CURRENT LITERATURE

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

General and Historical

Browne, S. G. Appropriate technologies for the future. Proc. R. Soc. Lond. **B 209** (1980) 183–186.

Crystal ball gazing is a hazardous occupation: the sharper the picture, the greater the possibility of error.

In the future, appropriate technologies that will raise standards of health and diminish the prevalence of disease in the Third World must take congnizance of such factors as burgeoning population growth, impossibly high cost of energy sources, a widening gap between food requirements and food production, increasing urbanization, and inherent difficulties of control of disease vectors and water-borne diseases.

The technologies that must be made available will be both large-scale and small-scale, low-cost and simple, improving life for the individual and the community, mediated by appropriately trained and adequately supervised polycompetent auxiliaries. The present reappraisal of health needs in the context of food (seeds, soils, irrigation, protection against loss of the harvested products) and of prevention of disease by appropriate prophylactic measures and its treatment will necessitate hard thinking and greater cooperation between all concerned.—Author's Summary

Hargrave, J. C. Update on leprosy. Med. J. Aust. (1981) 502–503.

The author has provided the Australian medical community with a succinct but comprehensive review of leprosy. Although leprosy occurs among all ethnic groups in Australia, most cases are found in Aborigines living in the tropics. There are some 800 cured patients in the Northern Territory and a few less in Western Australia. These two areas contain the bulk of the Australian cases. Queensland ranks next, and there are also a few other cases in each of the other states (with the possible exception of Tasmania). Leprosy is unquestionably a disease that can cause severe physical disability and deformity. It has the potential for serious social or family disruption, and in most societies it is stigmatizing. However, Australian Aborigines do not stigmatize Aboriginal patients unless they have been exposed to Western beliefs. This attitude undoubtedly stems from the era in which deformity was the rule.

A major policy platform of most departments of health in Northern Australia, and particularly in the Northern Territory, has been to use the skills and talents of Aboriginal health workers to control disease and promote good health. They have been intimately involved in the care and control of leprosy for many years. Acedapsone has been the mainstay of control in isolated communities in Australia. Roughly 3% of all lepromatous patients in the Northern Territory have sulfone resistance. The skin discoloration caused by clofazimine has been no barrier to its use in Aborigines. It enhances their own pigmentation and is highly regarded by them.—(*Adapted from* the article)

Chemotherapy

Abdul Razack, E. M. and Zahra, A. Multidrug treatment for reactions in leprosy. Lepr. India **53** (1981) 204–212.

Thirty-three leprosy patients in reaction were treated with a combination of metronidazole-diethyl carbamazine citrate-chlo-

roquin which was reinforced either with prednisolone and/or clofazimine in some, depending on the clinical state. The results were so encouraging as to recommend the combination alone to be the first choice while encountering leprosy patients in reaction early during the maiden spell—at no time in any case was dapsone withdrawn.—Authors' Summary

Anand, L. C., Tiwari, V. D., Rathore, B. S. and Singh, C. Clinical trials with Ciba 1906 in lepromatous leprosy. Lepr. India **53** (1981) 278–284.

A drug trial with Ciba 1906 was conducted in 50 cases of lepromatous leprosy who were intolerant to dapsone therapy. The drug was tolerated well and lepra reactions were infrequent and mild. Clinical improvements were seen in 72% of cases whereas no appreciable change was detected in 28% of cases. An average reduction of 0.4 in BI was detected in 62% of cases while the remaining cases did not show any reduction in BI. No significant side effects were encountered during the study. Antibacterial activity of Ciba 1906 was not found superior to dapsone.—Authors' Summary

Anderson, R. and Gatner, E. M. S. Changes in neutrophil motility accompanying dapsone and rifampicin therapy. Lepr. Rev. **52** (1981) 19–22.

Dapsone has been shown to stimulate the motility of normal neutrophils *in vitro* and the neutrophils of patients with lepromatous and tuberculoid leprosy *in vivo*. It is suggested that dapsone possesses immunostimulatory activity.—Authors' Summary

Anderson, R., Gatner, E. M. S., van Rensburg, C. E., Grabow, G., Imkamp, F. M. G. H., Kok, S. K. and van Rensburg, A. J. *In vitro* and *in vivo* effects of dapsone on neutrophil and lymphocyte functions in normal individuals and patients with lepromatous leprosy. Antimicrob. Agents Chemother. **19** (1981) 495–503.

