CURRENT LITERATURE

This department carries selected abstracts of articles published in current medical journals dealing with leprosy and other mycobacterial diseases.

General and Historical

Dogliotti, M. Leprostigma in hanseniasis. S. Afr. Med. J. **55** (1979) 102.

Ignorance, fear, and supersitition surround the problems of hanseniasis. In almost all cultures the predominant attitude is marked by emotion, disgust, and rejection towards persons suffering from this disease. All efforts aimed at the control of hanseniasis are doomed to failure unless the significance of stigma and associated social and economic factors are given adequate consideration. A programme of destigmatization is outlined.—Author's Summary

Eckes, L. K. Psoriasis und Lepra im Schicksal gemeinsamer Geschichte. (Psoriasis and leprosy in the light of common history.) Hautarzt **29** (1978) 331–336. (in German)

Over the centuries psoriasis was described as a variety of leprosy. It is only in the last century, however, that it was described as a separate entity. Many early medical descriptions of this worldwide affliction can be found which attempt to distinguish between the various kinds of leprosy. These attempts led to cultural-religious consequences on one hand and to different theories about their contagiousness and curability on the other. Today the current conviction that with the proof for the existence of a lepra bacillus the question of heritability of the disease can finally be discarded is being reconsidered. For both psoriasis and leprosy the search for relationships between these diseases and genetically determined markers in the blood-, serum protein-, and enzyme-group systems has led to applicable results which insofar as they can be interpreted as indications of selective factors, will enable us to understand the geographical distribution of both diseases.—Author's Summary

Godal, T. Leprosy research heading for the field. Trends in Biochemical Sciences **4** (1979) N77–N78.

The background of the development of the Immunology of Leprosy Scientific Working Group (IMMLEP) as a part of the Special Program for Research and Training in Tropical Diseases by the World Health Organization, the United Nations Development Program and the World Bank is reviewed. The author outlines some of the experiences and achievements of IMMLEP and indicates where he feels the emphasis of the program will be in the coming years.—(*Adapted from* article)

Gussow, Z. Notes on the history of leprosy in Louisiana. South Med. J. **72** (1979) 600–604.

In the late 1880s it became apparent in Louisiana that leprosy was endemic in the southern part of the state. Initially, the intention was to establish a leprosy hospital in the city of New Orleans, close to medical facilities, and where the bulk of the patients were to be found. The establishment, instead, of an isolated colony at the run-down plantation at Carville, 85 miles upriver, was the result of community indifference, misunderstanding of the nature of the disease, and expected depreciation of property values. Fear of the disease was a secondary matter. The practice of locating residential facilities for the chronically ill at long distances from the centers of physician practice and medical research continues to this day. Interestingly, the arguments that permit this to happen have not

changed appreciably from those of a century ago.—Author's Summary

Kirchheimer, W. F. Leprosy (Hansen's Disease). *In: CRC Handbook Series in Zoonoses*, Vol. I. James H. Steele, Editor-in-Chief. Boca Raton, Florida: CRC Press, Inc., 1979, 447–463.

The author presents an introductory overview of leprosy, beginning with a review of the highlights of leprosy research: the introduction of sulfones, development of mouse footpad research, identification of the leprosy bacillus, determination of its viability and efficacy of anti-leprosy drugs. He details the history of armadillo research and explains the usefulness of armadillos as a research model because they are monozygous.

After describing the general characteristics of *M. leprae*, the author explains the primary tests for the identification of *M. leprae*. He then goes on to outline the basic clinical characteristics of indeterminate, tuberculoid, lepromatous and borderline leprosy and summarizes certain immunological complications in leprosy such as antibody- and cell-mediated tissue damage as well as discussing the diagnosis and treatment of leprosy. Finally, the author deals with the current knowledge about epidemiological problems such as mode of exit of *M. leprae* from the body, mode of transmission, portal of entry and roles of sex, age and race. He concludes by reviewing basic ideas about the prevalence, distribution and control of the disease.—(Editor's Summary)

Monzon, H. and Rassi, E. Primary Care of Leprosy Patients. Abstract **IA** 3 XI International Leprosy Congress, Mexico City, Mexico. 13–18 November 1978.*

Since public health specialists have been receiving better information in relation to leprosy and leprologists have felt the need of completing their training, through a better knowledge of the disciplines concerned with public health, the theory that leprosy control programs (search for cases, treatment, etc.) should be under the responsibility of the local health services, at the level of the more elementary peripheral units, has become more widely predominant. This is the expression of a new trend of ideas which in one way or another will drag the old vertical campaigns towards integration with the general public health services.

In Venezuela we do not have much experience in what has been called "Primary Care of the Leprosy Patient" since, careful of the success reached by our Public Health Dermatology programs, we have kept the control of leprosy in the hands of highly specialized medical and paramedical personnel, even though they are administratively integrated within the local general public health services.

We understand that where more or less established leprosy control programs exist, "Primary Health Care of Leprosy Patients" should be tried out first in limited experimental areas, under the strict surveillance of specialized medical and paramedical personnel, who would have teaching, advisory, supervision and evaluation functions, representing, at various levels, the highest regional public health authority.

The first obstacle we envision is the adequate training of the peripheral workers, since the adequate care of leprosy patients includes at present very specific actions such as: public health education at the patient's level, specific treatment, detection of reactional cases, prevention and treatment of disabilities through simple methods such as exercises, massages, modification of shoes (manufacture of insoles and metatarsal bars, etc.), manufacture of ferules.

We consider that training in all the above mentioned aspects should last for a period of at least two months and, in the case of Venezuela, it should be done at our Central Public Health Dermatology Department.

The other important aspect, on which we have no information at present, relates to the rate of change of local personnel, since we know that rural doctors and doctors working in urban peripheral centers change with great frequency due to their vast majority being doctors who have just recently obtained their degree, who are completing their mandatory rural medicine period. In any case, among the basic and permanent

* Editor's note: The above abstract was inadvertently omitted from the XI Congress Supplement issue (Vol. 47, No. 2).

activities of our Services, we should include theoretical-practical training of local Medical and Paramedical personnel, according to the rules and regulations of the Central Department, with its advisorship, supervision and evaluation.—Authors' Abstract

Rodríguez, O. Lepra de Lucio. I. Historia y concepto. (Lucio's leprosy. I. History and concepts.) Dermatológia (Mexico) **22** (1978) 117–140. (in Spanish)

The author presents a synthetic and historical view of diffuse lepromatous leprosy (Lucio's leprosy) since the first report in which it is mentioned (Pascua, 1844) as far as the more recent immunological studies. She analyzes the masterly description of Lucio and Alvarado (1852) and the main data which have been accumulating since its identification (Latapí, 1936). Finally she exposes the thoughts of Mexican leprologists on the varieties of this entity: the pure and primary diffuse lepromatous leprosy (Lucio's leprosy in a strict sense) and the secondary diffuse lepromatous leprosy (Lucio's leprosy in a larger sense) and the characteristics that define them.—Author's Summary

Chemotherapy

Ascorbic acid: Immunological effects and hazards. (editorial) Lancet **1** (1979) 308.

This editorial cites evidence that ascorbic acid does not seem to decrease the incidence of colds and winter illness, although it may cause a modest reduction in the severity of symptoms of the common cold. The possible beneficial effects of ascorbate on neutrophil and macrophage function are reviewed as are the theoretically harmful effects of megadose ascorbate.—(*Adapted from* editorial)

Balakrishnan, S. and Sheshadri, P. S. Influence of rifampicin on DDS excretion in urine. Lepr. India **51** (1979) 54–59.

The plasma half-lives and urinary excretion levels of DDS were compared before and during concurrent administration of rifampicin in 23 cases of active lepromatous leprosy. The plasma half-life of DDS was found to be slightly less during rifampicin administration. The urinary excretion of DDS was found to be consistently enhanced in all the cases, particularly during the earlier phase of the therapy. This had no relation to the dose or the total duration of rifampicin therapy. The findings are discussed.—Authors' Summary

Errasti, P., Otero, R. and Purroy, A. Hepatotoxicity and functional acute renal insufficiency due to rifampin. Rev. Clin. Esp. **149** (1978) 295–298. (in Spanish)

A case of hepatic and acute renal toxicity due to continuous treatment with rifampin is presented. The clinical and laboratory findings suggest that a hypersensitivity reaction played the major role in this iatrogenic condition. Rifampin was discontinued, fluid and electrolyte therapy provided, and the patient's hepatic and renal function recovered.—(*Adapted from* article)

Girdhar, B. K., Ramu, G., Sreevatsa and Desikan, K. V. Introductory rifampicin therapy in lepromatous leprosy: A six month follow-up study. Lepr. India **50** (1978) 363–370.

A double-blind comparative trial of 300 mg of rifampicin given daily as against 50 mg D.D.S. administered likewise for an initial period of 3 months has been undertaken on 24 untreated cases of lepromatous leprosy. All the patients have been followed up for 6 months. The results revealed that patients in the former group became noninfective, as concluded from M.I. and mouse foot-pad results, within 3–4 weeks and their nasal ulcers healed faster. Clinical improvement was slightly better in the former group while no bacteriological differences were noticed in the two groups. E.N.L. was milder and slightly less common in the rifampicin group.—Authors' Summary

Girdhar, B. K., Sreevatsa and Desikan, K. V. Primary sulphone resistance. A pre-

liminary report. Lepr. India **50** (1978) 352–355.

A case of lepromatous leprosy proven to be a primary sulphone resistant one, has been reported. Bacilli from the case were found to be resistant as checked by their continued growth in the foot pads of mice receiving a diet containing 0.001% D.D.S. A study to identify such cases is being systematically pursued.—Authors' Summary

Gyi, K. M., Lwin, M. M., Myaing, Y. Y., Oo, K. M. and Shwe, T. Reliability of dapsone self-administration by leprosy patients in the Rangoon area. Lepr. Rev. **49** (1978) 283–286.

The application of urine tests to assess the reliability of dapsone self-administration by leprosy patients in the Rangoon area is described. Dapsone/creatinine ratios were determined on urine samples collected from the patients and the results compared with those from supervised controls. The results obtained demonstrated that the taking of dapsone by patients attending the out-patient dispensaries of the Rangoon General Hospital Skin Department and both the out-patients and in-patients served by the Htauk Kyant Hospital was good. However, patients from Hlegu, Hwawbi, Htauk Kyant, and Taik Kyi villages appeared to take dapsone rather irregularly. Possible reasons for their poor compliance are discussed, and suggestions are made as to how they might be encouraged to take their dapsone more regularly.—Authors' Summary

Kato, L., Mankiewicz, E. and de Thököly, I. An approach for the *in vitro* screening of drugs for activity against leprosy. Experientia **34** (1978) 1322–1323.

Slow growing strains of mycobacteria isolated from leprous tissues present a characteristic resistance pattern to antibacterial agents that is comparable to drug sensitivity of *M. leprae* in man. The authors propose the use of these strains of *M. scrofulaceum* as an inexpensive, rapid means of screening large numbers of compounds for potential anti-leprosy activity. Compounds selected with the proposed *in vitro* techniques might then be subject to testing in the *in vivo* footpad model. Ultimately the only reliable test subject for screening drugs for activity against leprosy is the human lepromatous leprosy patient.—(*Adapted from* article)

León, A. P. and Silva, J. H. Ensayo piloto de tratamiento a corto plazo de la lepra por quimioterapia e immunoterapia asociadas. (Pilot trial of a short-term treatment of leprosy by combined chemotherapy and immunotherapy.) Rev. Invest. Salud Publica **37** (1977) 69–81. (in Spanish)

Four cases of lepromatous leprosy (LL) and two cases of borderline lepromatous (BL) were treated for one year or more in a pilot trial with rifampin (600 mg daily by mouth) plus the antigen POG (a polysaccharide of *M. tuberculosis* combined to specific IgG, 0.1 to 0.5 ml, weekly, fortnightly, or monthly, subcutaneously). This treatment is termed a method of chemotherapy and immunotherapy associated (CIA). Evaluation of the results consisted of bacteriological criteria, determining changes in the bacteriological index (BI), and the morphological index (MI), and secondly with clinical criteria determining the rapidity and degree of improvement in general and in the cutaneous lesions. The BI in nasal scrapings dropped from an average of 3.1 to zero within three months. The BI from skin scrapings fell from an average of 4.1 to 0.8 within one year and reached zero afterwards. The MI of bacilli in the skin fell from an average of 66.6 to 0.8 in three months and to zero in six months. Clinical improvement was rapid and sustained. The degree of improvement was very good in four cases at the end of one year of treatment, good in one case, and moderate in one case. Two of the patients experienced ENL reactions with fever and pains in joints and muscles. In most cases the reactions were mild to moderately severe. Treatment with CIA was continued during these reactions with no evidence that continuation of the treatment aggravated the reactions. The authors feel that CIA is an effective anti-leprosy treatment for this limited period of observation. They feel it is probably more effective than any chemotherapy presently in use and deserves fur-

ther investigation.—(*Adapted from* authors' abstract)

Levy, L. Activity of derivatives and analogs of dapsone against *Mycobacterium leprae*. Antimicrob. Agents Chemother. **14** (1978) 791–793.

