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Abstracts

1. BECHELLI, M. L., KYAW LWIN, GALLEGO GARBAJOSA, P., MG MG GYI, UEMURA, K., SUNDARESAN, T., TAMONDONG, C., MATEJKA, M., SANSARRICQ, H. & WALTER, J. **BCG vaccination of children against leprosy: nine-year findings of the controlled WHO trial in Burma.** *Bull. Wld Hlth Org.* 1974, v. 51, 93.

The leprosy incidence rates so far in the vaccinated and unvaccinated children aged 5-9 and 10-14 years are similar. The BCG-vaccinated children aged 0-4 years at intake had an incidence rate lower than that of children in the control group. BCG vaccination did not protect household contacts or children aged 5-14 years not exposed in the household, and did not influence the distribution of the forms of leprosy in the cases detected. The lepromin reaction in relation to the age at intake was consistently stronger in the vaccinated children than in those of the control group; the younger the age group the more pronounced was the difference, which was only slight in the age group 10-14 years at intake. If the results of the late lepromin reaction are related to the age at onset (when the children are older than at intake), the differences between the BCG and the control groups tend to decrease. It does not seem that the BCG-vaccinated children suffer from a less serious form of leprosy than the nonvaccinated children (most of them nonreactors to tuberculin).

Authors' Summary

2. PALANDE, D. D. **A review of 23 operations on the ulnar nerve on leprous neuritis.** *J. Bone & Joint Surg.* 1973, v. 55-A, 1457.

Ulnar neurolysis and transposition operations were undertaken on 23 patients with leprous neuritis producing intractable pain, including seven with nerve abscess. The pain was relieved in all cases. Recovery of sensory and motor function varied with the type and duration of neuritic involvement. The results show that meticulous surgery on the diseased ulnar nerve in such patients can be done without damaging the nerve, and undertaken early may be a way to diminish the incidence of irreparable nerve damage.

T. F. Davey

The following Abstracts are reprinted, with permission, from *Tropical Diseases Bulletin,* January to April 1975.

3. WLD HLTH STATIST. REP., 1974, v. 27, No. 6, 234-6. **Leprosy.** [In English and French.]

Figures are given, where available, showing the numbers of cases of leprosy reported monthly in 1972 and 1973 in some 60 countries in Africa, the Americas, Asia, Europe, and Oceania.

4. SAINT-ANDRÉ, P. & CLASTRE, J. L. Une enquête sondage d'évaluation de la campagne contre la lèpre dans une zone de grande forêt en Côte-d'Ivoire (Région de Danané). [**A pilot evaluation enquiry into a leprosy campaign in an area of dense forest in the Ivory Coast (Danané district).**] *Méd. Trop.,* 1974, v. 34, No. 3, 361-5. English summary.

This brief paper summarizes the findings of a pilot survey designed to evaluate the results of a leprosy control programme in typical groups of small villages scattered in an area of dense

tropical forest. The whole population numbered about 18,000; the prevalence of leprosy was low, and a very low proportion of patients suffered from the lepromatous form. Total coverage was believed to have been achieved.

The authors consider that the routine treatment – fortnightly injections of suspensions of dapsone – resulted in clinical arrest in 65% of patients in 3 to 4 years, despite an undisclosed proportion making 50% of clinic attendances or less. The prevalence of leprosy has fallen to 5 per 1000. The authors recommend that doctors should release patients from treatment with greater readiness and, in such an area, that the leprosy programme should be combined with a campaign against other prevailing diseases, such as onchocerciasis.

S. G. Browne

5. MYRVANG, B. **Immune responsiveness to *Mycobacterium leprae* of healthy humans. Application of the leucocyte migration inhibition test.** *Acta Path. Microbiol. Scand. Sect. B,* 1974, v. 82B, No. 5, 707-14.

"Immune responsiveness to *Mycobacterium leprae* was studied, by the method of leucocyte migration inhibition, in 90 healthy adults allocated into four groups according to previous contact with leprosy patients. Groups working or living in close relationship with leprosy patients responded significantly more strongly to *Myco. leprae* than a group without such contact. With a selected concentration of *Myco. leprae* 71.2% of medical attendants dealing with leprosy patients, 22.2% of administrative staff of a leprosy hospital, and 50% of household contacts of leprosy patients showed migration indices <0.800, but none of the group without known contact with leprosy patients showed indices below the threshold value. Since the inhibition of migration to BCG was similar in all groups, and no evidence was found that other mycobacteria had provoked the positive responses elicited by *Myco. leprae,* the above figures appear to represent individuals immunologically stimulated with *Myco. leprae* itself. The study therefore, showed that the method of leucocyte migration inhibition may be used as an assay for specific detection and enumeration of immune responses mounted by *Myco. leprae.* The results lend strong support to the view that leprosy bacilli are frequently transmitted from patients to contacts. The introduction of *Myco. leprae* into the human body is, however, rarely accompanied by development of clinical signs of leprosy."

