

CURRENT LITERATURE

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

General and Historical

Fang, D. [Review of research on the ancient history of leprosy in China.] *China Lepr. J.* 4 (1988) 35–37. (in Chinese)

Much research on the ancient history of leprosy in China has been made in the last 50 years. According to a vast amount of records about the status of this long-known disease, researchers have concluded that the disease, which Ran-Bainiu, one of Confucius' disciples, suffered from about 2500 years ago, was leprosy. The studies also found that the Lirenfang, founded in 556 A.D. by the Indian monk Narendraysas, was the earliest form of a leprosarium in China. Some of the researchers have dealt with the contributions of certain leprologists and special leprosy books in ancient China. The history of the treatment of leprosy using traditional Chinese medicine and the legal history of leprosy in China have also been in-

vestigated. Researchers have collected a large amount of material, including medical, historical, literary and philosophical works involving leprosy. Some of them were discovered through archaeological studies. Some aspects of Chinese leprosy history are still unknown and need further exploration.—Author's English Abstract

Lechat, M. F. Leprosy: the long hard road. *World Health Forum* 9 (1988) 69–71.

Although progress has been made against leprosy, the disease still exacts a savage toll. Research into all aspects of its control continues to be essential. There is a need to be perpetually aware of the danger that other problems could divert attention and resources from the fight to defeat this scourge.—Author's Abstract

Chemotherapy

Antia, N. H., Ambrose, E. J., Upleker, M. W., Mahadevan, P. R. and Mester, L. Effect of deoxyfructoserotonin (DFS) on lepromatous leprosy. *Lancet* 1 (1988) 619–622.

To examine the antileprosy effect of deoxyfructoserotonin the drug was given in a dose of 10 mg/kg for 6 months to six patients with active lepromatous leprosy, in accordance with the WHO-THELEP protocol. Clinical and histological assessment and mouse foot pad studies suggest that the drug has some antileprosy effect.—Authors' Summary

Chen, L., et al. [Effects of treatment of multibacillary leprosy with RFD, B663, and

DDS.] *China Lepr. J.* 2 (1987) 211–212. (in Chinese)

Good clinical and bacteriological effect was obtained in 45 cases of multibacillary leprosy treated with RFD, clofazimine (B663), and dapsone (DDS) for 1–2 years. The group, untreated in the past, showed clinical improvement more evident than the treated group, and their BI decreased by 1.3 in the first year and by 2.1 in the second year. The group treated with DDS or DDS plus RFD in the past showed that their BI decreased by 0.9 in the first year and by 0.8 in the second year. With the dose of B663 being only 300 mg a month less pigmentation occurred.—Authors' English Abstract

Gao, Q., et al. [Effect of three drug therapy of leprosy.] *China Lepr. J.* **2** (1987) 214–215. (in Chinese)

Thirty-four cases of multibacillary leprosy were treated with rifampin (RFP), clofazimine (B663), and dapsone (DDS) for 2 years. All of the patients showed good clinical results and no obvious side effect was seen. The skin lesions of 84.4% of the patients have subsided and their BI as an average has decreased by 1.8, but in those with BI originally less than 2.0 the decrease was slower. The therapy regimen was able to control type 2 reaction and nerve pain.—Authors' English Abstract

George, J., Balakrishnan, S. and Bhatia, V. N. Drug interaction during multidrug regimens for treatment of leprosy. *Indian J. Med. Res.* **87** (1988) 151–156.

The influence of concurrently administered rifampin and clofazimine on the metabolism of 4,4'-diaminodiphenyl sulfone (dapsone, DDS) has been studied in 30 subjects on multidrug regimens for treatment of leprosy. Plasma and urinary levels of drugs were determined on days 2, 8, and 15 after administration of the drug, while creatinine levels in urine were also determined to overcome the effect of diuresis. During concurrent administration of rifampin the plasma levels of DDS gradually fell from day 2 to day 15 of rifampin administration and the decrease was most significant on day 15. Clofazimine did not exert any such influence on DDS metabolism. A comparison of urine and plasma levels of DDS showed an inverse relationship between the plasma levels and urinary excretion of DDS during the course of treatment. The findings suggest that during concurrent administration of DDS and rifampin, the intake of DDS should be regular and uninterrupted.—Authors' Abstract

Grosset, J., Guelpa-Lauras, C.-C., Millan, J., Bodian, M. and Perani, E. with technical collaboration of Pichet, C. *Int. J. Dermatol.* **26** (1987) 436–437. [*M. leprae* resistance against dapsone and rifampicin; results of a survey carried out in the Cap-Verde region (Senegal).] *Med. Trop.* **47** (1987) 171–175. (in French)

Since 1983, primary resistance of *Mycobacterium leprae* to dapsone (DDS) and rifampin has been evaluated in new cases of lepromatous leprosy observed in the Cap-Verde region in Senegal. Out of the 13 strains isolated, 10 (77%) have been found resistant to DDS, 7 at low level, 1 at intermediate level, 1 at high level; all of them have been found sensitive to rifampin. Similar results have been obtained with 57 strains isolated from patients not yet treated coming from different geographical areas; 37 (65%) were resistant to DDS, 27 at low level, 5 at intermediate level, and 5 at high level; all of them were sensitive to rifampin.

The level of resistance to DDS is very different in the case of acquired resistance. In 69 lepromatous patients treated for more than 5 years and showing a relapse, *M. leprae* was 62 times (90%) resistant to DDS, 6 times at low level, 21 at intermediate level, and 35 at high level; in addition, 13 times *M. leprae* was resistant to rifampin.—Authors' English Summary

Lin, Z., et al. [Antileprosy effect of RFD (R-77-3) in the mouse foot pad technique.] *China Lepr. J.* **2** (1987) 232–234. (in Chinese)

Five cases of multibacillary leprosy were treated with 3-{[4-(cyclopentyl-1-piperazinyl) imino] methyl} rifamycin SV (RFD, R-77-3). The bactericidal effect of the drug before and after treatment was determined by the mouse foot pad technique. Two cases received 900 mg and the others 1200 mg of RFD under supervision. All of the bacilli derived from the patients before taking the drug were able to infect the C57BL/6N mice, and the number of bacilli increased by 11.3 to 80 times. The bacilli taken on the seventh day after treatment did not infect the mice and multiplied only slightly in three cases.—Authors' English Abstract

O'Sullivan, J. F., Conalty, M. L. and Morrison, N. E. Clofazimine analogues active against a clofazimine-resistant organism. *J. Med. Chem.* **31** (1988) 567–572.

Clofazimine analogs active against a strain of *Mycobacterium smegmatis* 607 made resistant to the antileprosy agent have been synthesized. Activity (i.e., $\leq 2 \mu\text{g/ml}$ caus-

ing complete inhibition of growth) requires that there be a basic nitrogen in the "rimino" side chain and that the spacer distance between this nitrogen and the imino nitrogen be at least three carbon atoms. The nitrogen may be primary, secondary, or tertiary and may be part of an open chain or enclosed in a ring compound. Provided that the criteria of basicity and spacer distance are satisfied, all are active *in vitro* against both the sensitive and resistant strains. Substitution elsewhere in the molecule had little effect on the activity. The compounds have been shown to have growth inhibitory activity against human-derived *M. leprae* in murine macrophages in culture.—Authors' Abstract

Pieters, F. A. J. M., Woonink, F. and Zuidema, J. Influence of once-monthly rifampicin and daily clofazimine on the pharmacokinetics of dapsone in leprosy patients in Nigeria. *Eur. J. Clin. Pharmacol.* **34** (1988) 73–76.

In leprosy patients in Nigeria the influence of daily clofazimine and of once-monthly rifampin on the pharmacokinetics of dapsone has been investigated. Three days after rifampin the elimination half-life of dapsone was reduced from 40.4 to 25.3 hr ($n = 23$). Correspondingly, the plasma dapsone 24 hr after the last dose had fallen significantly from 2.63 to 2.02 mg/l. Clofazimine did not cause change in the pharmacokinetics of dapsone. It was concluded that, although rifampin had a considerable influence on the pharmacokinetics of dapsone, there is no reason to adjust the dose of dapsone during multidrug therapy of leprosy.—Authors' Summary

Raghavia, M., Bansal, R. D., Srinivasa, D. K., Soudarssanane, M. B. and Ramana, G. Absenteeism in leprosy patients in a rural area in Tamil Nadu. *Indian J. Lepr.* **59** (1987) 322–329.

Of the 3382 leprosy patients taking treatment in Hemerijckx Rural Centre Area, 150 randomly selected patients, who were irregular for treatment, were matched with 150 patients who were regular for treatment, by age, sex and type of disease. The characteristics and the reasons for regularity/irregu-

larity in treatment of these 300 patients were studied. There were more lepromatous patients (20%) among regulars. A greater proportion of irregulars belonged to backward (54%) and scheduled castes (35%). The proportion of irregulars was more (32%) in the initial phase of the disease. There were more irregular patients among the illiterate group (61%). The knowledge of the irregular patients about early sign, causation, spread, curability and duration of treatment was found to be lacking. The clinic timing was unsuitable for 33% of irregular patients; 23% of irregulars experienced some intolerance to DDS. While 94% of regulars attended clinic in order that they may be "cured," 63% of irregulars stayed away because of "work."—Authors' Abstract

Rao, C. K. Drugs against leprosy. *World Health Forum* **9** (1988) 63–67.

Following the disappointing results obtained with dapsone monotherapy, a concerted effort is now being made in India to introduce multidrug therapy in a program aimed at the eradication of leprosy. Favorable reports have been received from the districts where it has so far been possible to adopt this approach, although long-term follow-up will be necessary before it can be proclaimed a success.—Author's Abstract

Salafia, A. and Kharkar, R. D. Lamprene (clofazimine) and its side effects. *Indian J. Lepr.* **59** (1987) 313–314.

The authors report three cases of temporary generalized lymphadenopathy directly related to Lamprene (clofazimine) consumption. It appears that this side effect has never been reported in the literature.—Authors' Abstract

Samuel, N. M., Samuel, S. and Adiga, R. B. Combined chemotherapy of multibacillary leprosy patients. *Jpn. J. Lepr.* **55** (1986) 65–71.

Three hundred eighty multibacillary leprosy patients were treated with combined chemotherapy at Anandaban leprosy hospital in Nepal. The drugs used were rifampin, dapsone, clofazimine, and Isoprodian. This treatment is modeled on the short-

course chemotherapy of tuberculosis. A remarkable clinical and bacteriological improvement was observed in all patients. Old patients treated with three drugs were bacteriologically negative after 24–32 months of treatment and new patients treated with three drugs were skin-smear positive even after 36 months of treatment. However, new patients who received five drugs showed marked clinical and bacteriological improvement. Discoloration caused by clofazimine did not lead to interruption of treatment. We found the drug regimens safe, effective, and economical.—Authors' Abstract

Samuel, N. M., Samuel, S. and Adiga, R. B. Treatment of paucibacillary leprosy patients with dapsone and rifampin. *Jpn. J. Lepr.* **54** (1985) 193–197.

Five hundred ninety paucibacillary patients have been administered multidrug therapy (MDT) since 1981. Except for 22, all patients were regular for treatment. Thirty-two patients developed complications during therapy. All patients responded well to treatment. In the smear-positive group, the regression of the lesions was relatively slow and the lesions persisted. Patients were followed up for 28 months. At 18 months of post-MDT follow up, 13% of smear-positive patients and 9% of smear-negative patients relapsed. An overall relapse rate was 10%.—Authors' Summary

Shen, W., et al. [Multidrug therapy of multibacillary leprosy for one year.] *China Lepr. J.* **2** (1987) 213–214. (in Chinese)

A total of 38 cases of multibacillary leprosy were treated with multidrug therapy for 1 year in Qingdao City; 27 cases were newly found patients and the other 11 were relapsed cases. The result of the treatment showed that the effective rate clinically was 86.8% and the BI average decrease was 41.1%. Such side effects as pigmentation and skin dryness were slight, and the functions of the liver and kidneys remained normal during treatment.—Authors' English Abstract

Smith, W. C. S. Are hypersensitivity reactions to dapsone becoming more frequent? *Lepr. Rev.* **59** (1988) 53–58.

Hypersensitivity reactions to dapsone, which were common in the late 1940s and early 1950s and then virtually disappeared, have now reappeared in the last 5–6 years. Review of the literature and a postal survey of centers using dapsone on a mass scale confirm that the reaction has reappeared. The explanation for this is unclear but may be related to the use of dapsone combined with other drugs. These reactions are rare and some centers treating large numbers of patients with dapsone have not experienced any cases. Dapsone must still be regarded as a safe preparation.—Author's Summary

Sreevatsa, Girdhar, B. K. and Desikan, K. V. Screening of drug resistant strains of *Mycobacterium leprae* in lepromatous leprosy patients under multidrug treatment. *Indian J. Med. Res.* **87** (1988) 139–143.

In view of the possibility of the emergence of resistant strains of *Mycobacterium leprae* to one or more drugs following multidrug therapy (MDT), 40 patients who were under different regimens of MDT were screened for resistant mutants at the end of 2 years of treatment. Six patients were found to harbor drug-sensitive persisters. None of the patients, however, showed bacterial strains resistant to any of the drugs used. It appears that the initial 6 months of MDT is effective against preventing drug resistance. However, the problem of persisters cannot be completely eliminated by MDT given even for 2 years.—Authors' Abstract

Subcommittee on Clinical Trials of the Chemotherapy of Leprosy (THELEP) Scientific Working Group of the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases. Characteristics of the multiplication of dapsone-resistant strains of *Mycobacterium leprae* in mice. *Lepr. Rev.* **59** (1988) 5–10.

Twenty-seven percent of the 49 strains of *Mycobacterium leprae* isolated in the course of the THELEP-controlled clinical trials of combined chemotherapy of lepromatous leprosy in Bamako and Chingleput, and found to be resistant to dapsone, multiplied in significantly fewer mice administered

dapsone than in mice administered the dapsone-free diet.—Authors' Summary

Zeis, B. M., Anderson, R. and O'Sullivan, J. F. Inhibition of mononuclear leukocyte transformation *in vitro* by dihydrophenazines in comparison to clofazimine. *Lepr. Rev.* **59** (1988) 31–35.

To identify the molecular structures of the antileprosy drug clofazimine which mediate its immunosuppressive activity, the effects of ten phenazine derivatives on phytohemagglutinin-stimulated mononuclear leukocyte (MNL) transformations were investigated. It was found that modifications in the substituent at position 2 of the dihydrophenazine moiety decreased the antiproliferative activity. The nature of the chemical group in position 2 also influenced the immunomodulatory effect of halogenation in the paraposition of the phenyl-rings and anilino-rings.—Authors' Summary

Zhao, Z., et al. [Analysis of 130 cases of relapsed leprosy.] *China Lepr. J.* **4** (1988) 9–11. (in Chinese)

One hundred thirty cured cases of leprosy have relapsed between 1976 to 1986 in 11 counties of Guangdong Province and 59.9% of the relapses occurred within 6 years following the cure, with a mean period of 5.8 years. There is no correlation between the duration of treatment and the time of relapse. There are six tuberculoid cases which have transformed into borderline and six cases of borderline into the lepromatous type after relapse. There are new deformities and aggravation of former disabilities in 11 and eight cases, respectively. The results showed that regular following-up must be continued for at least 6 years, and the patients have to be taught how to protect themselves from deformity and aggravation of disability.—Authors' English Abstract

Clinical Sciences

Aggarwal, S. K., Arora, P. N., Chattopadhyay, S. P. and Ramakrishnan, K. R. Primary involvement of sole in leprosy (a case report). *Indian J. Lepr.* **59** (1987) 472–473.

Involvement of the plantar aspect of the foot secondary to nerve involvement in leprosy manifesting as a neuropathic ulcer is not an uncommon manifestation of the disease. However, primary involvement of the sole has not so far been reported to the best of our knowledge. We, therefore, thought it worthwhile to report a case of tuberculoid leprosy which presented with a primary annular lesion on the sole of the left foot.—(From the Article)

Arora, S. K. and Mukhija, R. D. Malignant melanoma over the trophic ulcer. *Indian J. Lepr.* **59** (1987) 414–415.

