

CURRENT LITERATURE

The current literature of leprosy is dealt with in this department as fully as possible. It is a function of the Contributing Editors (see inside of front cover) to provide abstracts of all articles published in their territories, but when necessary abstracts are taken from other sources.

McCoy, G. W. Leprosy in the United States; discussion. *In: Tuberculosis and Leprosy, the Mycobacterial Diseases. Symposium Series Vol. I, American Association for the Advancement of Science. The Science Press Printing Co., Lancaster, Pa., 1938, pp. 110-111.*

In the main this note is similar to the one noted in the preceding issue of THE JOURNAL (p. 289). Leprosy is not a major health problem in the United States; there are perhaps 400 or 500 known cases and at least one-half as many not known. In spite of the cases that are present in New York City the author knows of no case contracted there, with a single doubtful exception. He remarks on two unusual difficulties which are met with in any study of the factors leading to the prevalence and spread of leprosy: (a) the long "incubation period" and (b) the long time that may elapse between the appearance of symptoms and the recognition of the case. These features constitute one of the main reasons why we do not have more success in tracing the sources of infection. —H. W. W.

[PHILIPPINES] Annual Report of the Director of Health, 1937.

At the end of 1937 there were in total 8,825 cases in segregation in the Philippines. The six "skin dispensaries" of the health service reported 338 new cases, of which 233 were bacteriologically positive. From other regions smears were submitted to the central laboratory from 124 suspects, of which 62 were found positive. A mid-year survey of 5,956 cases receiving intensive treatment (ethyl esters of *H. wightiana* with 0.5 percent iodine being most commonly chosen by the patients) showed 60 percent improved and 22 percent worse; the former included 662 quiescent or negative cases (11 percent of the total examined), which number was increased by another 589 by the end of the year. The Disposal Committee, which makes semi-annual visits to all of the regional leprosaria and the Culion colony, made 1,356 examinations of patients in those institutions awaiting parole and released 456 of them. In its follow-up work with paroled patients only 22 provinces could be visited during the year; 970 patients were examined and 95 (practically 10 percent) were found to have become positive again, which gives emphasis to the importance of careful follow-up work as long as the parole system is continued to be a necessary complement of compulsory segregation. Concerning the children born of lepers at Culion, only 45 of the 216 at the colony could be accommodated in the nursery; the other 171, ranging in age up to 18 months, remained with their parents; three children became positive lepers during the year. A total of 182 other children born of lepers were under the care of the Bureau of Public Welfare.

—J. O. NOLASCO

[KEDAH] A health survey of the State of Kedah, 1935-1936.

It has been suggested that leprosy is not common in the Malay population. In this survey 51 suspected cases were detected, of which 23 were proved to be infectious. One advanced case, a Malay woman of considerable property, proved to be the aunt of another leper. It became clear that the entire district was aware of her condition, and information obtained from her disclosed the presence of five other cases in the neighborhood. There is, obviously, a considerable number of cases in the state which are not being reported, and consequently a corresponding number of early cases escaping detection and treatment. Undoubtedly it is dread of segregation which leads to concealment, as the people isolate their lepers. They do it in a most unsatisfactory way, however, usually by placing them in small kennel-like huts with no window or means of ventilation. One person encountered in such surroundings had lost both fingers and toes and was completely blind and ate his food with his mouth direct from a bowl on the floor; how long he had been incarcerated thus is not known. At present permission for home segregation is refused until decent humane housing conditions are provided. The actual number of cases recorded in Kedah has decreased in the last two years, but the number in Malays has increased by three times. The Chinese and Tamil lepers usually come from villages and estates where detection is bound to occur sooner or later. The decrease in notifications among them is of little significance as a "drive" was made in the more accessible areas during 1935 and was only extended to the rural districts during the survey.—[From report in *Jour. Trop. Med. & Hyg.* 41 (1938) 81-95.]

MACNAUGHTON, W. G. Central Leper Hospital, Makogai. Fiji Annual Medical and Health Report, 1937. Suva.

The island of Makogai is divided into two areas, one for the farm and "clean" labor, the other for patients who, as far as possible, are allowed to live their own lives in communities according to nationality. The nursing staff consists of fifteen European sisters of the Society of Mary, and ten native sisters. The number of patients increased during the year from 555 to 577. Among the 80 admissions were 32 Indians, 28 Fijians and 8 Rotumans. The 31 discharges of "arrested" cases were made up of 7 each of Fijians, Indians and Rotumans, 6 Solomon Islanders, 3 Cook Islanders and 1 Niue Islander. There were 27 deaths, a particularly low proportion for a hospital which keeps its incurables until death. Study of admissions indicates that cases are being received at an earlier stage of disease than heretofore, 51 out of the total of 80 admissions, and 24 of the 28 Fijians, being fairly early neural cases. It is again pointed out statistically that although the percentage of "cutaneous" cases is higher among the Indians than among the Fijians, the former appear to respond more readily to treatment, although, as would be expected, neural cases among either Indians or Fijians do better than cutaneous cases. Emphasis is laid on general hygiene, exercise and mental interest, in addition to more "specific" treatment. Gardening, sports, etc. are encouraged, and there are now gangs of skilled carpenters, mechanics, plumbers and painters who carry out all construction and other public works in the hospital area. All work is paid for at current rates, and the patients' cooperative

store showed a turnover for the year of over £2,500. [During 1938 the number of inmates increased further, to 619—433 males and 186 females. There were 135 admissions, 57 discharges and only 36 deaths—6% of the mean population.]
—C. J. AUSTIN

DOULL, J. A. Salient features in the epidemiology of leprosy. *In: Tuberculosis and Leprosy, the Mycobacterial Diseases. Symposium Series Vol. I, American Association for the Advancement of Science. The Science Press Printing Co., Lancaster, Pa., 1938, pp. 106-109.*

This is a general statement, pointing out many of the unsolved problems of the epidemiology of leprosy, with no new information or any feature of viewpoint that differs from what the author has expressed in previous articles that have been noticed in *THE JOURNAL* [see 4 (1936) 141-170 and 6 (1938) 429].
—H. W. W.

HOPKINS, R. Heredity in leprosy. *In: Tuberculosis and Leprosy, the Mycobacterial Diseases. Symposium Series Vol. I, American Association for the Advancement of Science. The Science Press Printing Co., Lancaster, Pa., 1938, pp. 112-118.*

Though leprosy is a family disease, prenatal transmission is so rare that it is unimportant, if not negligible, as an explanation. The moot question is whether or not a predisposition to the disease is a hereditary family characteristic. The author has concluded that there is racial susceptibility of people in regions that have never been invaded (as was the case in Hawaii), and that that condition is also seen otherwise (as in Mexicans in Texas as compared with the Texans). There probably is, too, a hereditary family lack of resistance, which emphasizes the importance of segregation. It would seem that Europeans and their descendants have acquired a high average level of resistance, and the Negro in Louisiana is even more resistant than the Louisianian of Caucasian ancestry. The relatively lesser incidence in females is attributed to inherent feminine characteristics and not to habits, occupation or environment.
—H. W. W.

HASSELLTINE, H. E. Institutional segregation in leprosy. *In: Tuberculosis and Leprosy, the Mycobacterial Diseases. Symposium Series Vol. I, American Association for the Advancement of Science. The Science Press Printing Co., Lancaster, Pa., 1938, pp. 119-122.*

After reviewing familiar facts and principles, the author discusses segregation in the United States, which is of the "modified compulsory institutional" type. The Federal government cannot compel lepers to go to the national leprosarium (Carville), but the state governments concerned can exercise such authority over them that they usually choose to go there, where they have considerable freedom and are not under guard. To lessen absconding, patients are permitted occasionally to visit their homes—but they have to obtain permission from the authorities of all of the states that they enter, and they have to agree to travel only by private automobile and not to stop at public eating or lodging houses. Home isolation has been tried by individuals but is not popular; one man isolated himself on a ranch but ultimately requested admission to Carville, and another did so in his own home but gave it up because of constant fear that his condition would become known and his family would suffer socially in con-

sequence. From the viewpoint of the patient, it is pointed out, institutional care and treatment is in every way as desirable in leprosy as in tuberculosis. —H. W. W.

COCHRANE, R. G. A new vision for leprosy work. *World Dominion* (London) 17 (1939) 62-66.

The author, with Rajagopalan, has described [THE JOURNAL 6 (1938) 324-330] the recently established investigation center for the study of childhood leprosy in connection with the Lady Willingdon Leper Settlement in Madras. In the present article he writes on the more general aspects of the leprosy problem as found in the Madras area, where there are probably more than 300,000 persons suffering from the disease and where the situation is so acute that last year over 800 who sought admission to the settlement had to be turned away. The problem of how to meet the needs of such vast numbers has led to the devising of a scheme which is designed to result in the isolation of the infective and deformed cases and to be easily managed and supervised and far more economical than the methods at present in vogue. —J. W. LINDSAY

LALL, H. K. An uncommon mode of infection in leprosy. *Lep. in India* 9 (1937) 150-151.

The author narrates a patient's story of infection by the blood of another leper. In a fight with that person he got smeared with his opponent's blood but took no notice of it, not washing until evening. A month later he felt a tingling sensation in the right ring and the left middle fingers, and after about three months a small depigmented, anesthetic patch appeared on the right buttock. [This account is reported uncritically, with no account taken of the fallacies inherent in such statements by persons in endemic regions, or of what would be an incredibly short incubation period if the infection occurred as supposed.] —DHARMENDRA

SAKURAI, H. Ueber den Einfluss des leprösen Leidens auf die körperliche Entwicklung vor oder nach Eintritt der Pubertät. [On the influence of leprosy on the bodily development before and after puberty.] *Japanese Jour. Dermat. & Urol.* 44 (1938) 168 (abstract).