6. KAHN, P. & SCOTT, T. **The pathology of a radial nerve biopsy in leprosy: light and electron microscopy.** *J. Path.,* 1974, v. 114, No. 2, 97-100.

"Light and electron microscopy of a radial nerve biopsy in a patient with longstanding leprosy and treated for four years, shows that in the nerve the end result of prolonged infection is loss of nerve fibres, severe endoneural fibrosis, and lamination of Schwann cell processes and collagen. These appearances resemble the 'onion bulb' whorls seen in other chronic peripheral neuropathies. Several bacilli and fragments of degenerate organisms were deomonstrated, which illustrates the difficulty of eradicating reservoirs of organisms which may persist in spite of prolonged treatment."

7. DASTUR, D. K. & DABHOLKAR, A. S. **Histochemistry of leprous nerves and skin lesions: acid phosphatase.** *J. Path.,* 1974, v. 113, No. 2, 69-77.

The occurrence of acid phosphatase in nerves in leprosy, not previously investigated, was found to be similar to that in skin lesions. In tuberculoid nerves enzyme activity showed three phases: almost none in the normal state, increased activity in the stage of early degeneration, and again none in the advanced stage. The situation in lepromatous nerves was probably similar. The enzyme was thought to be in the Schwann cell cytoplasm as well as in macrophages. Acid

phosphatase appears to be a reliable marker of lysosomal activity but does not by itself control bacillary multiplication.

D. S. Ridley

8. SAINT-ANDRÉ, P., FERAL, J., BUENO NUMEZ, A. M., GIRAUDEAU, P. & CISSE, B. Le traitement de l'érythème noueux lépreux (ENL) par le chloramphénicol. [**The treatment of erythema nodosum leprosum with chloramphenicol.**] *Afr. Méd.*, 1973, v. 12, No. 115, 871-8.

The authors treated with chloramphenicol 31 African patients suffering from clinically severe (22) or moderate (8) grades of erythema nodosum leprosum (ENL), and one patient with an acute peripheral neuritis. After careful pathological assessment, the patients were given 1 g of the drug three times a day; three-quarters took the drug orally and the remainder received it intramuscularly.

In patients suffering from severe ENL, either long-standing or recurrent, the raised temperature returned to normal within a week, and the skin lesions disappeared within 12 days in all patients and within eight days in a third. The level of C-reactive protein, which had been considerably raised in all patients, fell to zero within 18 days in all patients, and within 11 days in 60%.

In patients with less severe forms of ENL, a similar rapidity of disappearance of signs and pathological accompaniments was noted in some, but not in those patients suffering from a persistence of fewer ENL lesions.

The authors consider that chloramphenicol must now be reckoned as inferior only to thalidomide in the control of ENL, although relapse occurred in 30% of patients between 15 days and 4 months.

The mode of action of the drug is discussed in some detail, and the intriguing possibility that, in some instances at least, reaction may be precipitated by the presence of staphylococci in the urinary tract or elsewhere. The authors suggest that chloramphenicol may act on the antibodies that represent one of the components of the immune complex responsible for the triggering of the "reaction". Whatever the explanation, the treatment of a notoriously refractory complication of lepromatous leprosy by means of chloramphenicol deserves further investigation.

S. G. Browne

9. ANTIA, N. H. & BUNDEALLY, A. E. **Prolonged release of 4,4′-diamino-diphenylsulphone (DDS) by incorporation in silicone rubber.** *Int. J. Lepr.*, 1974, v. 42, No. 1, 58-62.

"Prolonged release of DDS by incorporation into silastic RTV sheets has been demonstrated in *in vitro* and *in vivo* studies in rabbits up to a period of 150 days. This is a preliminary report of a continuing study."

10. BEAMAN, B. L., KIM, K. S., LANÉELLE, M. A. & BARKSDALE, L. **Chemical characterization of organisms isolated from leprosy patients.** *J. Bact.*, 1974, v. 117, No. 3, 1320-29.