Trophic ulcers are one of the common complications of leprosy causing a lot of distress and disability to patients. Occasionally there may be a carcinomatous

change in the trophic ulcer. Most of the reports mention the development of squamous cell carcinoma. We report here a case in whom malignant melanoma developed over the trophic ulcer.—(From the Article)

Balachandran, C., Srinivas, C. R., Singh, K. K. and Venugopal, N. Histiocytic lymphoma simulating lepromatous leprosy—a case report. *Indian J. Lepr.* **59** (1987) 332–333.

Histiocytic lymphomas are known to begin with skin lesions and remain localized to the skin for months or years before visceral involvement becomes evident. We report a case of nodular histiocytic lymphoma with clinical features simulating lepromatous leprosy.—Authors' Abstract

D'Souza, G. A., Jindal, S. K., Malik, S. K., Kumar, B. and Kaur, S. Airway response to aerosol inhalations in leprosy. *Indian J. Med. Res.* **87** (1988) 190–193.

To investigate the role of autonomic regulation of bronchial reactivity, airway responses to irritant (citric acid and hypertonic saline) and bronchoconstricting aerosols (methacholine) were measured in 20 patients of leprosy, as compared to healthy controls. Significant differences were found in lepromatous leprosy. Cough frequency to irritant aerosols was markedly diminished. There was bronchial hyporeactivity in leprosy as demonstrated by significantly high PD₂₀ methacholine (geometric mean, 115.1 ± 3.4 mg). Postganglionic vagal fiber involvement is suggested as a factor responsible for bronchial hyporeactivity.—Authors' Abstract

Fain, O., Leon, A., Gayraud, M. and Guilevin, L. [Effectiveness of plasma exchanges in a leprotic erythema nodosum.] *Presse Med.* **17** (1988) 210–211. (in French)

Manifestation classique de la lèpre lépromateuse, l'érythème noueux lépreux (ENL) s'accompagne d'une altération de l'état général et parfois de manifestations viscérales: arthrite, iridocyclite, orchépididymite, névrite, glomérulopathie. En dehors des thérapeutiques classiques, corticoïdes, clofazimine, thalidomide, colchicine, les échanges plasmatiques (EP) ont été proposés. Nous rapportons une nouvelle observation de régression d'un ENL grâce à une courte séquence d'EP introduite devant l'échec des traitements conventionnels.—Authors' Abstract

Guha, P. K., Pandey, S. S. and Singh, G. Sporotrichoid nerve abscess. *Indian J. Lepr.* **59** (1987) 469–471.

An unusual presentation of a BT leprosy patient with multiple nerve abscesses and an approach to the diagnosis and management of the problem has been described. The article will refamiliarize the reader with the unusual nature of the presentation, diagnosis and management of nerve abscess associated with leprosy.—Authors' Abstract

Hoffman, V. N. and Korzeniowski, O. M. Leprosy, hypercalcemia, and elevated serum calcitriol levels. *Ann. Intern. Med.* **105** (1986) 890–891.

Hypercalcemia in granulomatous diseases is thought to result from production of calcitriol by granulomas, as has been previously demonstrated for sarcoidosis. The authors describe a female patient with possible rheumatoid arthritis and (genuine) leprosy, who had raised serum calcium and calcitriol levels. Her hypercalcemia was suppressed by prednisone treatment. [However, the case is very confused: her arthritis might have been due to leprosy rather than rheumatoid disease; her previous steroid history is not fully described; finally, the type of leprosy she had is not made clear.]—(S. B. Lucas in *Trop. Dis. Bull.*)

Koranne, V. and Srivastava, G. Lipomeningocoele masquerading as leprosy trophic ulcers. *Indian J. Lepr.* **59** (1987) 450–451.

Trophic ulcers over both feet in a 24-year-old male were initially diagnosed as of leprosy etiology. However detailed investigations revealed spina bifida and lipomeningocoele over the sacral region. The importance of thorough neurological investigations in such cases is stressed to avoid misdiagnosis of leprosy.—Authors' Abstract

Lu, B., et al. [Survey of eye diseases in leprosy patients in Huiyang Prefecture, Guangdong Province.] *China Lepr. J.* **2** (1987) 218–220. (in Chinese)

Three hundred thirty-nine cases with eye diseases were found among 443 leprosy patients living in leproseries. This accounted for 90.07%. The longer the duration of leprosy, the more severe the eye diseases. Multibacillary patients have more lesions of the eye, among which the loss of eyebrows and lashes, conjunctivitis, and turbid lenses are the most common. Paralytic lagophthalmos and iridocyclitis are considered as the most common cause of blindness and, therefore, the emphasis on controlling eye diseases in leprosy patients should be placed on them.—Authors' English Abstract

Mishra, B., Girdhar, A., Husain, S., Malaviya, G. N. and Girdhar, B. K. A borderline leprosy lesion on the palate: a case report. *Lepr. Rev.* **59** (1988) 71–74.

A patient with borderline tuberculoid leprosy was found to have involvement of hard palate which was histologically compatible with borderline leprosy (BB) in reaction. The possible modes of involvement of palate are discussed.—Authors' Summary

Pavithran, K. Sparing of leprosy macule in ampicillin hypersensitivity rash. *Indian J. Lepr.* **59** (1987) 309–312.

A case of tuberculoid leprosy is reported in a middle-aged female, who presented with generalized erythematous maculopapular rash which followed ampicillin therapy. In spite of extensive and severe involvement of the skin all over the body by erythema and rash, the hypopigmented patch of leprosy on the face did not show any erythema or rash and stood out more clearly as an island of pale area in the midst of a large area of erythema on the face. The possible mechanism of nondevelopment of erythema and rash in the patch is discussed.—Author's Abstract

Prasad, H. V., Balakrishnan, S., Dhanda-yuthapani, S., Bai, G. L. and Bhatia, V. N. LDH profile in an unusual case of borderline leprosy in reaction associated with portal hypertension. *Indian J. Lepr.* **59** (1987) 272–276.

The association of leprosy in reaction with portal hypertension is quite unusual. Herein is presented a report on the clinical status and biochemical studies done in a case of leprosy in reaction associated with portal hypertension.—(From the Article)

Rajan, M. A., Soundararajan, R., Krishnamurthy, V. and Ramu, G. Acute renal failure following rifampicin. *Indian J. Lepr.* **59** (1987) 286–292.

Three cases of renal toxicity due to rifampin are reported. All cases recovered following therapy, two required hemodialysis. It is important that cases on rifampin be monitored for renal toxicity and appropriate measures taken in time to prevent a fatal outcome, if detected.—Authors' Abstract

Ramachandran, A. and Neelan, P. N. Autonomic neuropathy in leprosy. *Indian J. Lepr.* **59** (1987) 277–285.

Twenty-one patients with borderline lepromatous and lepromatous leprosy of both sexes were taken for study after exclusion of autonomic disorders. Autonomic functions pertaining to the cardiovascular and genital systems were carried out. Five healthy volunteers served as controls. Autonomic function tests indicate definite involvement of the cardiovascular and genital systems. The incidence of autonomic neuropathy in the 21 patients studied ranged from 14.3% to 57% for various tests. There is involvement of the parasympathetic system (vagus nerve) which occurred early and was more common than involvement of the sympathetic system. The sympathetic damage is always associated with parasympathetic damage. The severity of autonomic neuropathy was found to be highest in leprosy of longer duration. Autonomic neuropathy occurs widely in leprosy as it does in diabetes mellitus.—Authors' Abstract

Rao, K. S., Kumar, M., Oommen, P. K., Siddalinga Swamy, M. K. and Selvaganapathy, S. Collagen sheet and its usefulness in healing of ulcers in leprosy patients. *Indian J. Lepr.* **59** (1987) 435–441.

Collagen is a natural tissue present in the body. For healing of any part collagen is essential. Collagen has been made available in the form of sheets for clinical use by the Central Leather Research Institute, Adyar, Madras. It has been tried in burns and ulcers. Plantar ulcers are common in leprosy and pose a problem in healing. Therefore, collagen was tried in our Institute on 75 patients having plantar ulcers, other types of ulcers like stasis ulcers and postoperative wounds. It has been found from our study that collagen sheet hastens the healing of wounds.—Authors' Abstract

Ryzen, E., Rea, T. H. and Singer, F. R. Hypercalcemia and abnormal 1,25-dihydroxyvitamin D concentrations in leprosy. *Am. J. Med.* **84** (1988) 325–329.

Two patients with lepromatous leprosy and hypercalcemia are presented. Serum immunoreactive parathyroid hormone and urinary cyclic adenosine monophosphate concentrations were suppressed. Serum 1,25-dihydroxyvitamin D [1,25-(OH)₂D] concentrations were elevated in one patient

and normal in the other. Urinary hydroxyproline excretion was slightly high in both patients. Hypercalcemia resolved with prednisone therapy. Abnormal 1,25-(OH)₂D production and/or metabolism may play a role in the pathogenesis of hypercalcemia in some patients with leprosy.—Authors' Abstract

Sadhu, S. K. and Panja, R. K. Subpolar tuberculoid leprosy. *Indian J. Lepr.* **59** (1987) 263–271.

The existence of subpolar tuberculoid leprosy was postulated by a few leprologists to explain clinical variations near the tuberculoid pole but they failed to precisely identify the same. An attempt has been made to describe the clinical and histological features of subpolar tuberculoid leprosy. Seventy-six cases of the TT-BT range according to Ridley-Jopling classification were examined by detailed clinical, histological, and immunological methods. Definite clinical and histological discrepancies from either BT or TTp were seen in 30 (39.4%) cases, confirming the existence of subpolar tuberculoid leprosy (TTs) and thus clarifying the immunological spectrum of leprosy.—Authors' Abstract

Singh, G., Dutta, R. K., Tutakne, M. A. and Tiwari, V. D. Leprosy with pellagroid features (a case report). *Indian J. Lepr.* **59** (1987) 330–331.

A case of leprosy with pellagroid features is presented. The diagnosis of leprosy was confirmed by bacteriological and histopathological examination. A therapeutic trial with nicotinic acid did not result in any improvement. The occurrence of scaling in leprosy is discussed.—Authors' Abstract

Singh, M., Kaur, S., Kumar, B., Kaur, I. and Sharma, V. K. The associated diseases with leprosy. *Indian J. Lepr.* **59** (1987) 315–321.

The prevalence of cutaneous, medical, and surgical disorders was studied in 846 leprosy patients. Common cutaneous disorders among leprosy patients were pityriasis versicolor, tinea, pyodermas, warts, acquired ichthyosis, scabies, pediculosis, and callosities. Only pityriasis versicolor had a higher

incidence when compared to the general population. Common medical diseases were tuberculosis, infectious hepatitis, and diabetes mellitus. The epidemiological importance of their co-existence with leprosy is discussed, and the relevant literature of other diseases found to be frequently associated with leprosy is reviewed.—Authors' Abstract

Sviridov, B. G., et al. [Treatment of patients with temporomandibular joint pathology developing in lepromatous leprosy.] *Stomatologiya (Mosk.)* **66** (1987) 41–43. (in Russian)

A total of 142 patients with leprosy-induced injuries to the temporomandibular articulation were treated. The therapy depended on the duration and clinical picture of the disease. In the test group the patients received diuciphon, while the control patients were given conventional sulfone drugs. The local treatment of the temporomandibular articulation in both groups was identical. The results of the therapy proved considerably better in the test patients.—Authors' English Summary

Takizawa, H. and Kobayashi, S. Twenty years observation of lepromin reaction (Mitsuda antigen) in leprosy patients. *Jpn. J. Lepr.* **55** (1986) 72–76. (in Japanese)

Positivity of lepromin reaction (LR) was often said to be increased after leprosy skin lesions were improved by chemotherapy. But there were no special reports dealing with long term observation of LR in the same patients. This study in Kuryu-Rakusen concerned the 248 inpatients whose clinical records were relatively complete and who were followed for more than 20 years. And the LR by standard Mitsuda antigen was tested covering 20 years (every year between 1975 and 1969 and each other year between 1970 and 1977). The following results were obtained: Thirty-three tuberculoid patients showed slight increases in LR during these 20 years ($r = 0.58$).

There were also slight increases in lepromatous patients during these 20 years ($p < 0.05$). Three groups were divided in relation to the bacteriological status in 1957 and 1977. A very few patients in the group,

who were bacteria-positive in 1957 and same in 1977, gave over 7 mm in LR in 1977. But the other two lepromatous groups indicated significant increases in LR in 1977 ($p < 0.05$); one of the two groups was bacteria-positive in 1957 and bacteria-negative in 1977, and another was bacteria-negative in 1957 and same in 1977. There was no significant relation between bacteria-negative time and LR in 1977 ($r = 0.288$), but there was significant increase of positivity in LR of the group which showed over 16 years in bacteria-negative time. However, we must give attention to the six lepromatous cases with negative LR whose bacteria-negative time was over 16 years. The lepromatous patients with over 7 mm LR in 1977 could be said to have eyebrows and to have no episodes of ENL ($p < 0.01$). It seems that these patients may have the element of borderline leprosy. The lepromatous patients, who were bacteria-negative and over 7 mm in LR, had few relapses with skin lesions or without skin lesions. Erickson reported subclinical relapse in 1951. It is considered that our relapse cases without skin lesions were subclinical, because these cases had no real relapses. The relapses with skin lesions were found within 3 years. It could be said that the quiescent lepromatous patients with over 7 mm in LR will have no episode of relapse after 3 years ($p < 0.01$).—Authors' English Abstract

Valencia, L. B. Leprosy—as seen by the patients. *World Health Forum* 9 (1988) 59–62.

Observations made in The Philippines suggest that intensive studies on the social aspects of leprosy would result in improved control programs in areas where the disease is endemic.—Author's Abstract

Vázquez-Botet, M. and Sánchez, J. L. Erythema nodosum leprosum. *Int. J. Dermatol.* 26 (1987) 436–437.

In our view, erythema nodosum leprosum (ENL) is not a uniform reaction, but its manifestations appear to be influenced by ethnic factors and the immunologic status of the patient. The immune-complex pathogenesis of ENL has been the most at-

tractive hypothesis during most of the years. However, the data accumulated during the last years regarding the role of cell-mediated immune response in the pathogenesis of ENL, either directly or by permitting production of an antibody critical to the formation of the immune response, permit us to conclude that both forms of immunity play a significant role in its pathogenesis.—(From Authors' Conclusion)

Yebra Sotillo, I., Castilla Garrido, J. M., Jimenez-Castellanos Ballesteros, R., Sotillo Gago, I. and Camacho Martinez, F. [Electromyography; a valuable method for the early diagnosis of the peripheral neuropathy of leprosy.] *Actas Dermosifiliogr.* 78 (1987) 737–741. (in Spanish)

The later evolution of Hansen's disease is conditioned by the tendency of *Mycobacterium leprae* to invade the peripheral nervous system. The authors have used electromyography (EMG) as a means to detect leprosy's peripheral neuropathy, and recommend this method for early diagnosis.—Authors' English Summary

Zhou, D., et al. [On suicide among leprosy patients.] *China Lepr. J.* 2 (1987) 240–243. (in Chinese)

An investigation was made of the suicide incidence among leprosy patients in relation to that of the general population in Baoying County, Jiangsu Province. The suicide rate is 13.6 per 100,000 in the general population and 1484.2 per 100,000 among leprosy patients. The leprosy patients commit suicide chiefly by hanging themselves, taking poison, or drowning themselves in a river. The suicide rate in men and in active patients is higher than that in women and in cured cases, increasing with age. The suicide rate of leprosy patients in villages far from towns is more frequent, and usually occurs 10 to 14 years after the onset of the disease. Social discrimination against leprosy patients plays an important role as a cause of suicide. Therefore, efforts to mitigate discrimination and misunderstanding of leprosy through public education are urgently needed for the somatopsychic health of leprosy patients.—Authors' English Abstract

Immuno-Pathology

Baumgart, K., Britton, W., Basten, A. and Bagshawe, A. Use of phenolic glycolipid 1 for serodiagnosis of leprosy in a high prevalence village in Papua New Guinea. *Trans. R. Soc. Trop. Med.* **81** (1987) 1030–1032.