The author investigated 13 cases of leprosy (3 male and 11 female) in which the disease began before or after the onset of puberty. In these patients the bodily development was poor. The author believes, contrary to the opinion of Mitsuda, that these findings cannot be explained on a psychic basis alone.—[Translation of the abstract.]

MERA TENORIO, H. Consideraciones sobre la función de la reproducción en los leprosos. [The reproductive function in lepers.] *Rev. Fac. Med. (Bogotá)* 6 (1938) 488-499.

In the leprosaria of Colombia, the author says, procreation among lepers cannot be stopped because it has not been possible to prove the place of heredity in leprosy. The statistical observations which have been made in this matter are limited and incomplete and therefore do not permit the formulation of conclusions, so it is necessary that the present state of things continue in order that observations regarding the matter

(heredity) may be made with complete statistics. Untainted children born in the leprosaria should be isolated early and followed systematically.

—H. W. W.

RIVELLONI, G. Ricerche morfologiche e funzionali sul sistema capillare cutaneo nella lepra. [Morphological and functional studies on the capillary system of the skin in leprosy.] *Gior. italiano Dermat. e Sifil.* 79 (1938) 281-305.

The author has studied the morphology (at the fold of the nail and over certain lesions) and the function (resistance and permeability) of the capillary system in a group of leprosy cases, 1 nodular, 7 mixed and 15 anesthetic. He concludes that, though in this disease there is no characteristic picture in the capillaries at the nail, there are some slight differences in the forms of the disease, the anesthetic form showing the most distinct differential characters. Of the leprosy dermatoses studied (érythème fixe, hyperchromic and achromic macules, scars of bullae, nodules) each presents special capillary images that are due exclusively to the disease. The capillary resistance is independent of sex, age or form of the disease, but seems to be related to its duration. It is diminished in the érythème fixe, the cicatrices and recent nodules, normal or almost so in achromatic macules, and much increased in fibrous nodules. The permeability seems to have the same relationships as resistance. The author believes that further study will show that this field of examination will prove to be of value in diagnosis and prognosis.—[From abstract in *Ann. Dermat. et Syphil.* 9 (1938) 744.]

PÄRTELPOEG, W. Ueber Tagesschwankungen der Blutkörperchensenkungsgeschwindigkeit bei Leprösen. [On the daily variation of the velocity of sedimentation of red cells in lepers.] *Arch. Schiffs- u. Tropen-Hyg.* 42 (1938) 253-259.

Leper patients studied after a two-month interruption of treatment showed a daily curve of the red-cell sedimentation rate that approximately coincides with that of Jores and Strutz. The maximal daily values were seen, with few exceptions, in the afternoon, the minimal in the early morning hours. Cases that had been treated for two months with chaulmoogra oil and carbonic acid-snow showed, in a large number of cases, a displacement of the maximal values from the afternoon to the evening, and of the lowest values from the early morning to before noon. Agreeing with Jores and Strutz, it is established that in a certain percentage of patients the maximal and minimal points in the curve occur at unusual times, whereby the increase and diminution of the rates might be fairly marked. Patients with such curves usually show an idiosyncrasy to chaulmoogra oil, and incidentally to other medicaments as well, and it is to be assumed that this acquired hypersensitivity is responsible for the atypical curves. Several curves show considerable differences between the morning and the afternoon values, and it follows that all such reactions that are to be used as control material of the course of the disease should always be observed at about the same hour of the day.—[From translation of author's summary.]

SPEIGHT, A. Erythrocyte sedimentation test and prognosis in leprosy. *Trans. Roy. Soc. Trop. Med. & Hyg.* 32 (1939) 505-509.

The sedimentation index curve derived from regular monthly readings is of much more significance in the prognosis of leprosy than isolated single readings; the latter may often be misleading owing to the variety of causes which affect the sedimentation rate. Such a curve is of prognostic value in so far as it conforms to one of three types that are described, two of them indicating a good prognosis, the third being usually associated with a poor one. Many patients show curves which do not approximate closely to any one type until allowance has been made for other factors which influence the index, such as complicating or intercurrent disease. When all available data, including the sedimentation curve, are taken into consideration it is usually possible to estimate the prognosis in leprosy patients with considerable accuracy.—[From author's summary.]

BLACK, S. H. The pathology of leprosy. *In: Tuberculosis and Leprosy, the Mycobacterial Diseases. Symposium Series Vol. I, American Association for the Advancement of Science. The Science Press Printing Co., Lancaster, Pa., 1938, pp. 97-105.*

This is a condensed summary of the features of the typical forms of leprosy as seen in patients at Carville, beginning with notes on the etiological agent, mode of infection, etc. It brings out nothing new aside from individuality of viewpoint in an occasional feature; for example, there are recognized only three possible courses of the disease after the first manifestations appear: the benign course, the malignant course, and regression until "apparently arrested but lying dormant and in readiness to reactivate..." [There is no recognition of a possibility of abortion with actual cure.] Histologically, the author holds, there are three types of lesions: the macular (banal inflammatory); the "reacting macular" ("frequently called tuberculoid leprosy"), in which there is a suggestion of toxin formation; and the lepromatous, in which there is an apparent state of symbiosis between the microorganism and the host. Out of 75 autopsies done, all lung lesions that seemed to be due to acid-fast bacilli were subjected to animal test, and in every instance but one they were found to be tuberculous. The exceptional case was interesting in that the lesion was a bronchogenic carcinoma with leprosy bacilli proliferating freely in the tumor cells. It is mentioned that the writer has found bacilli in large numbers in several neoplasms of the skin where the surrounding tissue had few or none.

—H. W. W.

PARMAKSON, P. Ueber die tuberkuloiden Veränderungen bei Nervenlepra in Estland. [On tuberculoid changes of neural leprosy in Estonia.] *Arch. f. Schiffs- u. Tropen-Hyg.* 42 (1938) 401-412.

In January, 1937, there were 158 cases of leprosy under compulsory isolation in the four leprosaria of Estonia. The author examined the 144 inmates of the three larger institutions and found 88 cases to be of the lepromatous type and 56 neural. Among the latter there were 14 patients with seemingly active skin lesions, and these were studied more thoroughly. Histological examination showed that in 2 cases the condition resembled the changes usually to be found in diseases caused by the Koch bacillus—these cases are tuberculoid. Another 4 showed tuberculoid changes together with the usual picture of chronic inflammation. In 6 cases there were only small tuberculoid foci in a limited number, and in 2 cases only the

common changes of chronic inflammation were found. This proves that tuberculoid changes can be found in the majority of cases of neural leprosy with skin lesions. Several leprosy workers have found the same in the colored patients. The author thinks that the condition is characteristic of neural leprosy in general and that it is not a peculiarity of the colored races, as is supposed by some. Clinically one can distinguish among cases with tuberculoid changes two kinds of skin lesions: (a) primarily developed macules and (b) small papules which are developed secondarily at the edges of old anesthetic areas. The primary lesions in the beginning resemble closely lupus vulgaris in an early state, but they differentiate upon further development. The disturbances and changes in the nervous system are typical of leprosy. The leprolin test is highly positive, the erythrocyte sedimentation index comparatively low. *M. leprae* could be found in the specimens from five cases, in all of which the development of tuberculoid change was limited. In the two cases of completely developed tuberculoid leprosy none were found. In smears the bacillus was found in one case from the skin and in another in the nasal mucus. The course of the disease in the tuberculoid cases was benign, and the author agrees with those workers who believe that the formation of tuberculoid changes in the skin indicates the presence of defensive powers in the organism. —AUTHOR'S ABSTRACT

RODRIGUES DE SOUZA, A. Breve estudo clinico da lepra tuberculoides. [A brief clinical study of tuberculoid leprosy.] Rev. Brasileira Leprol. 5 (1937) Spec. No., 223-231.

The author describes briefly the most common clinical signs seen in 52 cases of tuberculoid leprosy. Attention is called primarily to the sign of "invasion of the cavities" by the tuberculoid granuloma, either in the form of a diffuse infiltration or as clearly delimited macules. Tuberculoid leprosy imitates all of the manifestations of leprosy, even forming true tubercles from the morphological point of view. Of the 52 cases studied, 14 occurred in mutilated lepers, 3 in nodular or mixed cases, and 5 in maculo-anesthetic ones, while 30 were primarily tuberculoid. Insistence is laid on the importance of making second biopsies when the clinical and histological diagnoses are not in agreement, since tuberculoid leprosy may be present as an episodic phenomenon in a diverse leprotic structure. Erythrodermic forms (true desquamative erythrodermies) and scrotal trychophytoid macules are met frequently. The lesions of this form of the disease respond readily to chaulmoogra therapy.—[From author's summary.]

HUGHES, W. Tuberculoid leprosy. Trans. Roy. Soc. Trop. Med. & Hyg. 31 (1938) 383-399.

