacilli.

Objection 3 is that there was not a positive inoculation but only a graft of leprous tissue. This also is answered by the fact that there were no active results in the five other hamsters.

Treatment of Lepra Reaction with Hypertonic Glucose Solution by J. Correa de Carvalho. (Revista Brasileira de Leprologia; Vol. V, Special Number, 1937. Translated from Portuguese by J. W. Lindsay.)

In March, 1936, we began our experiments with glucose solution in the treatment of lepra reaction. At first we used isotonic glucose solution the action of which in lepers during the period of lepra reaction was the subject of our work published in the *Revista Brasileira de Leprologia* in a special number in 1936 entitled "New treatment of Lepra Reaction and other Lepra manifestations." In that article we referred to the thermic reactions which isotonic glucose solution produced in patients with lepra reaction, and to the beneficial effects seen in the immediate regression of the erythematous nodules and other "reaction" signs.

Later we began to use a 30% hypertonic solution of glucose intravenously in doses of 5 to 10 c.c. giving injections on alternate days.

Our experience with the employment of hypertonic glucose solution in the treatment of leper reaction covers more than a year during which we have had the most excellent results. Its action upon leprosy reaction is prompt and decisive.

With the very first injections the temperature falls, the nodules begin to regress, and the general condition improves considerably. Hardly any effect, however, has been observed on the neuritic pain. Contrary to the effects observed with the isotonic glucose solution, the hypertonic solutions rarely produce thermic reactions in patients with lepra reaction.

The hypertonic solution acts through its strongly tonic and antitoxic properties producing a very intense diuresis.

Arêa Leão in his work "Anaphylaxis. Clinical Applications. Methods of Desensitization," refers to the application of the sugars in the following terms: "the sugars (glucose and saccharose) in hypertonic solutions have a powerful desensitizing

action combined with a general tonic action on the organism. By their effect on the water in the tissues they produce an abundant diuresis, and so act beneficially on œdema of the skin, causing it to diminish and disappear. The sugars have a very wide range of application in dermatology. Hypersensitive dermatoses, manifestation of food or medicinal intolerance and intoxication, benefit greatly by their application."

At present almost all our patients with lepra reaction are submitted to the glucose solution hypertonic treatment, and we give here a series of 74 cases so treated.

The results shown were :

Complete recession	...	...	38 patients	51.35%
Improvement	...	...	30 "	40.55%
Slight improvement	...	...	1 "	1.35%
Unchanged	...	...	5 "	6.75%

The 30 cases that showed improvement were recent cases of reaction, already getting some treatment, and with only one or two nodules appearing, their general condition being excellent.

The 5 patients which remained unchanged were intractable cases of reaction, with complications of chronic nephritis and other diseases.

The results of our observations enable us to conclude that hypertonic glucose solution in doses of 10 c.c., injected intravenously on alternate days, gives better results in the treatment of lepra reaction than any other medicines hitherto employed; its action is beneficial in all cases of lepra reaction.

Pregnancy and Leprosy by G. A. Ryrle, in a letter to the *British Medical Journal* says:—

"In the interaction of pregnancy and associated pathological conditions leprosy must be, I imagine, one of the few major systemic diseases in which such action is totally one-sided. Leprosy does not have the slightest effect on the course of pregnancy; pregnancy has a marked effect on leprosy. A slow but progressive spread of the disease is usual, first noticeable in the later months of pregnancy and going on long after delivery. A pregnant woman with mild symptoms of leprosy may and often does become an advanced "textbook" case in a year's time. The primary factor is, I think, mineral depletion, as in my last twenty cases a richer diet with increased calcium intake appears to check the tendency to leprosy aggravation.

"Metabolic disturbances of various kinds frequently precipitate an acute febrile dissemination of leprosy (lepra fever). In over seven years' experience I have never seen the strain of pregnancy or parturition cause lepra fever, although I have seen

very severe attacks after disturbances of a very much lesser nature, dietary indiscretions or a few days' constipation, for instance. The leprosy aggravation caused by pregnancy is insidious and chronic. In these cases which I see both parents are, of course, lepers. Routine examination of placenta, cord, and baby are constantly negative for *Mycobacterium leprae*, and the child, if removed from the mother at or shortly after birth, remains free from leprosy."