Cell wall preparations from 13 leprosy-derived bacteria were analysed for carbohydrate, lipid and amino acid composition. These were compared with analyses of a characteristic species of *Corynebacterium, Mycobacterium* and *Propionibacterium.* All but one of the leprosy-derived bacteria could be assigned to one of these genera on this basis and the authors note that the characteristics of freshly isolated "leprosy bacilli" reported in the literature are encompassed by a combination of these genera but not by one alone. A mixed aetiology of leprosy in which mycobacteria and propionibacteria function as "helper bacteria" in the development of globi from spheroidal bodies is discussed.

S. Fletcher

11. SHAO, J. **Affinity of *Myco. leprae* to lymphocytes of leprosy patients in vitro.** *Dar es Salaam Med. J.*, 1973, v. 5, No. 1, 27-8.

"The adherence of *Mycobacterium leprae* to lymphocytes from patients with tuberculoid and lepromatous leprosy has been studied. The two groups were studied simultaneously.

"While lymphocytes from nine tuberculoid patients showed very high adherence property to the *Mycobacterium leprae,* there was an obvious diminished affinity for the leprae among the lymphocytes from nine lepromatous patients.

"It is concluded that lepromatous patients have a diminished number of circulating lymphocytes that have antigenic receptors for *Mycobacterium leprae.*"

12. IMAEDA, T. **Growth inhibitory activity of deoxyribonucleic acid-containing factor(s) isolated from lepromatous lesions.** *Infection & Immunity,* 1974, v. 10, No. 4, 957-9.

"Deoxyribonucleic acid-containing factor(s) isolated from *Mycobacterium leprae* suspensions obtained from lepromas of nine patients showed growth inhibitory activity against *Micrococcus* and both orange-red-pigmented and coccoid mutants of mycobacteria. No growth inhibition was observed for parent mycobacterial species, *Escherichia coli, Pseudomonas aeruginosa, Bacillus subtilis,* and *Staphylococcus epidermidis.*"

13. LIM, S. D., KIM, W. S., KIM, C. S., GOOD, R. A. & PARK, B. H. **NBT responses of neutrophils and monocytes in leprosy.** *Int. J. Lepr.*, 1974, v. 42, No. 2, 150-53.

"A role of cellular defense against infection of *Mycobacterium leprae* was studied with 36 leprosy patients. Using the NBT test, we found no significant difference in the proportion and absolute number of NBT positive neutrophils. However, these indices were markedly increased in the monocytes. Thus our results confirm that the monocytes are of prime importance in the defense against *Mycobacterium leprae,* but neutrophils are not. Neutrophils, however, do respond well against test endotoxin in this disease."

14. HAN, S. H., WEISER, R. S., WANG, J. J., TSAI, L. C. & LIN, P. P. **The behaviour of leprous lymphocytes and macrophages in the macrophage migration-inhibition test.** *Int. J. Lepr.*, 1974, v. 42, No. 2, 186-92.

"The bahavior of leprous lymphocytes and macrophages in the cell-mediated immune response to the specific antigens of leprolin was studied *in vitro* by the macrophage migration-inhibition test using a pure human cell system and a mixed cell system comprised of human lymphocytes and guinea pig macrophages. In the presence of leprolin, the migration of normal guinea pig macrophages was inhibited in the presence of tuberculoid lymphocytes but not in the presence of lepromatous or normal lymphocytes. In the presence of leprolin and tuberculoid lymphocytes, macrophages from tuberculoid, lepromatous and normal subjects showed similar degrees of migration inhibition. Whereas the migration of lepromatous macrophages was not inhibited in the presence of leprolin and either normal or lepromatous lymphocytes, the migration of tuberculoid macrophages in the presence of leprolin and lepromatous lymphocytes was inhibited to a slight but singificant degree.

"The results indicate that the capacity of lepromatous lymphocytes to respond to leprolin with the production of MIF is severely if not totally impaired but that the capacity of lepromatous macrophages to respond to MIF is normal. They also indicated that tuberculoid lymphocytes are sensitive to leprolin and can produce MIF in its presence."

15. AZULAY, R. D., SILVA, N. C., ZEO, A., PORTELA, A. B., FRANCA, J. C. B. & PELUSO, L. L. **The antileprotic action of clofazimine (B 663, G 30 320, Lamprene).** *Int. J. Lepr.,* 1974, v. 42, No. 1, 13-18.

Twenty patients in Rio de Janeiro were treated for 1-2 years with clofazimine (Lamprene; B 663) in a dosage of 100-200 mg daily. All were suffering from lepromatous leprosy and five had not been treated previously. The only side-effects were pigmentation and dryness of the skin, and mild indigestion. Results were good and the incidence of lepra reaction was low.