This comprehensive presentation of the author's somewhat brief experience with the tuberculoid variety of leprosy at Sungei Buloh, in Malaya, is introduced by a statement that failure to recognize the condition affects figures on the results of treatment of the disease. The incidence among the cases dealt with was, by race: Indian Tamils, 21 cases in 197 patients (10.6%); Chinese, 77 in 851 (9.0%); Malays, 3 in 82 (3.6%); in children the incidence was low (all races combined 5%). It is concluded that this condition is most frequent in races that have been long afflicted with leprosy. The clinical and histological features are described. Cases are briefly

presented to illustrate different phases of the condition, including reaction cases one of which was of the severe ulcerative form, bacteriologically positive, long thought to be a neural case that had become lepromatous. In one instance lesions receded during a period when pulmonary tuberculosis was active, and recurred when the tuberculosis improved, and emphasis is placed on this phenomenon. The possibility that in tuberculoid cases, especially those in reaction (which is held to be a purely local condition, in contra-distinction to reaction in lepromatous leprosy), bacilli may be found, sometimes in abundance, is pointed out. The author seems sceptical of the authenticity of apparent cures in this form of the disease—or for that matter, in any form. The significance of tuberculoid leprosy is discussed at considerable length, in a more or less speculative way.

—H. W. W.

PAUTRIER, L. M. Le syndrome de Heerfordt des ophthalmologistes n'est qu'une forme particulière de la maladie de Besnier-Boeck-Schaumann. Parotidite, irido-cyclite, paralysie faciale d'origine périphérique, paralysie du récurrent; éruption confluent de grosses sarcoids des bras et des cuisses; érythrodermie sarcoidique des jambes et des plantes des pieds; infiltration micro-nodulaire des deux poumons. [The syndrome of Heerfordt of the ophthalmologists is a special form of the Besnier-Boeck-Schaumann disease.] *Ann. Dermat. et Syphil.* 9 (1938) 161-197.

This article is mentioned here because the condition of the patient, as indicated by the list of symptoms given in the subtitle and especially as shown by the numerous excellent clinical photographs and photomicrographs, was such that in a leprosy region he would be very liable to be diagnosed as a marked case of tuberculoid leprosy in reaction. Several of the pictures would pass unchallenged if used to illustrate that condition. The author does not remark on this resemblance.

—H. W. W.

YOUNG, A. G. Oriental sore simulating leprosy. *Indian Med. Gaz.* 72 (1937) 421-422.

The author describes a case of oriental sore which, because of the unusual appearance of the nodules and the presence of anesthesia in the area between the nodules, was mistaken for one of leprosy. There were five nodules on the left arm and three on the right, all of a purple color, smooth and about the size of a large pea, with no tendency to break down or to form scabs. The area between the nodules on the left arm was completely anesthetic. No leprosy bacilli were found in smears made from the nodules, but antileprosy treatment (alepol) was started. Three months later an examination was made for Leishman-Donovan bodies, which were found in large numbers. Under appropriate treatment the condition cleared up within three weeks. [The possibility that the anesthesia might have been due to leprosy, and that the case was really a mixed one, is not discussed.]

—DHARMENDRA

LOWE, J. Leishmania infections of the skin and leprosy. *Lep. in India* 9 (1937) 109-110.

There are two different types of skin lesions caused by leishmania infection which may simulate leprosy lesions. One is postkala-azar dermal

eishmaniasis, the other oriental sore due to infection with *Leishmania tropica*. Cases of dermal leishmaniasis frequently occur in parts of India where kala-azar is common, but may appear elsewhere in patients who have previously resided in an endemic area. Two such cases are described in this report. Oriental sore is common in the Punjab and the northwestern part of India and is quite often mistaken for leprosy. Not infrequently cases are seen in Calcutta in people who have migrated from the northwest. Their lesions are not very like the commoner ones of leprosy, but they do resemble the occasional cases seen in which there are very thick erythematous lesions of tuberculoid leprosy. —DHARMENDRA

WHITAKER, L. Leprosy nodules on hard palate. *Lep. in India* 9 (1937) 149-150.

This report is of a case of leprosy in a boy aged 16 years, with two nodules on the hard palate. A slit smear from one of the nodules was found to be crowded with acid-fast bacilli. —DHARMENDRA

BEHELLI, L. M. AND GODOY DE ARAUJO, D. Associação lepra-tuberculose num caso de tumor ganglionar gigante da regio crural direita. [Associated leprosy and tuberculosis in a case of massive enlargement of crural lymph nodes.] *Rev. Brasileira Leprol.* 5 (1937) Spec. No., 303-315.

The authors describe a case in which the right crural lymph nodes formed a mass as large as the head of a new-born infant. They were adherent to each other and to the skin, in part fluctuant, with a fistula from which exuded yellow fluid. A diagnosis of mixed leprosy and tuberculosis was confirmed at autopsy, histologically and by inoculation of a guinea pig with the caseous material found on section. The tissue was totally destroyed, being reduced only to the much thickened capsule. This kind of adenopathy is rare among the patients in their institution (the Cocaes leprosarium, in São Paulo), and from published reports it would seem to be rare generally. The tuberculous element is believed not to have been introduced by way of the lymphatics, and so must have been hematogenous.—[From authors' abstract.]

DE CASTRO CERQUEIRA, G. Um interessante caso de lepra mista. [An interesting case of mixed leprosy.] *Rev. Brasileira Leprol.* 6 (1938) 341-352.

The case described is an advanced one with both achromic macules and nodules. Many of the latter probably developed upon the former. The leprolin tests gave discordant results, being positive in the macules and negative in the nodular and apparently healthy areas. Other experiences, not rare, confirmed these discordances and revealed the possibility of the occurrence of positive and negative reactions at the same time and in the same patient and with the same antigen, technique and dosis, but in different sites. From this it is concluded that there may exist purely local tissue reactions, independent of the general or humoral conditions. This is a new reason to believe that the results of the leprolin test must be interpreted with care in connection with prognosis.—[From author's summary.]

RODRIGUES DE SOUZA, A. Keratose pilar condicionada por lepromas em

acromegalico. [Keratosis pilaris produced by lepromas.] Rev. Brasileira Leprol. 6 (1938) 353-355.

The author presented to the Paulista Society of Leprology an acromegalic patient with keratosis pilaris conditioned by lepromas. That follicular phenomenon was marked on the trunk and upper members, but only in the area of the lepromas; the areas not occupied by lepromatous lesions were not affected by the keratosis. The microscopic picture of the lesions corroborates the clinical appearance as regards the nature of the condition.—[From author's summary.]

FERREIRA DA ROSA, A. Reação leprotica. [Lepra reaction.] Rev. Brasileira Leprol. 6 (1938) 1-13.

For the author there are three types of lepra reaction, cutaneous, neural and mixed, with three form of evolution, acute, subacute and chronic—or, better, recidivant. Lepra reaction should be envisaged as an allergic or parallergic condition, which can be provoked by iodides. Histologically and clinically it is of inflammatory nature. In the pure, true cutaneous manifestations of the condition acid-fast bacilli are not found, which proves its nonspecific origin.—[From abstract in *An. Brasileira Dermat. e Sifil.* 13 (1938) 174.]

BECELLI, L. M. Molestias intercorrentes como causas de reacao leprotica. [Intercurrent diseases as causes of lepra reaction.] Rev. Brasileira Leprol. 6 (1938) 451-469.

The author considers the study of intercurrent diseases in lepra reaction to be extremely important because in many instances they are responsible for the acute condition. He points out various incidental conditions (diseases, physiological factors, etc.) that affect definitely the course of the manifestations, and emphasizes causes that heretofore have not excited the attention of other authors; among these causes disease of the liver is mentioned specially. Intercurrent diseases probably affect the lepra reactions in the following way: as soon as the resistance falls in one part the bacilli suddenly multiply and overcome the resistance of the lymphatic system, and their lympho-hematogenic spread would correspond to the penetration of a new charge of disease-exciter in the organism; with that, a change of reactivity is produced and new manifestations of the disease.—[From the author's summary.]

CORREA DE CARVALHO, J. Tratamento dae reacção leprotica pelo soro glicosado hipertónico. [Treatment of lepra reaction by means of hypertonic glucose solution.] Rev. Brasileira Leprol. 5 (1937) Spec. No. 247-252.

In 1936 the author reported on the treatment of lepra reaction with isotonic glucose solutions, which produced thermic reactions and caused benefit indicated by the regression of erythematous nodules and other manifestations of the reaction condition. For the year preceding the present report he had used hypertonic (30%) glucose, giving it intravenously in 5 to 10 cc. doses on alternate days. The results are described as excellent, the effect on the lepra reaction being prompt and decisive—almost immediate reduction of temperature, beginning of subsidence of nodules, and improvement in the general condition, though no effect on neuritic pains

is seen. Curiously, the hypertonic solution does not produce thermal reactions; it acts through its strongly tonic and antitoxic properties, with which there is production of diuresis. Of 74 cases so treated, 38 (51%) underwent complete recession of the condition, and 31 (42%) were improved. The latter were recent cases under treatment, but the 5 unimproved cases were intractable ones, with chronic nephritis or other complications. These results are better than any which the author has obtained with other methods of treatment.—[From abstract in *Lep. Rev.* 10 (1939) 133.]

BRENKHAUS, O. A. Ueber Nebenwirkungen bei der Antileprolbehandlung. [On the side-effects of antileprol treatment.] *Dermat. Ztschr.* 77 (1938) 121.

This is an observation of a case, aged 57 years, affected with a "prémycosis" and treated with antileprol. After the third intramuscular injection of 0.5 cm. a dermatitis appeared in the form of eczema, with small pustules on the head and the extremities, accompanied by headache, fever and general malaise. It appeared to be an artificial dermatitis due to the antileprol, and it recovered without relapse.—[From abstract in *Ann. Dermat. et Syphil.* 9 (1938) 618.]

SCHMIDT, E. [Demonstration of cases treated with prontosil.] *Arch. Derm. u. Syph.* 177 (1938) 272-274.