Leprosy in Brazil and its Prophylaxis, by Dr. H. C. de Souza-Araujo.

Leprosy was introduced by Europeans and by African Negro slaves, but is not uniformly distributed throughout Brazil. There is comparatively little in the north, with its 4 lepers to the thousand inhabitants. At the end of 1937 32,984 lepers appeared in the census, of which 11,835 were isolated. Of these, 6,585 were in the State of S. Paulo alone. Actually fifteen leprosaria function and fourteen are under construction. There are six "preventoriums" for housing the children of lepers. Courses on leprology are given in three of the principal States, and there are also two centres for research.

Recent Advances in Leprosy.

The Lancet of July 2nd, 1938, reports the Prosser White oration by Prof. Charles Flandin on this subject with special reference to the methods adopted for dealing with the problem in France.

Prof. Flandin thought that the time was ripe to bring before British dermatologists the present position of leprosy, as summed up at the recent congress of the International Leprosy Association held at Cairo, and to draw their attention to conditions in France, which might have considerable interest in any country dependent very largely on the effort expended in ascertainment of leprosy cases; but there were certain disquieting features in the present situation in Europe which might lead to a reconsideration of our attitude to the whole problem. Although it was almost a law that leprosy declines as social and hygienic standards rise, and although the great leprologists of the last generation had declared that they had never or hardly ever come across leprosy of indigenous origin in Western Europe during the whole of their lives, yet Prof. Flandin had found in the short space of three years ten cases in Paris, none of which had ever left France. He referred to the discovery of indigenous cases in England by Dr. J. M. H. Macleod, and stated that in certain other European countries, notably Roumania, the disease was said to be slightly on the increase.

Commenting on administrative methods, he expressed his conviction that the compulsory notification in force in France was useless. The leper would change his name and run the risk of prison rather than expose himself to the possibility of being shut up in a leprosarium. As in tuberculosis, the examination of family contacts was essential, but this was impossible through official machinery. The education of the public was perhaps the most important need. They must be taught that only prolonged and intimate contact as in family life was dangerous, and that leprosy could be regarded as less contagious than tuberculosis, and at least equally amenable to treatment. Meanwhile, he pleaded for close co-ordination between the specialists of England and France interested in the subject in order that, first, some ascertainment of the real numbers might be made, and secondly, such action as might be needed should be the result of the experience of both countries pooled in a *front commun de la lèpre*.

International Jl. of Leprosy, Vol. VI, No. 3, July-Sept., 1938.

This is entitled "Cairo Congress Number" and gives the reports of the sub-committee (see *Leprosy Review*, Oct. 1938) and also abstracts of papers read at the Congress.

J. N. Rodriguez and R. S. Guinto write on *A Field Study of Leprosy*. A comparison is made of cases of leprosy found among the 6,063 inhabitants of Cordova, in the Philippines, when they were examined in 1933 with those found at a later examination two years later.

"Whereas 20 of the 45 closed cases recorded in 1933 were clinically active at that time, only 13 of them showed signs of activity in 1935, including one that became bacteriologically positive. There seemed to be a greater tendency to improvement of "closed" lesions among females than among males. Of 18 patients with macular lesions in 1933, nine were males and nine females; of the males, only one was classed as quiescent and one as arrested in 1935, while five of the females had become quiescent. Of 15 previously positive cases on parole in 1933, two were found to have died and four had relapsed since the first survey.

"There were 9 suspicious cases in which a definite diagnosis could not be arrived at in 1933. One was found to be tuberculoid leprosy on biopsy. Of the others, two were classified as "closed" lepers at the 1935 re-examination, three were definitely eliminated as non-lepers, and three were still considered as suspicious. There were 793 resident house contacts re-examined, and 105 other house contacts, no longer residents, who were examined for the first time. The data relating to these individuals is primarily of epidemiological interest and will be dealt with in a later report.

"Six new open cases had developed during the period between the two surveys. Only one came from the group of house contacts; the rest developed among individuals who were not known to have lived in the same house as a leper. One of the latter had been classified as a quiescent macular case in 1933; the rest either showed no lesions at all or, at most, only vague manifestations not characteristic of leprosy."