W. H. Jopling

16. ENNA, C. D. & JACOBSON, R. R. **A clinical assessment of neurolysis for leprous involvement of the ulnar nerve.** *Int. J. Lepr.,* 1974, v. 42, No. 2, 162-4.

"Neurolysis with or without transposition of the ulnar nerve was performed 103 times on 63 patients at Carville during the period 1960-1972. The results of the surgery were good in terms of immediate relief of pain, and a neural deficit seldom developed or progressed after the procedure. However, the pain often recurred albeit usually less severe than it had been originally. Although the immediate results of the surgery are, in general, good, one cannot be certain that the long-term results were any better than they would have been without surgery since we have no valid controls. A finding of particular interest is that the procedure has seldom been necessary since 1965 when B 663 and thalidomide were first used at Carville for control of reactions, suggesting that a severe ulnar neuritis is a less likely occurrence in patients receiving these drugs."

17. MEYERS, W. M. & STAPLE, E. M. **Monotony mitigated a mite: or, a superior skin smear slide.** *Int. J. Lepr.,* 1974, v. 42, No. 1, 74-5.

The writers of this letter from Kivuvu Leprosarium, Zaïre, describe the preparation of a slide on which eight skin smears from different parts of the body can be made. A standard microscope slide is coated with paraffin wax and laid on a ruled cardboard pattern. The tip of a scalpel is used to trace through the wax, dividing the greater part of the slide surface into eight equal squares. A portion at the end is left for the identifying name or number. The slide is then placed for 10 minutes in concentrated hydrofluoric acid, washed, and the wax removed by heating and rinsing in xylene. The smears are placed on the unetched side of the slide in a routine sequence. The slides are permanent, and two people can produce up to 200 a day.

F. I. C. Apted

18. DE FARIA, L. L. **Fluorescent staining for *Mycobacterium leprae* in tissue sections. Comparison with Fite-Faraco procedure.** *Int. J. Lepr.,* 1974, v. 42, No. 1, 52-4.

"Leprosy bacilli in tissue sections were stained for fluorescene microscopy. Thirty cases of leprosy with few bacilli were studied. Bacillary positivity was less with this method (33.3%) than with Fite-Faraco procedure (86.6%)."

19. DRUTZ, D. J., O'NEILL, S. M. & LEVY, L. **Viability of blood-borne *Mycobacterium leprae*.** *J. Infect. Dis.,* 1974, v. 130, No. 3, 288-92.

"Noncultivable acid-fast bacilli that circulate in the bloodstream of patients with untreated lepromatous leprosy are viable as judged by their capacity to multiply in the mouse footpad in a manner typical for *Mycobacterium leprae.* The continuous presence of up to 10^5 viable leprosy bacilli/ml of blood both reflects and helps to explain the extreme widespread nature of

infection in patients with lepromatous leprosy. Rifampin 'kills' *Myco. leprae* (i.e., inhibits multiplication in the mouse footpad) much more rapidly than does dapsone, but leprosy bacteremia persists for at least 12-16 weeks with either form of therapy. Circulating *Myco. leprae* are viable for up to six weeks after initiation of dapsone, but for fewer than four weeks after rifampin. Either dead *Myco. leprae* continue to circulate in treated patients, or the footpad technique is not sufficiently sensitive to detect low concentrations of viable *Myco. leprae.*"

20. KRAHENBUHL, J. L., LEVY, L. & REMINGTON, J. S. **Resistance to *Mycobacterium leprae* in mice infected with *Toxoplasma gondii* and *Besnoitia jellisoni*. *Infection & Immunity,*** 1974, v. 10, No. 5, 1068-71.

"Mice chronically infected with the intracellular protozoan *Toxoplasma gondii* or *Besnoitia jellisoni* were resistant to footpad challenge with *Mycobacterium leprae.* Resistance was manifested by lower numbers of recoverable *Myco. leprae* in the footpads of protozoal-infected mice and was enhanced in *Toxoplasma*-infected mice by a booster injection of *Toxoplasma* antigen in the infected footpad. The results suggest a major role for the activated macrophage in the control of *Myco. leprae* infection."

21. KWAPINSKI, J. B. G. & KWAPINSKI, E. H. **Pathobiological relationships between *Mycobacterium leprae* and its primitive host.** *Bull. Wld Hlth Org.*, 1974, v. 50, No. 5, 473-4.