The effects of dapsone on polymorphonuclear leukocyte functions and lymphocyte mitogen-induced transformation were assessed *in vitro* and *in vivo* in normal individuals and in newly diagnosed untreated patients with lepromatous leprosy. The effects of dapsone on the cell-free generation of superoxide by the xanthine : xanthine oxidase system and iodination of bovine serum albumin by horseradish peroxidase were also investigated. In normal individuals dapsone mediated stimulation of polymorphonuclear leukocyte migration *in vitro* and *in vivo*. Dapsone had no effects on postphagocytic hexose monophosphate shunt activity or superoxide generation *in vitro* but caused slight inhibition of peroxidase-mediated protein iodination *in vitro* and *in vivo* and hexose monophosphate shunt activity *in vivo*. Similar effects were found in patients with lepromatous leprosy. Dapsone also decreased the inhibitory activity of serum from patients with lepromatous leprosy on normal polymorphonuclear leukocyte migration *in vitro*. Progressive loss of serum-mediated inhibition of migration was observed after ingestion of dapsone by the patients. Further experiments showed that stimulation of polymorphonuclear leukocyte motility was related to inhibition of the peroxidase-H_2O_2-halide system *in vitro*. The drug caused inhibition of lymphocyte transformation at high concentrations *in vitro* but had slight stimulatory activity on phytohemagglutinin-induced transformation in controls and patients *in vivo*.—Authors' Summary

Cates, C. J. An assessment of dapsone self-administration in Gudiyatham Taluk. How should urinary dapsone/creatinine ratios be used? Lepr. Rev. **52** (1981) 55–64.

The self-administration of daily doses of 50 mg and 100 mg dapsone by leprosy patients in Gudiyatham Taluk, South India, was monitored by measuring urinary dapsone/creatinine ratios in outpatients compared with a group of inpatient controls on supervised doses of dapsone. A new method is described to analyze the results of such a survey; if widely used, this would allow comparison between the results of surveys in different areas. Overall, 37% of the 189 outpatients tested were judged to be taking dapsone regularly. The results were the same whether patients were tested

at clinics or at surprise home visits. The implications of these results are discussed with reference to leprosy control schemes and to further studies of this kind.—Author's Summary

Davies, R. A. and Ng, Y. Y. Dapsone compliance in North-east India. Lepr. Rev. **52** (1981) 51–53.

The dapsone/creatinine ratios of urine samples collected from outpatients attending a mission hospital clinic in Northeast India indicated that only about half of the patients had ingested their prescribed dapsone within the previous 24 hr.—Authors' Summary

Homeida, M., Babikr, A. and Daneshmend, T. K. Dapsone-induced optic atrophy and motor neuropathy. Br. Med. J. **281** (1980) 1180.

The authors describe the case of a 20 year-old healthy Sudanese man who took 600 mg dapsone daily for 10 days in order to cure what he imagined to be a leprosy lesion on his shoulder (in fact it was a lipoma). Eleven days later he was admitted to the hospital with vomiting, dizziness, blurred vision, and cyanosis of mucous membranes. He recovered after treatment with fluid replacement and ascorbic acid but was readmitted 3 days later with blurred vision, generalized muscular pains, weakness in both legs, and drop foot on the left side. Dapsone-induced motor neuropathy was diagnosed. A month after admission the visual loss persisted, and both optic discs became pale, suggesting optic atrophy.—A. C. McDougall (*From* Trop. Dis. Bull.)

Huikeshoven, H., de Wit, M., Soeters, A., Landheer, J. E. and Leiker, D. L. ELISA inhibition technique for the demonstration of sulphones in body fluids. II. A new method to monitor leprosy patient compliance under field conditions. Lepr. Rev. **52** (1981) 11–18.