A Leprosy Survey of the Eastern Border Districts of Basutoland, by R. C. Germond, shows how under segregation and efficient inspection leprosy is apparently dying out of Basutoland. Among the 13,187 people examined, 42 new cases were found. The extraordinary benignity of these cases is stressed: 90.5 per cent. are N_1 , while only 7.1 per cent. are C_1 and 2.4 per cent. C_1-N_1 . More than 50 per cent. of the neural cases are clinically almost negligible, the rest are early and slight. Most of the recurrences are extremely mild, and none of them severe or obviously infectious. In the same paper the history of a leper family is given. There were 97 lepers in all in 4 generations, of which 67 have died and 30 are still alive. Of the former, 26 died in the asylum and 41 (including deserters and arrested cases) died at home. Of the 30 survivors, 16 are inmates of the asylum, 12 are arrested cases and 2 are incipient cases at present on parole and under observation. Considering these people in more detail, 2 belonged to the first generation, beginning about 1836; 29 belonged to the second generation, beginning about 1861; 51 belonged to the third generation, beginning about 1886 and 15 belonged to the fourth generation, beginning about 1911. As regards admissions to the asylum, it is noteworthy that in 1914 (at the beginning of the leprosy campaign) the patients taken in included members of the first, second and third generations. The first representative of the fourth generation was not admitted until 1924, at the age of 16 years. There can be no doubt that the fall in the last generation is the result of compulsory segregation.

E. Shionuma, K. Nagai and T. Maeda, in an article on *The Climate Theory in Leprosy*, contend that in cold climates leprosy is of a more severe nature than in warm. This is specially seen in alopecia, eye lesions, nerve symptoms, which are found to be more common and severe in the more northerly and colder islands of Japan than in the more southerly.

R. G. Cochrane and G. Rajagopalan write a preliminary note on the newly established *Children's Leprosy Clinic at Saidapet*, near Madras City. They propose to keep children under observation in their homes and watch the course of leprosy in early untreated cases. They hope as a result of this investigation that further epidemiological factors will be brought to light, and thus to contribute towards the control of the scourge among children.

Sister H. Ross writes on *Pyreotherapy in Leprosy*. The rectal temperature of the patient is raised in a Kettering hypertherm. Three courses of weekly treatments were given: the first course consisted of eight treatments; the second, after a rest of

seven weeks, of six treatments; and after a rest of twenty-six weeks a third, of six treatments. During each treatment the rectal temperature was elevated to 105-106°F., with an average of 105.8°F. This temperature was sustained for five hours in four cases, and for one to three hours in one case. One patient refused the third course. The patients were carefully selected. The physiological and biochemical changes which took place in the body were studied. No clinical or bacteriological improvement is reported.

Norwegian Lepers in U.S.A. by H. P. Lie. A further proof is given of the spread of leprosy by infection, as opposed to heredity, by Hansen's examination of Norwegian emigrants to America. He found some 200 cases of leprosy among them, but in no Norwegians born in America had the disease shown itself. Heredity cannot be cancelled by emigration to another country. He explained the fact that the disease did not spread from the 200 original cases to their children by the better climatic circumstances and especially by the more roomy housing conditions and greater personal cleanliness observed in America.

G. A. Ryrie records *An Infantile Macular Eruption* in a child of 48 days, born of a mother with diffuse cutaneous lesions of leprosy in the form of serpiginous macules with faint erythematous macules. The bacteriological findings were somewhat doubtful, but "had I seen such a lesion in an adult I should have diagnosed it as a leprotic macule without hesitation. During the year 1937 three other similar cases have occurred in the Children's Home in Kuala Lumpur, two in Chinese children, the third in an Indian. They showed the same characteristics, macular eruptions of a few weeks duration unlike any of the skin rashes of children, and with a marked resemblance to tuberculoid leprosy. The lesions were bacteriologically negative in all cases."

Leprosy in the French Camerouns. (Le Devoir National).

Leprosy is a very common affection in tropical Africa. The *Service de Santé* has created an original organisation. The non-infectious lepers, and there are many such, have been left in the villages. Those who present the danger of contamination for their contacts have been grouped in agricultural colonies where they receive the care necessary to their condition. In the agricultural leper colonies life is almost that normally prevailing in the villages. The inhabitants work and cultivate plantations just the same as their healthy relations, and often recover.