"Newborn snakes were injected with 10^2-10^4 live or heated *Mycobacterium leprae.* Death occurred in 5-6 weeks. On autopsy, the snakes injected with live microorganisms showed pathological changes and numerous acid-fast bacteria were found in some organs. Material was also transferred from an experimentally infected snake to a group of normal newborn snakes, causing their death in three weeks. Extracts in phosphate-buffered saline, prepared from the tissues of infected snakes, were found to react with anti-*Myco. leprae* and anti-*Myco. lepraemurium* rabbit antisera. No immunodiffusion reactions were elicited by extracts from the organs of control snakes."

22. LAHIRI, S. C., SAHA, K., BASU, A. & MITTAL, M. M. **Serum histaminase in leprosy.** *Int. J. Lepr.*, 1974, v. 42, No. 2, 182-5.

"Serum histaminase was estimated in 29 healthy adults and in 36 leprosy patients including 27 lepromatous leprosy and nine tuberculoid leprosy cases. Of the 27 lepromatous leprosy individuals 14 suffered from *erythema nodosum leprosum.* The serum histaminase levels were significantly raised in leprosy patients as compared with normal controls. But there was no significant difference in the enzyme values between patients having lepromatous leprosy without ENL and those with tuberculoid leprosy. However, the value of serum histaminase was found to be further elevated when the lepromatous leprosy patients developed ENL."

23. MUKHERJEE, A. & GHOSH, S. **Study of lepra reaction.** *Int. J. Lepr.*, 1974, v. 42, No. 2, 143-9.

"The present work, undertaken with a view to elucidating the mechanism of lepra reaction, reports significant increase of plasma levels of fibrinogen and a closely related protein, heparin-precipitable-fraction (HPF), in cases of acute lepra reaction. Fibrinolytic activity has also been found to be impaired in them. This may account for the periodic episodes of fibrin deposition in histopathologic material including dermal blood vessels, which were conspicuous

during acute reaction. These patients also revealed variable deficiency in some of the coagulation factors—possibly as a result of 'consumptive coagulopathy'. The relevance of the findings to episodes of lepra reaction has been discussed."

24. BALAKRISHNAN, S., RAMANUJAM, K. & RAMU, G. **Adreno-cortical function tests in lepra reaction.** *Indian J. Med. Res.*, 1974, v. 62, No. 8, 1166-70.

"Adrenocortical function tests were carried out in 27 cases of lepromatous leprosy in the reactive and subsided phases of lepra reaction. The results show a significant lowering of total 17-ketogenic steroids excretion in urine in the patient group particularly in the reactive phase. The response to ACTH administration (carried out in three cases) also indicates a subnormal response. A relative increase in serum potassium level and a lowering of the serum sodium/potassium ratio in the reactive phase is associated with a marked lowering in the urinary excretion of potassium. A mild lowering in blood sugar levels and a flat type of glucose tolerance test are also seen in some patients with lepra reaction. These findings indicate the possible existence of a certain degree of adrenocortical insufficiency in lepra reaction and to a lesser extent in its subsided phase as well. The possible factors responsible for these findings are discussed."

25. OKADA, S., NAKAI, E., NARITA, M., TAKAHASHI, S. & HARADA, N. **Electron microscope study of** *erythema nodosum leprosum. Int. J. Lepr.*, 1974, v. 42, No. 1, 33-7.

"Electron microscopic study by means of the ferritin-conjugated antibody method revealed that the antigenicity of leprosy bacilli is localized in the cytoplasm of leprosy bacilli. In the lesion of ENL, the foamy structure of the lepra cell is ruptured and opens into intercellular spaces and the cell walls of leprosy bacilli are also ruptured. This suggests that antigenic cytoplasmic substance is released from lepra cells. As antibody to the cytoplasm of leprosy bacilli is present in the serum of ENL case, the outflow of cytoplasmic substance of leprosy bacilli results in antigen-antibody reaction which leads to ENL."

[These are interesting results. As two control groups were studied one assumes that the reported findings were special to the ENL group, although little is said about the controls. The illustrations are small, and the magnification stated is perhaps misleading.]

D. S. Ridley

26. BHATT, P. V. & ANTIA, N. H. **Study of viability of** *Myco. leprae* **from multiple tissue biopsies of ten leprosy patients using the mouse foot pad technique.** *Lepr. India,* 1974, v. 46, No. 2, 73-82.