This study reports on the usefulness of an IgM phenolic glycolipid-I (PGL-I) ELISA for serodiagnosis of leprosy in the first year of a prospective longitudinal community survey in a high (8.8%) prevalence village in Papua New Guinea. The IgM PGL-I ELISA had limited value as a screening method for detection of new cases. Many normal persons, particularly children, had elevated IgM anti-PGL-I antibodies, presumably a consequence of early subclinical infection.—Authors' Abstract

Bhatia, V. N., Rao, S. and Saraswathi, G. Auramine staining in histopathology sections. *Indian J. Lepr.* **59** (1987) 386–389.

Auramine staining was done on 65 histopathological sections from different types of treated leprosy cases which were negative by Fite-Faraco stain. All the sections except one showed auramine-positive organisms. The organisms were mostly coccoid except in BL/LL cases where beaded bacilli could be seen.—Authors' Abstract

Booth, R. J., Harris, D. P., Love, J. M. and Watson, J. P. Antigenic proteins of *Mycobacterium leprae*; complete sequence of the gene for the 18-kDa protein. *J. Immunol.* **140** (1988) 597–601.

Recombinant clones expressing antigenic determinants of the 18-kDa protein antigen from *Mycobacterium leprae* recognized by the L5 monoclonal antibody were isolated from a λ gt11 expression library and their nucleotide sequences determined. All clones expressed the *M. leprae*-specific determinant as part of a large fusion protein with *Escherichia coli* β -galactosidase. The deduced amino-acid sequence of the coding region indicated that all the λ gt11 recombinant clones contained an incomplete *M. leprae* gene sequence representing the carboxy-terminal two-thirds (111 amino acids)

of the 18-kDa gene and coding for a peptide of molecular weight (m.w.) 12,432. Subsequent isolation and sequencing of a 3.2kb *Bam*HI-*Pst*I DNA fragment from a genomic *M. leprae* cosmid library permitted the deduction of the complete 148 amino-acid sequence with a predicted m.w. of 16,607.

A second open reading frame 560 bases downstream from the 18-kDa coding sequence was found to code for a putative protein of 137 amino acids (m.w. = 15,196). Neither this nor the 18-kDa amino-acid sequence displayed any significant homologies with any proteins in the GENBANK, EMBL, or NBRF data bases.

Crude lysates from recombinant λ gt11 clones expressing part of the 18-kDa protein have been reported to stimulate the proliferation of some *M. leprae*-specific helper T-cell clones. Thus, it is significant that the complete 18-kDa sequence contains five short peptides predicted to be possible helper T-cell antigenic epitopes based on their propensity to form amphipathic helices. Although three of these occur within the 111 amino-acid carboxy-terminal peptide expressed by λ gt11 clones, the most highly amphipathic peptide is found in the amino-terminal region not present in the λ gt11 recombinants.—Authors' Abstract

Britton, W. J., Garsia, R. J. and Basten, A. The serological response to the phenolic glycolipid of *Mycobacterium leprae* in Australian and Nepali leprosy patients. *Aust. N.Z. J. Med.* **17** (1987) 568–573.

Antibodies to the species-specific phenolic glycolipid (PGL-I) of *Mycobacterium leprae* and a crude *M. leprae* sonicate were measured by ELISA in sera from newly diagnosed and treated leprosy patients from Sydney and Nepal. IgM anti-PGL-I antibodies were present in 88–90% of untreated patients at the lepromatous pole of the clinical spectrum and 35–55% of those at the tuberculoid pole. In treated patients with either form of the disease, IgM anti-PGL-I antibodies were within the normal range or minimally elevated. In contrast, high levels of IgG anti-PGL-I antibodies were detected

in both treated and untreated patients. Neither IgM nor IgG anti-PGL-I antibodies were elevated in sera from Mantoux-negative controls and only 1 out of 15 sera from patients with untreated tuberculosis contained significant amounts of antibody. Comparison of the data from the anti-PGL-I assay with the antibody response to a crude *M. leprae* sonicate revealed that the latter assay yielded more variable results and discriminated less well between lepromatous and tuberculoid subjects and between untreated patients and those on therapy. Thus, the IgM anti-PGL-I response signifies the presence of active disease, particularly in multibacillary cases, and has the potential to be used not only to monitor the response of these patients to therapy, but also to detect subclinical leprosy in high-risk groups such as the relatives of patients with lepromatous disease.—Authors' Abstract

Britton, W. J., Hellqvist, L., Garsia, R. J. and Basten, A. Antigens of *Mycobacterium leprae* identified by immunoprecipitation with sera from leprosy and tuberculosis patients. *Clin. Exp. Immunol.* **71** (1988) 394–398.

Mycobacterial antigens which react with human B lymphocytes were investigated by immunoprecipitation of radiolabeled sonicates of *Mycobacterium leprae* and *M. bovis* (BCG) with sera from patients with leprosy and tuberculosis in the presence of *Staphylococcus aureus*. SDS-PAGE analysis of the immunoprecipitates demonstrated that dense bands of M_r 12,000 (12K), 15K, 27K, 32–33K, 36K and 48K were the major antigens of *M. leprae* recognized by antibodies in lepromatous leprosy sera. Of these, only the 15–16K band reacted significantly with sera from patients with tuberculoid leprosy and tuberculosis. Other antigens including the T cell immunogens of M_r 18K and 70K reacted with some of the BL/LL sera tested. There were differences in the pattern of antigens precipitated from BCG sonicate by leprosy sera with the 65K antigen and a high molecular weight band (>94K) being readily detected. These results differ in part to those obtained by probing immunoblots of *M. leprae* sonicate with leprosy sera. Factors contributing to these differences are discussed.—Authors' Summary

Douglas, J. T., Wu, Q. X., Agustin, G. P. and Madarang, M. G. Evaluation of inexpensive blocking agents for ELISA in the detection of antibody in leprosy. *Lepr. Rev.* **59** (1988) 37–43.

In leprosy research, ELISA is currently being used to quantitate antibody concentrations in leprosy patients and their contacts. The advent of *Mycobacterium leprae*-specific synthetic antigens has tremendously increased the sensitivity and specificity of the detection system being used. It allows researchers to monitor the effectiveness of chemotherapy and also permits early detection of lepromatous patients likely to spread the disease and those contacts who have contracted it. The use of this detection system has now gained popularity among researchers in various countries throughout the world. However, its use in some countries is still being hampered by availability and high costs of reagents, particularly, blocking agents. We compared five blocking agents commonly used and found 10% skimmed milk or nonfat dry milk to be the most suitable. It is as effective a blocking agent as those popularly used. It did not adversely affect the pattern of the ELISA response expected of high and moderate reacting sera. It is relatively inexpensive compared to bovine serum albumin (BSA) or normal goat serum (NGS), readily available (it can be purchased at local grocery stores), stable at room temperature and very simple to prepare.—Authors' Summary

González-Amaro, R., Salazar-González, J. F., Baranda, L., Abud-Mendoza, C., Moncada, B., Garcia, R. and Alcocer-Varela, J. Evidence of cell-mediated immune contrasuppression in lepromatous leprosy: modulation of a putative T contrasuppressor cell-subset. *Clin. Exp. Immunol.* **71** (1988) 399–404.

Some lepromatous leprosy (LL) patients are characterized by the presence of activated suppressor T cells that specifically inhibit the immune response to *Mycobacterium leprae* antigens. Immune contrasuppressor (CS) cell activity antagonizes suppressor function. Whereas the former function has been extensively studied in leprosy, the latter has not been explored. We

studied the peripheral blood mononuclear cells (PBMNC) of 20 patients with leprosy (10 lepromatous and 10 tuberculoid) and 6 healthy contacts. We found CS-like activity in the PBMNC from some LL patients when assayed *in vitro* using lepromin as antigen. This CS-like function was found in CD8⁺, vicia villosa adherent (VV⁺) T cells. CS-like activity was not detected in PBMNC from either tuberculoid patients or healthy contacts. Pre-treatment of CD8⁺, VV⁺ cells with either recombinant IL-2 (5 U/ml) or recombinant interferon-gamma (1000 U/ml) did not modify significantly their putative CS function. However, in 50% of lepromatous patients the pre-incubation of CD8⁺, VV⁺ cells with both lymphokines together increased significantly the CS-like activity. These data suggest that the *in vitro* immune response to *M. leprae* in some LL patients can be augmented by either modifying numerically the contrasuppressor T cells or activating them with lymphokines.—Authors' Summary

Jeevan, A. and Asherson, G. L. Recombinant interleukin-2 limits the replication of *Mycobacterium lepraemurium* and *Mycobacterium bovis* BCG in mice. *Infect. Immun.* **56** (1988) 660–664.

BALB/c mice were infected with *Mycobacterium lepraemurium* in the foot pad or with *M. bovis* BCG intravenously with 5×10^7 bacilli. Recombinant interleukin-2 (IL-2) was injected intraperitoneally as a single dose (20,000 U), as a single course of five injections (400 U each), or as a 6-month course starting 3 days after the *M. lepraemurium* infection. BCG-infected mice received a single dose (1000 U) or five daily injections of 100 or 1000 U each. IL-2 significantly reduced the total bacterial counts in the foot pad, lymph nodes, and liver of *M. lepraemurium*-infected mice (50% to 85%) by 6 months and viable counts in the spleen (30% to 50%) by 60 days after BCG infection. The courses of IL-2 started at 60 days were more effective than those started at 3 days after *M. lepraemurium* infection ($p < 0.05$ to 0.001), and for BCG, 100 U of IL-2 was better than 1000 U ($p < 0.05$ to 0.01). These results indicate that IL-2 limits mycobacterial infections in mice, and

raise the question of its possible use in humans.—Authors' Abstract

Kumar, R. Mast cells in histoid lepromatous lesions. *Indian J. Lepr.* **59** (1987) 390–392.

Ten patients with histoid lesions among the lepromatous leprosy cases, of both sexes in the age group of 35–65 years, were included in this study. Skin biopsy from the nodule with surrounding healthy skin of histoid lesion was taken. The biopsies were fixed in susa solution and processed for light microscopy; 5–7 μ -thick sections were cut and stained with hematoxylin and eosin, toluidine blue and Fite-Faraco. Observations were made on the dermis to locate the mast cells and bacilli. Proliferation of mast cells and their degranulation was seen in the histoid nodule as compared to surrounding normal healthy skin where the cells were mainly intact. The study further investigates the role of mast cells in the histopathogenesis of the disease.—Author's Abstract

Lamb, F. I., Kingston, A. E., Estrada-G., I. and Colston, M. J. Heterologous expression of the 65-kilodalton antigen of *Mycobacterium leprae* and murine T-cell responses to the gene product. *Infect. Immun.* **56** (1988) 1237–1241.

The gene encoding the immunodominant 65-kilodalton antigen of *Mycobacterium leprae* was subcloned from a lambda gt11 clone into the high-copy-number plasmid pUC8. *Escherichia coli* containing these recombinants produced large amounts of the antigen, which was purified by polyacrylamide gel electrophoresis in the presence of urea. The ability of *E. coli* to recognize the mycobacterial promoter was confirmed by constructing additional clones in which the gene is flanked by transcriptional terminators from phage fd. A similar approach was used to demonstrate the expression of this gene in *Streptomyces lividans*. Mice immunized with killed *M. leprae* showed cell-mediated immune reactivity to the purified 65-kilodalton protein which stimulated both *in vitro* lymphoproliferative and *in vivo* delayed-type hypersensitivity responses.—Authors' Abstract

Lyons, N. F., Shannon, E. J., Ellis, B. P. B. and Naafs, B. Association of IgG and IgM antibodies to phenolic glycolipid-I antigen of *Mycobacterium leprae* with disease parameters in multibacillary leprosy patients. *Lepr. Rev.* **59** (1988) 45–52.

IgG and IgM antibodies to the phenolic glycolipid-I (PGL-I) antigen of *Mycobacterium leprae* were assessed using an enzyme-linked immunosorbent assay (ELISA) in 77 multibacillary leprosy patients. No correlations were found when their absorbance values were compared to: disease type and duration, bacillary load, reactional status, or concurrent secondary infection. A statistical difference was seen between patients with and without neurological deficiency.—Authors' Summary

Melancon-Kaplan, J., Hunter, S. W., McNeil, M., Stewart, C., Modlin, R. L., Rea, T. H., Convit, J., Salgame, P., Mehra V., Bloom, B. R. and Brennan, P. J. Immunological significance of *Mycobacterium leprae* cell walls. *Proc. Natl. Acad. Sci. U.S.A.* **85** (1988) 1917–1921.

Cell walls of *Mycobacterium leprae*, prepared by differential solvent extraction, were shown to contain arabinogalactan, mycolates, and peptidoglycan. In addition, amino-acid analysis revealed the unexpected presence of large amounts of protein that retained potent immunological reactivity. Purified cell walls stimulated proliferation of T cells from tuberculoid, but not from lepromatous leprosy, patients and elicited delayed-type hypersensitivity skin reactions in guinea pigs and patients sensitized to *M. leprae*. Analysis of the precursor frequency of antigen-reactive human peripheral T cells revealed that as many cells ($\approx 1/6000$) proliferate to antigen contained in cell walls as to intact *M. leprae*. Sequential removal of mycolates and arabinogalactan resulted in a large peptidoglycan-protein complex that retained all the immunological activity. This immunological reactivity and the inherent protein were destroyed by proteolysis. Thus, cell-wall protein is a major contributor to cell-mediated immune reactivity to this pathogenic mycobacterium.—Authors' Abstract

Mittal, A. and Nath, I. Human T cell proliferative responses to particulate microbial antigens are supported by populations enriched in dendritic cells. *Clin. Exp. Immunol.* **69** (1987) 611–617.

The efficacy of dendritic cells in antigen presentation was studied in eight healthy subjects using a lymphoproliferation assay. Both particulate (*Mycobacterium leprae*, H37Ra) and soluble (PPD, tetanus toxoid) bacterial antigens were used as stimulants over a concentration range of accessory cells (monocytes (MO) and dendritic cells (DC)) varying from 10% to 0.1% in co-cultures using T-enriched cells. In general, co-cultures with T+MO and T+DC at all concentrations of accessory cells showed significant improvement of antigen-induced lymphoproliferation over PBMC cultures. The improvement in $\Delta c t / \text{min}$ of T+DC co-cultures as compared to T+MO with parallel concentrations of accessory cells ($p < 0.05$ to < 0.01) was significant. Of the bacterial antigens used to test the antigen-presenting ability of DC, the particulate antigen (H37Ra) showed the most impressive improvement (380%) of T-cell proliferation in DC reconstituted cultures as compared to monocytes. PPD, soluble protein derived from a similar tuberculosis strain of mycobacteria, was not presented as effectively as the particulate equivalent even though the donors of the appropriate cell combinations showed skin test reactivity to this antigen.—Authors' Summary

Modlin, R. L., Melancon-Kaplan, J., Young, S. M. M., Pirmez, C., Kino, H., Convit, J., Rea, T. H. and Bloom, B. R. Learning from lesions: patterns of tissue inflammation in leprosy. *Proc. Natl. Acad. Sci. U.S.A.* **85** (1988) 1213–1217.

The clinical forms of leprosy constitute a spectrum that correlates closely with the degree of cell-mediated immunity. Patients with tuberculoid leprosy develop strong cell-mediated responses and have only a few, localized lesions; whereas patients with multibacillary lepromatous leprosy are specifically unresponsive to antigens of *Mycobacterium leprae*. T cells of the CD4+ subset predominate in tuberculoid lesions;

whereas CD8+ cells predominate in lepromatous lesions. Monoclonal antibodies that distinguish subpopulations of CD4+ and CD8+ cells were used to analyze the distribution of T cells infiltrating lesions across the disease spectrum. In lepromatous lesions, T cells of T-suppressor phenotype (9.3⁻) were the predominant CD8+ cells and suppressor/inducer cells (2H4+, Leu-8+) represented half of the CD4+ subset. In tuberculoid lesions, helper T cells (CD4+ 4B4+) outnumbered suppressor/inducer T cells by 14:1, compared with a ratio of 1.2:1 in peripheral blood. Analysis of the precursor frequency of antigen-reactive T cells permitted us to estimate that there was a 100-fold enrichment of T cells able to proliferate in response to *M. leprae* antigens in tuberculoid lesions (2/100), when compared with blood from the same patients. The methods used here to characterize the T-lymphocyte subsets and frequency of antigen-reactive T cells in leprosy may be useful in analyzing immunological reactions occurring in lesions of other inflammatory and autoimmune diseases.—Authors' Abstract

Mshana, R. N., Hastings, R. C. and Krahenbuhl, J. L. Infection with live mycobacteria inhibits *in vitro* detection of Ia antigen on macrophages. *Immunobiol.* **177** (1988) 40–54.