An enzyme-linked immunosorbent assay (ELISA) for sulfones in urine is described. This method for monitoring dapsone (DDS) self-administration is compared with the quantitative determinations of DDS/creatinine (D/C) ratios currently used. Urine samples collected from ten volunteers on 14 consecutive days after taking single doses of 100 mg DDS are studied together with pretreatment samples and urine containing standard amounts of DDS. The lowest quantity of DDS still visually detectable by ELISA inhibition is 0.01 μg/ml urine. All samples obtained up to 4–10 days after the 100 mg DDS doses are positive by this method, whereas the first negative D/C results occur on the third day. The method is especially apt to monitor substantial failure in DDS self-administration without using sophisticated instruments.—Authors' Summary

Kim, W. S. and Cinn, Y. W. Therapeutic trial of levamisole in patients with leprosy. Scientia Lepro **3** (1980) 65–72. (in Korean)

Levamisole is known to have some stimulating effect on cell mediated immunity even though its mechanism of action is unclear. The present study was undertaken to evaluate the therapeutic effect of levamisole in the patients with leprosy. Six patients (2 LL, 3 BL, and 1 BT) entered the study. All patients received dapsone (100 mg daily) and levamisole in a dose of 150 mg every other day by intramuscular injection for a period of 3 to 9 months. The results were as follows:

1) Two patients with LL could not tolerate levamisole because of erythema nodosum leprosum occurring after 5 to 7 doses of levamisole. These cases were excluded from further study.

2) Lepromin reactivity was unchanged in three patients with BL disease. One BT patient showed marked increase in lepromin skin test reactivity (Mitsuda).

3) Before levamisole therapy all patients were non-reactive to DNCB after sensitization. After therapy three of them were able to be sensitized with DNCB.

4) Peripheral blood T-cells were enumerated by E-rosette techniques before and after levamisole therapy. Four patients showed an increase in the percentage of T-cells after levamisole treatment.

This study showed that levamisole may have some adjunctive effect in the treatment of leprosy patients; however, the dosage and timing of administration should be

carefully determined on a case by case basis.—(*Adapted from* Authors' Summary)

Ko, Y. H. A study of DDS test in urine in leprosy control. Scientia Lepro **3** (1980) 27–37. (in Korean)

The article reports that 117 of 288 cases (41%) of leprosy patients were found not to take their medication as prescribed. In resettlement villages 109 cases out of 239 (46%) do not take doses of medication. Among outpatients the figure was 8 cases out of 49 (16%) who did not take their medication. The author points out that attendance at leprosy clinics does not mean that leprosy control activities have been well done. Specifically, it must be realized that prescription of medicine is no guarantee of the ingestion of the medication under situations of self-administration of drugs. Particular attention must be paid to leprosy resettlement villages in order to prevent disease relapse and the appearance of DDS resistance. Both of these conditions are the consequence of irregular and/or low doses of DDS or the failure to take treatment entirely.—(*Adapted from* Authors' Summary)

Kundu, S. K., Ghosh, S., Hazra, S. and Chaudhury, S. Multiple drug therapy—a comparative study with 2 tier and 3 tier combination of rifampicin, clofazimine, DDS, INAH and thiacetazone in lepromatous cases. Lepr. India **53** (1981) 248–258.

A comparative study with 2 tier and 3 tier combinations of rifampin, clofazimine, DDS, INAH and thiacetazone was conducted on fifty lepromatous leprosy cases for varying periods. Assessment showed that 2 tier combination of clofazimine and DDS produced good results, but the cost stood in the way, whereas the 3 tier combination of DDS, thiacetazone, and INAH also yielded good results with less expense to be incurred by patients. Whether therapy with this 3 tier combination could be continued for a longer period with sustained improvement is yet to be assessed by further studies for a considerable period.—Authors' Summary.

Lal, S., Garg, B. R. and Hameedulla, A. Gastro-intestinal side effects of clofazimine. Lepr. India **53** (1981) 285–288.

Three out of 300 patients with leprosy getting clofazimine therapy developed severe gastrointestinal side effects following the therapy in the dose of 100 mg daily after 1 month, 8 months, and 5 weeks respectively. One of the patients died due to the side effects. Indian patients appear to be more prone to severe gastrointestinal side effects of clofazimine and may develop the same after a shorter duration of therapy with smaller doses of the drug.—Authors' Summary

Levy, L. Activity of four clofazimine analogues against *Mycobacterium leprae*. Lepr. Rev. **52** (1981) 23–26.