Of 25 dapsone derivatives and analogs screened for activity against *Mycobacterium leprae* in the mouse footpad system, only 7 were active. All seven were metabolized to or contaminated with dapsone.—Author's Summary

Levy, L. and Anandan, J. A. Further studies of the action of antithyroid drugs on *Mycobacterium leprae*. Proc. Soc. Exp. Biol. Med. **158** (1978) 582–585.

Methimazole, an antithyroid drug, and thiambutosine, an antimicrobial active against *M. leprae* in the mouse, were both found to inhibit multiplication of *M. leprae* in the mouse foot pad when administered in concentrations too small to inhibit thyroid function of the mice. Moreover, methimazole inhibited multiplication *in vitro* of a number of cultivable *Mycobacteria*. Although the antimicrobial and the antithyroid effects may be exerted through a common mechanism, it appears that methimazole nevertheless possesses direct antimicrobial properties.—Authors' Summary

McDougall, A. C. Dapsone. Clin. Exp. Dermatol. **4** (1979) 139–142.

The author briefly reviews the use of dapsone in leprosy, and discusses the mechanism of its antibacterial action in leprosy as inhibiting the incorporation of para-aminobenzoic acid into dihydrofolate. The efficacy of dapsone as an anti-inflammatory-immunosuppressive agent is reviewed. Dapsone is reported to be effective in some 17 inflammatory conditions. The possible mechanisms of dapsone's anti-inflammatory action are discussed, particularly its possible effect on the membranes and contents of lysosomes.—(*Adapted from* article)

Matsuo, Y., Utsunomiya, S., Kajihara, N. and Sung-Kwang, K. Combinations of rifampicin and isoprodian in the treatment of *Mycobacterium leprae* infections in mice. Jap. J. Lepr. **47** (1978) 43–47.

Combinations of rifampicin and isoprodian were tested against *Mycobacterium leprae* in mice. Drugs were given by gavage one daily, 6 times per week, starting from the day of infection to day 21 after infection in the first experiment, and from day 51 to day 80 after infection in the second experiment. Although a few combinations had some increases of the growth delay over single doses, it is not likely that appreciably additive effect of both drugs has been noticed in the treatment of *M. leprae* infections in mice.—Authors' Summary

Pattyn, S. R. and Saerens, E. Evaluation of the activity of streptomycin on *Mycobacterium leprae* in mice. Lepr. Rev. **49** (1978) 275–281.

The effect of streptomycin on *Mycobacterium leprae* was studied in the conventional mouse model. The drug has a relatively high bactericidal activity that places it between dapsone and ethionamide or prothionamide. Its effect is more pronounced when administered immediately after the experimental infection than when treatment is started at a later time. This is probably the result of the higher activity of streptomycin on leprosy bacilli located outside cells. It is concluded that streptomycin could be a valuable companion drug during the initial treatment of dapsone resistant leprosy in countries with limited resources. Streptomycin as monotherapy is not suited for the short course treatment of paucibacillary leprosy.—Authors' Summary

Clinical Sciences

Bhagoliwal, A., Chandra, J. and Mishra, R. S. Some observations on default among leprosy patients. Lepr. India **51** (1979) 96–102.

The problem of default or irregularity in taking medicine is a great hindrance to the eradication of the disease. An attempt has been made here to judge this problem from

various angles and to pinpoint the factors leading to default. A cohort of 253 patients have been comprehensively interviewed and the results have been analyzed statistically.—Authors' Summary

Boopalraj, J. M. and Muthusami, T. C. Squamous cell carcinoma arising from trophic ulcers. Lepr. India **51** (1979) 74–77.

This study presents two cases of squamous cell carcinomas arising from trophic ulcers of leprosy patients attending the Government General Hospital in Madras. The authors analyze these cases in the light of earlier reports and conclude that: 1) squamous cell cancers arising from trophic ulcers in leprosy are not as uncommon as has been previously thought. 2) It is probable that trophic ulcers by themselves are not likely to become cancerous unless there are certain other associated or complicating factors which make them more vulnerable to it such as underlying osteomyelitis or a calcaneal spur. 3) Among trophic ulcers, heel ulcers appear more prone to malignant transformation.—(*Adapted from* article)

Chiron, J. P., Denis, F., Maupas, Ph. and Languillon, J. Infection par le virus de l'hépatite B chez les hanséniens. I. Detection de l'antigène et de l'anticorps de surface du virus de l'hépatite B par radio-immunologie. (Infection with hepatitis B virus in persons with leprosy. I. Detection of the surface antigen and the antibody of hepatitis B by radio-immunology.) Bull. Soc. Afr. Noire Lang. Fr. **23** (1978) 174–182. (in French)

The frequency of surface antigen of hepatitis B virus (HBs Ag) and the corresponding antibody (anti-HBs) has been researched in 553 patients with leprosy and 100 Sengalese blood donors. This study has been carried out by radio-immunoassay.

HBs Ag has been found in the serum of 25.5% of the leprosy patients as against 12% of the controls whereas the presence of antibodies (anti-HBs) has been shown to be 44.1% and 38% respectively. HBs Ag and/or anti-HBs markers have been revealed in 67.1% of the leprosy patients' sera.

The lepromatous forms more frequently possess HBs Ag and/or anti-HBs (74.6%) than the tuberculoid forms (62.9%).

No significant statistical differences with regard to sex, ethnic groups, or mode of life have been discovered.—(*Adapted from* authors' summary)

Dash, R. J., Samuel, E., Kaur, S., Datta, B. N. and Rastogi, G. K. Evaluation of male gonadal function in leprosy. Horm. Metab. Res. **10** (1978) 362.

Impotency, sterility, loss of libido, loss of sexual hair and gynecomastia are well documented in patients suffering from leprosy. They occur with greater frequency in lepromatous as compared to dimorphous and tuberculoid types.

Fifteen age matched controls, 22 lepromatous and 8 tuberculoid patients with leprosy were studied. The clinical features with special reference to testicular functions were recorded.

Significant alterations in serum LH, FSH, testosterone (T), estradiol-17B (E) and T/E ratio were noted in leprosy. Elevation of FSH was more than that of LH. The pattern of changes in serum levels of LH and FSH was similar to that in idiopathic oligo-azoospermia. Lower serum T and elevated E with consequent reduction in T/E ratio in the majority of cases could account for the loss of libido and the loss of sexual hair and gynecomastia.—(*Adapted from* article)

Datar, S. V., Pansare, M. S. and Katti, V. A. Leprosy and ABO blood groups. Lepr. India **50** (1978) 388–391.

Two-hundred fifty patients of lepromatous and non-lepromatous leprosy were studied. The statistical analysis showed that there is no relationship between the blood groups and lepromatous or non-lepromatous leprosy. The results are discussed in comparison with the work of other authors.—Authors' Summary

David-Chaussé, J., Texier, L., Dehais, J., Bullier, R. and Louis-Joseph, L. Manifestations articulaires au cours de deux cas de lèpre. (Articular manifestations in two cases of leprosy.) Revue du Rhumatisme **45** (1978) 361–365. (in French)

Two case reports are made of patients with arthrosynovitis occurring unexpectedly in the course of reactions in leprosy. One deals with a patient with tuberculoid leprosy in whom a monoarthritis of the knee followed an intradermal lepromin skin test. The other patient had lepromatous leprosy, and developed a polyarthritis as a part of erythema nodosum leprosum after several months of sulfone therapy. The authors review the literature concerning articular signs occurring in reactions in leprosy and discuss therapy.—(*Adapted from* article)

Eknoyan, G. and Dillman, R. O. Renal complications of infectious diseases. Med. Clin. North Am. **52** (1978) 979–1003.

The authors include, as a part of this general review, a discussion of the renal complications of leprosy. The clinical manifestations of renal disease in leprosy are outlined. Kidney biopsy studies are reviewed, which have shown a spectrum of renal disease including proliferative glomerulonephritis, interstitial nephritis, and amyloidosis. The authors conclude that the proliferative glomerulonephritis seen in leprosy is likely the result of immune-complex disease. The relation of leprosy to amyloid disease of the kidney is less clear, but is felt almost certainly to be related to the chronicity of infection and perhaps to other factors such as diet and environment. The interstitial nephritis seen in some cases is more often associated with advanced stages of disease of very long standing and may have multiple etiologies including analgesic nephropathy, chronic genitourinary infections, or prolonged chemotherapy.—(*Adapted from* article)

Fraguela Rangel, J. V., Baquero, G. F., Beoto, T. K. and Angulo, M. H. Alopecia de cuero cabelludo en lepra. (Scalp alopecia in leprosy.) Rev. Cub. Med. Trop. **29** (1977) 29–31. (in Spanish)

A clinical-pathological study of 270 patients admitted to the "El Rincón" Leprosarium is made. The incidence of scalp alopecia, its localization on the skull, and its association with the polar form of lepromatous leprosy are stressed.—Authors' Summary

Garcia, C. A., Hackett, E. R. and Kirkpatrick, L. L. Multiple mononeuropathy in lymphomatoid granulomatosis: Similarity to leprosy. Neurology **28** (1978) 731–733.

Multiple mononeuropathy and anesthetic granulomatous skin lesions were the first manifestations of lymphomatoid granulomatosis in a young woman. The skin lesions resembled those of leprosy. Lymphomatoid granulomatosis is related to midline granulomas and other idiopathic granulomatous angitic lesions.—Authors' Abstract

Kapur, T. R. Study of non-lepromatous leprosy among Indian armed forces personnel. Lepr. India **51** (1979) 81–86.

A clinico-histopathological study of 50 cases of non-lepromatous leprosy among Indian Armed Forces personnel is presented. Maximum cases were of tuberculoid (TT) type. Thirty four individuals were having single lesions. Posterior aspect of elbow and medial aspect of forearm were the favourite sites. Both the Indian and Ridley and Jopling classification was studied while classifying the lesions. The individuals belonged to almost all the states of India. All of them denied the history of contact with a known case of leprosy. The highest prevalent age group was between 20 to 30 years. Two cases of tuberculoid and 3 of maculo-anaesthetic leprosy were without involvement of nerves.—Author's Summary

Kapur, T. R. and Rao, S. M. B. Post-traumatic tuberculoid leprosy. Lepr. India **51** (1979) 112–114.

Inoculation of tuberculoid leprosy has been described by various leprologists off and on and this mode of onset has been established. A case of tuberculoid leprosy over the thumb, appearing after trauma in an army recruit, is described with a review of the literature.—Authors' Summary

Karat, A. B. A. Complications of leprosy. Lepr. India **50** (1978) 405–413.

Leprosy is essentially a systemic disease and is a great "mimicker" of many other diseases. It affects apart from skin and peripheral nerves, haemopoietic, reticulo-en-

dothelial and endrocine systems as well as eyes, bones and muscles.—Author's Summary

Lynch, P. Greater auricular nerve in diagnosis of leprosy. Br. Med. J. **2** (1978) 1340.

Three hundred and thirty-seven 17-year-old Nepali recruits were examined to find the frequency with which one or both of their greater auricular nerves were either visible or palpable. The greater auricular nerve was visible or palpable on one or both sides in 212 (63%) subjects and ranged in diameter from 2 to 4 mm. The population studied were young, fit, and slim and had well developed neck muscles, perhaps as a result of carrying heavy loads on wicker baskets supported by a headband. Since there has no new case of leprosy among these soldiers since 1970, the author concludes that the greater auricular nerve is often detectable in normal individuals from an endemic area and that its usefulness in the diagnosis of leprosy is thereby diminished.—(*Adapted from* article)

McDougall, A. C., Harman, D. J., Waudby, H. and Hargrave, J. C. Peripheral nerve biopsies in the diagnosis of leprosy in Aboriginal patients from the Northern Territory of Australia. J. Neurol. Neurosurg. Psychiatry **41** (1978) 874–881.