Both antigen-specific and nonspecific anergy are common features of disseminated mycobacterial infections, and the pathogenesis of such anergy is as yet not fully understood. To date, most studies have focused on the efferent limb of the immune response, and no detailed information is available on the early macrophage-T cell interaction and its consequence on T-cell clonal proliferation. To gain information on this crucial phase of mycobacteriosis, we have conducted studies to evaluate the effect of *Mycobacterium kansasii* infection on Ia expression induced by T-cell-derived lymphokine and have assessed whether such cells can adequately present either mycobacterial or allogeneic antigens to T cells.

In vitro infection of mouse resident peritoneal macrophages with live but not heat-killed *M. kansasii* resulted in a significantly reduced percentage of cells expressing monoclonal antibody detectable Ia antigen

following optimal stimulation with crude lymphokine preparations or recombinant mouse gamma interferon. In parallel experiments, macrophages infected with the mycobacteria were co-cultured with syngeneic *in vivo M. kansasii* sensitized nonadherent, nylon-wool purified lymph node cells, and lymphoproliferation was measured by ³[H]-thymidine incorporation. It was shown that in co-cultures with macrophages infected with live *M. kansasii*, the lymphocyte proliferation was marked even in very low infection ratios. In contrast, the response to heat-killed bacilli was dose dependent, reaching peak levels only in high infection ratios. The ability of infected macrophages to present allogeneic antigens was assessed using the mixed leukocyte reaction. Macrophages infected with heat-killed *M. kansasii* were able to induce a mixed leukocyte reaction similar to uninfected macrophages; whereas macrophages infected with live *M. kansasii* were unable to stimulate allogeneic T cells.

These findings may have implications on immunological disturbances often seen in mycobacterial infections, such as leprosy, in which there can be large numbers of non-toxic, viable intracellular bacilli.—Authors' Abstract

Narayanan, R. B. Immunopathology of leprosy granulomas—current status: a review. *Lepr. Rev.* **59** (1988) 75–82.

The nature and characteristics of infiltrating cells in leprosy granulomas have been elucidated. It has been possible to understand some of the features of antigen-presenting cells like macrophages and LC in these lesions. In particular, the lack of expression of Ia-like antigens by epithelioid cells *in situ* and in experimental mycobacterial granulomas could suggest that these cells may not be involved in antigen presentation. More interestingly, macrophages from lepromatous granuloma express abundant Ia-like antigens and therefore may possess the ability to present antigen. Incidentally, a large proportion of these macrophages were adherent to a plastic surface. It is known that adherent cells are involved in antigen presentation. Nonreactional lepromatous lesions contain only occasional positive T lymphocytes while during reactional phase,

there was an influx of large numbers of T lymphocytes. Recent attempts to isolate the cells from the dermal granulomas have proved to be successful and have given a way for studying functional characteristics of lesional cells. With these available facts, it is hoped that an investigation along the following lines will be possible in the future: a) mechanism leading to lymphocyte deficit in lepromatous granulomas; b) to clone the T4+ and T8+ cells from lesions and to assess their characteristics; c) to study the characteristics of lesional macrophages and their products; and d) role of Langerhans' cells and T6+ cells in the development of leprosy lesions.—Author's Conclusions

Paksoy, N. Indeterminate leprosy: a clinical and histopathological evaluation. *Indian J. Lepr.* **59** (1987) 399–404.

Twenty-seven histologically confirmed, indeterminate leprosy cases were evaluated clinically and histopathologically at the SLR & TC, Karigiri, South India, in 1985. The main clinical finding was a single or multiple (up to 3) patches. This was found in 25 (92%) of 27 cases. Only 2 cases showed an area of anesthesia without any skin lesion. Loss of sensation was present in 22 cases (81%). Histologically all cases (100%) showed lymphohistiocytic infiltration around the dermal structures and around/in the dermal nerves. Acid-fast bacilli were found in 17 cases (63%). They were detected most commonly in the cellular infiltrate in the dermis (7 cases, 26%) and secondly in the dermal nerves (5 cases, 14%). Careful search and deeper sections increased the chance of detecting bacilli. Criteria for histological diagnosis are discussed.—Author's Abstract

Pemajayantha, V., Pinto, M. R. M. and Eriyagama, N. B. The relationship between reactivities to lepromin A (Fernandez and Mitsuda) and a soluble protein antigen of *Mycobacterium leprae*. *Asian Pac. J. Allergy Immunol.* **5** (1987) 39–46.

Three methods of evaluation were used to investigate the relationship between skin-test reactions elicited by different antigens of *Mycobacterium leprae*. The latter were the Fernandez and Mitsuda reactions to lep-

romin, and that to a soluble protein antigen (SPA) of *M. leprae*. All three methods of evaluation demonstrated some degree of relationship though not as high as would be expected. The closest correlation was between Mitsuda and SPA reactions; while Fernandez and Mitsuda, and Fernandez and SPA reactions showed more-or-less similar coefficients of correlation.—Authors' Summary

Rawlinson, W. D., Basten, A., Britton, W. J. and Serjeantson, S. W. Leprosy and immunity: genetics and immune function in multiple case families. *Immunol. Cell Biol.* **66** Part 1 (1988) 9–21.

Genetic susceptibility to infection with *Mycobacterium leprae* was studied in 10 multiple case families of Australian Aborigines. Of the 87 members available for study, 24 had proven stable clinical leprosy which had been or was still being treated with diamino diphenyl sulphone. Evidence of contact with *M. leprae* in the remaining 63 members as assessed by ELISA to *M. leprae* sonicate and phenolic glycolipid (PGL) or by indirect immunofluorescence antibody assay was found in 78%, 64%, and 71%, respectively. By contrast, *in vitro* assays of T-cell function (LMAT and LTT) were less reliable indicators of exposure.

Evidence was sought for possible linkages between human leukocyte antigen (HLA) or non-HLA genes and four marker phenotypes including clinical leprosy, clinical subtype of leprosy and lymphocyte transformation or leukocyte migration inhibition factor (LIF) production in response to *M. leprae* antigen. No associations were found with any particular HLA or non-HLA gene. On the other hand, sequential analysis of the data from the 10 families was strongly suggestive of a linkage between HLA haplotype and nonresponsiveness to *M. leprae* as manifest by lack of LIF production but not lymphocyte transformation.

The model which best fits the data is for a gene on chromosome 6 in close linkage with the HLA haplotype, with two alleles, autosomal recessive inheritance and penetrance of 90%. On this basis, it can be suggested that disease type (lepromatous leprosy) rather than disease susceptibility may be controlled by genes within or closely

linked to the major histocompatibility gene complex.—Authors' Summary

Robinson, P. and Mahadevan, P. R. A component of *Mycobacterium leprae* as immunomodulating agent for immune deficient cells of leprosy patients. *J. Clin. Lab. Immunol.* **24** (1987) 171–176.

The delipidified component of the insoluble portion which presumably is the cell wall of *Mycobacterium leprae* (DCW) was able to induce lymphocyte proliferation in the leukocyte culture from the peripheral blood of lepromatous leprosy patients. Normally, these cells show no lymphocyte proliferation in response to *M. leprae* or their sonicated extract. The delipidified component (DCW) appears to be proteinaceous and able to induce antibodies in the rabbit. The DCW has affinity to the sera from lepromatous leprosy patients but not sera from normal healthy individuals or tuberculoid leprosy patients. The ability to induce lymphocyte proliferation is blocked by agglutination of DCW with patient sera, heat treatment of DCW, or protease treatment of the component. Along with lymphocyte proliferation, DCW also induces ability in the macrophages to render phagocytosed *M. leprae* nonviable. Thus, it is proposed that DCW of *M. leprae* could be a potent immunomodulator for immune deficient cells of leprosy patients. The efficacy of DCW as a probable immunoprotector for *M. leprae* infection in mice has already been demonstrated earlier.—Authors' Summary

Rook, G. A. W. Progress in the immunology of the mycobacterioses. *Clin. Exp. Immunol.* **69** (1987) 1–9.

The author discusses the nature of the mycobacterial antigens that evoke protective responses, the antigens or epitopes involved in responses of suppressor T cells, other hypotheses to explain lepromatous leprosy, the effector mechanisms of protection, immunopathology of tuberculosis, the possible role of mycobacteria in the pathogenesis of some idiopathic diseases, and mycobacteria and immunoregulation.—(C. A. Brown in *Trop. Dis. Bull.*)

Samuel, N. M., Neupani, K., Samuel, S. and Adiga, R. B. Vaccination of borderline tuberculoid leprosy patients with BCG plus killed *Mycobacterium leprae*. *Jpn. J. Lepr.* **55** (1986) 29–34.

Two hundred sixty-one borderline tuberculoid leprosy patients skin tested with leprosin A showed negative responses. They were divided into three groups: group A, 130 patients were repeat skin tested after 2 years when 22 (17%) patients were leprosin A positive; group B, 48 patients skin tested at 6 monthly intervals for 24 months revealed that 11 (23%) were leprosin A positive; group C, 83 BT patients were offered on an average four vaccinations with BCG plus killed *Mycobacterium leprae* at intervals of 8–12 weeks; 72 (87%) showed positive delayed cutaneous responses to leprosin A. Leprosin A conversion rates in vaccinated BT patients were significantly greater than the nonvaccinated ($p < 0.001$). It is concluded that the anergy observed among borderline tuberculoid patients may be overcome by vaccinotherapy.—Authors' Abstract

Su, L., et al. [Determination of immune function in leprosy patients.] *China Lepr. J.* **4** (1988) 12–15. (in Chinese)

The synthesis of macromolecules in transformation of T and B lymphocytes induced by PHA and LPS separately in human peripheral blood was studied by the incorporation of radioactive compounds. The ^{14}C -valine incorporated radioactivity of T lymphocytes in active leprosy patients was significantly reduced, but the ^{14}C -valine, ^3H -TdR, and ^{14}C -UR incorporated radioactivity of B lymphocytes was significantly increased. The incorporation of radioactivity of ^{14}C -valine, ^3H -TdR, and ^{14}C -UR in T and B lymphocytes of cured leprosy patients is within normal range. This demonstrates that cellular immunity is the main immune response in leprosy patients.—Authors' English Abstract

Volc-Platzer, B., Stemberger, H., Luger, T., Radaszkiewicz, T. and Wiedermann, G. Defective intralésional interferon-gamma activity in patients with lepromatous

leprosy. Clin. Exp. Immunol. **71** (1988) 235–240.

Cryostat sections of full-thickness skin biopsies from 21 patients along the whole spectrum of leprosy were subjected to immunohistological examination with special regard to defective lymphokine production. There was an inverse relationship between intra-lesional interleukin-1 (IL-1) reactivity and IL-2R expression, in that the latter was markedly observed in tuberculoid lesions. Whenever epithelioid-cell-containing granulomas were present in paucibacillary forms, significant reactivity within the central phagocytic cells with the monoclonal antibody directed against interferon-gamma was detectable. The keratinocytes covering tuberculoid lesions abundantly expressed class II alloantigens (HLA-DR antigens), indicating high intra-lesional interferon-gamma activity. In contrast, multibacillary forms revealed significant anti-IL-1 reactivity within the cellular infiltrate. IL-2R-bearing cells were virtually absent as was anti-HLA-DR reactivity of the keratinocytes, underlining a defective intra-lesional interferon-gamma activity.—Authors' Summary

Wilkinson, D., de Vries, R. R. P., Madrigal, J. A., Lock, C. B., Morgenstern, J. P., Trowsdale, J. and Altmann, D. M. Analysis of HLA-DR glycoproteins by DNA-mediated gene transfer; definition of DR2 β gene products and antigen presentation to T cell clones from leprosy patients. J. Exp. Med. **167** (1988) 1442–1458.

We have used DNA-mediated gene transfer to express HLA class II molecules in mouse L cells for serological, biochemical, and functional analysis. cDNA clones encoding the DR2 β a and DR2 β b products of the DR2Dw2 haplotype were subcloned into a mouse Moloney leukemia virus-based expression vector (pJ4) and transfected separately into mouse L cells together with a HLA-DR α /pJ4 construct. These transfectants have allowed differential analysis of the two DR2 β products in a manner normally prohibited by the concomitant expression seen in B cells. Two-dimensional SDS-PAGE analysis of the transfectants de-

finer the more acidic β chain as the product of the DR2 β a sequence, and the more basic chain as the product of the DR2 β b sequence. The LDR2a transfectants present antigen efficiently to *Mycobacterium leprae*-specific T-cell clones and are capable of presenting synthetic peptide, 65-kD recombinant mycobacterial antigen and *M. leprae*. Of the DR2Dw2-restricted T-cell clones we have tested, all use the DR2 β a chain as their restriction element. Inhibition studies with monoclonal antibodies (Mabs) demonstrate the dependence of presentation by the transfectant on class II and CD4, while Mabs against LFA-1, which substantially inhibit presentation by B-lymphoblastoid cell lines, do not inhibit transfectant presentation.—Authors' Summary

Wu, Q., Davis, G. A. and Douglas, J. T. [Evaluation of blocking agents for ELISA in detection of leprosy antibody.] Chung-Kuo I Hsueh Ko Hsueh Tuan Hsueh Pao **9** (1987) 223–225. (in Chinese)

This article describes evaluation of blocking agents for ELISA in detection of leprosy antibody. The authors first recommended skim milk (SKIM) or egg white (EA) as the blocking agent for an ELISA in detection of leprosy antibody. Results showed 10% SKIM to be the most effective blocking agent, capable of storage at room temperature for a long time, and purchasable from any grocery. SKIM and EA are cheap and simple in preparation with a blocking effect comparable to other blocking agents.—Authors' English Summary

Wu, Q., et al. [Study on serological property of synthetic glycoconjugates containing the immunodominant epitope of PG-I.] China Lepr. J. **4** (1988) 16–20. (in Chinese)

The results of comparisons of PGL-I, ND-P-BSA- and NT-P-BSA-ELISA in sera from leprosy patients (136), tuberculous patients (20), autoimmune skin diseases (10), and normal persons (36) from nonendemic areas of leprosy indicated that there were highly significant positive correlations between the three antigens tested (PGL-I vs ND-P-BSA, $r = 0.89$, $p < 0.0005$; PGL-I vs NT-P-BSA, $r = 0.82$, $p < 0.0005$; ND-P-BSA vs NT-

P-BSA, $r = 0.91$, $p < 0.0005$). In multi-bacillary patients, the rate of positivity was 100% with the three types of antigens used. In BT, 100% with PGL-I and ND-P-BSA, 80% with NT-P-BSA, but in TT, 100% with PGL-I only. All of the three antigens were negative in normal persons. When we increased the normal value of each antigen from A to 3A (i.e., C), the crossreactivity for each was significantly decreased. Interestingly, the sensitivity of PGL-I-ELISA was not significantly influenced, however, only partial crossreactivity was excluded. The crossreactivity of NT-P-BSA-ELISA was excluded, but the sensitivity was significantly decreased. Fortunately, ND-P-BSA-ELISA essentially remained both sensitivity and specificity unaffected. These results suggest that PGL-I-ELISA in combination with ND-P-BSA-ELISA or single ND-P-BSA-

ELISA (normal value in combination with C) may be very useful tools for clinical applications and serodiagnosis and for the study of subclinical infection in leprosy.— Authors' English Abstract

Xu, S., et al. [Effect of treating leprosy with PHA in a short term.] *China Lepr. J.* 2 (1987) 220–222. (in Chinese)

One percent phytohemagglutinin (PHA) solution was locally injected into the skin lesions once or twice a week in a dose of 0.3 ml for 1–10 weeks for removing remaining leprosy bacilli. A total of 78 points with the BI being 0.5 to 2.0 were injected, of which 93.6% showed excellent effectiveness and 63 became negative. No side effect was found.— Authors' English Abstract

Microbiology

Chakrabarty, A. N., Dastidar, S. G., Das, S. and Chaudhury, S. K. Repeated isolation of *Nocardia* like organisms from multibacillary cases of leprosy. *Indian J. Lepr.* 59 (1987) 247–262.