From two patients with lepromatous leprosy, four with borderline-lepromatous, and four with borderline-tuberculoid leprosy, biopsy specimens were taken of skin, lymph node, dartos, nasal mucosa, nerve, and striated muscle, homogenized and injected into footpads of mice. Six patients had received treatment albeit "irregular" in three and of short duration in two. From the four patients with borderline-tuberculoid leprosy, only the nerves contained *Mycobacterium leprae*. From the other patients the nerves contained the largest number of bacilli per g, and also in these tissues the morphological index was higher than in the other tissues [although no figures of the latter index are given and these might have explained the statements that the growth rate of bacilli from tissues other than nerves was slower].

C. S. Goodwin

27. FILDES, C. **Organized nerve tissue cultures infected with** *Mycobacterium leprae* **and** *Mycobacterium lepraemurium. Int. J. Lepr.*, 1974, v. 42, No. 2, 154-61.

"Organotypic cultures of dorsal root ganglia and of whole cross sections (muscle somite, cord and ganglia) were prepared from rat and mouse fetal tissue. Duplicate cultures were inoculated with *Myco. leprae* and *Myco. lepraemurium* respectively and compared with controls (uninfected cultures) over an incubation period of 50 days. There was no evidence of a cytotoxic reaction to the bacilli. Following fixation and staining, the cultures inoculated with *Myco. leprae* were found to contain large numbers of bacilli at the end of the 50-day incubation period, whereas those inoculated with *Myco. lepraemurium* were comparatively free of bacilli. With the electron microscope, cultures inoculated with *Myco. leprae* can be further distinguished from those inoculated with *Myco. lepraemurium* by the formation of large vacuolated inclusion bodies and by the presence of extremely large myeliniform figures, contained mainly within macrophages and fibroblasts.

"Rat and mouse dorsal root ganglia were equally susceptible to infection with *Myco. leprae.* No infection of cord tissues was observed. It is suggested that this exposure period (of less than two months) may not be long enough to encompass major involvement of Schwann and satellite cells."

28. LEVY, L., MOON, N., MURRAY, L. P., O'NEILL, S. M., GUSTAFSON, L. E. & EVANS, M. J. **Studies of the mouse footpad technic for cultivation of** *Mycobacterium leprae.* **I. Fate of inoculated organisms.** *Int. J. Lepr.*, 1974, v. 42, No. 2, 165-73.

"The possibility of loss from the mouse footpad of a large fraction of an inoculum of *Myco. leprae* was suggested by a preliminary experiment, and a systematic investigation of this problem was undertaken. A series of experiments with various inocula, including freshly harvested *Myco. leprae, Myco. leprae* stored at 4°C, *Myco. marinum,* and suspensions of ^{99m}Tc-sulfur colloid all yielded much the same result: 60% to 90% of the inoculum could not be recovered by a harvest performed soon after footpad inoculation. The recovery of organisms added to footpad tissue harvested from uninoculated mice was nearly complete, excluding the possibility of an inherent deficiency of the harvesting procedure. Recovery of the inoculum was improved somewhat when a more extensive harvest was done, but much of the inoculum remained unaccounted for. Inoculum was lost even when dead mice were inoculated, and when anesthetized mice were inoculated to minimize the possibility of leakage. When radioactive colloidal particles of about the same size as *Myco. leprae* were inoculated, traces were found in the blood, liver, spleen and inguinal lymph nodes, but the quantities of the radioactive material in these organs were smaller than expected if that fraction of the inoculum lost from the footpad were distributed uniformity among all of the tissues of the mouse.

"Loss of a large fraction of inoculated *Myco. leprae* from the mouse footpad occurs regularly, does not represent an artifact, and is not the result of leakage of the inoculum. Loss occurs probably by way of the circulation. The organisms lost from the footpad do not appear to be uniformly distributed in the mouse, suggesting that they may be taken up preferentially from the blood by some organ such as the bone marrow."

29. LEW, J., YANG, Y. T. & PYUN, W. S. **Experimental infection of the Korean chipmunk (*Tamias sibiricus asiaticus,* Gmelin) with** *Myco. leprae. Int. J. Lepr.,* 1974, v. 42, No. 2, 193-202.

"1. *Myco. leprae,* obtained from lepromatous nodules either by conventional grinding or trypsin purification methods, multiplied in both footpads and ears of the Korean chipmunks through the first and the second passage experiments. Growth of *Myco. leprae* in these inoculated tissues became evident after a lag phase of approximately seven months post-inoculation.

"2. Characteristic leprotic changes were observed in footpads of the chipmunks inoculated with trypsin-purified *Myco. leprae* 13 and 16 months previously, and these changes included extensive leproma formation, the presence of massive numbers of acid-fast bacilli in the foam cells and the involvement of dermal nerve fibers by acid-fast bacilli.