This item is a report of a meeting in which there were demonstrated two cases of lepromatous leprosy from the Bad Cannstatt skin clinic which are of some interest because they had been treated with prontosil. The first patient had lived in Surinam from 1914 to 1927, when the disease appeared; the other was in South America from 1913 to 1928, the first symptoms appearing a year later. Both cases had become advanced before they came under the reporter's care; both underwent slow improvement under antileprol therapy, with local application of trichloroacetic acid, but neither became bacteriologically negative (nasal smears). After combined treatment with prontosil, however, the smears became negative and had remained so for 3 months, though otherwise there was no definite evidence of improvement. —H. W. W.

BADGER, L. F. AND PATRICK, D. W. Effects of intramuscular injections of vitamin B₁ on acute leprosy neuritis and of oral administration on the general disease. A preliminary report. *Publ. Health Bull. (U. S.P.H.S.)* 53 (1938) 969-978.

It has long been considered that there is some connection between leprosy and dietetic deficiencies, and various attempts to demonstrate this have been made from time to time. The vitamin B complex has received most attention, and there is a certain amount of evidence that patients are improved by its administration by mouth. The authors experimented with dried brewers' yeast and synthetic vitamin B₁ concentrate given by mouth, but neither in the group of 17 adults patients given 15 grams of the former daily for 6 months, nor in the 11 children given 800 units of the latter daily for 6-8 months (both groups controlled) was there any improvement ascribable to this treatment. One child developed an acute neuritis. The authors' attention then turned to the use of B₁ concentrate given intramuscularly for the treatment of acute neuritis—of which, incidentally

they describe two forms, a severe one in which the nerve becomes much swollen and extremely painful, and a mild one with little swelling and tenderness but accompanied by neuralgic pain. Ten cases were so treated, 300 units daily by injection once daily, and twice daily by mouth "with rather spectacular results." All of them improved, in at longest a matter of a very few days, and in 5 of 7 cases in which the treatment was started on the day of onset of the neuritis, all pain had gone within 48 hours—in 4 of them within 24 hours. Thus the treatment appeared to be of definite value, but the authors point out that the study must be continued on a larger, controlled group before definite conclusions can be drawn.

—H. W. W.

PINARD, M. Heureux résultats thérapeutiques dans les tuberculoses cutanées et dans la lèpre avec certains extraits pancréatiques. [Favorable therapeutic results with certain pancreatic extracts in cutaneous tuberculosis and leprosy.] *Union méd. Canada* 67 (1938) 715.

The author acquired a special pancreatic extract which Auclair had used in an attempt to immunize guinea-pigs against tuberculosis, and used it therapeutically, giving intradermal injections twice a week and latterly also intramuscularly each day. The results obtained in cutaneous tuberculosis were rapid and manifest. In a case of leprosy there were no more bacilli in the nasal mucus after the ninth injection. These results are very interesting and, if the extract of beef pancreas has the same effect, there is here a field for more extended experimentation.—[From abstract in *Ann. Dermat. et Syphil.* 9 (1938) 1005.]

PRUDENTE, A. La chirurgie structive en face des deux plus grands fléaux de l'humanité: le cancer et la lèpre. [Plastic surgery with respect to the two most dreadful scourges of mankind, cancer and leprosy.] *Rev. Chir. Structive* 7 (1937) 148-155.

After discussing the matter with respect to cancer, the author insists on the scientific and social importance of repair of the deformities caused by leprosy. He shows the difficulties of cutaneous transplantations in cured cases of leprosy, owing to the scarring of the skin. The organ which is most attacked is the nasal pyramid, due to destruction of the cartilaginous septum. Ear trimming and correction of limb deformities are worth notice, as also the "gerodermie cutanée de la face"—i.e., the pendulous state of the face after subsidence of cutaneous lesions which gives the face the wrinkled appearance of senile skin.

—A. DUBOIS

TIANT, F. R. Tratamiento actual de la lepra. [Present-day treatment.] *Rev. Cienc. Méd. (Havana)* 1 (1938) No. 2, Aug.

The author, visiting physician at the San Lazaro Hospital in Havana, emphasizes the fact that because leprosy is so protean in its manifestations the physician must personally know each individual case. He then discusses the four essential principles of treatment, as enumerated by Sousa-Lima: (1) cooperation of the patient, (2) improvement of the general condition and resistance of the patient, (3) use of the largest quantity of special drug that is compatible with maintenance of the patient's condition, the best drugs to be used by the most efficient methods of application,

and (4) uselessness of treating the most advanced cases and those in the initial period. —H. W. W.

VELDS, M. Welke therapie bij lepra? [What therapy in leprosy?] *Geneesk. Tijdschr. Nederlandsche-Indië* **78** (1938) 3152-3164.

Writing from the Poelau si Tjanang leprosarium at Deli (Sumatra) the author, recognizing that lesions undergo spontaneous fluctuation, points out the fallacies of conclusions regarding the results of treatment drawn only from photographs. Along with more generally recognized factors that have to be considered he includes the formalin-serum and the Takata reactions. No notable difference was observed in results with iodized chaulmoogra ethyl esters when used alone or in combination with old tuberculin (Fischer). The results in 47 patients during two years or more were: improved 23%, stationary 70%, worse 7%. Phenolized cod-liver oil favors increase of weight. General treatment includes a good climate, lowlands being not recommended. There is a lot to be said for Müllder's method of treatment by ultra-violet rays, the author thinks, and he regrets that because he has only one apparatus and limited time his use of this modus is restricted to hastening the healing of wounds.—[From author's summary.]

BENCHETRIT, A. Comentarios al segundo centenar de enfermos de lepra curados bajo la dirección del Dr. A. Benchetrit en la Lazareto de Agua de Dios. [Comments on the second hundred of leprosy patients cured under the direction of Dr. Benchetrit at the Agua de Dios leprosarium.] Bogotá, 1938, privately printed, 184 pp.

After discussing the general considerations regarding the leprosy problem in Colombia, and offering recommendations for administrative decentralization and scientific centralization, the author presents data and pictures of patients successfully treated by him. The report is entirely in line with the many, peculiar to him, that he has published in the past. —H. W. W.

COLE, H. I. AND CARDOSO, H. T. Isolation and properties of gorlic acid, an optically active liquid fatty acid. *Jour. American Chem. Soc.* **60** (1938) 612.

After several vacuum distillations of the ethyl esters of *Carpotroche brasiliensis* oil, pure gorlic acid was isolated for the first time. It was also isolated from *O. echinata* oil. Gorlic acid has the same structure as chaulmoogric acid except for one extra double bond located in the side chain between the fifth and sixth carbon atoms. It melts at 6°C. and boils at 232.5°C. at 10 mm. Hg pressure; iodine number (Hanus) 179.7 (found) and 182.5 (calculated.); molecular weight 277.8 (found) and 278.2 (calculated). Specific optical rotation is +60°, the specific gravity 25/25 0.9436, the refractive index (25°) 1.4782. Similar data for methyl and ethyl gorlate are given. —AUTHORS' SUMMARY

COLE, H. I. AND CARDOSO, H. T. Analysis of chaulmoogra oils. I. *Carpotroche brasiliensis* (sapucainha) oil. *Jour. American Chem. Soc.* **60** (1938) 614.

A qualitative and quantitative analysis of *Carpotroche brasiliensis* oil was made by a method developed by the authors, which is described. The

total fatty acids of this oil consist of hydnocarpic acid 45%, chaulmoogric acid 24.4%, goric acid 15.4%, palmitic acid 6.6%, oleic acid 6.3%, loss and unsaponifiable 2.3%.
—AUTHORS' SUMMARY

COLE, H. I. AND CARDOSO, H. T. Analysis of chaulmoogra oils. II. *Oncoba echinata* (gorli) oil. Jour. American Chem. Soc. 60 (1938) 617.

Oncoba echinata (gorli) oil from French West Africa was analyzed by the method described in the first article of this series. The total fatty acids of this oil consists of chaulmoogric acid 74.9%, goric acid 14.7%, palmitic acid 7.8%, oleic acid 2.2%, loss and unsaponifiable 0.4%. No hydnocarpic acid was present.
—AUTHORS' SUMMARY

PARMAKSON, P. Ueber die Hautreaktion mit Leprolin bei Leprakranken und ihre klinische Verwertung. [On the skin reaction with leprolin in leprosy patients and its clinical evaluation.] Arch. Schiffs- u. Tropen-Hyg. 42 (1938) 117-123.

The leprolin test done on 60 patients was negative in 68% of the nodular cases, 22% of the mixed cases, and in 7% of the maculo-anesthetic cases. In the course of a year the reaction had changed in 10 patients. In those in whom it was positive, there was general clinical improvement; but in the negative ones aggravation of the condition was seen. The average values of the white blood picture and the sedimentation reaction of the red blood cells before the leprolin test are given. They showed a constant tendency to improvement when one goes from the group of patients with a negative reaction to those that were positive. Together with other clinical examinations the leprolin test is a valuable method that facilitates the following of the condition of the patient during treatment.—
[From author's summary.]

ROTBURG, A. AND FLEURY DE OLIVEIRA, J. A reação da lepromina na tuberculose. [The lepromin test in tuberculosis.] Rev. Brasileira Leprol. 5 (1937) Spec. No., 287-291.

The lepromin test was applied to 70 cases of tuberculosis resident in the Hospital S. Luiz Gonzaga, São Paulo. Considering positive only those reaction lesions that were larger than 5 mm. on the 30th day, they found 90% positive tests among the males and 81% among the females. The findings, therefore, are within the limits of positivity generally attributed to healthy adults in endemic leprosy areas; there seems not to be a correlation between leprosy and tuberculosis immunity, because the test is negative in leprosy, even in slightly bacillated cases. Dividing the cases tested accordingly to general bodily vigor, there were more negative tests (35%) in extremely debilitated cases of advanced tuberculosis than in the less severe ones (7.5%). The difference is attributed to cachetic anergy, without epidemiological interest.—[From authors' abstract.]