Nocardia-like organisms were isolated from all the 22 multibacillary cases of leprosy, on minimal media consisting of only mineral salts and supplemented with simple C-sources (e.g., liquid paraffin, tetradecane, etc.) and N-sources (e.g., ammonium salts, urea, asparagine, gelatin, etc.). Complex organic substances, e.g., xanthine, tyrosin, casein, peptone, meat extract, egg proteins, serum, blood, yeast extract as well as medium 199, did not support the growth of these organisms at all. Paraffin-urea minimal (PUM), paraffin gelatin minimal (PGM), and gelatin minimal medium, as well as the agar slants of these media, selectively allowed good growth of these organisms on which these could be serially propagated continuously, and isolated as pure cultures; these were acid-fast long slender rods which were seen to arise directly from fragmented or unfragmented long, slender hyphae, forming at places mycelial tufts many of which, on ageing, sporulated

abundantly. Their acid-fastness was pyridine susceptible and these were DOPA-oxidase positive; these grew best under reduced O_2 tension, at pH 7.0–8.0 and temperature about 28°C. Serologically, these appeared to be sufficiently related to each other, two nocardiae (*N. brasiliensis* and *N. caviae*), and some mycobacteria.— Authors' Abstract

Franzblau, S. G. Oxidation of palmitic acid by *Mycobacterium leprae* in an axenic medium. *J. Clin. Microbiol.* 26 (1988) 18–21.

The ability of *Mycobacterium leprae* to oxidize palmitic acid during incubation in an axenic medium was studied. By using a Buddemeyer-type detection system, partially purified nude-mouse-derived *Mycobacterium leprae* was found to produce $^{14}CO_2$ from ^{14}C -labeled palmitic acid in a linear fashion for at least 1 week. Procedures known to remove residual host tissue did not diminish the rate of $^{14}CO_2$ evolution, indicating that bacterial metabolism was being measured. Palmitate oxidation was temperature sensitive, with an apparent optimum of 33°C, but pH insensitive. Bacilli

exposed to a variety of antileprosy drugs for 1 or 2 weeks displayed significantly reduced rates of $^{14}\text{CO}_2$ evolution upon subsequent addition of ^{14}C -labeled palmitic acid. This activity could be readily detected with 10^6 bacilli, thus indicating its potential for use in clinical susceptibility testing.—Author's Abstract

Franzblau, S. G., Harris, E. B. and Hastings, R. C. Axenic incorporation of [^{14}C]palmitic acid into the phenolic glycolipid-I of *Mycobacterium leprae*. FEMS Microbiol. Lett. **48** (1987) 407–411.

Incorporation of [^{14}C]palmitic acid ([^{14}C]PA) into the specific phenolic glycolipid-I (PGL-I) of freshly harvested, nude mouse-derived *Mycobacterium leprae* was investigated in an axenic modified Dubos medium. Incorporation was approximately linear for 10–14 days at pH 7.2, 33°C. No incorporation of radiolabeled phenol, acetate, tyrosine, phenylalanine, bicarbonate, proprionate, or UDP-glucose was detected. Procedures known to remove residual host tissue did not diminish the rate of [^{14}C]PA incorporation, indicating that bacterial metabolism was being measured. The antileprosy compounds, rifampin and dapsone, significantly reduced incorporation of the label. The ability to quantitate PGL-I synthesis in the extracellular bacillus should facilitate a better understanding of the optimum conditions for metabolism in *M. leprae*.—Authors' Summary

Kusaka, T., Nomaguchi, H., Miyata, Y. and Mori, T. Analysis of mycolic acids and various carbon-chain-length's fatty acids in *Mycobacterium lepraemurium* originated from rough and smooth colonies grown on Ogawa's yolk media. Jpn. J. Lepr. **55** (1986) 13–21. (in Japanese)

Analysis of constitutive fatty acids and assays *in vivo* of fatty acid-synthesizing activity were carried out in respect of two kinds of *Mycobacterium lepraemurium*, one originated from the rough colonies (5th generation, R-bacilli) and the other from the smooth colonies (80th generation, S-bacilli); both were grown on Ogawa's yolk media. It was concluded that S-bacilli seemed to

have more active $\text{C}_{14\sim 26}$ -fatty-acid-synthesizing ability than R-bacilli, while the former seemed to have $\text{C}_{27\sim 58}$ -fatty acid-and mycolic acid-synthesizing abilities less active than the latter. In spite of a lower content of mycolates in the S-bacilli than the R-bacilli, no qualitative difference in mycolates-structure was observed. Using HPLC, mass-spectrometry as well as ^1H -NMR-analysis, both bacilli have α -mycolates (containing two cyclopropane-rings), β -mycolates (containing one each of cyclopropane-ring, methy-branch and oxo-group) and dicarboxylic mycolates (containing one cyclopropane-ring).—Authors' English Abstract

McDermott-Lancaster, R. D. and Hilson, G. R. F. Rifampicin-resistant strains of *Mycobacterium leprae* may have reduced virulence. J. Med. Microbiol. **25** (1988) 13–15.

A strain of *Mycobacterium leprae* resistant to rifampin (RMP) failed to infect normal mice when injected into the foot pads (FP) at a dose of 10 or 100 bacilli/FP, although it could be maintained by serial passage in mice by the use of inocula of 10^4 bacilli/FP; normal mice can be infected by RMP-sensitive *M. leprae* at a dose of 10 bacilli/FP. By contrast, nude (athymic) mice could be infected with an inoculum of 10 bacilli/FP of the RMP-resistant strain. It is suggested that the strain concerned possessed reduced virulence for normal mice, and the implications of this for the probability of occurrence of human disease caused by RMP-resistant strains of *M. leprae* are discussed.—Authors' Summary

Pattyn, S. R., Van Caekenberghe, D. L. and Verhoeven, J. R. *In vitro* activity of five new quinolones against cultivable mycobacteria. Eur. J. Clin. Microbiol. **6** (1987) 572–573.

Ciprofloxacin and norfloxacin have been shown to be active against rapid-growing and slow-growing mycobacteria, including *Mycobacterium tuberculosis*.

The purpose of this study was to gather additional information on the activity of amifloxacin, ciprofloxacin, norfloxacin, ofloxacin, and pefloxacin against various cul-

tivable mycobacteria. Ciprofloxacin was the most active quinolone, with MICs ranging from 0.125 mg/l to 0.25 mg/l for rapid-growing mycobacteria and from 0.125 mg/l to >64 mg/l for slow-growing mycobacteria. Ofloxacin was generally one dilution less active, however individual differences for ofloxacin as well as for the less-active products, i.e., amifloxacin, norfloxacin, and pefloxacin, were possible.—(From the Article)

Postaire, E., Schnirer, F. and Darbord, J. C. [Liquid chromatography contribution towards new bacteriological analysis.] Bull. Inst. Pasteur **86** (1988) 145–157. (in French)

In recent years there has been increasing interest in the value of a number of chemical and physico-chemical analytical methods for the detection and characterization of microorganisms. Liquid chromatography has become increasingly popular, and its potential has been recognized to be equivalent to that of gas chromatography; the two techniques are often considered to be complementary rather than competitive. After a short basic presentation of analytical data of liquid chromatography, the authors describe the impact of HPLC on microbial analyses. Identification of anaerobic bacteria, purification of bacterial lipopolysaccharides, study of fermentation products by intestinal microflora, analysis of mycolic acid-containing bacteria, purification and isolation of bacterial enzymes are developed. The HPLC with UV and refractometric detection belongs to the category of useful methods which during recent years

have proven valid for the above-mentioned purposes.—Authors' English Summary

Wheeler, P. R. Measurement of hypoxanthine incorporation in purified suspensions of *Mycobacterium leprae*: a suitable method to screen for anti-leprosy agents *in vitro*. J. Med. Microbiol. **25** (1988) 167–174.

The rate of incorporation of hypoxanthine was measured in suspensions of *Mycobacterium leprae*, with and without added antileprosy agents. Dapsone, clofazamine, and brodimoprim, as well as other benzylpyrimidines, inhibited hypoxanthine incorporation, and their minimum inhibitory concentrations for incorporation with intact *M. leprae* were near the minimum inhibitory concentrations at which the agents have antibacterial effects. At subinhibitory concentrations for hypoxanthine incorporation, some combinations of benzylpyrimidines and dapsone were inhibitory, suggesting that synergic effects of antileprosy agents might also be detected by the inhibition of hypoxanthine incorporation. Thus, demonstration of inhibition of hypoxanthine incorporation in *M. leprae* could be a rapid method for screening antileprosy agents and especially for preliminary testing of new, potential antileprosy agents. The rate of hypoxanthine incorporation was generally lower in suspensions of *M. leprae* with lower viability, but it was not proportional to viability so the technique would not be suitable for accurate determination of viability.—Author's Summary

Experimental Infections

Bharadwaj, V. P., Izaki, S., Tanji, O. and Izaki, M. Ultracytochemical and light microscopic histochemical studies in murine leprosy. Jpn. J. Lepr. **55** (1986) 186–198.

The present study was carried out to envisage lysosomal status and mechanisms involved in the two polar types of murine leprosy using different strains of mice.

Suspensions of 1×10^7 *Mycobacterium lepraemurium* Hawaiian strain were injected subcutaneously into the sternal area of specific-pathogen-free (SPF) male mice of following strains: C57BL/6N, CBA/J, C57BL/6N (nu/+), and C57BL/6N (nu/nu). Acid phosphatase and alkaline phosphatase were demonstrated using coupling azo-dye methods. Lysosomes were demonstrated at ultracytochemical level using acid phosphatase

tase as marker enzyme. The present study revealed that the lysosomal morphology and functional behavior in immunologically activated macrophages in resistant strains of mice were almost similar to the observations discerned in tuberculoid leprosy where cell-mediated immunity is present. The other polar type of murine leprosy in immunologically deficient strains of mice revealed that lysosomal morphology and its cell-membrane integrity was lost, which is also observed in human lepromatous leprosy which is devoid of cell-mediated immunity.—Authors' Summary

Fukunishi, Y. [Electron microscopic findings of the peripheral nerve lesions of nude mouse inoculated with *M. leprae*—perineural lesion.] *Jpn. J. Lepr.* **54** (1985) 82–87. (in Japanese)

The main purpose of this report is to describe the electron microscopic findings of peripheral nerve lesions, especially perineural lesion, of experimental nude mouse inoculated with *Mycobacterium leprae* isolated from human leproma. Intracytoplasmic foamy structures are observed inside the perineural cells as well as those found inside Schwann cell, axon, macrophage, and fibroblast. The intracytoplasmic foamy structures found inside the perineural cells are bigger than those inside the other host cells observed in the peripheral nerve lesions. Invasion route or process of *M. leprae* into the perineural cells are not elucidated. It is considered that *M. leprae* inside the phagolysosomes of perineural cell come into the space surrounding perineurium after the rupture of perineural cell at the end of their lifespan. The peripheral nerve lesions of experimental nude mouse inoculated with human *M. leprae* are not influenced by cell-mediated immunity *in vivo*. Experimental nude mouse inoculated with human *M. leprae* is a very good model for studying the early stage of histopathological finding of peripheral nerve lesions in lepromatous leprosy.—Author's English Abstract

Job, C. K., Sanchez, R. M., Diggs, C., Hunt, R., Stewart, M. and Hastings, R. C. Our experience with breeding of nine-banded armadillos (*Dasypus novemcinctus*) in

captivity. *Indian J. Lepr.* **59** (1987) 239–246.

The nine-banded armadillo is considered the best animal model in the study of leprosy. Armadillos have never been successfully bred in the laboratory and therefore animals required for the experiments are captured from the wild and are likely to carry many diseases including leprosy. An attempt was made to breed them in captivity. Our attempt to house them in various combinations in their natural environment in the farmlands of Louisiana was successful. Although a significant increase in conception and delivery was recorded, consistent breeding of the animals was not obtained.—Authors' Abstract

Kazda, J., Fasske, E., Kolk, A., Ganapati, R. and Schroder, K. H. The simultaneous inoculation of *Mycobacterium leprae* and *M. intracellulare* into nude mice: development of cutaneous leproma and acceleration of foot pad swelling. *Indian J. Lepr.* **59** (1987) 426–434.

Organisms of the nonpathogenic *Mycobacterium intracellulare* serotype 19 Darden enhanced the pathogenicity of *M. leprae* when inoculated together into the foot pads of nude mice. This supporting effect could be demonstrated by an acceleration of foot pad swelling, beginning 4 months after inoculation and by the development of cutaneous lepromas on dorsal and lateral body sites within 6 months after inoculation. These lepromas increased in number and size during the 9 months they were under observation and demonstrated micromorphological characteristics similar to those of human leprosy.—Authors' Abstract

Kohsaka, K., Miyata, Y., Ito, T. and Okamura, N. Inoculation of *Mycobacterium leprae* into beige mice. *Jpn. J. Lepr.* **54** (1985) 171–175. (in Japanese)

The beige mouse, which has partially defective natural killer (NK) function, is known as a model of Chediak-Higashi syndrome in man. Six-week-old beige mice, C57BL/6J-*bg/bg* and W/W^{bg/bg}, were provided from Okamura and used in the experiment. CBA and C3H mice or nude mice (BALB/c-*nu/nu*) were added as controls. Bacillary

suspensions of *Mycobacterium leprae* were prepared from three materials. Kurume-naha strain, 6th and 7th generation, was obtained from nude mouse developed experimental leprosy (obtained from a previously untreated patient and was passaged in nude mice). Suruga-YM and Amami-KM strains were prepared from a leproma taken from a relapse case of a lepromatous patient and from a newly untreated patient, respectively. The mice were inoculated with 5.0×10^3 , 1.1×10^5 , 5.0×10^5 , 5.0×10^6 , 2.0×10^7 , and 7.0×10^7 *M. leprae* per 0.05 ml into their right hind foot pads.

No significant differences were observed in the growth of *M. leprae* between the beige and normal mice even though the proliferation was remarkable in nude mice. When a small number of *M. leprae*, 5.0×10^3 , 1.1×10^5 , and 5.0×10^5 , was inoculated in beige mice, bacillary proliferation reached up to 10^6 in the foot pad, the same as the normal control group. On the other hand, no further proliferation was found in the mice inoculated with a large number of the bacilli. The results indicate that the susceptibility of the beige mouse to infection with *M. leprae* was not more than that of normal mice.—Authors' English Abstract

Malaty, R. and Togni, B. Corneal changes in nine-banded armadillos with leprosy. Invest. Ophthalmol. Vis. Sci. **29** (1988) 140–145.

Leprosy is the third leading cause of blindness worldwide; however, little is known about the ocular changes that occur during the disease process. We have studied the eyes of 2 nine-banded armadillos with experimental *Mycobacterium leprae* infection by light and electron microscopy. Both animals had been inoculated intracutaneously, one 5 years and the other 2 years previously. Light microscopy revealed invasion by acid-fast bacilli (AFB) which were seen in keratocytes and mononuclear phagocytes in all layers of the corneal stroma. In both animals, large macrophage granulomas were observed in the deep stroma, which was vascularized. AFB also were found in macrophages and vascular endothelial cells. By electron microscopy, numerous bacilli were found in the keratocytes, macrophages, and Schwann cells of

myelinated and unmyelinated axons, and in the endothelial cells of blood vessels. The localization of *M. leprae* and the presence of inflammatory cells in the ocular tissue of both animals suggest that the bacilli reach the eye by the neural and/or vascular route. One animal showed much more extensive disease and bacillary yield than the other, indicating that ocular involvement may be independent of the generalized infection. Further studies of early ocular involvement in the armadillo and other animals could help to clarify the pathogenesis of this potentially blinding infection.—Authors' Abstract

Saito, H., Tomioka, H. and Kitagawa, T. The lack of therapeutic effects in mice of the combined gamma-irradiated *Mycobacterium leprae* and viable BCG against *Mycobacterium leprae* infection. Jpn. J. Lepr. **54** (1985) 57–61.