In the 12 years from 1964 to 1976, 171 peripheral nerve biopsies were taken from 81 Aboriginal patients in the Northern Territory of Australia, in whom a diagnosis of leprosy was either known or strongly suspected. Sixty-eight biopsy samples were from 19 patients known to have leprosy, and who were under assessment for nerve grafting, results of which have already been published. We describe here the histopathological findings in the remaining 62 patients, in whom a diagnosis of leprosy was suspected on clinical grounds, backed in many cases by abnormalities of nerve conduction. Forty-one patients (66%) had abnormal histopathological findings in the nerve biopsy sample, 19 (31%) showing definite evidence of leprosy. Several patients with enlarged peripheral nerves, in whom the biopsy findings did not confirm leprosy, remain under observation; their future investigation will include lymphocyte transformation tests and testing with refined lepromin, together with repeat nerve biopsy, where ethical and feasible. The clinical and epidemiological data suggest that a previous, and perhaps self-healing, form of leprosy may account for the neurological findings.—Authors' Summary

Marks, Jr., S. C. and Subramaniam, K. The cellular basis for alveolar bone loss in leprosy. Lepr. Rev. **49** (1978) 297–303.

Maxillary alveolar bone biopsies from 7 patients with lepromatous, borderline, or tuberculoid leprosy and 6 patients without leprosy were examined microscopically to identify cellular sources of bone loss. Osteoclasts and osteolytic osteocytes were found in greatest numbers in 3 patients with lepromatous leprosy who also had the greatest loss of alveolar bone. These cells were scarce or absent in bone biopsies from the patients with borderline or tuberculoid leprosy and from the patients without leprosy. These data are interpreted to mean that osteoclasts and osteolytic osteocytes represent the cellular basis for alveolar bone loss in leprosy.—Authors' Summary

Nigam, P., Dubey, A. L., Dayal, S. G., Goyal, B. M., Saxena, H. N. and Samuel, K. C. The association of leprosy and pulmonary tuberculosis. Lepr. India **51** (1979) 65–73.

The association of leprosy with pulmonary tuberculosis was seen in 20 cases during January 1972 to October 1977. Of these 20 cases, 15 were of lepromatous, 3 of dimorphous and 2 of tuberculoid leprosy. The maximum number of cases was from the 3rd decade of life with male to female ratio of 3:1. Patients were suffering from the disease for a very long time (8 cases of lepromatous leprosy with duration of illness 10–15 years). The symptoms of leprosy seemed to have preceded the symptoms of pulmonary tuberculosis. Duration of tuberculosis in most of them was within 6 months (55%). The predominant presenting symptom was cough with expectoration (100%) and fever (80%). Anaemia (75%) and crepitations (60%) were the presenting physical sign mainly. Radiologically bilateral extensive pulmonary lesions were seen

in 14 cases (70%). Sputum for acid-fast bacilli was positive in 80% of cases. The general condition and nutritional status was poor and death resulted in 4 cases (3 of lepromatous and 1 of dimorphous leprosy).—Authors' Summary

Nuttall, F. Q. Gynecomastia as a physical finding in normal men. J. Clin. Endocrinol. Metab. **48** (1979) 338–340.

The prevalence of palpable gynecomastia was determined in 306 normal adult men ranging in age from 17–58 yr. Palpable breast tissue was present in 36% and was bilateral in all but 7 subjects. In the great majority of cases, the gynecomastia was 4 cm or less in diameter. A diameter greater than 5 cm was distinctly unusual. With advancing age there was a progressive increase in the prevalence of gynecomastia. This increase was most striking in those over the age of 44 and in the 20- to 24-yr-old group compared to those 19 yr old or less. In those over the age of 44, the prevalence was 57%. These data indicate that palpable gynecomastia is common in normal adult men. This high prevalence must be taken into consideration when attributing gynecomastia to a drug or disease state.—Author's Summary. (It is conceivable that gynecomastia attributable to leprosy may be overestimated.—RCH)

Ortiz, Y. and Giner, M. Lepra de Lucio. II. Aspectos clínicos, de laboratorio y gabinete. (Lucio's leprosy. II. Laboratory and theoretical clinical aspects.) Dermatológia (Mexico) **22** (1978) 141–163. (in Spanish)

Twenty five patients with diffuse lepromatous leprosy were studied. Thirteen of them from the group I (pure and primary form), eight with Lucio's phenomenon, and twelve from the group II (secondary form), five with erythema nodosum, two with erythema nodosum and necrotisans, and one with erythema multiforme. Age was between 11 and 54 years, the middle was thirty three.

This study confirmed the well known symptomatology of diffuse cases: diffuse skin infiltration all over the body, anhydrotic and even ichthyosiform skin, loss of eyebrows, eyelashes and body hair, frequent epistaxis and final perforation of nasal septum and other symptoms described in former publications. From laboratory studies: very high sedimentation rate, reacting C protein in more than half of cases, hypochromic anaemia in one third, $VDRL^+$ in 30% (group I) and 16% (group II), hyperglobulinemia. No other abnormal findings.—Authors' Summary

Price, J., Davis, M. and Ramu, G. Comparison of the reaction to Dharmendra antigen in the normal skin and in the lesion of leprosy patients. Lepr. India **51** (1979) 87–95.

In this study 0.1 ml of Dharmendra antigen was injected intradermally into the normal skin and lesions of 35 leprosy patients. The response was measured at 24 hours, 48 hours and 21 days.

It was found that the maximum response to Dharmendra antigen occurred at the end of 24 hours and started waning by 48 hours. In tuberculoid leprosy, there was significantly greater response in the lesion as compared with the nearby normal skin. It has been suggested that this could reflect an increased immunological activity at the site of the lesion.

In the borderline tuberculoid cases with annular lesions, Dharmendra antigen was injected into the peripheral infiltrated area and into the apparently normal centre of the lesion, and a greater response was found at the centre. This might be the site of a previous lesion. The late reaction at the end of 21 days did not show much significant difference.—Authors' Summary

Sengupta, U., Sinha, S. and Ramu, G. Immunological assessment of sera of leprosy patients. Lepr. India **51** (1979) 43–48.

IgG levels were significantly high in sera of all types of leprosy. Household contacts of lepromatous leprosy (LL) cases also showed significantly higher values for IgG when compared to that of controls. Except polar tuberculoid (TT) cases and household contacts other types of leprosy revealed a significant rise in IgA levels in their sera. IgM was only raised in borderline tuberculoid (BT) cases.

C-reactive protein (CRP) was present in

the sera of all types of leprosy. Highest positivity (97%) was shown by sera from erythema nodosum leprosum (ENL) cases. Rose-Waaler antibody (RA) was noted in BT, borderline leprosy (BL), LL and ENL cases. The significance of these findings is discussed.—Authors' Summary

Sreevatsa, Sengupta, U., Ramu, G. and Desikan, K. V. Evaluation of bacteraemia in leprosy patients. Lepr. India **50** (1978) 381–387.

Thirty-five patients of leprosy have been screened for bacteraemia by haemolysis (HL), leucocyte adherence (LA) and buffy coat (BC) methods and the results have been compared. The HL method has yielded not only higher number of acid-fast bacilli (AFB) but also has detected more frequently AFB in blood of leprosy patients as compared to other methods. Further, it has been established that the skin over the cubital fossa does not play any significant role in contaminating blood samples while sampling blood by venipuncture.—Authors' Summary

Subramaniam, K. and Marks, Jr., S. C. Alveolar bone loss in leprosy—A clinical and radiological study. Lepr. Rev. **49** (1978) 287–296.

Alveolar bone loss in 47 patients with lepromatous, borderline, or tuberculoid leprosy was studied clinically and radiographically. Alveolar bone loss was greater in the maxillary anterior region than in other areas. Alveolar bone loss around maxillary central incisors, measured on periapical radiographs, was significantly greater in patients with lepromatous leprosy. No changes in alveolar bone loss could be detected over 6 months. These results were compared with measurements of alveolar bone loss from 56 patients without leprosy who sought dental treatment. These data are interpreted to mean that bone loss between maxillary anteriors is a characteristic manifestation of leprosy, particularly of the lepromatous type.—Authors' Summary

Weshler, Z., Leviatan, A., Gordon, R. and Kopolovic, J. Development of Hodgkin's disease in a patient with leprosy. Oncology **35** (1978) 281–284.

We present a patient with leprosy who developed Hodgkin's disease of the nodular sclerosing type. There are two previous reports describing the combination of leprosy and Hodgkin's disease in a single patient.

Hodgkin's disease was diagnosed 14 months after the complete disappearance of *Mycobacterium leprae* from the skin lesions, under treatment with DDS (diaminodiphenyl-sulfone). Hodgkin's disease was treated with irradiation and chemotherapy. Obstructive jaundice developed which resolved under treatment by irradiation of the hilar area of the liver, chemotherapy, and hormones. During two years of immunosuppressive therapy, without DDS, no exacerbation of the leprosy occurred.—Authors' Summary

Immuno-Pathology

Alexander, J. and Smith, C. C. Growth of *Mycobacterium lepraemurium* in non-stimulated and stimulated mouse peritoneal-derived and bone marrow-derived macrophages *in vitro*. Infect. Immun. **22** (1978) 631–636.

Mycobacterium lepraemurium cells were found to multiply in normal mouse peritoneal-derived and bone marrow-derived macrophages *in vitro*. Whereas activated peritoneal-derived macrophages demonstrated marked bacteriostasis for *M. lepraemurium*, significant bactericidal activity was exhibited by activated bone marrow-derived macrophages. However, only a small proportion of the bacteria were killed by activated bone marrow-derived macrophages with subsequent and enhanced bacterial growth. It is suggested that a rapid turnover of monocytes in active lesions is required to control mycobacterial infections *in vivo*. These results would suggest that careful consideration be given to the choice of the host cell in studies involving

obligate intracellular parasites.—Authors' Summary

Anthony, J., Vaidya, M. C. and Dasgupta, A. Immunological methods employed in an attempt to induce erythema nodosum leprosum (ENL) in mice. Lepr. India **50** (1978) 356–362.

In the mouse foot pad model five different parameters were employed to stimulate the condition of ENL as observed in the human. The experimental groups with five to six months leprosy infection were injected intravenously with various antimycobacterial antibodies, *M. leprae* sonicate and B cells obtained from syngenic donors. The control group of animals, infected similarly, were treated either with *M. leprae* sonicate or gamma globulins precipitated from normal human serum. All recipients were killed at one day interval excepting those with B cell transfer, which were sacrificed at seven days. The sites of predilection for immune complex deposition viz. foot pad and kidney as well as the spleen were examined by light and fluorescence microscopy. These findings are described and discussed.—Authors' Summary

Bedi, T. R., Kumar, B. and Kaur, S. Histopathologic study of clinically normal appearing skin in lepromatous leprosy. Lepr. India **51** (1979) 78–80.

Skin biopsies from clinically normal skin of the scalp, axillary and groin regions in 20 lepromatous leprosy patients revealed significant histopathological findings in up to 25 percent of the patients. The positive findings could, perhaps, be enhanced by studying larger skin materials from these body areas. Indeed, no skin area appears to be immune from invasion by *M. leprae*.—Authors' Summary

Bhide, M. B., Pradhan, K. S. and Bapat, C. V. A vaccine from ICRC bacilli against *M. leprae* infection in mouse foot-pad. Lepr. India **50** (1978) 334–344.

A vaccine was prepared from ICRC bacilli strain C-44 by γ-irradiation and injected subcutaneously in two batches of CBA mice. Equal numbers of vaccinated and untreated mice were challenged with fresh *M. leprae* infection in foot-pads (7.5×10^3). The first group was challenged at 2 weeks and others at 1, 2 and 3 months after vaccination. The foot-pad harvests were made at monthly intervals from the 6th month, to estimate the group of *M. leprae* in a pair of vaccinated and untreated mice.

In normal untreated mice, the *M. leprae* exhibited normal growth pattern with final yield 2×10^6 (max.). In vaccinated mice challenged after 2wk and 1mo, the yields of AFB were higher (2.5×) than in normal mice at 6 to 8 months. The number then dropped sharply, and remained low, with a small rise later. In the groups, 2mo and 3mo, the growth of *M. leprae* remained suppressed without initial enhancement. The results expressed as the ratio of yields, Vac/Cont. show that there is early enhancement phase (2.5) followed by sharp drop (0.6) and suppression (0.2) of growth of *M. leprae* in vaccinated mice in comparison with that in the untreated mice. The results demonstrate that irradiated ICRC bacilli used as vaccine, can induce protective mechanisms against *M. leprae* infection in mouse foot-pad. It appears that CMI develops at about 6 weeks after vaccination. The pattern of growth—enhancement, drop and arise—in the vaccinated mice suggests specificity of action, i.e. antigen-induced CMI. The data also establish the feasibility of the mouse model for the study of anti-leprosy vaccines.—Authors' Summary

Birdi, T. J., Salgame, P. R. and Antia, N. H. The role of macrophages in leprosy as studied by protein synthesis of macrophages from resistant and susceptible hosts—A mouse and human study. Lepr. India **51** (1979) 23–42.