ROTBURG, A. Estudos sobre as reações tuberculínicas na lepra. [Studies on the tuberculin reaction in leprosy.] Rev. Brasileira Leprol. 6 (1938) 245-272.

The author reviews previous work with the tuberculin test in leprosy (38 references) and reports on rather extensive investigations. In 219 cases the Mantoux test, done with a 1/10,000 dilution of Dorset's synthetic

tuberculin, was positive in 47% (varying from 27 to 66% in different age groups) compared with 38% in 135 nonlepers (varying from 18 to 54%). There was no definite relation to the form of the disease, aside from an increased frequency in nodular cases which he attributed to higher tuberculosis rates in that group. The same complication explained relatively higher rates in the higher age groups. It is therefore concluded that the reaction is specific for tuberculous infection and is not a group effect. In none of the cases was there any evidence of special hyperergy or anergy, as claimed by some writers; higher rates in lepra reaction cases (66% as against 42% in nonreaction cases) gave the author the impression that tuberculosis may be of importance in determining that condition, possibly by parallergy. In that connection, of 104 tuberculin-positive cases the development of lepra reaction in 4 cases, and the exacerbation of mild reaction in 3 cases, was noted 2 to 8 days after inoculation. In tuberculoid cases no evidence was found of an underlying tuberculous condition (a tuberculous soil, which Rabello Jr. has suggested with regard to the etiology of that condition), and no evidence of a possible cross-reaction between tuberculoid leprosy and tuberculous antibodies. No relation was found between the tuberculin and the lepromin tests; groups of lepromin-positive and lepromin-negative children showed approximately equal results with the tuberculin test.

—H. W. W.

ROTBURG, A. AND BECHELLI, L. M. Considerações sobre a vacinação antivariolica e as reações tuberculínicas na lepra. [Vaccina and tuberculin tests in leprosy.] *Rev. Brasileira Leprol.* 5 (1937) Spec. No., 293-302.

Out of a total of 1,076 lepers vaccinated against smallpox, 38 came for consultation 1 to 20 days afterward (especially between the third and fifth days) with symptoms of lepra reaction. Of these cases 36 were of the nodular and infiltrative type, 1 neural, and 1 arthralgic. In 36 of the cases the lepra reaction followed a positive vaccination. The Mantoux test with 1:10,000 tuberculin was made in 23 of these cases and found positive in only 12, and the clinical examination for tuberculosis was negative in all. This investigation was made in order to eliminate the factor of tuberculosis, upon which the vaccinia could have acted, provoking the lepra reaction indirectly. The Mantoux test itself was also followed by reaction in 6 cases—in 4 after negative tests. In one instance the sole symptom was an acute neuritis of the ulnar of the arm on which the test was done. No therapeutic effect of the smallpox vaccination was seen in 16 cases observed for more than 2 years; 6 cases were unchanged, 4 were improved, and 4 became worse, but the unfavorable change had begun before the vaccination. The literature on erythema nodosum in dermatology and the interpretations of it are reviewed. The hypothesis of Denney and Hopkins of a symbiosis between the leprosy bacillus and the vaccinal virus is criticized, the reaction—including perhaps the neuritis observed—being considered a parallergic phenomenon.—[From authors' abstract.]

DI LIDDO, F. La reazione di Witebsky, Klingstein e Kuhn nella lebbra. [Reaction of Witebsky, Klingstein and Kuhn in leprosy.] *Riforma Med.* 54 (1938) 970-972.

The author reports on his findings with 163 sera. Group 1:40 lepers,

33 positive (83%), 7 negative. As to types, 35 nodular and 1 mixed cases gave 30 positives (86%), 5 neurals gave 3 positives. Group 2, 52 intimate contacts: 11 positive (21%), 41 negative. Group 3, 6 cases of cutaneous tuberculosis: 3 positives (50%). Of 4 cases of lupus vulgaris, 3 were positive; 2 cases of lupus erythematosus were both negative. Group 4, 40 cases of venereal disease: 11 positive (27%) and 2 doubtful. This group included 25 cases of sero-positive syphilis, of which 7 (28%) were positive and 2 doubtful; and 10 sero-negative syphilis cases, of which 3 (30%) were positive. Group 5, 25 miscellaneous skin cases: 5 positive (20%), of which three were entirely healthy, one had eczema and one had a non-gonococcal cervicitis.—[From abstract in *Urol & Cutan. Rev.* 42 (1938) 690.]

RABELLO, JR. AND PINTO, T. Interêt de la séro-réaction de Witebsky, Klingenstein et Kuhn pour la connaissance des formes de la lèpre. [The Witebsky-Klingenstein-Kuhn reaction and the forms of leprosy.] *Bull. Soc. Path. exot.* 31 (1938) 339-341.

The results obtained with the Witebsky-Klingenstein-Kuhn reaction indicates that "tuberculoid leprosy" has a place apart among the forms that are grouped, quite incorrectly, under the name of "neural leprosy." In about 60 cases of each form the authors have found the reaction to be positive in 68% of tropho-neurotic cases and 60% of macular cases, but negative in 70% of the tuberculoid ones. Applying both this test and the Mitsuda reaction it is found that, in general, the following applies:

	<i>W.K.K. Mitsuda</i>	
Lepromatous leprosy.....	+	-
Tuberculoid leprosy.....	-	+

These two forms are the "poles" of the disease, between which are placed the maculo-anesthetic forms.—[From abstract in *Bull. Inst. Pasteur* 36 (1938) 866.]

RABELLO, JR. Faîtes nouveau de l'immunologie de la lèpre; conséquences qui en découlent pour notre conception générale de la maladie. [New facts regarding the immunology of leprosy and their influence on our general understanding of the disease.] *Bull. Soc. française Derm. et Syph.* (1938) 823-827.

The author contributes nothing new but reviews work, mainly in South America, with the Mitsuda and W.K.K. tests. [His statements regarding the latter, and the conclusions regarding the significance of both in classification, have been sufficiently noted in this section.] Regarding the Mitsuda reaction he points out, among other things, the fact that it is unlike any reaction known to ordinary immunology; it differs from the "immediate" reactions of the anaphylactic type, and the "delayed" reactions of the tuberculin type, being so much later; he proposes to call it a "prolonged" reaction. Referring to Fernandez' work with a *tuberculoid* antigen, he says that that gave much less strong reactions and "only in hyperallergic cases." His own work with Villela, with fractionated lepromin, had shown that the lipid fractions were always inactive, activity being confined to the protein complex (see Cairo reports). He repeats regarding the constant positives with tuberculoid cases, usual negatives with lepromatous ones, intermediate position of others [ordinary neural]. Schujman has shown

that the reaction is almost always negative during ordinary lepra reaction [but would it not be negative in the same cases when quiescent?], but positive in cases of tuberculoid reaction. Fernandez had observed the reactivation of an old Mitsuda-reaction focus when the patient underwent lepra reaction of the tuberculoid type; that speaks strongly in favor of the specific allergic nature of the reaction. —H. W. W.

SOULE, M. H. AND MCKINLEY, E. B. The bacteriology and immunology of leprosy. *In*: Tuberculosis and Leprosy, the Mycobacterial Diseases. Symposium Series Vol. I, American Association for the Advancement of Science. The Science Press Printing Co., Lancaster, Pa., 1938, pp. 87-96.

The first part of this article reviews with summary brevity the outstanding points regarding the discovery of the leprosy bacillus and attempts to cultivate it, that appear in the review by McKinley that was completed in the preceding issue of THE JOURNAL. Attempts to produce the disease in experimental animals are touched on briefly, including Soule's inquiry—a negative one—regarding the possible occurrence of a leprosy-like infection in wild rats at the Culion colony [see THE JOURNAL 3 (1935) 291]. His failure to find bacilli in (or to grow it from) large numbers of specimens of blood at Culion is mentioned. The subject of immunity is confined to serological work; the lepromin reaction is not mentioned. —H. W. W.

FAURE-BEAULIEU, M. AND BRUN, G. Les formes granulaires du virus lépreux dans les lésions hanséniennes. Leur mutation "in situ" en formes bacillaires. [The granular forms of the leprosy organism in the lesions; their mutation in situ into bacillary forms.] *Compt. rend. Soc. Biol.* 127 (1938) 1437; *also*, *Paris Méd.* (1938) May 7.

This report is of the examination of specimens which had been sent to Paris from Indo-China in 10% formalin. The lesions were "achromic or hyperchromic macules, leprides or erythematous patches," which clinically were certainly leprosy but were bacteriologically negative. In the sections were found the forms described by Vaudremer, granulations and bacilli, sometimes blue-staining and sometimes acid-fast. Cultivation of one of these bacteriologically negative tissues by Vaudremer's method gave a strain of nonacid-fast cocci and diplococci. Reexamination, 14 months later, of the fluid and the fragment of tissue that had remained in it showed, besides granulations, bacilli which had become acid-resistant. It is recalled that Vaudremer described sporulation of the Hansen bacillus in his cultures. The authors believe that they have demonstrated that "the acid-fast Hansen bacillus represents an adult form of the leprosy virus, the evolutive cycle of which comprises also granular and nonacid-fast bacillary stages."—[From abstract in *Bull. Inst. Pasteur* 36 (1938) 857.]

KEDROWSKY, W. J. Variations in the actinomycetes, in connection with the theory of the mycotic nature of the viruses of tuberculosis and leprosy. *Philippine Jour. Sci.* 62 (1937) 439-462.