Gamma-irradiated *Mycobacterium leprae* in combination with BCG given once biweekly to mice from 2 weeks up to 187 days after infection with *M. leprae* caused no significant growth inhibition of *M. leprae* at the site of the infection.—Authors' Summary

Samuel, N. M., Crawford, C. L. and Grange, J. M. Ultrastructure of human foetal Schwann cells in tissue culture infected with *Mycobacterium leprae*. Lepr. Rev. **59** (1988) 17–24.

Human Schwann cells from fetal peripheral nerves were grown in tissue culture and infected with *Mycobacterium leprae*. After fixation for electron microscopy the ultrastructural features of infected Schwann cells were studied. The findings reproduce previous ultrastructural findings of adult human Schwann cells in tissue culture and clearly demonstrate that *M. leprae* infects cultured Schwann cells. Most of the *M. leprae* remained electron dense, suggesting retained viability, and did not appear to induce any toxic change in the Schwann cells.—Authors' Summary

Subowo. An attempt to induce a histological ENL symptom in *M. leprae* infected nude mice. Jpn. J. Lepr. **55** (1986) 173–185.

An attempt to induce erythema nodosum leprosum (ENL) reaction in *Mycobacterium leprae*-infected, athymic, nude mice by using antileprosy drugs such as dapsone (DDS) and rifampin (RMP) was unsuccessful. Immune complexes which are accepted as the etiology of ENL could not be detected in the tissues of the infected nude mice. The presence of neutrophil foci in the tissues alone is not sufficient to confirm the onset of ENL. Although we could not succeed in the induction of ENL in nude mice, we may draw some conclusions from the experiments: Neutrophil accumulation in foot pads could not be prevented by early clofazimine (Lamprene) treatment; neutrophil accumulation was not modulated by DDS and RMP treatment and only slightly modulated by long-duration Lamprene treatment; early and long duration of Lamprene treatment showed marked healing process in the tissues. Further study for exploring the mechanism of ENL reaction by transferring of T subsets in nude mice is suggested.—Author's Summary

Vaishnavi, C., Ganguly, N. K., Kumar, B., Chakravarti, R. N. and Kaur, S. Renal involvement in *Mycobacterium leprae* infected mice; histopathological, bacteriological and immunofluorescence study. *Indian J. Lepr.* **59** (1987) 416–425.

Swiss albino mice were inoculated in the foot pads with *Mycobacterium leprae* obtained from an untreated lepromatous patient. The kidneys obtained from the animals sacrificed during different periods were processed for histopathology, the presence of acid-fast bacilli (AFB), and immunofluorescence studies. Renal lesions, AFB, and immune complex deposits were seen in the infected animals. Such findings have not been studied in great detail in experimental leprosy earlier.—Authors' Abstract

Vaishnavi, C., Kaur, S., Kumar, B. and Ganguly, N. K. Role of immune complexes in alteration of lymphocyte subpopulation numbers and functions in experimental leprosy. *Indian J. Lepr.* **59** (1987) 452–461.

Swiss albino mice (normal as well as thymectomized and irradiated) were inoc-

ulated into the foot pads with *Mycobacterium leprae* and divided into two main phases of study. Phase I was comprised of animals not given preformed immune complexes (IC). Uninfected controls were however included. Phase II consisted of animals given *in vitro* prepared IC at zero day period (OdIC), 3-month period (3mIC), or 6-month period (6mIC) to both uninfected and infected groups. Splenic lymphocytes were isolated to quantify T and B cells and their responses to *M. leprae* antigen and four different mitogens. Significant decreases in T-cell counts and blast transformation were seen in the *M. leprae* infected animals which were also given immune complexes. Immunosuppression by IC was therefore seen to be enhanced in the presence of *M. leprae* infection.—Authors' Abstract

Yogi, Y. and Nakamura, K. The nude mouse as an experimental lepromatous leprosy model (continued): the lepromatoid lesions in mystacial vibrissae located site of injection. *Jpn. J. Lepr.* **55** (1986) 41–47.

Employing congenitally vibrissaeless nude mice, inoculations of *Mycobacterium leprae* were made either into the right upper lip at the side of mystacial vibrissae or the right dorsal site of the hind foot at a dose of 5.0×10^5 , respectively. We have established severe lepromatoid lesions of the injected upper lip, including neighboring tissues, and systemic lesions in the vibrissaeless nude mouse with intra-upper lip inoculation method. These systemic lesions occurred after injections into the upper lip as well as after hind-foot injections. However, in spite of severe nose lesions at an earlier stage, the intra-upper lip infection, with lung lesions or lesions involving dentine, skin of the mandible site and tongue could not be accelerated. These findings led to the conclusion that the preferable infection sites in the nude mouse, especially in the vinyl isolators, were reconfirmed. That is to say, our simple combined method by which the dorsal sites of the fore and hind feet as well as foot pad site and intra-upper lips were injected with *M. leprae* was useful for increasing the yield of *M. leprae* at an early stage after the infection and also for establishing

an experimental lepromatous leprosy model.—Authors' Summary

Yogi, Y. and Nakamura, K. The experimental inoculation with *Mycobacterium leprae* in the congenitally asplenic mouse. *Jpn. J. Lepr.* **55** (1986) 35–40.

Using congenitally asplenic mice and their litter mate *+/+* mice as the control, as well as four different mouse strains, inoculations of *Mycobacterium leprae* were made either into the fore foot at a dose of 1.2×10^4 or in the hind foot at a dose of 4.0×10^4 in order to study the influence of the immunobiological characteristics of *Dh/+* mice

on the growth of *M. leprae*. Multiplication of *M. leprae* was not detected in the hind foot of *Dh/+* mice, showing highly advanced bone deformities with muscular atrophy at any time following inoculation. Growth of about 10^6 bacilli per foot was observed in the hind foot of *+/+* mice and all the other strains of control mice. On the other hand, the fore limbs of *Dh/+* mice having no deformities showed the growth of *M. leprae* to almost the same extent as that of control mice. In conclusion, the immunobiological characteristics of congenitally asplenic mice had no effect on the multiplication of *M. leprae*.—Authors' Summary

Epidemiology and Prevention

Chanteau, S., Cartel, J.-L., Roux, J., Plichart, R. and Bach, M.-A. Comparison of synthetic antigens for detecting antibodies to phenolic glycolipid I in patients with leprosy and their household contacts. *J. Infect. Dis.* **157** (1988) 770–776.

Three synthetic antigens related to the natural antigen phenolic glycolipid I (PGL-I) were compared for their efficacy in detecting leprosy when used as antigens in an enzyme-linked immunosorbent assay (ELISA) for IgM antibody to PGL-I. Absorbance values for ELISAs using the three antigens correlated well ($0.79 < r < 0.99$) and had a high rate of agreement ($89.5\% < a < 98.4\%$). Of three subjects (household contacts of patients with leprosy) who later developed the disease, one with lepromatous and one with indeterminate leprosy were seropositive by ELISAs using the three antigens before the clinical onset of disease; one who developed borderline tuberculoid leprosy was seronegative. The predictive value of a positive result for the test was very low ($< 2.4\%$) and the predictive value for a negative result was high ($> 99.9\%$) because of the low prevalence of leprosy in French Polynesia (1.78/1000). The high sensitivity, specificity, and efficiency of the tests using the three antigens confirmed their great value for the serodiagnosis of leprosy, especially the multi-

bacillary form; the ELISA using natural trisaccharide 3-*p*-hydroxyphenylpropionate bovine serum albumin seems to be more specific and sensitive for detecting the paucibacillary form.—Authors' Abstract

Dharmshaktu, N. S., Sharma, R. C., Devarajan, L. and Mittal, B. N. A survey on proportion of multibacillary cases of leprosy in Himachal Pradesh. *Indian J. Lepr.* **59** (1987) 300–308.

The present village survey indicates that although the percentage of multibacillary (MB) cases remains high (50%) even after deducting the cases fit for discharge yet there is no evidence of high proportion of MB cases among newly detected cases. The percentage of MB cases among newly detected leprosy cases is 16.7, but when old and new cases are put together and cases fit for discharge are deducted—the percentage of MB cases increases to 50. This high percentage of MB cases is due to prolonged irregular treatment of old cases that are still clinically active, even after 10–30 years of treatment. The state level, district level/Leprosy Control Unit level data also indicated a high percentage of MB cases which was mainly due to underdetection of cases particularly of paucibacillary type, nondischarge of MB cases fit for discharge, prolonged irregular

treatment of the remaining MB cases that are active, and various other contributory factors.—Authors' Abstract

Feenstra, P. and Tedla, T. A broader scope for leprosy control. *World Health Forum* **9** (1988) 53–58.

After examining the drawbacks of vertical programs for the control of leprosy and the obstacles in the way of integration into primary health care systems, the authors outline experiences gained in the struggle against the disease in Ethiopia and Indonesia. They argue that, in the long run, leprosy control programs can be implemented efficiently and effectively as integral parts of general health services based on the primary health care approach.—Authors' Abstract

Gao, S. [Analysis of new cases in the families of 131 leprosy patients.] *China Lepr. J.* **2** (1987) 200–202. (in Chinese)

From a total of 2089 household contacts in 103 families with leprosy patients in Yiyuan County of Shandong Province (China) 131 new leprosy cases were found. The prevalence rate of leprosy in the household contacts is 62.71/thousand and the rate in the local population is only 1.1/thousand. The prevalence in the contacts of multibacillary patients is 109/thousand and that in those of paucibacillary cases is 14.6/thousand.—Author's English Abstract

Kim, D.-I. Present status and future of leprosy in Korea. *Jpn. J. Lepr.* **54** (1985) 116–117.

The epidemiological trend of leprosy: According to the survey done in 1965, the prevalence rate was to be 2.6/1000 population. However, recent data analysis shows that the prevalence rate is estimated to be about 0.8/1000 population. Therefore the number of leprosy patients in Korea is estimated at about 32,000. With an active leprosy control program and socioeconomic improvement, the number of newly detected cases has been decreasing year by year. In 1983, 362 cases were detected showing multibacillary leprosy 54.1% and paucibacillary leprosy 45.9%. However, a large portion of them (65.6%) had antileprosy treat-

ment by themselves for several years before registration. Ten years ago, the ratio of multibacillary to paucibacillary (L/T) was 1.0:1.6, but today it is 1.7:1.0.

The smear positivity rate of registered patients has been decreasing slightly year after year. However, secondary dapsone-resistant relapse cases are becoming a more common finding in the country, but no accurate figures are available to analyze the extent of the problems. However, from our limited observation, the prevalence of acquired dapsone resistance is suspected to be about 8% of known multibacillary cases under treatment. Of the 48 previously untreated lepromatous patients, 10 cases (20.8%) were proven to be primary dapsone resistant through mouse foot pad tests.

The chronological trend of age at onset of leprosy showed that the first sign of leprosy mainly appeared to shift from the age group of under 25 years (77%) to the age group of 26–50 years during the past 20 years.

Reviewing the epidemiological trend of leprosy, prominent socioeconomic development, decreasing tendency of high-risk population and multidrug therapy leprosy control program, etc., it is certainly considered that leprosy in Korea will be no more a main public health problem by the year of 2000.

Present status of leprosy: As of 1983, there are 26,470 registered leprosy patients under treatment in the country with nearly half (12,896) being treated as outpatients at home, a third (9628) as outpatients in the 101 resettlement villages, and the remaining one seventh (3946) as inpatients in either the National Sorokdo Hospital or one of the five voluntary leprosaria; 62.5% of the total registered patients are multibacillary leprosy and 37.5% paucibacillary leprosy. The ratio of male to female is 3:2. The age distribution is: under 19 years 1.1%, 20–39 years 21.4%, 40–59 years 54.7% and over 60 years 22.8%. About 10% of all registered cases are listed as smear positive. Geographical distribution of known cases shows that 4829 (18.2%) are living in the central zone; 12,835 (48.5%) in the south-east zone and 8806 (33.3%) in the south-west zone, and thus 81.8% of registered patients are living in the southern part of the country.

Leprosy control program: Very few cases are diagnosed and managed by private practitioners, so for practical purposes all diagnostic, treatment and control activities are done by 218 local health centers (LHCs), 23 "skin clinics," and 23 leprosy mobile teams. The skin clinics and mobile teams are operated by either the Korean Leprosy Control Association (KLCA) or voluntary agencies—mostly missionary groups. The KLCA is technically not an official government agency but operates with budgets from the central and provincial governments. Its headquarters is undertaking various research projects and provides training for medical and auxiliary medical workers in leprosy diagnosis, management and control. It has a hospital wing for the management of problem cases and those needing reconstructive surgery.

The mobile teams consisting of a doctor, skin-smear technician and driver are extensively involved in surveys of contacts and population in highly endemic areas to detect new cases and the mobile team leader (MTL) also oversees the work of the leprosy control paramedical worker (LCW) assigned to the LHC. The MTL sees patients at the LHC once monthly, and an attempt is made to see all active cases at least quarterly and to do skin smears on them at least twice a year.

Ma, H. Prevention and control of leprosy in China and some of its problems today. *Jpn. J. Lepr.* **54** (1985) 113–115.

All are familiar with the long history of leprosy in China and in countries like India and the East. Also you are familiar with the fact that leprosy was epidemic at times in Europe, however, leprosy died out even before the era of the sulfones. Norway was the last country which could document in a detailed manner the demise of the disease at about the time of the beginning of the dapsone era. But in countries like China and India where the disease existed for thousands of years there was no such dying out.

Today in China we are attempting by manmade efforts to eradicate leprosy by the end of the century. The story of leprosy in recent times in China (1949–1984) has been characterized by a rapid fall in prevalence and incidence. The actual situation today is

such that we are able to raise the goal of eradication, basically, by the year 2000.

We have reduced the total cases of leprosy from 500,000 at the time of the founding of the Chinese People's Republic in 1949 to less than 100,000 cases in 1984. This, of course, does not include the cases that will continue to turn up over the next 15 years. These results were obtained by various preventive measures and social, economic and culture inputs.

We set up in the early years a specialized leprosy service manned by over 10,000 trained personnel, administered by the Ministry of Health, through various levels down to the province, the prefecture, the county and lowest primary health unit. This vertical organization is separate from the regular medical services but cooperates with it.

We established over 1100 various institutions such as dermatology (leprosy) clinics, prefectural level and county prevention and control centers, leprosy hospitals and leprosy villages, and various other organs of prevention and control.

The policies of prevention and control centered around segregation of multibacillary cases. We pursued active campaigns for case finding, segregation, treatment, both domiciliary and institutional, case holding and follow-up.

We relied mainly on dapsone, although at different times we added various other drugs such as TBI and isoniazid. Actually, until 1983 we had not practiced any other multidrug therapy, which includes rifampin or clofazimine. We did try the thioamides but our rates of hepatotoxicity were unacceptable. We have a background prevalence of hepatitis of viral origin which may have enhanced the danger of using the thioamides in our country.

We pursued regular training and education, including upgrading of our leprosy personnel year in and year out, on a national basis, with emphasis on drawing in local medical personnel from endemic and/or high-prevalence areas. However, it is to be noted that most of our specialized leprosy workers in the upper ranks are mostly middle doctors (3 years medical education) and less than 5% of doctors in the leprosy service have medical university degrees. In later

years, there was some post-graduate training through fellowships, workshops and demonstration work in cooperation with other international organizations such as WHO, the Sasakawa Memorial Health Foundation, the Damien Foundation, and the Secours de Lepré of Canada, and others in the USA and India.