In 1935 the number of lepers in the Camerouns was computed at 10,727, of whom 4,097 are living in agricultural colonies. It

goes without saying that the early cases also remain under supervision and are treated by the doctors of *L'Association Médicale Indigène*.

The Treatment of Leprosy at the St. Antoine Leprosarium at Harrar, Ethiopia, by Jean Féron. *Revue de Médecine et d'Hygiène Tropicale*, October 1938.

Dr. Féron acted as doctor in charge of this leprosarium from 1930 to 1936. He describes what he states to be a daily treatment which is completely painless and gives 100 per cent. of cures in macular leprosy, 50 per cent. of cures in tuberculous leprosy, and in other cases, stabilisation (arrest of disease and return to a normal life). His trial with the ordinary remedies such as chaulmoogra and its esters and soaps, gave inconstant results. "It being considered in a general way that the heavy metals stop growth of bacilli, and that copper in particular neutralises certain toxins, such as tetanus and diphtheria . . . it is therefore natural that we should have recourse to simple preparations of copper. Copper prevents the proliferation and puts an end to the morphological cycle of Hansen's bacillus . . . The treatment that we have now established at Harrar for some of our patients is as follows :—

1. Monday, Wednesday and Friday : Injection I.V.Z. Cu 3 c.c.
2. Tuesday, Thursday and Saturday : Injection I.V.Z. Or c.c
3. Monday and Thursday : We dissolve in the syringe 1 ampoule :
1 ctg. cyanide of mercury in 2 c.c. of distilled water.

(I.V.Z. is a fine colloidal preparation of the metal.)

The addition of cyanide of mercury has the following objects :

1. As a nerve sedative.
2. Promotion of the penetration of gold and copper ions which increase the diffusion of cyanide of mercury in the nerve centres.
3. Preventive and curative treatment of ocular leprosy, which is so grave and common among whites."

He states that "The leprosarium at Harrar forms a veritable agricultural colony in which the able-bodied lepers work, thus regaining their strength and forgetting the length of the treatment and their distressing condition. The treatment may last many months before any apparent amelioration appears in the state of the lesions. The general condition is improved rapidly. The lesions change their aspect and sensation returns in the first place. It is generally at the end of about six months after the restoration of sensation that the lesions recede and gradually disappear."

Unfortunately the number of patients treated, the length of time that they were under observation after their "cure" and the standard adopted for estimating when "cured" are not mentioned.

A Treatment of Perforating Ulcers in Leprosy, by H. Mehta, (Jl. of the Malaya Branch, British Medical Association, Vol. 2, No. 2, Sept. 1938). The treatment consists of subcutaneous injections of a freshly prepared solution of Rivanol.

"In preparing the solution absolute cleanliness is, of course, essential. As it deteriorates if kept for more than twenty-four hours, it is advisable to use freshly prepared solutions. The solution is the following:—Rivanol, gr. 1; glucose, gr. 2; calcium lactate, gr. 1; sodium thiosulphate, gr. 2; aqua, c.cm. 10. In making the solution rivanol should be dissolved separately in warm distilled water and added to the other ingredients.

"In giving the injection care must be taken to introduce the solution into the subcutaneous tissue. Intradermal administration will result in ulceration. Even with all this care, consequent on the expression of the fluid along the needle track, a small necrotic ulcer may form, but this heals rapidly with no dressing whatsoever. The immediate result of the injection is the appearance of a swelling with pain and intense itching; the former lasts for two or three days and then subsides. Mention need hardly be made of the necessity for taking due precautions against sepsis. The sites selected for injections are along the nerve paths supplying the part affected, proximal to the lesion: but it is equally important to infiltrate the immediate vicinity of the ulcer with the solution. Areas where the swelling will cause undue pain and even damage to the tissues, such as over the bones, at the vicinity of the tendon sheaths and joints, should as far as possible be avoided.