Four clofazimine analogues were found active against *Mycobacterium leprae* in the mouse foot pad system, but none was as active as clofazimine itself. The results suggest the importance of the two *p*-chloro-substituents that are a structural feature of clofazimine.—Author's Summary

McDougall, A. C. and Jones, R. L. Intraneural ceroid-like pigment following the treatment of lepromatous leprosy with clofazimine (B663; Lamprene). J. Neurol. Neurosurg. Psychiatr. **44** (1981) 116–120.

A 33 year old male Nigerian presented with widespread involvement of peripheral nerves, several of which were tender and painful. Nerve biopsies confirmed the presence of *Mycobacterium leprae* in both endoneurial and perineurial areas, mainly in foamy macrophages (Virchow cells), but there were also large accumulations of an amorphous, acid-fast, and alcohol-fast material which was not obviously of bacterial origin. Appropriate stains indicated that this had many characteristics of lipofuscin. Although not previously known, it was at this stage discovered that the patient had received treatment with leprosy drugs nearly three years before presentation in this country. One of these was clofazimine, an aniline aposafranine derivative known to produce a ceroid-like pigment in the tissues

of patients treated with this drug for lepromatous leprosy.—Authors' Summary

Ramu, G., Sreevatsa, Sengupta, U. and Desikan, K. V. Evaluation of multiple regimens in leprosy. Lepr. India **53** (1981) 190–196.

Assessment of bacteremia has been made at weekly intervals in 36 lepromatous leprosy patients who were put on different antileprosy drugs under four regimens, i.e., DDS alone, DDS in combination with rifampin (DDS+RIF), clofazimine (DDS+CLF) and thiacetazone (DDS+TCT). In general, with the continuation of treatment the bacillary load in the blood decreased considerably while the bacteriological index (BI) of the skin remained constant during the study. No significant difference was noted in *M. leprae* clearance from blood between the groups treated with DDS alone and groups treated in combination with CLF and TCT. However, DDS+RIF treatment was most efficient in clearing acid-fast bacilli (AFB) from blood as compared to those noted with other drug regimens.—Authors' Summary

Sohn, J. G., Park, Y. J. and Hah, Y. M. An experience on treatment of five intractable indeterminate leprosy cases. Korean Lepr. Bull. **13** (1980) 95–100. (in Korean)

Usual doses of dapsone are generally recommended in the treatment of indeterminate leprosy. Five cases of indeterminate leprosy were diagnosed on the basis of pathological, bacteriological, and immunological testing and showed various types of symptoms of disease reactivation while on a course of regular dapsone therapy. These cases have become stationary on high dose dapsone administration.—Authors' Summary

Clinical Sciences

Bajaj, A. K., Gupta, S. C., Sinha, S. N., Govil, D. C. and Gaur, U. C. Sequential renal functions in leprosy. Lepr. India **53** (1981) 185–189.

Sequential renal functions have been studied in eight patients with lepromatous leprosy during and after subsidence of erythema nodosum leprosum. The renal functions which were impaired during reaction were observed to improve during the quiescent phase unless there were associated complications such as amyloidosis. The possible mechanisms for altered renal functions during the reactive phase of the disease have been discussed.—Authors' Summary

Bechelli, L. M., Haddad, N., Pagnano, P. M. C., Neves, R. G., Melchior, Jr., E., Fregnan, R. C. Etude de la cicatrice leprominique chez des malades de lèpre et des personnes sans manifestations de la maladie testés avec l'antigène humain et différentes concentrations de l'antigène du tatou (essais à double insu). (Double blind trials to study the lepromin scar in leprosy patients and in children and adolescent noncontacts, tested with human antigen and different concentrations of armadillo antigen). Acta Leprol. **76–77** (1979) 173–179. (in French)

Three double blind trials were carried out to determine the mean size of the lepromin scar in leprosy patients and in unaffected children and young boys, tested with different concentrations of armadillo antigen (160, 40, 20, 10, 5, 2.5, and 1×10^6 bacilli/ml) and human antigen (40×10^6 bacilli/ml). Trials were undertaken in an attempt to find out the concentration of armadillo lepromin (A) that would give similar results to human lepromin (H). The conclusions are as follows:

1) The armadillo lepromin containing 1×10^6 bacilli/ml provoked similar results as the human antigen. The highest concentration (160 and 40×10^6 bacilli/ml) caused strong reactions and large scars, very often representing an inconvenience and a nuisance for patients and unaffected persons.