"3. Among the chipmunks inoculated with trypsin-purified *Myco.leprae* for the preparation of the chipmunk lepromin antigen, apparent swelling of the inoculated tissues was observed in a considerable number of the chipmunks at ten months after inoculation. Two such swollen footpads contained 2.0×10^{10} acid-fast bacilli each.

"4. The results of skin tests in a series of leprosy patients with the chipmunk lepromin antigen, prepared with acid-fast bacilli harvested from swollen infected footpads, were identical with those of standard lepromin antigen prepared from biopsied lepromatous nodules."

30. WLD HLTH STATIST. REP., 1974, v. 27, No. 12, 750-52. **Leprosy.** [In English and French.]

Monthly and annual figures for the numbers of cases of leprosy reported to WHO in 1973 and 1974 are given for more than 60 countries. Those for 1974, and in some instances for 1973, are incomplete. In Africa the highest figures for 1973 were reported by Chad (1298 cases), Mali (2798), and Senegal (1705). In Central America, Cuba reported 266 cases and Surinam 151. In Asia, the highest 1973 totals were in Sri Lanka (749), Philippines (615), and West Malaysia (318). In Europe, the Netherlands reported 50 cases, Portugal 35, Spain 26, and France 14. Other European countries reported a few cases; there is no report from the U.K. The United States reported 135 cases in 1973.

F. I. C. Apted

31. SEAL, S. C. & GHOSE-HAZRA, A. **Clinico-epidemiological study of leprosy in Calcutta. Follow-up work at the homes of the patients, and suggestions for control measures.** *J. Indian Med. Ass.*, 1973, v. 61, No. 9, 375-82.

Many of the problems of leprosy control in the sprawling, overcrowded city of Calcutta are brought out in this paper. The situation is probably worse now than when the reported figures were collected (that is, before 1972). Each year (from 1961 to 1966), 4093 cases of leprosy (on average) were diagnosed at the leprosy clinic of the School of Tropical Medicine. Of these, 23.7% had lepromatous leprosy; about 60% had, for two or three years, indications that they suspected were due to leprosy, before presenting themselves at the clinic. In this series, adults were no less susceptible to infection than children. Over half the patients had apparently contracted the disease while resident in Calcutta itself.

Very few of the patients (only 8.3%) admitted any history of contact, a finding that suggests that, in an area of such prevalence, opportunities for infective contacts must be of very frequent occurrence.

The authors discuss the epidemiological implications of the enquiry, with particular reference to the unknown or unidentified sources of infection, the age of first infection of the majority of the population (even those in close household or conjugal contact with index cases), and the ubiquitous nature of the endemic in all social groups. Leprosy is becomming an urban disease in India, with changing epidemiological features. While a welcome decrease in social stigma is noticeable, community attitudes to the disease itself and to its victims still play an important—perhaps decisive—role in the success of the leprosy campaign. The authors make several unexceptionable suggestions for the control of leprosy in the urban context of present-day Calcutta.

S. G. Browne

32. KAPOOR, K. K. & GUPTA, S. C. **Serum cholesterol and alkaline phosphatase in different types of leprosy.** *Lepr. India,* 1974, v. 46, No. 3, 152-6.

"Serum cholesterol was found to be significantly decreased in all types of leprosy. No correlation between the decreased levels of serum cholesterol and severity of the disease was observed. Serum alkaline phosphatase was found to be within normal limits in different types of leprosy. The values in patients with tuberculoid type of leprosy were similar to those among normal healthy control subjects. In all other types of leprosy the values were found to be on the higher side of normal range. This slight increase from the mean normal value was statistically significant in sera from patients dimorphous, lepromatous and lepra-reaction."

33. BHUTANI, L. K., BEDI, T. R., MALHOTRA, Y. K., KANDHARI, K. C. & DEO, M. G. **Histoid leprosy in North India.** *Int. J. Lepr.*, 1974, v. 42, No. 2, 174-81.

The authors describe the clinical, bacteriological and histological findings in 20 patients suffering from histoid leprosy at the All India Institute of Medical Sciences, New Delhi. In seven patients histoid lesions were the first signs of leprosy noted; the remaining 13 developed them five months to 14 years after their disease began. Some unusual histological features were observed.

[Cases 8 and 18 are labelled borderline, but the presence of histoid nodules indicates that they have downgraded to lepromatous and are in the sub-polar lepromatous group.]