The author records his previous rather detailed observations on the relations of actinomycetes, diphtheroids and the acid-fast bacilli of tuberculosis and leprosy, and concludes that he has established the mycotic nature

of the causative organisms of those two diseases. On the basis of his own findings and other data he makes the general statement that a very close genetic relationship exists between the actinomycetes and the diphtheroid microbes, and he provides additional though indirect proof in favor of the mycotic concept of tuberculosis and leprosy. He considers it more than probable that the Koch "bacilli" and the Hansen "bacilli" can change, while in the outside medium, into a more stable condition of more highly differentiated mycotic nature that stands nearer to the molds, and holds that the epidemiologic significance of this phenomenon must be very great.

—J. O. NOLASCO

WATANABE, Y. AND NONAKA, N. Experimental studies on chickens concerning leprosy. (Inoculation test with human and rat leprosy.) *Kitasato Arch. Exp. Med.* 15 (1938) 40-44.

Chickens were inoculated in the muscle of the breast with suspensions of rat and human leprosy tissues, and the gross and microscopic changes that ensued were studied. Chickens inoculated with rat leprosy showed considerable pathological changes and numerous acid-fast bacilli at the place of inoculation, but in the internal organs the lesions were mild and acid-fast bacilli few. On the other hand, those inoculated two or three times with human leprosy showed comparatively mild local lesions (infiltration and nodules) and few acid-fast bacilli, but relatively pronounced lesions were found in the internal organs. In the liver, nodules the size of rice grains were observable, and even when such lesions were not visible to the naked eye histological examination revealed many small ones. Similar lesions may also be found in the spleen and lung. These nodules may contain many acid-fast organisms. Though it is evident that the lesions were due to the inoculated bacilli, it is difficult to say whether or not they were due to actual infection; in the course of time the bacilli become few and in consequence the lesions regress. It is suggested that animal inoculation can be used, as can cultures, for the differentiation of the leprosy bacillus from those of tuberculosis.—[From abstracts.]

WATANABE, Y. Experimental studies on animals concerning leprosy. Report IX. Inoculation tests with human leprosy. Part 2. *Kitasato Arch. Exper. Med.* 15 (1938) 179-198.

Rats were given subcutaneously in the thoracic region, at intervals of 1 to 2 weeks, three injections of about 1 cc. of a suspension of bacilli from human lepromas. These injections produced a reaction consisting at first of round-cell infiltration, followed by a nodular, epithelioid-cell formation, sometimes with central caseation where there were found bacilli that gave the impression of having multiplied. Cultures were negative. This lesion continued as a granulomatous infiltration in which bacilli were again found, sometimes even in globi, and Langhans cells. In the lymph nodes, pseudo-tuberculous nodules were observed. When such lesions were transferred to other rats there was a similar, though more feeble, reaction. In the next passage (3rd generation) a reaction was rarely produced, and never in the 4th generation. The reaction depends upon the bacilli inoculated more than upon the susceptibility of the animals, and is a pseudo-tuberculous formation and not a true leprosy granulation tissue.—[From abstract in *Bull. Inst. Pasteur* 36 (1938) 860.]

KRIZ, J. R. Experimental lesions induced in the rabbit with the acid-fast chromogenic bacillus (Duval) from human leprosy. *American Jour. Trop. Med.* **18** (1938) 213-225.

In 1936 the author reported the isolation of "R" and "S" forms of Duval's chromogenic acid-fast bacillus obtained from the human lepra nodule; these variants differed morphologically and culturally. In the experiments now reported rabbits were repeatedly injected with the variants, after preliminary injections with a sterile filtrate from fluid cultures of Duval's organism for the purpose of sensitizing the animals. Inoculations in different animals were made subcutaneously, intraperitoneally and by intranasal insufflation. The results so far indicate that the "S" form produces lesions in the rabbit which in many respects resemble the human leprosy lesions. In some of the organs there were found foci of the so-called lepra cells, and epithelioid cells and an occasional giant cell, in a matrix of newly-formed connective tissue. Acid-fast bacilli were found, both free in the interstitial tissue and intracellularly in some of the large mononuclear cells. These findings, together with generalized thickening of the blood vessels and marked loss in weight, give a picture, it is claimed, that closely simulates that of leprosy in man. The "R" form did not give similar results and is considered the more saprophytic. —H. W. W.

SELLARDS, A. W. AND PINKERTON, H. The behavior of murine and human leprosy in foreign hosts. *American Jour. Path.* **14** (1938) 421-434.

Much of the matter of this article appeared in a previous one [see *THE JOURNAL* **6** (1938) 135]. It is to be added that human leprosy bacilli were maintained in animals for nearly four years. Monkeys were inoculated and after more than a year leprosy bacilli were found in small numbers in smears of inguinal glands. Inoculations were made to other monkeys and a similar low grade infection developed during a period of more than a year. Portions of the pia mater of one of these monkeys were implanted intracerebrally in white rats; 15 months later many acid-fast bacilli were found in the brain of 1 of these rats. However, no progressive disease was established and no active lesions developed. —H. W. W.

PINKERTON, H. AND SELLARDS, A. W. Histological and cytological studies of murine leprosy. *American Jour. Path.* **14** (1938) 435-441.

The lesions developing at the sites of inoculation of rat leprosy in various animals, examined primarily to determine whether or not true infection had taken place, were studied with regard to the origin and development of the lepra cell. They were found to derive largely from mesenchymal cells of the reticulo-endothelial system, though exceptionally epithelial cells of the epidermis, testicular tubules and epididymis became distended with lepra bacilli, which observation is held to suggest that the relative resistance of epithelial cells to infection may depend on the inability of lepra bacilli to enter them, rather than on intracellular conditions unfavorable to their growth. In long-infected rats and mice the tissues of practically all organs except the kidneys were extensively replaced by nonvacuolated lepra cells distended with bacilli. In rabbits and monkeys there were produced with rat leprosy material progressive local and metastatic lesions in which the lepra cells were often vacuolated, and acid-fast bacilli

were much less numerous than in rats and mice. Nonpathogenic acid-fast bacilli, injected intracerebrally, were taken up by macrophages and neutrophils but disappeared in a few weeks, never producing metastatic lesions. Virulent tubercle bacilli in mice, although innocuous on subcutaneous inoculation, produced progressive and metastatic infection when injected intracerebrally; the lesions were noncaseating and the tubercle bacilli were found largely within macrophages, so that these lesions closely resembled those of leprosy.

—H. W. W.

SATO, M. Rattenlepra. 4. Teil. Bacteriologisch-serologische Untersuchungen. [Bacteriological and serological investigation of rat leprosy.] Japanese Jour. Dermat. & Urol. 43 (1938) 16-21 (abstract section).

The results of this investigation, the purpose of which was to determine similarities and differences between rat and human leprosy, are quite interesting. For instance the rat leprosy bacillus is usually 2 to 3 microns long and 0.2 to 0.3 microns wide. In some rats bacilli were found that measured 6 by 0.5 microns, but on the whole, if the bacilli exceed 4 microns it is presumptive that other acid-fast organisms have become mixed with them. Rat bacilli contain definite granules and show end-knobs. This organism stains with the usual stains but takes Sudan III with great difficulty; it stains well with osmium; it is Gram-positive in fresh smears as well as in old lepromas; it is exceedingly resistant to decolorization. It has not yet been successfully cultivated. Serologically it was found that no specific antibodies are elaborated in the blood.—[From abstract in *Urol. & Cutan. Rev.* 42 (1938) 454.]

GOMES, J. M. Pesquisas sobre a lepra murina. Eliminação de "virus." [On the elimination of the "virus" of rat leprosy.]. Rev. Brasileira Leprol. 6 (1938) 273-290.

When rats are inoculated with a filtrate of the Stefansky bacillus, they eliminate through the nose acid-fast bacteria which are one of the forms of their bacterial cycle, and also filtrable forms. The elimination of the filtrable germ, or virus, begins after 24 hours and continues for some time. A similar condition has been noted in advanced rat leprosy, but it is sporadic. The elimination of virus does not depend on the presence of acid-fast bacteria in the nostrils. The presence of a filtrable germ in the mucous membrane was demonstrated by sacrificing the inoculated rats, beginning after 24 hours, and triturating the nose in physiological solution, filtering the suspension through a Seitz filter, and inoculating the filtrate into other rats. These animals were killed 1 or 2 weeks later and the presence of acid-fast bacilli in the lymph nodes nearest to the point of inoculation was determined, this being considered a positive test. The nasal filtrate of normal rats was always found negative. The rat's heart blood seeded in Tyrode solution and also on Petroff's medium gave chromogenic cultures of different appearances and colors, grossly and microscopically; their nature is uncertain. As for the virus, the author states, some writers believe that it is the active form in human leprosy, while others attribute an immunizing action to this germ, which corresponds to that of tuberculosis.—[From author's summary.]

REVIEWS

LEPROSY REVIEW. East Africa Number, vol. 10, 1939, No. 1, pp. 1-102.

This issue is devoted exclusively to an unsigned, freely-illustrated report of the observations made by Dr. E. Muir during his tour of East Africa in 1938. Descriptions are given of the leprosy conditions existing in all of the British territories from Malta to Tanganyika, and also in the Belgian Congo, and suggestions and recommendations are offered with regard to the situation in these regions.¹

Regarding *Malta*, it is pointed out that though leprosy exists to some degree in most of the Mediterranean countries, it is perhaps surprising that it should still persist here. The provisions for lepers are excellent as regards hospital accommodation and treatment, but indications are given for improving the situation. Specifically these are: modification of the existing segregation laws; appointment of a trained, whole-time worker who would organize the time of the patients, introduce occupational therapy and otherwise ameliorate their condition, to make the hospital more popular; and the carrying out of a leprosy survey and an educational campaign by a doctor trained for that kind of work.