"For an ulcer of the big toe, inject 3 c.cm. of the solution in the centre of the sole and 1 c.cm. in three places round the ulcer. For ulcers of the sole of the foot, inject 3 c.cm. in the external, back and internal part of the calf and 3 c.cm. in the hollow of the sole, and 2 c.cm. in two or three places round the ulcer. The subsequent injections should be given in different places."

Treatment of Lepra Reaction with Omnadin Injections, by H. Boenjamin (Medische Berichten, Sept. 1938).

The author treated 12 leper patients at the Plantingen Leper Settlement who were suffering from lepra reaction. Of these 12, 10 gave favourable results. The course consisted of two or three injections which were given intramuscularly in doses of 2 cc. daily. The patients stood the injections well without serious local reaction.

Leprosy in Queensland. The Adelaide Advertiser, Australia, November 19th, 1938, announces that "The Director-General of Health in Queensland (Sir Raphael Cilento) reported that the gradual increase in the incidence of leprosy among the aboriginal population, and to some extent among the white people of Queensland, was a serious matter. The council recommended a grant of £8,000, spread over five years, to assist the Queensland health authorities in investigating this matter."

Death by Desiccation of Lepra Bacilli. (Mouvement Sanitaire, October, 1938).

The germs, freed from all medium, reduce *in vacuo* and, suspended in saline, the colour test of oxido-reduction if they are living, but not if they are dead. Messrs. Marchoux and Prudhomme, who have applied this method to the bacilli of human and rat leprosy, have communicated to the Academy of Medicine that it permits them to confirm that the two germs lose simultaneously all their powers of reduction in less than 30 minutes of heating to 60° centigrade and desiccation. There is thus a biological analogy between the two bacilli, and it is important in the prophylaxis of leprosy that the bacilli of Hansen and of rat leprosy, when desiccated, cease to be infectious.

Rat Leprosy. Experimental Infections of White Rats by Contact and by Food. By P. H. J. Lampe. (Geneeskundig Tijdschrift voor Nederlandsch-Indie. Afl. 4 Deel 78, 1938).

The author summarises his paper thus:—" In these experiments rat-leprosy could be transmitted to young white rats by contact with white rats which suffer from *leprous skin lesions*. The contact included clawing, biting and cannibalism, and it seems highly probable that this "aggressive" mode of contact played an important role in the experimental results (local preference of bacilli manifestations for cervical and axillary lymph nodes). Ectoparasites were not observed and contact with wild rats can be precluded.

An attempted transmission of the disease to young white rats by contact during 50 weeks with white rats affected with the *glandular* form of the disease, gave negative results. This negative side of the experiment seems valuable, though it concerned only two contact animals and one source of infection. The experiment, however, lacks the total devouring of the tissues of diseased animals (infected lymph nodes), which may happen in natural conditions.

The possibility of a *transmission by food* (imitation of cannibalism) was experimentally proved with 100% positive results (on very young white rats), in contradistinction to positive results in a small percentage of instances described by other authors. The resistance of the virus in the dead animals and the posthumous dispersion of the virus (soil-contamination) needs further research.

The result of these experiments, together with facts concerning the endemicity of the disease, suggests that the "aggressive" contact with rats which suffer from leprous skin lesions (only a few and expelled from the community) and the cannibalism

of infected rats (of all types) is of high significance for the natural spread of the disease, as far as the mutual contact of rats plays a role in this connection. One could even accept this mode of transfer as the actual factor, if it were not for the normal aspect of the glandular form of rat leprosy in *wild* rats which makes this dubious.

The glandular form of rat leprosy in wild rats is characterized by a certain preference for the inguinal nodes, which does not agree with the type of lymph node affections to be expected from a transfer by "aggressive" contact and cannibalism. This ordinary picture of the glandular form of natural rat leprosy may be connected with the frequent occurrence of lesions and sores in the back and hind limbs of wild rats, usually attended with a non-specific inflammation of the inguinal nodes, and due, probably, to bites by pursuing animals. This happens in nature and not in the experimental cages. Speculations are obvious: infective bites by infected rats(?); open sores as portal of entry(!); inflamed nodes as *locus minoris resistentiae*. Nevertheless, the pathogenesis of this more or less regular affection of the inguinal nodes in wild rats is still a doubtful question, to which the experiment—an extremely disproportionate imitation of natural conditions—gives no convincing answer".