^{3}H-leucine uptake by macrophages from Swiss white and C57BL mice before and after *M. leprae* infection was studied. A depression in ^{3}H-leucine uptake after infection was observed only in Swiss white mice. ^{3}H-leucine uptake was also studied in blood derived macrophages from normals, and LL and TT patients. A depression was obtained in ^{3}H-leucine uptake after *M. leprae* infection in macrophages from LL patients.—Authors' Summary

Bjune, G., Duncan, E., Barnetson, R. St. C. and Melsom, R. *In vitro* modulation of lymphocyte responses to photohaemagglutinin by plasma in mother and baby at the time of birth. Increased lymphocyte responses in babies of mothers with lepromatous leprosy. Clin. Exp. Immunol. **32** (1978) 517–522.

Peripheral blood lymphocytes from nineteen healthy mothers, sixteen mothers with borderline tuberculoid leprosy and fourteen mothers with borderline or polar lepromatous leprosy, and their newborn babies, were stimulated *in vitro* with phytohaemagglutinin (PHA). The responses in medium supplemented by serum from a pool of healthy non-pregnant individuals were compared with responses in medium supplemented by plasma from the mothers or from their babies, to assay for the presence of non-specific effects on T-cell responses. It was found that plasma from the mothers at the time of labor profoundly suppressed their own lymphocyte responses to PHA. However, the lymphocyte responses of healthy mothers were not significantly suppressed when cultivated in the presence of plasma from the babies, indicating that the suppressive factor(s) of normal pregnancy did not pass the placental barrier. Plasma from mothers with leprosy had a greater inhibitory effect on their babies' lymphocytes than plasma from healthy mothers. This raises the possibility that plasma from leprosy patients contains suppressive factors other than those associated with pregnancy. Babies of lepromatous leprosy mothers, who might have been exposed to mycobacterial antigens *in utero*, had higher PHA responses than the other babies, possibly due to a compensatory reaction to early stresses in the immune system.--Authors' Summary

Byun, S. Y. and Chung, T. H. Effect of tubercin-3 on serum electrophoretic patterns in lepromatous leprosy. Kyungpook Univ. Med. J. **19** (1978) 57–64. (in Korean)

This study was planned to determine the effect of tubercin-3, tuberculoprotein complex, on the serum protein electrophoretic pattern in a lepromatous leprosy patient. Before and after the tubercin-3 treatment for six months, the quantitation of the serum total protein immunoglobulin (IgG, IgA, IgM), serum protein electrophoresis, and chemical analysis of serum glycoprotein were carried out with the following results.

The serum total protein of the lepromatous patient was 6.9 mg %, by electrophoretic fractionation; albumin 49.1%, globulin 50.9%, and A/G ratio 0.99. A/G ratio was lower than normal. The values noted were not changed during tubercin-3 treatment. Through immunoelectrophoretic analysis, no specific fraction appeared in lepromatous serum.

By immunodiffusion analysis, the values of each class of immunoglobulins were respectively as follows: IgG 1340.4 mg %; IgA 236.3 mg %; IgM 166.7 mg %. The higher values of immunoglobulins were continued after tubercin-3 treatment for 6 months.

Electrophoretic fractions of lepromatous serum glycoprotein revealed the following: alpha-1 fraction, 13.53%; alpha-2, 33.52%; beta-, 40.42%; the gamma fraction showed higher in lepromatous serum while the alpha-2 fraction was higher in the control.

The protein moiety of glycoprotein was 203.8 mg %, and the sugar moiety was 21.5 mg %; these values were higher than the control. During tubercin-3 administration, the values were gradually decreased and reached 143.7 mg % in protein moiety and 12.0 mg % in sugar moiety after 6 months treatment.—(*From* Korean Medical Abstracts)

Chacko, C. J. G., Bhanu, T., Victor, V., Alexander, R., Taylor, P. M. and Job, C. K. The significance of changes in the nasal mucosa in indeterminate, tuberculoid, and borderline leprosy. Lepr. India **51** (1979) 8–22.

A study of nasal biopsies from 137 leprosy patients classified on the basis of clincal, microbiological and skin biopsy as indeterminate, tuberculoid, borderline-tuberculoid and borderline-lepromatous was undertaken. Changes suggestive of leprosy viz., nerve and smooth muscle inflammation with a few acid-fast bacilli in a proportion of the biopsies were seen in all groups

of patients examined. This suggests, that even in indeterminate and tuberculoid leprosy the disease becomes generalized by the time clinical manifestations appear in skin. Tuberculoid granuloma was seen in two nasal biopsies from borderline-tuberculoid leprosy patients, one of which was located in the wall of a vein, suggesting the possibility of intravascular dissemination of the disease even in non-lepromatous leprosy. Thirty-three of the patients were children 15 years and below and they also showed changes such as nerve and smooth muscle inflammation but bacilli were seen only in the borderline group. These findings suggest involvement of the nasal mucosa early in the course of the disease as 70% of the children had the skin lesion for less than one year. The nasal mucosa offers favourable conditions for the growth of the organisms and is readily accessible to infection by droplets, and therefore, it could be one of the primary sites of involvement in leprosy.—Authors' Summary

Chandi, S. M. and Job, C. K. The early cellular response to *M. leprae*. Lepr. India **50** (1978) 345–351.

The ultrastructural changes that develop in mouse peritoneal macrophages from 10 minutes up to 14 weeks after exposure to *Mycobacterium leprae* are presented. Phagocytosis occurred by a process of engulfment by cytoplasmic processes and incorporation into a phagosome, into which lysosomal enzymes were subsequently introduced. Electron transparent zones (E.T. Z.) were not observed around phagocytosed bacilli in this study, however discrete droplets of lipid-like material appeared in the cytoplasm of macrophages, between 2 and 4 weeks after ingestion of the microorganisms. Phagosomes with double limiting membranes were observed in macrophages harvested as early as 40 minutes after exposure to *M. leprae*, contrary to the observations of Evans and Levy (1972).—Authors' Summary

Estrada-Parra, S., Rojas-Espinosa, O., Quesada-Pascual, F., Ortiz, Y., Castro, M. E., Padierna, J. and Jiménez, L. Lepra de Lucio. IV. Perfil inmunológico. (Lucio's leprosy. IV. Immunological profile.) Dermatológia (Mexico) **22** (1978) 175–181. (in Spanish)

A group of patients suffering from diffuse lepromatous leprosy complicated with Lucio's phenomenon was studied. They showed severe impairments in several of their immunological parameters. The levels of the total serum proteins were elevated mainly due to an increase in the alpha-2 and gamma-globulin fractions. All of the immunoglobulin classes were elevated but the IgG and IgM classes were the most altered. The studied complement components (C_3 and C_4) were normal and the 50% hemolytic complement (CH_{50}) was only slightly elevated. The C-reactive protein and rheumatoid factor(s) tests were positive in many cases. Thirty-three percent of the patients had circulating immune complexes as detected by their reaction with C1q, and all of them had circulating antimycobacterial antibodies.

In general, the patients showed low numbers of T-lymphocytes (E-rosettes) and, in some cases, B-lymphocytes (EAC-rosettes) counts were elevated. A great majority of the patients gave negative LIF tests with lepromin as the antigen. The few cases in which the LIF test was positive could well be the result of a cross reactivity to *M. tuberculosis* antigens. The LIF test with PPD as the antigen and the response to the intradermal injection of PPD and other antigens were comparable to the results obtained in a normal group.

These and other studies enable us to conclude that the patients with diffuse lepromatous leprosy have a specific depression in their cell-mediated immunity to the *M. leprae* antigens and that the Lucio's phenomenon could be the result of a type III, immune complexes-mediated, hypersensitivity.—Authors' Summary

Faber, W. R., Leiker, D. L., Nengerman, I. M., Zeijlemaker, W. P. and Schellekens, P. T. A. Lymphocyte transformation test in leprosy: Decreased lymphocyte reactivity to *Mycobacterium leprae* in lepromatous leprosy, with no evidence for a generalized impairment. Infect. Immun. **22** (1978) 649–656.

Untreated leprosy patients were examined with respect to lymphocyte transfor-

mation *in vitro* after stimulation with mycobacterial and other microbial antigens, allogeneic lymphocytes, or nonspecific mitogens. Methods were used to circumvent technical variability. The results were compared with those obtained in controls matched for age, sex, race, and environment. No evidence was found for a generalized impairment of lymphocyte transformation *in vitro*, whereas a specific defect towards *Mycobacterium leprae* was demonstrable in lepromatous leprosy patients. The response to *M. leprae*, investigated in untreated and treated leprosy patients, decreased along the leprosy spectrum. Moreover, the results of the one-way mixed lymphocyte cultures showed that lymphocytes from leprosy patients had a normal stimulator and responder capacity, when they were tested against a panel of allogeneic lymphocytes. The influence of serum factors was investigated in untreated leprosy patients in the mixed lymphocyte culture. On average, tuberculoid as well as lepromatous sera showed a low-level depressive effect, but some sera showed a stimulatory effect. Therefore, a depressive effect of serum factors cannot be considered to be a general feature of leprosy. The correlation between the Mitsuda type of lepromin skin test and the lymphocyte reactivity *in vitro* to *M. leprae* was studied, and a positive correlation was found.—Authors' Summary

Fotedar, A., Mehra, N. K., Mustafa, A. S. and Talwar, G. P. Local reactions to intradermal instillation of *Mycobacterium w* and ICRC bacilli in mice. Lepr. India **50** (1978) 520–533.

Local reactions have been recorded in the mouse, after intradermal administration of *Mycobacterium w* and ICRC bacilli in the mouse foot pad. The response obtained with live *Mycobacterium w* was higher than with ICRC bacillus employed in the same dose and form. Live *Mycobacterium w* given at 2×10^7 bacilli produced a transient thickness of the foot pad at 48 hours, a dip on day 8 and a notable rise again on day 12, which persisted up to 26th day of the observation period. Live bacilli produced a better reaction than autoclaved bacilli. Histology showed principally the infiltration of mononuclear cells at the injection site.

Dose response studies indicate a low sensitization at 2×10^6 bacilli and a good response at 2×10^7 bacilli. 2×10^8 bacilli produced a pronounced thickness of the foot pad from day 1 onwards with no inflexion seen in the foot pad response around days 8 and 12. *Mycobacterium w* given intradermally in the thigh evoked a positive recall reaction to *Mycobacterium w* sonicates injected in the foot pad. The time kinetic pattern of this response resembled that given by non-pathogenic mycobacteria.—Authors' Summary

Girdhar, B. K. and Desikan, K. V. Results of skin tests with five different mycobacteria. Lepr. India **50** (1978) 555–559.

A comparison of intradermal response to injection of Dharmendra type of coded antigens, prepared from different species of mycobacteria by Professor G. P. Talwar, has been made over a three week period.

The positive skin test response in TT and BT cases with *Mycobacterium w* (DW) and ICRC bacillus (DG) was found to be similar to *Mycobacterium leprae* (DL). However, this parallelism was not seen with negative responses. While *M. leprae* (DL) gave a negative skin test reaction in LL and BL cases, *Mycobacterium w* (DW) and ICRC bacillus showed a marginal induration. *Mycobacterium phlei* (DY) gave a good early response in TT and BT patients and also gave a negative reaction in LL and BL cases similar to *M. leprae* (DL).

These observations are based on a small pilot study. A similar study on a much larger number of subjects needs to be carried out with a more thorough statistical analysis of the results for better evaluation.—(*Adapted from* article)

Godal, T. Immunological aspects of leprosy—Present status. Prog. Allergy **25** (1978) 211–242.

This is an extensive, up-to-date review (177 references) of the immunology of leprosy. The article cannot be adequately abstracted and should be read in the original for the wealth of information it contains.—RCH

Govil, D. C. and Bhutani, L. K. Delayed hypersensitivity skin reactions to lepro-

min and antigens prepared from four other mycobacteria. Lepr. India **50** (1978) 550–554.