2) For unaffected persons the armadillo lepromin 1×10^6 bacilli/ml seems the most adequate for current use.

3) Though leprosy patients had not been tested with concentrations lower then 20×10^6 bacilli/ml, taking into account the similarity of results with unaffected persons, it seems that they could be currently tested with lower concentrations, 5, 2.5, and perhaps 1 million bacilli/ml.—Authors' Summary

Bechelli, L. M., Haddad, N., Pagnano, P. M. G., Neves, R. G., Melchior, E. and Fregnan, R. C. Réaction précoce (Fernandez) chez des enfants et adolescents non-contacts et sans manifestations de lèpre, testés avec lepromine humaine et différentes concentrations de l'antigène du tatou en trois essais à double insu. (Early [*Fernandez*] lepromin reaction in unaffected noncontacts children and adolescents tested with human antigen and different concentration of armadillo antigen in three double blind trials). Acta Leprol. **76–77** (1979) 181–190. (in French)

This is part of a study to find out the concentration of armadillo lepromin that may be currently used in testing non-affected persons and leprosy patients. With this aim, three trials have been undertaken to determine the frequency and the intensity of early (Fernandez) reaction to human (H) lepromin (40×10^6 bacilli/ml) and to armadillo antigen (A) in different concentrations (160, 40, 20, 5, 2.5 and 1×10^6 bacilli/ml).

From the analysis of all the data in the three trials our conclusions are as follows:

1) The human lepromin with a content of 40 million bacilli/ml (H 40) induced the early Fernandez reaction in a very low proportion (around 5%) of unaffected children and young boys. Thus the slight value of 48 hr reading in routine work is confirmed.

2) The higher the concentration of armadillo lepromin, the higher tends to be the frequency of positivity of the Fernandez reaction, which occurs only in a low proportion of unaffected children and young boys tested with human antigen. The results might be explained by the bacillary content and the tissue components of the armadillo lepromin.

3) The inducement of early reaction seems similar for human lepromin (H 40) and armadillo lepromin containing 1 million bacilli per ml, and this appears to be the best bacillary content for current use in affected persons. When it is intended to detect the highest possible number of early lepromin reactors, the latter should have a high concentration of bacilli per ml (160 million or more). However these should not be recommended because of the scar they leave.—Authors' Summary

Brandt, F., Malla, O. K. and Anten, J. G. F. Influence of untreated chronic plastic iridocyclitis on intraocular pressure in leprous patients. Br. J. Ophthalmol. **65** (1981) 240–242.

The intraocular pressures of a total of 1015 eyes of leprous patients who never had ophthalmological care or local eye treatment were measured. The patients were categorized according to the type of leprosy they had, and the eyes were categorized as without or with chronic plastic iridocyclitis. In patients with the tuberculoid and lepromatous types of leprosy the intraocular pressure was significantly lower in eyes with chronic plastic iridocyclitis than in unaffected eyes. It has been shown that chronic plastic iridocyclitis which remains untreated for many years results in significantly lower intraocular pressure.—Authors' Summary

Browne, S. G. Looking out for leprosy. Publ. Hlth., Lond. **94** (1980) 215–218.

Looking out for leprosy involves and presupposes a modicum of knowledge of the presenting signs of leprosy, a raised awareness of the possibility of leprosy, and an acquaintance with the procedures necessary to make and to confirm the diagnosis.

A photokit profile of a typical sufferer from leprosy in this country would be as follows:

a) an adult male;

b) probably born and lived for several years in a country where leprosy is endemic;

c) more likely to be from the subcontinent of India or Nigeria or the West Indies;

d) has been in England from a few days to several years;

e) has probably had treatment for leprosy in his country of origin.