Throughout the 35 years of work, efforts were made to educate the public and the administrative as well as government personnel, teachers, the medical profession and others. The unscientific attitude to leprosy still persists among many elements of our population. There is a fear, a phobia regarding leprosy. Irrational attitudes towards leprosy persist. This is seen particularly now when we propose not to segregate the multibacillary cases. In the past we did segregate the patients and the public supported us. Now when we propose "chemotherapeutic isolation" for multidrug therapy which would permit us to put all patients on outpatient treatment (except a few special cases that need hospital care) the public in many cases opposes us, requesting that we isolate the infectious cases. When there are so few cases among large populations and fear exists, they refuse to openly come for diagnosis and/or treatment.

Research work was carried out in the field of epidemiology, culture of *Mycobacterium leprae*, searching for treatment with traditional Chinese medicine combined with modern drugs, field trials of BCG, sero-immunological testing and various other trials of case finding, preventive and control measures (such as whole counties using only domiciliary or outpatient treatment). The Dermatology Research Institute continued an active research program and a new National Leprosy Center is now being established in Guangzhou, Guangdong Province, to guide and coordinate all national leprosy work under the Ministry of Health.

Some of the problems now remaining are along these lines:

How to find the very small number of cases scattered in a huge population. How to find the cases in the incubation period who will go on to contract leprosy; or super-early detection of cases to permit more scientific guidelines for prevention and prophylactic treatment to be given. How to

educate all elements of the public and remove the unscientific attitude and fear towards Hansen's disease or "Ta Feng" or leprosy. How to find answers to these and other problems through more sophisticated epidemiological studies, and finally but not last: How to raise the professional level of our leprosy staff, improve training and give them more improved equipment and logistics support. How to guide research along lines useful to a developing country. How to avoid using our meager research personnel for too much theoretical basic research. Can't we depend on the developed countries to make the breakthroughs and then use them for our work. I realize this is in a way a selfish approach but on the other hand we can provide realistic usable policies on how to eradicate leprosy in China!

Misra, R. S. and Ramesh, V. Leprosy in the Union Territory of Delhi. *Indian J. Lepr.* **59** (1987) 293-299.

One hundred seventy-seven patients with leprosy residing in Delhi comprised 16.4% of the total Urban Leprosy Centre attendance in a 3-year retrospective study with a M:F ratio of 3:1. The average age at onset of disease was 28.75 years and childhood leprosy was only 6.78%. The cases of pauci- and multibacillary leprosy were almost evenly distributed. Borderline leprosy (including BT, BB and BL of Ridley-Jopling classification) comprised the largest single group with 51.42%, followed by lepromatous with 21.47%. In 90% of the cases the high probability of acquiring the infection during the period of stay in the city and the involvement of lower age group are pointers towards the endemic nature of the disease in the region.—Authors' Abstract

Mwanasangezi-Bin-Moussa and Groenen, G. Reasons for non-response during an ongoing leprosy survey in northern Zaire. *Ann. Soc. Belg. Med. Trop.* **67** (1987) 271-275.

Low community response was observed during an ongoing leprosy incidence survey in an hyperendemic area in northern Zaire. The reasons for the low response rate were investigated through interviews with 100 absentees. The following observations were

made: 1) The individuals in the sample had a poor understanding of the purpose of the survey; 2) Persons known to have leprosy were of the opinion that the disease is incurable; 3) There was general dissatisfaction with the way the survey was conducted. This was due to differences in perception between the survey team and the community. The findings are discussed, and recommendations are made to improve community participation.—Authors' Summary

Saikawa, K. Study on prevention of leprosy. 2. Chemoprophylaxis trial for leprosy household contact children. *Jpn. J. Lepr.* **54** (1985) 187–192. (in Japanese)

Many leprologists have reported that the incidence rate in household contacts of leprosy patients is higher than that in noncontact children. To reduce the incidence in the children, BCG vaccination has been tried in several areas and a chemoprophylaxis trial also has been carried out by Dharmendra, etc. The author has tried chemoprophylaxis for 162 leprosy household children since 1970 in Okinawa. One hundred twenty-five children were given dapsone (DDS) (2 mg/kg) every day for 2 years and 37 children were given the same drug in combination with rifampin (10 mg/kg) once a month for 6 months. Thirty-five contact children (DDS group) were examined immunologically by the FLA-ABS test and the Mitsuda test before and after chemoprophylaxis; 49% of contacts were immunologically unchanged by FLA-ABS test and 69% were improved by Mitsuda test. The incidence rate of leprosy among the chemoprophylaxis group was 0.71%; the rate in the nonprophylaxis group was 2.1%. The chemoprophylaxis trial for leprosy household contact children in Okinawa is fairly effective.—Author's English Abstract

Shu, H., et al. [A study of subclinical infection with *M. leprae*. (I). The infection rate among household contacts of leprosy patients and the detection of population at high risk of infection.] *China Lepr. J.* **2** (1987) 197–200. (in Chinese)

Phenolic glycolipid-I-ELISA was used to examine 291 household contacts of 137 leprosy patients in Baoying County, Jiangsu

Province. The result showed the positive rates as being 19.4% in the contacts of active BT leprosy patients, 22.2% in the contacts of BB, 38.5% in those of BL, and 40.0% in those of LL, and negative in five contacts of TT patients. A similar result was also obtained in the contacts of cured BL and LL patients. Mitsuda reaction was determined in 150 ELISA-positive contacts, 131 of whom showed positive reactions.—Authors' English Abstract

Wang, L., et al. [General situation of leprosy control in Anhui Province.] *China Lepr. J.* **4** (1988) 3–4. (in Chinese)

There were 6986 cases of leprosy accumulated from 1956 to 1986 in Anhui Province, most of which have been cured. At present active patients number 1197. The prevalence of leprosy has decreased from 0.07 to 0.02/1000 and the mean incidence in every 5-year period declined from 0.42 to 0.09/100,000. The vast majority of the patients are distributed mainly on the two sides of the Yangtze River, especially around the city of Huainan and in She County south of Anhui. The number of villages with leprosy patients is gradually decreasing. It is noted that the proportion of multibacillary patients in newly found cases is rising. The authors suggest some measures which could be used in leprosy control work in the future.—Authors' English Abstract

Yin, S. [The management target of leprosy control.] *China Lepr. J.* **4** (1988) 5–7. (in Chinese)

A total of 6420 cases of leprosy have been found between 1950 to 1986 in the city of Qingdao, Shandong Province, 73.5% of which have been cured. Now there are 180 active patients there with an incidence of 0.08 to 0.48/100,000 and a prevalence of 0.007 to 0.065/1000 in various counties. From now on, the emphasis will be on strengthening target management of leprosy control, carrying out in an all-round way MDT regimen, popularizing rehabilitation therapy, spreading knowledge of leprosy control widely for removing discrimination against the patients and attracting social forces to support the leprosy control work, and increasing intellectual investment in the

training of leprosy workers at various levels.—Author's English Abstract

Zhou, D., et al. [Study on the factors relating to morbidity and mortality in leprosy patients.] *China Lepr. J.* **2** (1987) 237–240. (in Chinese)

The morbidity and mortality of leprosy were analyzed through the methods of pro-

gressive regression and the life table in Baoying County, Jiangsu Province. The regression analysis showed that case-finding and case-treating as early as possible are the keys to controlling leprosy. The results of the life table study indicated clearly that leprosy affects the life span only slightly, apart from its effect on the suicide rate.—Authors' English Abstract

Rehabilitation

Brunel, W., Schecter, W. P. and Schecter, G. Hand deformity and sensory loss due to Hansen's disease in American Samoa. *J. Hand Surg.* **13A** (1988) 279–283.

We report the prevalence of sensory loss and hand deformity in 63 patients with Hansen's disease in American Samoa. Open ulceration, the most common deformity, was present in 41% of patients; sensory abnormalities were present in 54% and were bilateral in 65%. The presence of abnormal sensibility correlated with a high percentage of other deformities. Hand abnormalities were most prevalent in lepromatous patients and were related to a prolonged duration of disease. Nerve thickening did not appear to be a helpful clinical finding to assess the degree of sensory loss.—Authors' Abstract

Kaplan, M. and Gelber, R. H. Care of plantar ulcerations: comparing applications, materials and non-casting. *Lepr. Rev.* **59** (1988) 59–66.

We have reviewed our experience with plantar ulcer care in our population of 525 patients treated between 1982 and 1987. Patients were treated with standard plaster of Paris casts, alternative methods of casting, and without casting. Of the 24 patients who received casts, all healed, while 23 of the 30 patients healed without casting. The average healing time for those who were casted was 5.6 ± 2.6 weeks and for those uncasted, 8.1 ± 6.6 weeks ($p = 0.1$). It was concluded that ulcers can heal without cast-

ing and that alternative casting procedures offer certain significant advantages. Such approaches are especially applicable to the current leprosy population being treated in the community and remaining ambulatory.—Authors' Summary

Kulkarni, V. N., Mehta, J. M., Sane, S. B. and Sharangpani, R. C. Management of tarsal disintegration (T.D.) in leprosy. *Indian J. Lepr.* **59** (1987) 393–398.

Tarsal disintegration (TD) is a known entity occurring exclusively in the neuropathic foot of leprosy and being influenced by several factors among which the disease itself and altered biomechanics constitute the main. In this study done on more than 50 cases at the Dr. Bandorawalla Leprosy Hospital, Kondhawa, these factors have been studied in detail and it has been found that the increased and abnormal shearing forces constitute one of the major factors both in occurrence and progression of TD. Treatment based mainly on conservative lines is thus aimed at minimizing these forces which occur during the heel-toe pattern gait. Depending upon the severity of the case, immobilization, periodic check x-rays, graded weight bearing and suitable modified footwear appliance are recommended. A fixed ankle brace (FAB) serves well, controlling the ankle movements by its rocker action and ultimately reducing the forces occurring during the normal heel-toe pattern. It has also been found that if the case is detected early and treated promptly the process can be controlled satisfactorily. Careful screen-

ing in high-risk groups is stressed and health education emphasized.—Authors' Abstract

Rao, K. S., Balakrishnan, S., Oommen, P. K., Siddalinga Swamy, M. K. and Durai, V. Restoration of plantar sweat secretion in the feet of leprosy patients. *Indian J. Lepr.* **59** (1987) 442–449.

As part of the studies on nerve damage and its consequences in leprosy, the status of sweat gland function in the anesthetic sole of the feet of leprosy patients was investigated qualitatively and semi-quantitatively, before and after surgical decompression of the posterior tibial neurovascular bundle. Sweat prints of the feet of the patients were obtained preoperatively and postoperatively on Whatman's No. 1 filter paper. The paper was treated with 1% ninhydrin and the intensities of the ninhydrin positive areas were quantitated; 41 feet of 36 patients have been studied in this manner. Sweat print analyses of 20 normal people have also been done, and included for comparison. This operative procedure has been found to effect an improvement in the sweat gland function in the feet of more than 50% of leprosy patients studied so far.—Authors' Abstract

Rao, V. A. and Kawatra, V. K. Cataract extraction in leprosy patients. *Lepr. Rev.* **59** (1988) 67–70.

Forty-one eyes of 36 leprosy patients were operated on for cataracts. The ocular findings contributing to blindness among the 41 operated eyes were corneal opacity (26.8%), old uveitis (36.6%) and glaucoma (7.3%). Shallow anterior chamber in the early post-operative period was observed in 26.8% of cases. The use of systemic corticosteroids definitely reduced the incidence of postoper-

ative uveitis (2.4%). Thirty-seven (90.24%) eyes showed improvement in their visual acuity of two Snellen's lines or more after surgery. We conclude that cataract surgery may help in rehabilitation of already disabled and handicapped leprosy patients.—Authors' Summary

Zhang, G., et al. [A modified method of Brand's extensor to flexor four tailed graft operation.] *China Lepr. J.* **4** (1988) 11–12. (in Chinese)

Brand's extensor-to-flexor four-tailed graft operation (EF4T) was modified: half of the tendon of the motor muscle (ext. carp. rad. long.) is split and cut off as a free grafting in order to lengthen the motor tendon so that the free grafting from fascia lata or other sources need not be done. The modified EF4T operation was performed in three patients, and satisfactory results were obtained.—Authors' English Abstract

Zhang, X. [Socio-psychological factors in leprosy control.] *China Lepr. J.* **4** (1988) 7–9. (in Chinese)

Leprosy patients have been always suffering discrimination by society so that they hide their sickness for fear of such treatment in a vain effort to protect themselves against discrimination which could cause aggravation of their deformity and disability. It has become an important matter to put the social view of leprosy and leprosy patients onto the basis of modern science. Only by removing the social discrimination against leprosy patients can the measures of controlling leprosy be carried out well. The patients would win sympathy from the community and therefore they would take treatment regularly in accordance with doctor's orders.—Author's English Abstract

Other Mycobacterial Diseases and Related Entities

Aziz, A., Ishaq, M., Jaffer, N. A., Akhwand, R. and Bhatia, A. H. Clinical trial of two short-course (6-month) regimens and a standard regimen (12-month) chemotherapy in retreatment of pulmonary tu-

berculosis in Pakistan: results 18 months after completion of treatment (Lahore Tuberculosis Study). *Am. Rev. Respir. Dis.* **134** (1986) 1056–1061.

Two 3-drug regimens [rifampin, isoniazid, pyrazinamide (RHZ) and rifampin, isoniazid, ethambutol (RHE)] were given for 6 months to sputum-positive ambulatory tuberculosis patients and compared with a 12-month regimen involving streptomycin, isoniazid, and ethambutol (SHE). There was a high default rate from each group (20–27%). For those completing the study there were sputum conversions of 85% (RHZ), 82% (RHE), and 56% (SHE). The addition of a fourth drug was thought necessary to increase conversion rates. Relapse occurred in all groups, initially averaging 17% but at the end of 2 years giving an overall failure rate of 30–40%. Resistance to all the drugs used was found in some sputum cultures but did not significantly affect the results. [These results are disturbing in that failure rates, drop out, relapse rates are all high. The chemotherapeutic control of tuberculosis in developing countries would seem to be an unlikely outcome from these results and related studies referred to by the authors.]—(M. Hooper in *Trop. Dis. Bull.*)

Bhattacharya, S., Ranadive, S. N. and Bhattacharya, A. Distinction of *Mycobacterium tuberculosis* from other mycobacteria through DNA hybridization. *Indian J. Med. Res.* **87** (1988) 144–150.

The dot-blots containing DNA isolated from *Mycobacterium tuberculosis* were hybridized with ³²P-labeled total *M. tuberculosis* deoxyribonucleic acid (DNA) at high stringency (64°C, 50% formamide); or at low stringency (42°C, 50% formamide). Under high-stringency conditions it was possible to abolish hybridization with all mycobacteria tested except *M. bovis*. Mycobacteria could also be directly spotted and lysed on nitrocellulose filters and used for hybridization, thus making this technique suitable for clinical diagnosis. *M. tuberculosis* could be distinguished from *M. bovis* by Southern hybridization of Pst I digested DNAs with ³²P-labeled molecular cloned *M. tuberculosis* probe (pL3) DNA. It hybridized with a 3.4 kb band in Pst I digests of *M. tuberculosis* DNA but not in digests of *M. bovis* and *M. avium* DNAs. This unique band could serve as a useful marker for *M. tuberculosis*.—Authors' Abstract

Brudnaya, Y. E., Amjiteatrova, N. F. and Kalugina, N. M. [New method for the determination of the virulence of non-tuberculous mycobacteria and faintly virulent *M. tuberculosis*.] *Zh. Mikrobiol. Epidemiol. Immunbiol.* **11** (1987) 9–12. (in Russian)

A new method for enhancing the sensitivity of white mice to infection with faintly virulent mycobacteria is proposed. The method consists in the sensitization of animals with pertussis monovaccine introduced in a single-intraperitoneal injection 7 days before the infection of animals with the culture under study. The method permitted the detection of residual virulence in all opportunistic mycobacteria under study.—Authors' English Summary

English, C. K., Wear, D. J., Margileth, A. M., Lissner, C. R. and Walsh, G. P. Cat-scratch disease; isolation and culture of the bacterial agent. *JAMA* **259** (1988) 1347–1352.