The antileprosy measures that have been employed in the *Anglo-Egyptian Sudan* [which have been described in *THE JOURNAL*, especially 2 (1934) 193-200; 3 (1935) 73-79, and 4 (1936) 516-518] are reviewed favorably, though it is recommended that better staff arrangements be made in the way of full-time workers—a doctor, a general supervisor for agricultural and industrial work, and a trained European lay helper.

The northeastern portion of the *Belgian Congo*, adjacent to western Uganda, was visited. An especially striking feature of the situation there (as in southern Sudan) is the relatively mild form of the disease as compared with that seen in northern India. The incidence is about 4%. Valuable survey and census work is being done.

In *Uganda* excellent work is done by government and mission doctors. A description of the Bunyonyi Lake settlement is given and suggestions are made regarding extension of the work, and for the provision of a trained European lay worker to develop the community life of the patients and occupational therapy. In the fine Kumi home, with 315 leper children and 400 adult patients, the superintendent, Miss Laing, is the only European on the staff, and it is recommended that she be given a European assistant. To attract patients, the district commissioner asks a headman to call in all of the lepers in his area and Miss Laing demonstrates to them the results of treatment in the settlement.

The work in *Kenya Colony*, also done by the government and mission doctors, is highly commended. They, however, often have so many demands for other duties that the lepers may sometimes not receive their due attention, so here also there is great need for suitably trained whole-time European assistants for the medical work, occupational therapy and the organization of agricultural settlements.

In *Tanganyika Territory* fifteen leper institutions were visited, most of

¹This review supplements the original article by Dr. E. Muir which appears elsewhere in this issue.—EDITOR.

which are connected with missions. Here, although as high as 10% incidence had been reported for certain districts, it was found that 3% is nearer the actual figure. Excellent work is done by devoted workers but here also more qualified workers are needed. There are homes for leper children, but the conditions of promiscuous sleeping accommodation need remedying, and the earlier removal of infants from leprosy parents is urged.

The situation in *Zanzibar* is reviewed and attention is drawn to the great improvement that is evident since the suspension in 1935 of the policy of compulsory segregation and the introduction of the voluntary system.

Leprosy exists in the *Aden Colony and Protectorate*, but most of the cases in the Sheikh Othman Leprosy Hospital have come from outlying regions, as the Yemen, some 100 miles distant. They have generally come seeking treatment for some other diseases. Consideration is given to the protests of the possible danger to the Aden population of the spread to them of infection by such patients coming from leprosy districts outside, but it is held that the advantages of hospital treatment of the patients outweigh any possible risk.

Leprosy in the adjacent territories of *British Somaliland* and *Ethiopia* (Abyssinia) is an international matter, and the necessity is urged of an attempt to coordinate efforts for its control in the two countries. Suggestions are made which might lead to such cooperation as exists between British Uganda and the Belgian Congo.

In general, this report contains much valuable information regarding methods of dealing with leprosy in the places visited. It emphasizes the necessity for intensive educational propaganda in leprosy countries, and also the need of trained personnel, as well as the advisability of cooperation between neighboring countries.

—J. W. LINDSAY

TUBERCULOSIS AND LEPROSY; THE MYCOBACTERIAL DISEASES. Symposium Series Vol. I, American Association for the Advancement of Science. The Science Press Printing Co., Lancaster, Pa., 1938, 133 pp. (price \$2.50).

This volume comprises the papers presented in a symposium held at a meeting of the American Association for the Advancement of Science in Denver, in June, 1937. In total, including added ones, there are 19 papers by a total of 24 contributors. As a summarization of the outstanding features of the closely related group of diseases of man and animals caused by the mycobacteria (except rat leprosy), this symposium is of such interest to students of leprosy that it is abstracted here.

I. GENERAL INTRODUCTION

WHITE, W. C. *Tuberculosis, leprosy and other diseases caused by acid-fast bacteria* (pp. 9-10). This introductory note explains that the purpose of the symposium is to bring into prominence "a common disease process" caused by the acid-fast family of microorganisms. An outstanding feature of this process—for which, he says, Long has proposed the appropriate term "mycobacteriosis"—is that, whichever germ is involved, it for a time thrives inside one class of the body cells, the "monocytes." Localization

of the process, differing in different animals, apparently depends upon the function of those cells; in man they are very abundant in the lungs and the tubercle bacillus wreaks its principal damage there. This idea is also applied in other diseases—in the Johne paratuberculosis of cattle to the monocytes of the intestine, and in human leprosy to the monocytes of the skin and nerve sheaths. Speculatively, there is some relation to a food supply needed by both cell and bacillus. It is in the later stages of the diseases process that the various affections produced by these germs develop their special features.

II. THE PATHOLOGY AND BACTERIOLOGY OF TUBERCULOSIS

KAHN, M. C. AND MONIDEZ, J. F. *Some morphological characteristics of the tubercle bacillus* (pp. 11-20). There are three views regarding the reproduction of the tubercle bacillus: (1) simple, the ordinary fission of the acid-fast form (coccioid, granule and nonacid-fast forms being degeneration products); (2) complicated, pleomorphic, with at times a process of rapid segmentation to produce a granular nonacid-fast phase; and (3) one involving a filterable phase. Kahn tends toward the second view, having seen in hanging drops (a) segmentation of the bacillus into three or more ovoid, acid-fast units, (b) reduction of these into fine, nonacid-fast granules, (c) development from them of extremely fine and delicate, nonacid-fast rods, which elongated and enlarged, and (d) development thus of the mature acid-fast bacilli. The authors here report on recent studies of young colonies of tubercle bacilli by histological methods, which have revealed an outer, younger zone composed largely of the nonacid-fast fine granules and rods, and an inner core or medulla composed almost entirely of larger, acid-fast bacilli. Old colonies were not stratified, being composed almost entirely of acid-fast bacilli. Similar forms have been found in the bovine strain, and also in *M. phlei*, but not in *M. marinum*, *M. smegmatis* or the Chapin "rat-leprosy" strain. Young avian bacillus colonies contained numerous nonacid-fast rods of different sizes, but not granules. Growth membranes of tubercle bacilli on fluid cultures were also studied, to the 145th day, a special staining method being used. On the 4th day only 10% of the bacterial population consisted of acid-fast rods and coccioid bodies; after the 40th day the cyanophilic element decreased rapidly and after 115 days almost all elements were acid-fast. Experiments on filterability led to the conclusion, contrary to that of certain other workers, that none of the forms passed Berkefeld filters, or any Zsigmondy-Bachman filters of less than 0.1 micron pore diameter.

ANDERSON, R. J. *Chemical studies on the tubercle bacillus and other acid-fast bacilli. Part I. Chemical studies on the fats and lipids of the acid-fast bacilli* (pp. 20-22). This note deals very briefly with the element that sets off the acid-fast bacilli as peculiar among bacteria, namely, the ether-soluble compounds, or lipids, which constitute from 25 to 40% of their weight. The discussion of the three groups of these substances, phosphatides, fats and so-called waxes would be difficult to summarize further with profit.

HEIDELBERGER, M. AND MENZEL, E. O. *Chemical studies on the tubercle bacillus and other acid-fast bacilli. Part II. Cell carbohydrates and proteins of the tubercle bacillus* (pp. 22-23). The writers had previously

reported on the complex mixture of polysaccharides extracted from the H37 strain of the tubercle bacillus after defatting, and now report having made a similar fractionation of that element of a bovine strain. With regard to the proteins of the cells, intensive work on their separation has shown, among other things, that the human bacillus has at least two immunologically distinct antigens. Comparison with similar elements of other organisms indicates lack of serological distinction between the human and bovine strains, but clear distinction between either of them and the avian strain or the Timothy hay organism.

SEIBERT, F. B. *Chemical studies on the tubercle bacillus and other acid-fast bacilli. Part III. The proteins of culture filtrates of acid-fast bacilli* (pp. 23-24). Study of the protein fractions of different types of acid-fast bacilli had shown differences distinct enough for the precipitin reaction to identify them. The study was then extended to ascertain if similar differences could be detected between different strains of the same type, using five human tubercle cultures—the work involving use of 30 to 40 liters of tuberculin culture filtrate of each strain, yielding 0.2 gm. of protein per liter. They were found to be identical, serologically and with respect to electrometric titration. This result is in marked contrast, it is noted, to Henderson's experience with various strains of bacilli isolated from leprosy tissues, among which the specific (homologous) protein always gave the highest titer, though there were cross-reactions.

LURIE, M. B. *Immunity to mycobacterial diseases, with special reference to tuberculosis* (pp. 25-33). Of particular interest in relation to leprosy is the fact that rabbits inoculated intravenously with avian bacilli acquire a "Yersin" type of infection with marked, diffuse infiltrations of cells that are loaded with bacilli but are not apparently injured by them. If the animal survives, however, the diffuse condition is replaced by a miliary tuberculosis of the liver and spleen, with typical epithelioid tubercles with few bacilli, and with caseation. Johne's disease of cattle and the nodular [lepromatous] lesions of human leprosy are compared with the earlier stage of the condition described, and their immunological features are mentioned, including lepra reaction. In mammalian tuberculosis similar features are seen, e.g., diffuse infiltration of bacillus-laden mononuclear cells after heavy intravenous inoculation of a normal guinea-pig, and the contrasting nodular condition produced in sensitized animals. The author asks if it may not be that these two phases, the diffuse (nontoxic, nonsensitized) and the nodular (toxic, allergic) are developed in all of the mycobacterial diseases, in different degrees and at different rates. "It is conceivable that the differences in the pathology and immunology of the various 'acid-fast diseases' may be found, among other factors, to be functions of the varying degrees of parasitism of the different acid-fast forms for different animal species." With that he goes on to a rather detailed consideration of the nature of immunity in tuberculosis, which could not be dealt with satisfactorily here.