Antigens prepared from five mycobacteria viz. *M. leprae*, *M. vaccae*, *M. phlei*, *M. w* and ICRC bacillus were used for assessing cross reactivity between different antigens on sixteen patients with different forms of leprosy. ICRC bacillus and *M. w* gave the best correlation with *M. leprae*.—Authors' Summary

Gray, F., Nosny, Y., Sebille, A. and Escourolle, R. Données fournies par l'examen de 18 biopsies musculaires systématiques chez des lépreux. (Data supplied by examination of 18 routine muscle biopsies in leprosy.) Arch. Anat. Cytol. Pathol. **26** (1978) 29–35. (in French)

Examination of 18 routine muscle biopsies in leprosy showed in 10 out of 15 cases of lepromatous leprosy, an interstitial infiltration by the leprosy granuloma and in three cases of tuberculoid leprosy a secondary atrophy of nerve and other neurological signs.

In the cases of lepromatous leprosy, Hansen's bacilli were observed in the cytoplasm of Virchow's cells, and in one case in the muscle fibres; none were seen in cases of tuberculoid leprosy.—Authors' Abstract

Harboe, M., Mshana, R. N., Closs, O. Kronvall, G. and Axelsen, N. H. Cross-reactions between mycobacteria. II. Crossed immunoelectrophoretic analysis of soluble antigens of BCG and comparison with other mycobacteria. Scand. J. Immunol. **9** (1979) 115–124.

Cross-reactions between *Mycobacterium bovis* BCG and various other mycobacteria, *Nocardia asteroides*, *Corynebacterium pyogenes* and *Listeria monocytogenes* were studied by incorporating antibodies against these bacteria in the intermediate gel of a crossed immunoelectrophoretic system with BCG antigen and anti-BCG antibodies. In the BCG reference system forty-four distinct antigenic components were recorded, of which thirty-three cross-reacted with *Mycobacterium tuberculosis*, twenty-five with *M. avium*, twenty-one with *M. duvalii*, eighteen with *M. smegmatis*, fifteen with *M. nonchromogenicum*, twelve with *M. phlei*, eight with *N. asteroides* and two with *C. pyogenes*, whereas no cross-reaction was detected with *L. monocytogenes*. The value of the method for characterization of mycobacterial antigens is discussed. A taxonomic system based on this method appears particularly valuable for studies of noncultivable mycobacteria such as *M. leprae*. A majority of twenty-one patients with lepromatous leprosy had anti-BCG antibodies of restricted specificity, affecting only four or five BCG antigens, although one patient had twelve anti-BCG specificities. Most of these antibodies reacted with those BCG antigens that cross-react extensively with other mycobacteria.—Authors' Summary

Hogerzeil, L. M. and Prabhudass, N. Delayed hypersensitivity skin reactions to lepromins prepared from *M. leprae* and selected cultivable mycobacteria. Lepr. India **50** (1978) 560–565.

Lepromins prepared from *M. leprae* and from selected cultivable mycobacteria were tested in 50 leprosy patients. Preparation *M. w* showed the best correlation with true lepromin, especially in the group of TT patients.—Authors' Summary

Koranne, R. V., Singh, R. and Iyengar, B. *Mycobacterium leprae* in the striated muscle of tuberculoid leprosy patients. Lepr. India **50** (1978) 375–380.

Striated muscle specimens from 24 untreated proved cases of tuberculoid leprosy and five healthy normal individuals were studied histopathologically for the evidence of leprous pathology. Atrophy or damage to the muscle fibre was not observed in any patient. Nineteen (79.16%) cases showed evidence of leprosy in striated muscles. Seventeen (70.83%) cases showed scanty histiocytic infiltrate between the muscle fibres. Thirteen (54.16%) cases had acid fast bacilli mostly inside the muscle. There was no correlation between the location of the bacilli and that of the histiocytes; in two cases, acid fast bacilli were seen without the histiocyte. The bacilli were solidly staining and were lying singly in the undam-

aged muscle. There was no evidence of tuberculosis and, in the control group, none showed any AFB or infiltrate.

The presence of lepra bacilli did not depend upon the location of the muscle. Two of the muscle specimens not underneath the cutaneous lesions also had acid fast bacilli. 21.05% of these cases also showed simultaneous involvement of liver and lymph nodes. These are strong evidences of the systemic nature of disease in tuberculoid leprosy as well.—Authors' Summary

Kumar, R., Vaidya, M. C. and Keshwani, N. H. *In vivo* response of mast cells to lepromatous serum. Lepr. India **51** (1979) 49–53.

Adult healthy mice of pure line Institute strain were given, into the foot pad, an intradermal injection of normal human serum in group A and lepromatous serum in group B. In both groups, the animals were killed at varying time intervals. Serial paraffin sections of the foot pad skin 5–7 μ thick, were cut and stained with haematoxylin and eosin, toludine blue, acridine orange and para-bromaniline. On comparing the two groups, in group B the response of mast cells was more prompt, pronounced and persistent. The increase in the number of cells was accompanied by explosive degranulation around nerves, blood vessels and muscles. This response became less by 15 days but did not disappear completely. There were still few intact cells in the dermis. Histamine, heparin and 5-HT showed a corresponding rise. The importance of the findings is discussed.—Authors' Summary

Laub, R., Delville, J. and Cocito, C. Immunological relatedness of ribosomes from mycobacteria, nocardiae and corynebacteria, and microorganisms in leprosy lesions. Infect. Immun. **22** (1978) 540–547.

Serological relatedness of ribosomes from microorganisms of the *Mycobacterium, Nocardia,* and *Corynebacterium* genera has been analyzed by the microplate immunodiffusion technique. *Mycobacterium* and *Nocardia* proved homogeneous and closely related taxa, whereas *Corynebacterium* was found to be a heterogeneous phylum connected by remote links to the others. The taxonomic position of "diphtheroid microorganisms" (non-acid-fast, gram-positive bacteria morphologically similar to corynebacteria), which were found together with *Mycobacterium leprae* in human leprosy lesions, was also investigated. Ribosomes of diphtheroid bacteria strongly cross-reacted with antisera against several mycobacteria and nocardiae but not against corynebacteria. Moreover, ribosomes from independently isolated diphtheroid strains proved serologically related and yielded strong cross-reactions with antisera against *M. leprae* as well as with sera from leprosy patients. Hence, diphtheroid microorganisms represent a homogeneous group immunologically related to mycobacteria in general and more specifically to *M. leprae.*—Authors' Summary

Lawrence, C. and Schreiber, A. J. Leprosy's footprints in bone-marrow histiocytes. N. Engl. J. Med. **300** (1979) 834–835.

Bone marrow aspirates from two cases of lepromatous leprosy in New York showed imprints of unstained leprosy bacilli on routine Wright's stained preparations. Subsequent staining with a modified Fite's stain demonstrated the bacilli in a more conventional fashion. The authors call attention to these "unique histiocytes" in the hope of minimizing delay in diagnosis of lepromatous leprosy in areas where it is uncommon.—(*Adapted from* article)

Minagawa, F., Yoshino, Y. and Abe, M. Early immune responses to nude mouse following intravenous injection of *Mycobacterium leprae.* Jap. J. Lepr. **47** (1978) 37–42.

For the purpose of elucidating the immune mechanism in the early stage of leprosy, three strains of mice, conventional BALB/c, SPF BALB/c-nu/+ and BALB/c-nu/nu mice, were injected intravenously with a mixture of 10^7 *M. leprae* and 10^8 sheep red blood cells. All of these mice showed a similar degree of antibody response to *M. leprae,* as demonstrated by indirect immunofluorescence, the antibody-titer reaching the maximum within a week after the injection of antigens. The production of IgG antibodies was somewhat de-

layed and the titer reached to a plateau within 2 or 3 weeks. No decline of antibody-titer was observed till at least 5 weeks after the injection of antigens. The transfer of thymocytes from immunized nu/+ donors to nu/nu recipients did not influence the antibody-titer in the recipient.

Both agglutinins and hemolysins to sheep red blood cells were less produced in nu/nu mice than in nu/+ and conventional mice. After the transfer of thymocytes followed by a second injection of antigens, nude mice showed a low level of antibody response which was sensitive to mercaptoethanol treatment. *In vitro* transformation of spleen cells to *M. leprae* antigens was not seen in any of the mice, except for a positive response by one nude mouse into which thymocytes from an immunized donor and a second injection of antigens were given.

From these observations it may be concluded that the production of anti-*M. leprae* antibodies is thymus-independent and that this immune response can be induced at an early stage of leprosy infection without induction of cell-mediated immunity.—Authors' Summary

Mshana, R. N., Closs, O. and Harboe, M. Antibody response in rabbits to *Mycobacterium bovis* BCG. Scand. J. Immunol. **9** (1979) 175–182.

The specificity of the immune response after immunization with *Mycobacterium bovis* BCG was studied by crossed immunoelectrophoresis with intermediate gel in a BCG/anti-BCG system, in which the reaction against thirty distinct components of BCG was recorded. After a single injection of total sonicate of 3 mg (dry weight) bacilli, the antibody response was markedly similar in eight rabbits. The earliest and strongest response was directed against nine components of BCG; all but one of these belonged to the group of thirteen components that cross-react extensively with other mycobacteria. After repeated immunization with sonicate from about 0.8 μg of BCG bacilli, five components still induced a marked antibody response. All but one of these components are among the most widely cross-reacting BCG components, and the observations made after subsequent challenge with the higher dose of BCG indicate that low-zone tolerance was induced against other components of the bacilli. The implication of these findings concerning formation of anti-mycobacterial antibodies in normal individuals and during mycobacterial infection is discussed.—Authors' Summary

Mustafa, A. S. and Talwar, G. P. Delayed hypersensitivity skin reactions to homologous and heterologous antigens in guinea-pigs immunized with *M. leprae* and four selected cultivable mycobacterial strains. Lepr. India **50** (1978) 509–519.

Guinea-pigs were immunized with *Mycobacterium leprae* in saline and with autoclaved preparations of *Mycobacterium w*, ICRC bacillus, *Mycobacterium phlei* and *Mycobacterium vaccae*. A group of animals were also immunized with live *Mycobacterium w*. All animals were challenged after one month of injection with Dharmendra and Mitsuda lepromins from *M. leprae* and other mycobacteria. Induration produced in response to the challenge antigens has been recorded on different days. All bacteria produced delayed hypersensitivity response in guinea-pigs to challenge with homologous mycobacterial preparations and *M. leprae*. In most cases, the early reaction was higher with homologous antigens as compared to *M. leprae* antigens. The late reactions to homologous and *M. leprae* antigens were however of comparable order especially in animals immunized with *Mycobacterium w*, and ICRC bacillus. Animals immunized with *M. leprae* gave low late reactions with preparations from *Mycobacterium phlei* and *Mycobacterium vaccae*.—Authors' Summary

Mustafa, A. S. and Talwar, G. P. Early and late reactions in tuberculoid and lepromatous leprosy patients with lepromins from *Mycobacterium leprae* and five selected cultivable mycobacteria. Lepr. India **50** (1978) 566–571.

Skin reactions have been measured in tuberculoid and lepromatous leprosy patients with Dharmendra and Mitsuda type of lepromins prepared from *M. leprae*, *Mycobacterium w*, ICRC bacillus, *M. phlei*,

M. vaccae and *M. gordonae*. In tuberculoid patients *Mycobacterium w* gave the closest response to *M. leprae*; however, in lepromatous and borderline lepromatous cases, this bacterium produced greater response than *M. leprae*.—Authors' Summary

Mustafa, A. S. and Talwar, G. P. Enlargement of draining lymph nodes by four selected cultivable strains of mycobacteria. Lepr. India **50** (1978) 534–538.

Mycobacterium phlei, Mycobacterium vaccae, ICRC bacillus and *Mycobacterium w* were injected intradermally in the thigh of Swiss strain of mice and the enlargement of the draining lymph node vis-a-vis the contralateral glands was recorded at 4 weeks. *Mycobacterium w* was the most effective in causing the enlargement of lymph nodes with an almost hundred percent positivity index. The bacteria produced the enlargement in both the live and killed state.—Authors' Summary

Mustafa, A. S. and Talwar, G. P. Five cultivable mycobacterial strains giving blast transformation and leukocyte migration inhibition of leukocytes analogous to *Mycobacterium leprae*. Lepr. India **50** (1978) 498–508.