This composite photokit portrait would be an approximation of the majority of patients notified and registered in this country. If general practitioners would look out for him and have their aroused suspicions confirmed without delay by a dermatologist, then no time would be lost in rapidly reducing the infectivity of the patient to zero and in preventing nerve damage and consequent deformity. Leprosy is not a big problem in this country, and by no stretch of imagination a threat to the general public, but a continuing situation worth tackling wisely and well.—(*Adapted from* the article)

Choi, S. R. A study on the treatment defaulters in leprosy at the out-patient clinic. Korean Lepr. Bull. **13** (1980) 79–85. (in Korean)

Treatment defaulters were defined as patients receiving less than 1½ years of treatment and non-defaulters defined as those receiving 1½ years of regular treatment. Overall, 47.5% of 1084 patients were treatment defaulters. Treatment defaulters increased with the duration of treatment prescribed. There were no significant differences in treatment defaulters and treatment non-defaulters as to age and sex. Patients living close to the treatment center, married patients, and educated patients were significantly more frequent among the treatment non-defaulters, while students, military and guards, farmers and forestry workers were significantly more frequent among the treatment defaulters. More patients in the age range of 20 to 49 years received regular treatment, while those less than 19 years and more than 50 years of age tended to be irregular. Bacteriologically positive patients with borderline and lepromatous disease tended to receive regular treatment, while most of the indeterminate and tuberculoid cases received irregular treatment.—(*Adapted from* Author's Summary)

Dethlefs, R. Prevalence of ocular manifestations of leprosy in Port Moresby, Papua New Guinea. Br. J. Ophthalmol. **54** (1981) 223–225.

The prevalence of ocular lesions in patients with leprosy attending the Port Moresby General Hospital leprosy clinic was 52%. The prevalence of potentially sight threatening lesions in these patients was 12%. Their mean age was 26.3 years, and the mean estimated duration of disease was 7.2 years.—Author's Summary

ffytche, T. J. Cataract surgery in the management of the late complications of lepromatous leprosy in South Korea. Br. J. Ophthalmol. **65** (1981) 243–248.

Clinical examination of 113 patients in South Korea with lepromatous leprosy and severe visual impairment showed that the main cause of visual loss was the combined effect of corneal and lens opacities associated with small nonreacting pupils and iris atrophy. Cataract surgery with broad iridectomy and inferior sphincterotomy offers these patients with chronic lepromatous complications the best chance of preserving vision. Eighty-one cataract operations were performed under local anesthesia and in 90% vision improved; in 60% this improvement was 2 Snellen's lines or more.—Author's Summary

ffytche, T. J. Role of iris changes as a cause of blindness in lepromatous leprosy. Br. J. Ophthalmol. **65** (1981) 231–239.

Clinical and pathological investigations in a group of 113 patients with leprosy of long duration demonstrated the importance of iris changes as a cause of blindness. In lepromatous leprosy the so called "chronic iritis" produces iris atrophy with small nonreacting pupils which exaggerate the visual impairment created by developing lens changes and corneal opacities. The cause of this "chronic iritis" is believed to be neuroparalytic from early involvement of the small nerves of the iris, particularly the autonomic supply. Clinical and pharmacological evidence for this theory is supported by the histological changes observed in 18 specimens of iris removed during the course of cataract surgery with progressive atrophy of the iris preferentially affecting the dilator muscle and leading to a non-

reacting meiosed pupil. Further pharmacological and histological studies are to be undertaken on lepromatous patients with iris involvement with a view to establishing possible methods of prevention.—Author's Summary

Husser, J. A., Arnold, J. and Marchand, J. P. Corrélation entre clinique et histologie dans la lèpre. (Correlations between clinical elements and histology in leprosy.) Dakar Méd. **25** (1980) 137–142. (in French)

The histo-clinical correlations have been studied in newly detected cases of leprosy patients during consultations in the Dakar Department of Endemic Diseases. These stress the difficulty of a pure clinical diagnosis in unstable forms of leprosy and indicate the importance of a histological examination in their classification and in the study of their therapeutic evolution.—Authors' Summary

Kaur, S., Kumar, B. and Darshan, H. Choice of sites for study of slit skin smears. Lepr. Rev. **52** (1981) 27–33.