A gram-negative bacterium or its cell-wall-defective variants were isolated from lymph nodes of ten patients with cat-scratch disease. Cultured bacteria were morphologically identical to vegetative and wall-defective forms seen in human tissues. Three of seven patients with recent cat-scratch disease had fourfold or greater rises in antibody titer against the cultured bacteria; the remaining four patients had maximum titers of 1:32 to 1:128. Rabbit antiserum to cultured bacilli reacted in immunoperoxidase stains with vegetative and wall-defective cat-scratch disease bacilli in lymph node, skin, or conjunctiva and with vegetative or wall-defective bacteria isolated from ten patients. Vegetative bacteria produced lesions in the skin of an armadillo identical to early lesions in human skin. Vegetative bacteria were recovered from the lesions in the armadillo.—Authors' Abstract

Feureisl, R. and Papezova, E. [Short-course therapy of patients with pulmonary tuberculosis by antituberculous drugs and levamisole.] *Probl. Tuberk.* **3** (1988) 31–32. (in Russian)

A controlled clinical study was performed to determine the effect of levamisole (deca-

ris) on treatment of new cases of pulmonary tuberculosis with antituberculous drugs. The patients were randomly divided into two groups: a) those treated with antituberculous drugs alone and b) those treated with the same antituberculous drugs and decaris. The treatment with and without the use of decaris was completed in 26 and 25 patients, respectively. Bacteriological, roentgenological, and immunological investigations revealed no statistically reliable differences in the treatment results in both the groups.—Authors' English Summary

Golyshevskaya, V. I., Elshanskaya, M. P. and Akhynov, S. B. [Dynamics of the excretion of bacterial and ultramicro forms of *Mycobacterium tuberculosis* by patients with pulmonary tuberculosis in the process of chemotherapy.] Zh. Mikrobiol. Epidemiol. Immunobiol. **3** (1988) 22–27. (in Russian)

The specific features of bacterial excretion by patients with pulmonary tuberculosis in the process of chemotherapy, depending on the duration of treatment, have been studied, and the time-course of the excretion of ultramicro forms of mycobacteria by patients with and without caverns in the lungs in the process of chemotherapy has been followed. The results of the detection of *Mycobacterium tuberculosis* ultramicro forms with the use of the biological and bacteriological methods indicate that both these methods are highly effective and informative. The method of the direct reversion of ultramicro forms into coccoid ones in Shkolnikova's culture medium with 10% of plasma added has proved to be the simplest. The injection of sputum filtrates containing filter-passing (ultramicro) forms of mycobacteria into experimental animals induced the development of specific minor tuberculous inflammation of a productive character without the caseation of granulomas or progressing; such inflammation coursed as a latent lymphohematogenous process.—Authors' English Summary

Jones, W. D., Jr. Bacteriophage typing of *Mycobacterium tuberculosis* cultures from incidents of suspected laboratory cross-

contamination. Tubercle **69** (1988) 43–46.

Bacteriophage typing was performed on 235 *Mycobacterium tuberculosis* cultures submitted from 31 laboratories. In each instance, either the attending physician questioned the misdiagnosis of tuberculosis or the laboratory supervisor suspected that laboratory cross-contamination had occurred. Phage typing data confirmed these suspicions. Phage typing is a useful adjunct in the investigation of suspected cross-contamination of laboratory cultures of *M. tuberculosis*.—Author's Summary

Lazarova, A., Popov, A., Balabanova, M. and Dimitrova, J. [Fluorescent microscopy for the study of acid-fast bacilli in cutaneous tuberculosis.] Actas Dermosifiliogr. **78** (1987) 781–783. (in Spanish)

Thirteen skin biopsies from patients with cutaneous tuberculosis were studied with the help of the fluorescent microscopy method using the fluorochromes auramine OO and rhodamine B. The value of this method is compared with the Ziehl-Neelsen technique, as well as with the bacteriological studies (cultures from biopsies). The results from the present study confirm the advantages of the fluorescent method in the diagnosis of cutaneous tuberculosis.—Authors' English Summary

Markov, A. G., Vladimirov, M. A. and Kucherov, A. L. [Enzyme immunoassay for specific antibodies in prophylactic examination of persons with posttuberculous lesions.] Probl. Tuberk. **12** (1987) 56–58. (in Russian)

A total of 1607 persons out of those under dispensary observation due to residual post-tuberculous lesions in the lungs (dispensary groups III and VII) were examined. Along with clinicomicrobiological and roentgenological examinations, there were performed serological tests for specific antibodies with the solid-phase enzyme immunoassay. In the seropositive group including 21% of the total number of the examined persons, 83 out of 88 persons, or 94.3%, showed reactivation and recurrence

of tuberculosis.—Authors' English Summary

Meng, M. [On some problems in the classification of leprosy.] *China Lepr. J.* **4** (1988) 38–41. (in Chinese)

Ridley-Jopling's spectrum classification of leprosy has many advantages, but on the other hand also has some defects. For example, tuberculoid granuloma represents delayed hypersensitivity reaction (DHR), i.e., destructive hypersensitivity, while the classification regards tuberculoid as a polar form of highest immunity. In fact, in most periods of the tuberculoid type the disease only shows nonspecific infiltration (NSI). Perhaps we could consider that NSI, including indeterminate leprosy, is a polar form of leprosy and the other is lepromatous. Of course the concept of indeterminate group must be shifted. It is now difficult to solve completely this problem but discussion on it would be profitable.—Author's English Abstract

Pao, C. C., Lin, S.-S., Wu, S.-Y. and Juang, W.-M. The detection of mycobacterial DNA sequences in uncultured clinical specimens with cloned *Mycobacterium tuberculosis* DNA as probes. *Tubercle* **69** (1988) 27–36.

A plasmid DNA library was constructed from restriction endonuclease digested genomic deoxyribonucleic acid (DNA) of a virulent strain of *Mycobacterium tuberculosis* isolated from sputum of a patient. The sensitivity and specificity of two of the cloned DNA fragments in detecting *M. tuberculosis* and its related DNA sequences were analyzed by DNA-to-DNA hybridization. The level of detection was determined to be 50 picograms of *M. tuberculosis* DNA, which is approximately equivalent to 10,000 mycobacterial genomes. These two *M. tuberculosis* DNA probes did not cross-hybridize to DNA of nonmycobacterial origin, nor with DNA from 9 out of 11 other mycobacterial species. Mycobacterial DNA sequences could be detected in 134 of 441, or 30.4%, of various types of uncultured clinical specimens from 365 patients by the DNA probes; whereas traditional culture method showed only a 19.0% positivity rate

for the same specimens ($p < 0.001$). The overall sensitivity and specificity of the DNA probes in detecting *M. tuberculosis* are 90.5% and 83.8%, respectively. The DNA hybridization test may become a useful tool for the early and rapid determination of mycobacterial infection in uncultured clinical specimens.—Authors' Summary

Papiha, S. S., Singh, B. N., Lanchbury, J. S. S., Roberts, D. F., Parsad, C. E., Wentzel, J. and Murty, K. J. R. Association HLA and other genetic markers in South Indian patients with pulmonary tuberculosis. *Tubercle* **68** (1987) 159–167.

Histocompatibility antigens (A, B, and C loci) and 23 other single gene characters were studied in 204 pulmonary tuberculosis patients belonging to a single endogamous group in South India. None of the previously reported associations with HLA antigens was confirmed, nor any new one found. The blood O and Rh-negative associations were also not confirmed, although a new association with the Jk blood group system appears possible. Of particular interest is the association with the phosphoglucosyltransferase (PGM1) system, which parallels that found in a different population located some 1000 km away. Relative risks were calculated to measure the resistance of individuals with the PGM1*2+ allele.—(AS in *Trop. Dis. Bull.*)

Pospelov, L. E., Serova, L. D., Malenko, A. F. and Litvinov, V. I. [Study on relation between distribution of locus DR antigens of HLA system and tuberculosis in various populations.] *Probl. Tuberk.* **10** (1987) 54–56. (in Russian)

The relation between tuberculosis development and DR antigens of the human HLA system was studied in three populations: 86 patients with tuberculosis and 80 healthy persons of the Uzbek nationality, 96 patients with tuberculosis and 183 healthy persons of the Turkmen nationality, and 137 patients with tuberculosis and 114 healthy persons of the Russian nationality were examined immunogenetically. It was shown that development of tuberculosis was associated with one and the same antigen DR2 in all of the three investigated populations.

At the same time antigen DR3 was less frequent in patients with tuberculosis than in the healthy persons. It is obvious that the relation between tuberculosis and antigen DR2 is primary (true) while that between tuberculosis and the locus B antigens is secondary since it was revealed by unbalanced attachment to the locus DR antigen.—Authors' English Summary

Rungruang, S. Further observations on the breeding and rearing of BALB/C nude (nu-nu) mice under normal laboratory conditions. *Lepr. Rev.* **59** (1988) 25–30.

An account is given of the breeding and rearing of BALB/C (nu-nu) mice under normal laboratory conditions, in a research institute in Thailand. Starting with 20 pairs of mice in 1980 over 4000 have now been successfully bred and reared in this unit: on reaching adult age (30 days), the mortality rate is nil. A detailed description is given of the housing unit, cages, bedding, diet, animal husbandry, and neonatal management. The approach used is demanding in terms of professional time and the need for constant attention to detail—but it is successful. Our experience is in striking contrast to published evidence on the absolute need for specific pathogen-free conditions for this animal model.—Author's Summary

Sadoff, J. C., Ballou, W. R., Baron, L. S., Majarian, W. R., Brey, R. N., Hockmeyer, W. T., Young, J. F., Cryz, S. J., Ou, J., Lowell, G. H. and Chulay, J. D. Oral *Salmonella typhimurium* vaccine expressing circumsporozoite protein protects against malaria. *Science* **240** (1988) 336–338.

Immunization with radiation-attenuated malaria sporozoites induces potent cellular immune responses, but the target antigens are unknown and have not previously been elicited by subunit vaccines prepared from the circumsporozoite (CS) protein. A method is described here for inducing protective cell-mediated immunity (CMI) to sporozoites by immunization with attenuated *Salmonella typhimurium* transformed with the *Plasmodium berghei* CS gene. These transformants constitutively express CS antigens and, when used to immunize mice

orally, colonize the liver, induce antigen-specific CMI, and protect mice against sporozoite challenge in the absence of antispore antibodies. These data indicate that the CS protein contains T-cell epitopes capable of inducing protective CMI, and emphasize the importance of proper antigen presentation in generating this response. Analogous, orally administered vaccines against human malaria might be feasible.—Authors' Abstract

Sadykov, A. S., Fondaminskaya, L. D., Pospelov, L. E. and Malenko, A. F. [Antigens HLA and diverse forms and variants of pulmonary tuberculosis.] *Probl. Tuberk.* **2** (1988) 56–58. (in Russian)

One hundred thirty-five patients with pulmonary tuberculosis and 69 healthy volunteers (control group) were subjected to typing by antigens HLA-A, B, C and DR. The patients with pulmonary tuberculosis were divided into three groups: new cases of tuberculosis (66 patients), cases with stable fibrocavernous tuberculosis (27 patients), and cases with progressing fibrocavernous tuberculosis (42 patients). It was shown that with increasing of the disease severity, the frequency of antigen HLA-DR2 increased while that of antigens Cw4 and DR3 decreased. These data may be indicative of the tuberculosis process dependence on the presence or absence of the HLA complex antigens.—Authors' English Summary

Saito, H. and Tomioka, H. Susceptibilities of transparent, opaque, and rough colonial variants of *Mycobacterium avium* complex to various fatty acids. *Antimicrob. Agents Chemother.* **32** (1988) 400–402.

Three different colonial variants of *Mycobacterium avium* complex were studied for their susceptibilities to capric, lauric, oleic, and linolenic acids. Smooth T variants with transparent and irregularly shaped colonies were much more resistant to all the fatty acids than were the smooth D variants with opaque and dome-shaped colonies. Rough variants with granular and irregularly shaped colonies showed nearly the same

susceptibility to the fatty acids as did the smooth T variants.—Authors' Abstract

Selvakumar, N., Kumar, V., Paramasivan, C. N. and Prabhakar, R. Mycobacteriocin typing of *Mycobacterium tuberculosis* isolated from patients in south India, Hong Kong & Britain. *Indian J. Med. Res.* **86** (1987) 162–164.

A total of 148 strains of *Mycobacterium tuberculosis* (south India, 118; Hong Kong, 24; Britain, 6) were screened for mycobacteriocin production by cross-streak method using nine rapid growers (group IV mycobacteria) as indicator strains adapting the scheme suggested by Takeya and Tokiwa. Eighty-six percent (127 of 148) of the cultures were found typable into two types—type 11 (84%), and type 9 (2%). The remaining 14% (21) cultures were untypable and exhibited different inhibition patterns not reported earlier. Since 98% (125 of 127) of the typable cultures belonged to type 11, the limitation of the present indicator system for typing *M. tuberculosis* from south India is discussed.—Authors' Abstract

Shen, D., et al. [Observation on the therapeutic effect of 60 cases of cutaneous diseases treated with thalidomide.] *Chin. J. Clin. Dermatol.* **17** (1988) 16–18. (in Chinese)

Sixty cases of chronic discoid lupus erythematosus (CDLE), nodular vasculitis (NV), erythema nodosum (EN), Bechet's syndrome (BS), familial benign chronic pemphigus (FBCP), prurigo nodularis (PN), erythema anularis centrifugium (EAC), and lichen planus (LP) were treated with thalidomide. Among 35 cases of CDLE, 20 cases (57.1%) cured, 13 cases (37.1%) with excellent result, one case good, one case ineffective. Among 9 cases of NV, 2 cases cured, 4 cases with excellent result, 3 cases ineffective. Most cases of EN, BS, PN, and EAC had certain effect. One case of LP was ineffective. The pharmacological action and side effects of thalidomide are reviewed and discussed.—Authors' English Abstract

Storrs, E. E., Burchfield, H. P. and Rees, R. J. W. Superdelayed parturition in ar-

madillos: a new mammalian survival strategy. *Lepr. Rev.* **59** (1988) 11–15.

Armadillos are generally believed to have a gestation period of 8–9 months that includes a 3- to 4-month period of embryonic diapause. Nevertheless, 21 females bore litters 13–24 months after capture and subsequent isolation from males. Two of these animals were pregnant in successive years. Evidence is presented that this is a facultative survival mechanism, induced by stress, that has not been previously reported among mammals.—Authors' Summary

Suzuki, Y., Orellana, M. A., Schreiber, R. D. and Remington, J. S. Interferon- γ : the major mediator of resistance against *Toxoplasma gondii*. *Science* **240** (1988) 516–518.

Mice were injected with a monoclonal antibody to interferon- γ to examine the importance of endogenous production of this lymphokine in resistance against infection with the sporozoan parasite *Toxoplasma gondii*. Mice with intraperitoneal infections of *T. gondii* that received no antibody survived and developed chronic *T. gondii* infection; whereas the infected mice that received the monoclonal antibody died of toxoplasmosis. The activation of macrophages, which kill *T. gondii* *in vivo*, was inhibited by administration of the monoclonal antibody, but the production of antibodies to *T. gondii* was not suppressed. The fact that an antibody to interferon- γ can eliminate resistance to acute *Toxoplasma* infection in mice suggests that this lymphokine is an important mediator of host resistance to this parasite.—Authors' Abstract

Ye, S., et al. [Study on cell culture of *M. leprae*. (II). Effect of temperature on viability of *M. lepraemurium*.] *China Lepr. J.* **2** (1987) 229–231. (in Chinese)

The effect of various temperatures on the viability of *Mycobacterium lepraemurium* was measured by a cell culture model. The results showed that the viability of *M. lepraemurium* obviously decreased when heated at 56°C for 30 min, 56°C for 70 min, 60°C for 5 min, and 100°C for 5 min. When

a suspension of *M. lepraemurium* was kept in a refrigerator (4°C) for 48 hr and in a freezer (-38°C) for a week, their viability showed no significant change. When similarly stored in a freezer (-38°C) for 2 and 4 weeks, the viability was slightly decreased. The strain of *M. lepraemurium* multiplied

in mouse peritoneal macrophages and produced typical nodules in the mouse and could be passaged from one to another. This indicated that the mycobacterium was pathogenic for mice.—Authors' English Abstract