Fifteen cultivable mycobacteria and BCG have been screened for antigens resembling those of *M. leprae* in two cell-mediated immunity tests, namely the antigen driven blast transformation of peripheral leukocytes and leukocyte migration inhibition assays carried out with cells from a panel of tuberculoid leprosy patients. Five strains of mycobacteria were singled out for their ability to give reactions analogous to *M. leprae* in these test systems. Three of these are previously known strains, namely *M. vaccae, M. phlei* and *M. gordonae*. The fourth was the strain cultivated at the Indian Cancer Research Centre, Bombay from leproma nodules, and the fifth, a hitherto undescribed strain of fast growing mycobacteria coded in these studies as *Mycobacterium w*.—Authors' Summary

Novales, J. Lepra de Lucio. III. Aspectos histopathológicos. (Lucio's leprosy. III. Histopathological aspects.) Dermatológia (Mexico) **22** (1978) 164–174. (in Spanish)

By histopathological study these were the findings: in superficial and intermediate dermis, lepromatous infiltrates as small foci around vessels and appendages. Infiltrates were more dense in deep dermis and hypodermis. In ear lobes infiltrates are rather similar to those found in nodular lepromatosis and are well separated from the epidermis by the Unna non-affected zone.

In Lucio's phenomenon, epidermal necrosis and ulcerations were observed and sometimes intraepidermic bullae. Epidermal changes were not seen in all cases, but vasculitis of small or medium size vessels surrounded by neutrophils and a number of bacilli was present in every case.

Regarding dermal fibers, in these diffuse cases, elastic ones were found destroyed, reticular, augmented and collagen, normal.

By biopsies of liver, hepatocytes were found normal, amyloid absent and small lepromatous foci were observed in hepatic and periportal connective tissue. The same may be said about testis, epididymis and mammary gland: lepromatous infiltrates and bacilli were found in all the cases.

Finally, it was observed that with treatment with rifampin, the bacilli deteriorated faster than in cases treated with dapsone.—Author's Summary

Prasad, H. K., Singh, A. K. and Talwar, G. P. Ability of *M. leprae, Mycobacterium w* and ICRC bacillus to produce macrophage activating factors from lymphocytes of leprosy patients. Lepr. India **50** (1978) 539–549.

Lymphocytes from tuberculoid and lepromatous leprosy patients were cultured for 24 hours with *M. leprae, Mycobacterium w* or ICRC bacillus. The supernatants from these cultures were tested for activation of human peripheral blood monocyte derived macrophage lysosomal acid phosphatase and beta-glucuronidase (in some cases). Eleven experiments were performed using different combinations of macrophages and donor lymphocytes. In 7 cases both *M. leprae* and *Mycobacterium w* generated mediators from lymphocytes which activated macrophage enzyme to a similar extent. The

results with ICRC bacillus were concordant with *M. leprae* in 3 cases but discordant in 3 cases.—Authors' Summary

Saha, K., Agrawal, S. K. and Misra, R. C. Gut-associated IgA deficiency in lepromatous leprosy. Scand. J. Immunol. **8** (1978) 397–402.

Sera, intestinal secretions, and intestinal biopsies were collected from twelve biopsy-proved lepromatous leprosy patients with the help of a capsule invented by Roy Choudhury. Sera from another twenty-five proved lepromatous cases were also included. Sera and intestinal aspirates from twenty-five normal subjects and twenty patients with intestinal tuberculosis were also taken as controls. Acid-fast organisms, morphologically resembling *Mycobacterium leprae*, were detected in the intestinal aspirates of only two leprosy patients. Immunoglobulin levels in their sera and intestinal secretions were estimated by the single radial immunodiffusion technique. Significant elevation of serum IgG, IgA, and IgM, selective IgA deficiency in intestinal aspirates and flattening of the intestinal villi along with mononuclear cell infiltration were conspicuous observations in the leprosy group. On the other hand, the patients with intestinal tuberculosis showed elevation of the IgG level in serum as well as in the intestinal secretions. It was postulated that persistent challenge by *M. leprae* or its antigens to the IgA immunocytes of the intestinal epithelium might have induced tolerance leading to IgA deficiency and subsequent subtotal atrophy of the intestinal villi in the patients with lepromatous leprosy.—Authors' Summary

Sahib, H. S. M. and Vellut, C. Some observations on skin reactions induced by lepromin and four other mycobacterial antigens. Lepr. India **50** (1978) 579–587.

A study on skin reactions induced by *Mycobacterium leprae*, lepromin and four other mycobacterial antigens was done on 47 leprosy patients of Hemerijckx Leprosy Center, Polambakkam, as a first stage towards a vaccine approach. There was no exact correlation between lepromin and any one of the four antigens in all types of leprosy. In lepromatous and borderline cases, a better correlation was noted between lepromin and *M. vaccae*, and *M. phlei* antigens in its negativity and less response. In tuberculoid cases, a better correlation was noted between lepromin and ICRC bacillus and *M. delhi* (*Mycobacterium w*) antigens. In general, ICRC bacillus and *M. delhi* (*Mycobacterium w*) antigens produced greater reactivity in all types of cases.—(*Adapted from* article)

Saxena, V. K., Singh, U. S. and Singh, A. K. Bacteriological study of a rapidly growing strain of mycobacterium. Lepr. India **50** (1978) 588–596.

Morphological, colonial and biochemical characteristics of a strain of mycobacteria, which exhibited antigenic cross reactivity with *M. leprae* as indicated by antigen driven blast transformation of leukocytes, leukocyte migration inhibition test *in vitro*, and delayed hypersensitivity skin test in leprosy patients, are described. It belongs to Runyon's group IV and can be distinguished from other known species of rapidly growing mycobacteria. It is non-pathogenic in mice. The strain has been tentatively named as *M. w*.—Authors' Summary

Sengupta, U., Ramu, G. and Desikan, K. V. Assessment of Dharmendra antigen. Lepr. India **50** (1978) 599–609.

Dharmendra antigen has certain advantages over Mitsuda antigen and these have been enumerated. Consequently, a reappraisal of Dharmendra antigen has been done. A variation in the degree of lepromin reaction was noted when the tests were performed with different batches of Dharmendra antigen. This was found to be due to variation in the bacillary content which was further confirmed by dilution experiments. Standardization of the antigen by bacillary count has been found to give better results. Dharmendra antigen prepared with a concentration of 160 million bacilli per ml was found to give not only early lepromin reaction but also late reaction comparable to Mitsuda antigen. It was also found that with a concentration of 16 million bacilli per ml (one tenth the concentration of Mitsuda antigen), the results were consistent and reproducible.—Authors' Summary

Sharma, M. K., Foroozanfar, N. and Ala, F. A. Progressive BCG infection in an immunodeficient child treated with transfer factor. Clin. Immunol. Immunopathol. **10** (1978) 369–380.

BCG vaccination in a 10-year-old Iranian girl was followed by local progression of the lesions and spread to distant sites. The histology of the skin lesions revealed no tubercle formation. She was found to have defective cell-mediated immunity. Antituberculous therapy failed to heal and prevent local progression of the lesions. She was therefore treated with dialyzable transfer factor prepared from tuberculin-positive donors. Subsequently, the cutaneous lesions have healed completely and the cutaneous anergy to antigens other than PPD has reverted to normal.—Authors' Summary

Sharma, R. C. and Singh, R. Comparative study of skin reactions in leprosy patients to *M. leprae*-lepromin and to antigens from cultivable saprophytic mycobacteria. Lepr. India **50** (1978) 572–578.

Eighteen cases of different types of leprosy were studied to see the skin reactions to known lepromin and to antigens from four cultivable saprophytic mycobacteria. ICRC bacillus gave best results in tuberculoid leprosy—even as compared to *M. leprae*, whereas *M. delhi* (*M. w*) gave the second best result in tuberculoid leprosy. However, so far as the antigenic similarity between ICRC bacillus and *M. delhi* (*M. w*) with *M. leprae* is concerned, there was hardly any difference between the two.—Authors' Summary

Sher, R., Anderson, R., Glover, A. and Wadee, A. A. Polymorphonuclear cell function in the various polar types of leprosy and erythema nodosum leprosum. Infect. Immun. **21** (1978) 959–965.

Polymorphonuclear leukocyte motility, both *in vivo* and *in vitro*, and reduction of Nitro Blue Tetrazolium was studied in tuberculoid and lepromatous leprosy patients and a group of lepromatous patients with erythema nodosum leprosum (ENL). A profound defect in random migration, chemotaxis, and chemokinesis was found in lepromatous patients with and without complicating ENL, and marked depletion of skin window migration confirmed these *in vitro* findings. Tuberculoid patients exhibited a mild defect in polymorphonuclear leukocyte motility. Serum inhibitors of normal polymorphonuclear leukocyte chemotaxis were found in all types of leprosy, but sera from lepromatous and ENL patients were most inhibitory. Resting levels of Nitro Blue Tetrazolium reduction were normal in all three groups. Reconstitution of polymorphonuclear leukocyte cells from normal and ENL patients with ENL serum, however, showed increased Nitro Blue Tetrazolium reduction well above the normal range, whereas reconstitution with normal, lepromatous, and tuberculoid sera failed to increase Nitro Blue Tetrazolium reduction above the normal values.—Authors' Summary

Stoner, G. L., Touw, J., Belehu, A. and Naafs, B. *In-vitro* lymphoproliferative response to *Mycobacterium leprae* of HLA-D-identical siblings of lepromatous leprosy patients. Lancet **2** (1978) 543–547.

Lymphoproliferative responses to *Mycobacterium leprae* and P.P.D. were measured in 23 lepromatous and borderline lepromatous leprosy patients and in 27 of their normal siblings. At the same time siblings HLA-D identical with the patients were identified by the absence of a mixed-lymphocyte reaction. The 7 siblings who were HLA-identical to lepromatous patients responded as well to *M. leprae* as did the 20 HLA-non-identical normal siblings. In contrast, 22 of the 23 lepromatous patients failed to respond to *M. leprae* but responded normally to P.P.D. The specific unresponsiveness of lepromatous patients thus does not result from an HLA-linked genetic defect and the defective cell-mediated immune response to *M. leprae* seems to be acquired, not inherited. Lepromatous patients may be high responders to antigens shared by *M. leprae* and other micoorganisms in whom a strong antibody response has blocked the induction of an *M. leprae*-specific cell-mediated immune response.—Authors' Summary

Talwar, G. P. Towards development of a vaccine against leprosy. Introduction. Lepr. India **50** (1978) 492–497.

Theoretically, an anti-leprosy vaccine can be of three types: (1) it may consist of *M. leprae* antigens; (2) it may be based on cultivatable non-pathogenic mycobacteria possessing desirable cross-reacting antigens with *M. leprae*; (3) it may be a combination of BCG with (1) or (2) of above.

There are a number of characteristics that one should look for in a search for a desirable cultivatable non-pathogenic mycobacteria possessing desirable cross-reacting antigens with *M. leprae:* (1) It should, of course, have antigens which cross-react with *M. leprae*. The resembling antigens should be those involved in cell mediated functions; (2) The bacteria should have a potent immunizing capacity. Mere possession of common or cross-reacting antigens may not suffice; (3) In view of the observations that lepromatous leprosy patients are negative to lepromin and do not have the ability to recognize some *M. leprae* antigens, it can be inferred that they are tolerant to these constituents. In the strategy to be evolved, it will be mandatory to seek ways and means to break this tolerance. One of the approaches that can be employed for this purpose is to couple the tolerant antigens to those against which there is no tolerance. The linking of "self" proteins to "foreign" carriers or haptens can elicit an immune response to the tolerant antigens as has been successfully achieved in our studies on anti-human chorionic gonadotropin. Thus the requirement that we have framed for our desirable organism is not only the possession of cross-reacting antigens to *Mycobacterium leprae* but also those which are different and to which lepromatous leprosy patients can respond. It is hoped that with the associated immunogenic antigens, it may also be possible to generate an immune response against the tolerant antigens.—(*Adapted from* article)

Turk, J. L. Relation between delayed hypersensitivity and cell-mediated immunity. (editorial) J. R. Soc. Med. **72** (1979) 243–245.

The author reviews the subject and concludes that delayed hypersensitivity is one of the manifestations of cell-mediated immunity reactions. Under certain circumstances it may parallel host resistance to infection; in other situations it may parallel more closely inflammatory tissue changes. Particularly, it may be involved in granuloma formation leading to fibrosis. However, it should be emphasized that delayed hypersensitivity and cellular immunity may frequently be directed at the same time against different antigens on the same organism.—(*Adapted from* article)

Yamashita, K., Iwamoto, T. and Iijima, S. Immunohistochemical observation of lysozyme in macrophages in leprosy. Acta Pathol. Jap. **28** (1978) 697–703.