SABIN, F. R. *The pathology of tuberculosis* (pp. 34-38). This discussion is limited to the significance of the "hard" and "soft" tubercles. The former are the so-called typical tubercles of the text-books, discrete, simple, made up of epithelioid cells (including Langhans giant cells) and lympho-

cytes. The soft tubercles are diffuse, loose, indefinitely outlined, with many kinds of cells and much necrosis. The others, it is pointed out, can be produced by phospholipins from any acid-fast organism, by avirulent strains and attenuated dissociation ones, or by virulent organisms in a resistant host; and

... it is thereby suggested that host resistance is made effective through an action on the bacillus expressed as a degradation of its virulence. Highly virulent strains in a susceptible host show not only complex, progressive, cellular reactions to the bacillus, but also a toxic necrosis of the tissues of the body. The cellular reactions are probably due to products from the bacillus, because every cellular reaction found in the disease can be induced by chemical fractions extracted from the bacillus. It is only the virulent organisms, in contrast to the avirulent and attenuated ones, which give rise to a toxic necrosis...

CORPER, H. J. *Discussion of the common characteristics of the acid-fast bacteria* (pp. 39-41). This is a summary statement of present knowledge of certain features of these organisms, with special mention of "reacceptance" of the existence of a specifically developed immunity; the general challenging of the existence of a common tuberculosis bacteremia; the possibility that the acid-fast form may be only one stage in the growth of the tubercle bacilli (though he speaks of the "waning views on the existence of filterable forms of tubercle bacilli"); and the fact that tuberculosis follows "limited definite forms with surprising extreme possibilities," which last subject is expanded. Virulence is defined as:

... the power of tubercle bacilli to multiply in the host, as contrasted to the inability of avirulent bacilli to multiply; yet avirulent bacilli appropriately applied can produce tubercle. This criterion of virulence has made it possible to study specific artificial immunity in tuberculosis and to try to determine the factors active in its production from a bacillary standpoint. We have found that although a definite relative specific immunity can be produced in both man and animals by appropriate injections of avirulent human and bovine tubercle bacilli, certain saprophytic acid-fast bacilli in approximately equal or larger amounts did not produce this same effect.

III. TUBERCULOSIS IN ANIMALS

STILES, G. W. *Tuberculosis in domestic animals* (pp. 42-53). This paper reviews broadly and succinctly, with many references, the subject of tuberculosis as it affects our common barnyard herds and flocks. The susceptibility of laboratory animals to the three strains of *M. tuberculosis* is tabulated as follows (Van Es and Martin):

Strain	Cavia	Rabbit	Fowls
Bovine.....	+++	+++	0
Human.....	+++	+	0
Avian.....	0	+++	+++

FELDMAN, W. H. *The histopathology of the intradermic tuberculin reaction in cattle* (pp. 54-58). This rather specialized article sets forth, in part, that the tissue reaction to tuberculin in sensitized cattle is a definite and consistent one, demonstrable within three hours as edema with a perivascular and perineural accumulation of cells which, after the first few hours, is predominantly mononuclear ("histiocytic"), and that is at its maximum in 60 to 72 hours. While most of the edema disappears after 5 to 7 days, collections of histiocytes persist for as long as 28 days.

CRAWFORD, A. B. *The specificity of the tuberculin reaction in cattle and laboratory animals* (pp. 59-65). The problem indicated is not only a practical one, but also of general interest with regard to reactions induced in animals by the mycobacteria. In cattle, most trouble is caused by the condition characterized by peculiar subcutaneous tuberculoid nodules (incorrectly called "skin lesions") which cause reactions to mammalian tuberculin; acid-fast organisms can usually be demonstrated in them, but they are extremely refractory to cultivation, like the leprosy bacillus. On occasion cattle exposed to human tuberculosis, especially in tuberculosis sanatoria where ambulatory patients have access to the herds, give positive reactions. Sensitization to the avian strain readily occurs, and it may sometimes give nonspecific reactions in practice. The individual types of parasitic acid-fast organisms cause group- rather than type-specific sensitization to tuberculin. One group comprises the bovine and human tubercle bacilli, sensitizing to mammalian tuberculin. The second group includes the avian tubercle bacillus, the bacillus of Johne's disease, strains isolated by the author from the "skin-lesion" condition, and "some strains of lepra bacilli"; these all sensitize to avian tuberculin. A third group comprises the various acid-fast bacilli isolated from cold-blooded animals, which do not sensitize to either mammalian or avian tuberculin.

DAINES, L. L. *On certain acid-fast bacteria as the probable cause of skin lesions in tuberculin-reacting non-tuberculous cattle* (pp. 66-68). This is a review of the bacteriology of the "skin-lesion" condition mentioned in the preceding article, which some workers have concluded is due to mycobacteria other than the tubercle bacillus, though they can sensitize to tuberculin. The organism has been very refractory to cultivation. Crawford's strains have been mentioned. The author has succeeded many times in cultivating from these lesions a purely acid-fast, chromogenic (orange) bacillus. It produces apparently typical skin lesions in cattle, often with tuberculin sensitization but not tuberculosis. Nonacid-fast organisms that also grew in the cultures proved not to be forms of this one. It has not been identified with any known strain, and may derive from the soil.

HAGAN, W. A. *Johne's disease or paratuberculosis of cattle, with a note on the disease in sheep* (pp. 69-79). This peculiar disease of cattle—occasionally, too, of sheep—is of decided interest to students of leprosy. Its outstanding features are: the peculiar localization of the lesions, in the intestinal tract and the associated lymph nodes; the prolonged "incubation period," one to five or more years; its afebrile course, usually with fatal end due to exhaustion and dehydration from diarrhoea; the diffuse infiltration of the intestinal wall with histiocytes and epithelioid cells, often with Langhans giant cells, but apparently without the focalization of ordinary tubercles and without "the slightest microscopic evidence of degenerative changes"; and, finally, the organism, *M. paratuberculosis*. The bacilli, which occur within and outside of the mononuclear leucocytes, are found in enormous numbers in the acute cases, when the cells are distinctly separated from each other, but are less numerous in older lesions, in which the cells tend to fuse to form "symplastic tissue." This organism resisted cultivation until Twort devised a special medium containing other, killed, acid-fast germs to supply preformed material peculiar to organisms of its class. The infection does not cause cutaneous allergy. Reactions are got-

ten however, on subcutaneous or, better, intravenous injection of "johnin." Cross reactions with avian tuberculin are had.

ARONSON, J. D. *Tuberculosis of cold-blooded animals* (pp. 80-86). This is a rapid review of spontaneous lesions resembling tuberculosis and containing acid-fast bacilli that have been found among fish, frogs, snakes, turtles, alligators and iguanas. The lesions seen and the various organisms that have been cultivated from them are described.

IV. LEPROSY

SOULE, M. N. AND MCKINLEY, E. B. *The bacteriology and immunology of leprosy* (pp. 87-96).

BLACK, S. H. *The pathology of leprosy* (pp. 97-105).

DOULL, J. A. *Salient features in epidemiology of leprosy* (pp. 106-109).

MC COY, G. W. *Leprosy in the United States; discussion* (pp. 110-111).

HOPKINS, R. *Heredity in leprosy* (pp. 112-118).

HASSELLTINE, H. E. *Institutional segregation in leprosy* (pp. 119-122).

[Summaries of these articles appear among the regular leprosy abstracts in the preceding pages of this issue.]

V. SUMMARY AND UNIFICATION

LONG, E. R. *Tuberculosis, leprosy and allied mycobacterial diseases* (pp. 123-133). In this address Long analyzes some of the known facts concerning the various diseases due to the acid-fast bacteria and attempts to indicate a common pattern in them. (Incidentally, he notes that the conditions called rat "leprosy," fish "tuberculosis," etc., are so named for convenience, "with little satisfaction to the namers and to the everlasting annoyance of the special experts in 'true' leprosy and tuberculosis.") Besides the naturally occurring diseases, a wide variety of disease processes can be induced experimentally, with variations: (a) from one strain of mycobacteria in different animal species; (b) from different strains of mycobacteria in one animal species; (c) from one strain of mycobacteria in one animal species modified by immunization; (d) from one strain of mycobacteria in one animal species with genetic variability in susceptibility; (e) from the dissociated elements of one strain of mycobacteria in one animal species. Thus a wide variety of mycobacterial diseases occurs as a result of animal and bacterial variability. However, constants occur in the chemical constituents of both host and his cells and of the infecting agent. Little that is significant is known of the former. Of the latter, the bacillary lipids act as stimulants for the mononuclear phagocytes; the acute inflammatory exudations and toxic necroses result from protein action, especially in the hypersensitive state, while the chronic changes are due in large measure to the lipids. The ultimate "epithelioid" appearance of the characteristic cells appears to be the result of destruction of acid-fast bacilli within them and cytoplasmal dispersion of their constituent lipids. Some of the carbohydrates as well as proteins appear to be toxic for animal cells. With these facts at hand it is understandable that the mycobacterial diseases vary greatly as the result of interplay of variable bacteria and variable animal cells, each with its individually characteristic content of biologically active chemical constituents. —H. W. W.