W. H. Jopling

34. DHARMENDRA. **Infectivity of "open" cases of leprosy under treatment.** *Lepr. India,* 1974, v. 46, No. 3, 188-91.

The author reviews the "highly controversial" subject of the non-viability of non-solidly staining leprosy bacilli and concludes:—

". . . that there is no conclusive evidence to justify any change in our existing criteria of non-infectivity of 'open' cases under treatment. On the other hand, there are cogent reasons against affecting a change in the criteria. In the author's opinion it would be wise to stick to old criteria based on bacteriological negativity (B.I. Zero) of multiple skin smears, and maintained at examinationns repeated over three consecutive months. After that the patient should be examined every six months to ensure that he continues to be negative. The period of this six monthly check up will vary according to the type and past severity of the disease, and on the period for which the patient had remained positive prior to becoming negative."

35. NAVALKAR, R. G., PATEL, P. J., DALVI, R. R. & LEVY, L. **Immune response to *Mycobacterium leprae:* plaque-forming cells in mice.** *Infection & Immunity,* 1974, v. 10, No. 6, 1302-6.

"Intravenous immunization with a cell extract of *Mycobacterium leprae* produced a primary immune response of considerable magnitude, followed by an equally large response after secondary stimulation, as measured by assay of plaque-forming cells (PFC). Infection with *Myco. leprae* or immunization with cell extract by the footpad route produced a lower level of response than that seen in the intravenous group. Identical patterns of response, although not of the same magnitude, were observed after both primary and secondary challenges in the two footpad groups, one infected with viable *Myco. leprae* and the other immunized with *Myco. leprae* cell extract. The secondary response after a booster dose to all these groups appeared to be an enhanced immunoglobulin M response. Control studies confirmed that the immune response was a direct result of the host-parasite interaction and that the PFC observed resulted from stimulation of antibody-forming cells by antigens of *Myco. leprae.* The similarity in time

of appearance of peak PFC levels in the two footpad groups may be attributed to the live challenge passing through a latent phase. Alternatively, the challenge is known to contain a large proportion of nonviable cells, and it may also contain soluble *Myco. leprae* antigens. Studies of the cross-reactivity of the antigens have extended previous observations on antigens shared between *Myco. leprae* and other mycobacterial species. Use of the two antigen-containing fractions of the *Myco. leprae* cell extract has suggested that one of the fractions contains some shared antigens, whereas the other has an antigen specific to *Myco. leprae.*"

36. CLOSS, O. & HAUGEN, O. A. **Experimental murine leprosy. 3. Early local reaction to *Mycobacterium lepraemurium* in C3H and C57/BL mice.** *Acta Path. Microbiol. Scand. Sect. A,* 1975, v. 83, No. 1, 51-8. **4. The gross appearance and microscopic features of the local infiltrate after subcutaneous inoculation of C3H and C57/BL mice with *Mycobacterium lepraemurium.*** *Ibid.,* 59-68.

"*Myco. lepraemurium* was injected subcutaneously into two inbred strains of mice, C3H and C57/BL, in order to study the local reaction at various time intervals. Within six hours an acute inflammatory reaction developed at the site of injection. In the course of the following days it was replaced by a mononuclear infiltrate. The influx of mononuclear cells appeared to be somewhat greater in C57/BL than in C3H mice. Apart from this, little difference was observed between the two strains until at four weeks when a vigorous granulomatous reaction developed in the C57/BL strain. This reaction apparently arrested further local spread of the infection. The histological appearance of the infiltrate indicated that a delayed hypersensitivity reaction was taking place. No sign of such reaction was observed in the C3H strain.

"Mice of the inbred strains C57/BL and C3H were inoculated subcutaneously on the thorax with *Myco. lepraemurium.* In C57/BL mice a firm, raised, sharply defined nodular infiltrate developed four weeks afterwards, while in the C3H strain the infection produced a soft, flattened infiltrate with ill-defined margins, which did not become palpable until 10 weeks after inoculation. A limited spread of the infection occurred early in both strains, but apparently multiplication of the microorganisms was very restricted in C57/BL mice; progressive, disseminated growth of the bacilli was observed in the C3H strain only. In C57/BL mice the granulomatous reactions, developing four weeks after inoculation and leading to abscess formation, ulceration and scar formation, apparently inhibited both local multiplication and further spread of the bacilli. In C3H mice no host reaction was detected and the bacilli appeared to grow unrestrictedly. In some C57/BL animals, decrease in host resistance occurred during the infection, causing reactivation of the local lesion and an apparently rapid proliferation of bacilli. Observations regarding the lesions in superinfected animals indicated that a systemic immune reaction develops in the C57/BL strain about four weeks after inoculation, whereas this does not occur in the C3H strain."