Lysozyme activities of skin granulomas of 24 patients in leprosy were studied. Lepra cells of all 15 lepromatous leprosy (patients) showed strong lysozyme activity in cytoplasma. In the specimens stained with lysozyme and Ziehl-Neelsen's carbolfuchsin double stain, conspicuous lysozyme activity around *M. leprae* was observed. One borderline case was negative. Lysozyme of epithelioid cells and giant cells of 10 tuberculoid types were completely negative. These results suggest that lysozyme plays only a small role in the disposal of *M. leprae* in macrophages, and other mechanisms than bacteriolytic function of lysozyme are responsible for the defense against these bacilli.—Authors' Summary

Microbiology

David, H. L., Clément, F. and Meyer, L. Adsorption of mycobacteriophage D_{29} on *Mycobacterium leprae*. Ann. Microbiol. (Inst. Pasteur) **129A** (1978) 563–566.

This paper demonstrates the specific adsorption of mycobacteriophage D_{29} onto *Mycobacterium leprae* and describes the experimental conditions necessary to obtain satisfactory adsorption.

The optimal conditions for adsorption were a high concentration of calcium chloride (10–20 mM) in the mixture and to add the bacteriophages to the bacterial cells packed in a small volume, which appeared to facilitate the interaction between the viruses and the bacteria.

The adsorption of mycobacteriophage D_{29} was not followed by the efficient infection of *M. leprae*. However, the demonstration of adsorption indicated that one may eventually find the proper conditions for the replication of this or other bacteriophages in *M. leprae*.—(*Adapted from* article)

David, H. L., Clavel, S., Clément, F., Meyer, L., Draper, P. and Burdett, I. D. J. Interaction of *Mycobacterium leprae* and mycobacteriophage D_{29}. Ann. Microbiol. (Inst. Pasteur) **129B** (1978) 561–570.

This study of the interaction between *Mycobacterium leprae* and the mycobacteriophage D_{29} showed that the viruses caused a patchy damage of cell wall structure and the accumulation in the host of internal crystalline structures. Whether the observed ultrastructural alterations were caused by the replication of D_{29} was not clear. Mitomycin C also caused the accumulation of crystalline structures in *M. leprae*.—Authors' Summary

Delville, J. Réflexions sur la microbiologie de la lèpre. (Reflections on the microbiology of leprosy.) Bull. Mem. Acad. R. Med. Belg. **133** (1978) 259–270. (in French)

The etiological agent of leprosy, *M. leprae*, described as an acid-alcohol-fast organism according to the Ziehl-Neelsen technic is not always present as such in leprosy lesions. Other technics are more appropriate and will detect bacilli in lesions where Ziehl-Neelsen fails to do so.

The experimental infection in men and animals and the problem of the cultivation of Hansen's bacillus are discussed.

The most outstanding characteristics of the diphtheroids isolated from leprosy patients are analyzed and their relation with *M. leprae* is discussed.—Authors' Summary

Experimental Infections

Convit, J. Indigenous leprosy in the armadillo (*Dasypus novemcinctus*). J. Reticuloenthel. Soc. **24** (1978) 605–607.

This guest editorial briefly outlines the history of the experimental transmission of leprosy to the armadillo and the controversy surrounding the first reports of the existence of indigenous or naturally occurring leprosy among armadillos in the United States. Since the existence of a disseminated mycobacteriosis indistinguishable from experimentally induced leprosy has now been reported by four independent groups in nine-banded armadillos from Louisiana and Texas, the author concludes that there can no longer be any doubt that the phenomenon exists. It is pointed out that in contrast to the experience in the United States, both attempts at experimental transmission and surveys for indigenous leprosy have not been successful in South America. The possibility is raised that there may be genetic differences between nine-banded armadillos in South America and North America. The point is made that once the existence of the natural infection has been accepted, the need arises to conduct more detailed epidemiologic studies to define the extent and characteristics of the phenomenon with a view to clarifying aspects of its transmission, the spectrum of its clinical manifestations, its possible origin, and possible genetic and immunologic differences between nine-banded armadillos in South America and North America.—(*Adapted from* editorial)

Harboe, M., Closs, O., Rees, R. J. W. and Walsh, G. P. Formation of antibody against *Mycobacterium leprae* antigen 7 in armadillos. J. Med. Microbiol. **11** (1978) 525–535.

A radioimmunoassay developed to measure antibody against *Mycobacterium lep-*

rae antigen 7 in man was applied to the nine-banded armadillo (*Dasypus novemcinctus*). Normal armadillo sera had low but significant antibody activity in the test. Fourteen of 17 armadillos with systemic mycobacterial infection after inoculation with *M. leprae* showed increased antibody activity in the assay, and in some instances the activity was higher than in a pool of sera from patients with lepromatous leprosy. Crossed immunoelectrophoresis with armadillo serum in the intermediate gel revealed antibodies against five distinct antigenic components of *M. leprae*. Development of systemic mycobacterial infection after inoculation with *M. leprae* is thus associated with a distinct humoral immune response. The use of radioimmunoassay for selection of animals for inoculation and for following the development of the infection is discussed.—Authors' Summary

Hobbs, H. E., Harman, D. J., Rees, R. J. W. and McDougall, A. C. Ocular histopathology in animals experimentally infected with *M. leprae* and *M. lepraemurium*. 1. *Mycobacterium leprae* and *M. lepraemurium* infections in the mouse. **McDougall, A. C. and Rees, R. J. W.** Ocular histopathology in animals experimentally infected with *Mycobacterium leprae* and *M. lepraemurium*. 2. *Mycobacterium leprae* infections in the 9-banded armadillo (*Dasypus novemcinctus* L.) Br. J. Ophthalmol. **62** (1978) 516–524.

At varying periods of time following the successful establishment of systemic infections with *Mycobacterium leprae* or *M. lepraemurium* in the mouse and the nine-banded armadillo, eyes were examined by light microscopy. Inoculation of bacilli was by the intravenous or intraperitoneal route or directly into the hind footpads; eyes were not directly inoculated in this study. During periods of up to 3 years under laboratory conditions no animal showed evidence of impaired vision or blindness, and the external appearance of both eyes was normal. The ocular histopathology and the sites of accumulation of bacilli are described. In immunologically normal mice infected with *M. lepraemurium* bacilli were much commoner in extraorbital tissues, but they were, nevertheless, found in various tissues within the orbit, including the ciliary body and sclera. In immunologically normal mice (and one rat) injected with *M. leprae* of human origin no bacilli were found in the eye, but in mice immunologically depressed by thymectomy and total body irradiation considerable numbers of bacilli were present in the iris and ciliary body and also in the limbal cornea. In the armadillo bacilli were found in large numbers in virtually all tissues except the lens, retina, optic nerve, and aqueous and vitreous humours, but the uveal tract was heavily involved.

Findings are discussed in relation to the great frequency of ocular involvement and the importance of immune-complex disease in patients with lepromatous leprosy, and to factors which may favour the localization and multiplication of *Mycobacterium leprae* in the eye.—Authors' Summary

Kawaguchi, Y., Matsuoka, M. and Kawatsu, K. Pathogenicity of cultivated murine leprosy bacilli in mice. 2. The pathogenicity of bacilli from smooth colonies. Jap. J. Exp. Med. **48** (1978) 211–216.

Cultivated murine leprosy bacilli of Hawaiian-Ogawa strain produce visible colonies only on 1% Ogawa's egg yolk medium and their colony form is usually rough in appearance. However, colony-dissociation from rough to smooth began to occur after the 9th to 15th cultural passages.

As stated in our previous paper, the rough colony bacilli were found to be more virulent for mice than the bacilli of the original Hawaiian strain maintained only by mouse passages.

On the contrary, the smooth colony bacilli did not produce the palpable leproma at the subcutaneous inoculation site and only very slight lesions were produced in the viscera even in the highly susceptible C3H mice. In the other strains of mice the leproma due to the smooth colony bacilli developed more slowly and were smaller than those due to the rough colony bacilli. And, visceral lesions were also slighter in the former than in the latter mouse group. However, one exceptional mouse strain was BALB/c. There were no differences in

the development of mouse leprosy between the bacilli from rough and smooth colonies in this strain.

In nude mice (BALB/c-*nu/nu*), the lesion with the smooth colony bacilli at the subcutaneous inoculation site developed much more slowly than that with the rough colony bacilli. The lesion with the smooth colony bacilli was palpable as a soft and diffuse infiltration at 30 weeks and reached to a malignant leproma at 40 weeks, contrasting infection with the rough colony bacilli in which subcutaneous lesion developed soft and large, malignant type, leproma at 20 weeks, and leaving no survivals after 30 weeks.

From the results of the present experiments, it is obvious that the bacilli from smooth colonies are generally much less virulent for mice than those from rough colonies of Hawaiian-Ogawa strain and those of the original Hawaiian strain.—Authors' Summary

Kirchheimer, W. F. Examination of North American armadillos for mycobacteriosis—A further report. Lepr. India **51** (1979) 60–64.

In a total of 396 individual wild-caught armadillos examined (306 from Louisiana and the remainder from Florida and Texas), the author has found leprosy-like disease in one Louisiana animal (0.3%). This armadillo with leprosy-like disease was brought to Carville in February 1978 by an independent trapper and was said to have been trapped twenty-five air miles west of Carville across the Mississippi River. It had signs of generalized mycobacteriosis which was confirmed histopathologically after its death in May 1978. Bacteriologically, the acid-fast bacilli are so far indistinguishable from *M. leprae*. The results of mouse footpad multiplication are pending. In addition, a mycobacterium was cultured from an inguinal lymph node. This last is in no way unusual and has been observed in several laboratories. The author feels that Dharmendra's plea for a proper investigation of the phenomenon of "natural" leprosy in armadillos by workers who have not been associated with one view or the other in the past should be supported.—(*Adapted from* article)

Leininger, J. R., Donham, K. J. and Rubino, M. J. Leprosy in a chimpanzee. Morphology of the skin lesions and characterization of the organism. Vet. Pathol. **15** (1978) 339–346.

Microscopic features of lepromatoid lesions in a chimpanzee inoculated with bovine leukemia virus consisted of diffuse dermal infiltrations of foamy histiocytes, except for a subepidermal "clear zone" devoid of infiltrating cells. Acid-fast organisms were in histiocytes, dermal nerves, and a branch of the left radial nerve. The organisms were more intensely acid-fast with the Fite-Faraco than with the Ziehl-Neelsen stain. The organisms did not oxidize 3,4-dihydroxyphenylalanine (DOPA) to indole but their acid-fast staining quality was removed by pretreatment with pyridine. Human leprosy patients, inoculated simultaneously with chimpanzee and human lepromin, reacted similarly to both lepromins. Organisms, when inoculated into mouse footpads, multiplied in 6 months to a quantity that was compatible with their identification as *Mycobacterium leprae*.—Authors' Summary

Epidemiology and Prevention

Davey, T. F. A day in the life of Yeeranna—A cautionary tale. Lepr. Rev. **49** (1978) 269–274.

Considering the clinical and bacteriological data of a known untreated patient with early lepromatous leprosy in the setting of personal habits, social behavior, insect transmission, and modern transport, it becomes possible to envisage an ordinary day in the life of this patient in which he becomes the source from which 100 people are infected with *Mycobacterium leprae* up to a distance of 50 miles from his home. In one month this total could become 3000, and if only 1% of these developed clinical leprosy, 30 cases of leprosy would result,

of whom 3 could be potentially lepromatous in type.—Authors' Summary

Hitzeroth, H. W., Walter, H. and Hilling, M. Genetic markers and leprosy in South African Negroes. I. Serum protein polymorphisms. S. Afr. Med. J. **54** (1978) 653–658.

The phenotype frequencies of the serum protein polymorphisms Hp, Gc, Tf, Gm, and Inv were determined on a sample of 250 South African Negroes with leprosy. These results were compared with data derived from 918–977 (depending on the polymorphism tested) healthy Negro controls of similar geographical and ethnic origin in order to determine whether or not any association existed between specific phenotypes and the occurrence of leprosy. The data derived from the present study were also compared with those of similar comparative analyses on African and non-African populations. Because of the contradictory results between samples with regard to the polymorphisms Hp, Gc, and Inv, an association of any of these phenotypes and leprosy appears to be highly improbable. With regard to the polymorphisms Tf and Gm, however, such associations cannot be ruled out. The questions arising from the results are discussed.—Authors' Summary

Saul, A. Lepra de Lucio. V. Epidemiología y terapéutica (Lucio's leprosy. V. Epidemiology and therapy.) Dermatológia (Mexico) **22** (1978) 182–188. (in Spanish)

The author has collected epidemiological data on 25 patients with Lucio's leprosy and has inquired further into the matter by means of a questionnaire to 16 leprologists who work in the northwest and central regions of Mexico. The information obtained confirmed older well-known findings: diffuse leprosy is most common in the State of Sinaloa (80% of the cases) and after it come Colima, Jalisco, and Michoacán. From the 25 cases studied epidemiologically, information was obtained about another nineteen cases who were related to them. These twenty-five patients had 135 contacts. Half of these contacts were examined, but only one new patient was discovered. The majority of the 25 cases studied epidemiologically had been discovered by dermatological consultation.

These patients were usually treated with DDS although some of them were treated with a combination of DDS and rifampin. Fifteen of these patients developed a lepra reaction consisting of erythema nodosum leprosum. None of them developed Lucio's phenomenon during treatment.—(*Adapted from* author's English summary)

Rehabilitation

Finseth, F. and Harrison, S. Use of the intramedullary polypropylene peg for joint stabilization in leprosy. Hand **9** (1977) 250–252.

Joint arthrodesis is indicated when motion in a joint cannot be restored and that joint requires stabilization in an optimal functional position.

The Harrison intramedullary peg has been used to advantage for this purpose in hand reconstruction in leprosy in a rural developing area. It is a method to be considered for selected cases requiring joint stabilization to improve total hand function.—Authors' Summary

Fritschi, E. P. A new operation hand splint for intrinsic replacement tendon transfers. Lepr. Rev. **50** (1979) 21–24.

The author describes a new splint for use in the operating room at the time of reconstructive surgery for intrinsic minus hand deformity in leprosy. The splint is carved out of solid wood and differs from presently available splints in that it provides a very definite curve in the metacarpal regions of the palm which allows the transverse metacarpal arch to be maintained during the suturing of the tendons. The splint has been in use for the past six months, and early results are promising.—(*Adapted from* article)

Sebille, A. Respective importance of different nerve conduction velocities in leprosy. J. Neurol. Sci. **38** (1978) 89–95.

Motor and sensory nerve conduction studies were performed in the distal part of the ulnar, median, and radial nerves of 12 tuberculoid and 12 lepromatous leprosy patients, compared with 15 normal subjects. Slowing of sensory conduction velocity (SCV) was shown in all nerves with no difference between tuberculoid and lepromatous patients. The radial SCV slowing is correlated ($p < 0.001$) with the clinical findings. Impairment of motor distal latencies was observed only in tuberculoid patients. It is concluded that the radial SCV is the most reliable conduction test and is proposed as an early diagnostic test for leprosy.—Author's Summary

Sebille, A. and Gray, F. Electromyographic recording and muscle biopsy in lepromatous leprosy. J. Neurol. Sci. **40** (1979) 3–10.

The aim of this study was to detect early muscular changes in lepromatous leprosy using simultaneously electromyography and muscle biopsy. In 13 subjects a single clinically normal muscle innervated by the popliteal nerve was studied. Three were found to be normal. All the others were electromyographically denervated. Histopathologic findings included only 3 cases of fascicular atrophy. In 8 cases inflammatory nodules were observed in the connective tissue of the muscle and acid-fast bacilli were present in the Virchow cells in 5. In only one patient were intact acid-fast bacilli found in muscle cells. It was concluded that electromyography was the better method of detecting early denervation, while muscle biopsy was the better examination to detect "lepromatous myositis." In practice these techniques are complementary in the study of muscle data in lepromatous leprosy.—Authors' Summary

Other Mycobacterial Diseases and Related Entities

Bae, E. D. and Choi, T. K. Diagnosis of tuberculosis by use of Korean chipmunks. Chungnam. Med. J. **5** (1978) 31–38. (in Korean)

In order to investigate the possibility of the use of Korean chipmunks for the diagnosis of tuberculosis, specimens collected from suspected tuberculous patients were tested, and the following results were obtained.

1. The Korean chipmunks were more susceptible to tubercle bacilli than mice.
2. Out of the 79 suspected tuberculous patients, 40 cases were confirmed by microscopic examination.
3. Out of the 39 microscopically negative cases, 6 cases were confirmed by culture and 21 cases by animal inoculation.
4. Compared with culture and mice inoculation, the inoculation into chipmunks resulted in early diagnosis by a few weeks.
5. Identification of tubercle bacilli by Korean chipmunks' inoculation was considered more rapid and susceptible than by culture and mouse inoculation. It was considered an appropriate experimental animal for diagnosis. —(*From* Korean Med. Abstracts)

Campbell, P. R. Defective leukotaxis in monocytes from patients with pulmonary tuberculosis. J. Infect. Dis. **139** (1979) 409–417.

Because the accumulation of macrophages and their precursors, peripheral blood monocytes, in foci of infection is an important feature of the host response to mycobacterial challenge, the leukotactic responsiveness of monocytes from patients with active tuberculosis was evaluated. With a double-filter, *in vitro* technique, defective leukotaxis was demonstrated in monocytes from 19 of 20 untreated patients, whereas normal leukotactic responses were found in monocytes from 11 of 15 patients with chronic, nontuberculous

pulmonary inflammatory diseases. This defect may be related to increased activity of a naturally occurring, heat-stable plasma substance with a molecular mass of ~2.3 $\times 10^5$ daltons that inhibited leukotactic responsiveness. Monocyte leukotaxis improved and the leukotactic inhibitory activity of plasma disappeared in most patients while they were on therapy; these phenomena were unrelated to bacteriologic conversion or resolution of symptoms. *In vitro* studies with isoniazid, ethambutol, and rifampin excluded a direct effect of these drugs or their metabolites on monocytes or on the leukotactic inhibitor in plasma. Thus, defective leukotaxis of monocytes in patients with pulmonary tuberculosis may be an epiphenomenon of the local tissue reaction.—Author's Summary

Chu, C. Y. Interaction between *Mycobacterium fortuitum* and macrophages from the mouse peritoneal exudate concerning intracellular ecology. Tubercul. Resp. Dis. **25** (1978) 115–119. (in Korean)

Numerous studies on the interaction between phagocytes and pathogen were reported; however, information on the infection-establishing mechanisms by *M. fortuitum* is incomplete. It would be worthwhile to learn mechanisms involved in *M. fortuitum* infections as a consequence of the relationship between host and parasite.

Thus, an experiment was performed to study the mode of interaction between mouse peritoneal macrophages and *M. fortuitum in vitro*. Normal mouse peritoneal exudate collected was pooled in the cell maintenance medium and mixed with the suspension of *M. fortuitum*. The bacteria macrophages suspension in a Leighton tube with cover-slip were incubated at 37°C for 120 minutes. After a 30 minute interval of incubation, the ratios of the macrophages associated with bacteria to the total ones and the distribution of the macrophages laden with bacteria by the bacterial number were measured from the stained cover-slip.

The ratios were summarized as follows:

1. Ratios of macrophages associated or containing *M. fortuitum* rapidly increased to 52% until 90 minutes of incubation and thereafter gradually increased to 57.8% at 120 minutes.
2. During the incubation period, continuation of increase in the number of macrophages containing many bacilli resulted in an increase in the total number of *M. fortuitum*.—(*From* Korean Medical Abstracts)

Larrabee, W. F., Jr. and Talavera, R. Skin sensitivity of adults on the Isthmus of Panama to *Mycobacterium xenopi* sensitin. Am. J. Trop. Med. Hyg. **28** (1979) 106–109.

A group of 106 adult Panamanian men were skin tested with a standard human tuberculin (RT 23) and three sensitins prepared from atypical mycobacteria. Two of the sensitins (prepared from *Mycobacterium kansaii* and Battey organism) are commonly used to detect atypical mycobacterial infections. The third (prepared from *M. xenopi*) had not been used in Panama previously. Skin sensitivity proved to be significantly higher to the *M. xenopi* sensitin than to the others. The known epidemiology of *M. xenopi* is briefly reviewed.—Authors' Summary

Lenzini, L., Rottoli, P. and Rolloli, L. The spectrum of human tuberculosis. Clin. Exp. Immunol. **27** (1977) 230–237.

Clinical, morphological, and immunological studies of human tuberculosis have enabled the spectrum of the disease to be determined. We have investigated the cell-mediated immune responses by means of skin tests and leukocyte migration inhibition to PPD, and the humoral immune responses by means of immunodiffusion and haemagglutination tests.

Patients with tuberculosis can be classified into two polar groups—reactive (RR) and unreactive (UU), the former showing good cell-mediated immunity and little or no antibody formation and the latter poor cellular responses and exuberant antibody production. The intermediate forms show characteristics of the neighbouring polar groups.

The existence of a spectrum of immune response in tuberculosis, which has long been suspected, is now demonstrated.—Authors' Summary

Lew, J., Lee, Y. N. and Kim, S. K. A study on newly formulated mycobacterial me-

dia and their application in rapid diagnosis of chronic mycobacterial diseases. Tubercul. Resp. Dis. **25** (1978) 57–62. (in Korean)

We made attempts to formulate simple media supporting better growth of mycobacterial species and to evaluate feasibility of the media used in rapid diagnosis of the chronic mycobacterial diseases. One of the media formulated is a phosphate buffered medium with 0.1% hyaluronic acid and 6.0% bovine serum albumin in addition to 3.0% glycerol.

This medium was originally formulated in Skinsnes' group, but we made slight modification. The other is a semisynthetic medium made of umbilical cord extract supplemented with 10% sheep serum as a final concentration. Mycobacterial species employed in the experiments gave better growth yield in the newly formulated media than in the conventional Dubos liquid medium. We also checked the pathogenicity of *M. tuberculosis* $H_{37}Rv$ grown in the different media to mouse. Tubercle bacilli grown in the Dubos liquid medium showed more potent pathogenicity to mouse than those grown in the newly formulated media.—(*From* Korean Med. Abstracts)

Packchanian, A. Experimental cutaneous leishmaniasis with *Leishmania tropica* in albino hairless mice, *Mus musculus*. Trans. R. Soc. Trop. Med. Hyg. **73** (1979) 31–36.

Cutaneous leishmaniasis was produced in 90 hairless mice, *Mus musculus*, with cultures of two strains of *Leishmania tropica* (one isolated from an exogenous human case in Texas, and the other a gerbil strain from the USSR). The mice were inoculated intradermally in five areas of the dorsal side of the body. Most of the inoculated mice developed visible cutaneous leishmaniasis. The early lesions at the sites of inoculation were small red papules appearing within one to two months following inoculation; some of these papules disappeared after a few weeks, others became nodular or pustular. These lesions gradually enlarged and became ulcerated, measuring about 5 to 10 mm in diameter, and some persisted as long as 386 days. The edges of the lesions were usually raised, indurated, and pink; the adjacent skin showed no visible reaction. The centre of the ulcer was either moist or covered with a dry brownish-grey crust. In a few cases the lesions were very extensive and merged with each other, covering nearly two thirds of the dorsal body surface. Smears from the edges of the lesions were positive for the amastigote (aflagellar) form of *L. tropica*, which produced infections when inoculated into other hairless mice and grew readily in promastigote (flagellar) form on NNP-2 medium (Packchanian, 1959) with suitable antibiotics (Packchanian, 1957). Although mice were inoculated intradermally with *L. tropica*, several animals with extensive skin lesions of cutaneous leishmaniasis also developed generalized leishmaniasis. This was proved by positive blood culture tests for promastigotes (from 15 mice) and by demonstration of the amastigote form of *L. tropica* in various organs such as the spleen, liver, kidney, heart and lymph nodes. On the other hand, heart blood from 18 mice with small skin lesions when tested during 62 to 269 days following infection, yielded negative results for promastigotes. The mice were kept under observation (60 to 478 days) before they were killed or died. The results of this study have demonstrated that the hairless mouse, *Mus musculus*, is a suitable laboratory animal for studying experimental cutaneous leishmaniasis.—Author's Summary

Thomsen, K. and Rothenborg, H. W. Clofazimine in the treatment of pyoderma gangrenosum. Arch. Dermatol. **115** (1979) 851–852.

Ten patients with pyoderma gangrenosum, seven female and three male, 25 to 94 years old, mainly with multiple lesions, have been treated with clofazimine, 100 mg three times daily. Associated disease was registered in three patients: diabetes mellitus, a previous adenocarcinoma of the colon treated by hemicolectomy, and pustulosis palmoplantaris. In a further patient, M-component was found in the serum. In seven cases the lesions were completely healed by two to five months of therapy, and in three cases the ulcers healed partially. Side effects were redness of the skin in seven cases and dryness of the skin in two patients. No hematological side effects occurred. The working mechanism is still obscure.—Authors' Summary