In view of recent publications drawing attention to the importance of fingers and toes as sites for slit skin smears in leprosy, a study has been carried out on patients in India to compare the bacterial load and morphology of bacilli at various sites in both treated and untreated lepromatous patients. Although the ear lobes gave maximum bacteriological and morphological indices in most instances, a few cases gave higher values at elbows, fingers, and toes. In three patients bacilli could be detected only from sites other than ear lobes. The importance of taking slit skin smears from peripheral sites, including fingers and toes, is stressed.— Authors' Summary

Kim, D. I. A study on liver damage in leprosy patients during lepra reaction. Scientia Lepro **3** (1980) 5–16. (in Korean)

One hundred six cases with leprosy were investigated for liver damage through routine liver function tests and serum transaminase assays (SGPT and SGOT) during E.N.L. (lepra reaction), and the following results were obtained:

1. No special abnormal findings were found during lepra reaction by routine liver functions tests.
2. On serum transaminase assays, patients with lepra reaction showed slightly higher mean values of SGPT and SGOT than those without reaction; however, both groups were within normal limits.
3. There were more cases that showed high serum transaminase activity in patients with lepra reaction than those without reaction.
4. In order to investigate liver damage in leprosy patients, serum transaminase assays are more sensitive indexes than those without reaction.
5. It is considered that leprosy patients who have their livers invaded with many leprosy bacilli could have acute liver damage during lepra reaction, although the majority of them do not.— (*Adapted from* Author's Summary)

Malla, O. K., Brandt, F. and Anten, J. G. F. Ocular findings in leprosy patients in an institution in Nepal (Khokana). Br. J. Ophthalmol. **65** (1981) 226–230.

A total of 466 leprosy patients in Nepal, some advanced cases were surveyed for ocular lesions; 74.2% were found with ocular features, and 12.7% of the eyes were blind. The patients were classified in tuberculoid, borderline-borderline, and lepromatous groups. Lepromatous leprosy is responsible for major ocular complications and blindness.—Authors' Summary

Ness, P. M., Hymas, P. G., Gesme, D. and Perkins, H. A. An unusual factor-X inhibitor in leprosy. Am. J. Hematol. **8** (1980) 397–402.

Two cases of Hansen's disease demonstrating a lupus-like inhibitor directed against the activation of coagulation factor X are described. Each case showed factor X activity markedly depressed by an inhibitor when measured in one assay system

yet normal levels were measured by three alternate factor-X assay systems.*—Authors' Summary

Reddy, S. C., Raju, B. D. and Achary, N. R. S. B. Survey of eye complications in leprosy in Prakasam District (Andhra Pradesh) Lepr. India **53** (1981) 231–239.

A field study was conducted to find out the incidence of eye complications in leprosy. The ocular lesions were found in 4.72% of lepromatous leprosy and in 1.15% of non-lepromatous leprosy cases. Out of 130 patients with eye ailments, 60% were males, ranging in age from 9 to 70 years; 38 were suffering from lepromatous leprosy, and 92 from the non-lepromatous type. Mean duration of leprosy was 8.63 years in lepromatous and 6.42 years in non-lepromatous leprosy. The important eye complications observed were corneal anesthetia, lagophthalmos, and anterior uveitis. The corneal lesions (63.1%) were found to be the most common in this study. It is suggested that a periodical ocular examination of all leprosy patients is essential for the early diagnosis and treatment of eye complications, which finally result in blindness if left untreated.—Authors' Summary

Sun, Y. X. and Chou, H. The significance of anesthetic macules in the early diagnosis of leprosy. Communications on Research of Prophylaxis and Therapeutics in Dermatology **9** (1980) 39–40. (in Chinese)

The article analyzes 320 cases of leprosy (242 males and 78 females) with 252 cases of lepromatous leprosy (L), 66 cases of tuberculoid leprosy (T), and two cases of indeterminate leprosy (I). The earliest symptoms are presented as follows:

The results show that anesthetic macula with dermal color are the commonest early symptoms (150 cases, 46.9%); the next is erythema (60 cases, 18.7%); the next is hypopigmented macules (46 cases, 14.4%). According to the patients' complaints, most lesions of the anesthetic macules were spread over the buttock and the extremities, varying from 2–4 cm in diameter, occasionally the size of a palm, at the early stage of the disease. The color of the skin of the anesthetic areas is generally normal, mostly accompanied by anhidrosis, causing dryness of the skin. The number of affected areas is usually single but occasionally may be multiple. No other symptoms than insensitivity to pain and heat may occur in the affected area. The typical lesion takes a gradual course of development, the time ranging from several weeks or months to several years.—Zhao Bian

Li Wenzhong, Ye Gan-yun, Wang Heying, Liu Jihe, Qiang Nengxian, Ye Shunzhang, Wu Qinxue, Zhang Yongfa and Ma Bukuan. Histoid leprosy: clinical and experimental observations. Acta Academiae Medicinae Sinicae **3** (1981) 23–26. (in Chinese)

Sixteen cases of histoid leprosy were found among 499 inpatients in Quinhu Leprosarium during the period of 1975 to 1979. It was estimated that the incidence of histoid leprosy was 3.2% of the total of inpatients and 6.8% of the LL-BL patients respectively. Clinical studies suggested that all these cases were sulfone resistant. In eight cases of histoid leprosy, drug sensitivity on *M. leprae* was tested by the technique of growing bacilli in the foot pads of mice fed with various concentrations of DDS diet. Six of them revealed DDS resistance while low grade DDS resistance could not be excluded in the other two cases. Blood sulfone levels were determined, and no evidence of poor absorption of DDS was found. All these cases gave negative Mitsuda reactions. There were no significant differences in ERFC tests and PHA-lymphocyte transformation tests between the histoid cases and the active BL-LL patients as well as the BT-TT patients. The authors suggest that the emergence of sulfone resistant strains of *M. leprae* might be one of the etiologic factors in inducing

* Editor's Note: Depressed factor X activity in a prothrombin time-dependent system with artificial substrate and Russell's viper venom; normal values in a prothrombin time-dependent system with human substrate and in partial thromboplastin time-dependent systems with artificial or human substrate.—RCH

histoid leproma. Prolonged irregular sulfone intake or insufficient dosage of DDS resulted in the development of sulfone resistance.—Authors' Summary

Yamamoto, Y. Radiological studies on changes in calcaneus trabecula in leprosy. Jap. J. Lepr. **49** (1980) 20–37. (in Japanese)

A useful study was made of the changes observed by X-ray of the trabeculae of the calcaneus in the feet of patients with leprosy. The trabeculae disappear, and in a particular pattern, with alterations of the strains to which the calcaneus and foot bones as a whole are subject in patients with paralyzed peroneal nerves (foot drop) with fracture and in deformities. Although the author makes no specific mention of this, presumably X-ray changes would be useful in monitoring increasing deformity and applying corrective treatment. There are seven excellent plates. All but the tables are in Japanese.—R. Schram (*From* Trop. Dis. Bull.)

Yao-De, Z. Report on histopathological re-examination of 50 discharged patients. J. Clin. Derm. **10** (1981) 67–69. (in Chinese)

This article reports the results of re-examining the skin biopsies from 50 patients with lepromatous leprosy who had been discharged as clinically cured according to the criteria set by the Fuchow Conference in 1963 except that the presence of a few degenerated foam cells was allowed. The biopsies were all negative for leprosy bacilli by the Wade-Fite staining method. Maintenance treatment was continued after discharge. In the re-examination of these cases, Harada's method, which has a higher positive rate, was used. Twenty-one of the patients (42%) were negative by the Wade-Fite method but were found to be positive by Harada's method. Positive findings were most frequent in specimens with degenerated foam cells. As a result of these findings, we consider it improper to liberalize the curative criteria by allowing the skin biopsies to contain degenerated foam cells. The criteria of the Fuchow Conference should be followed without change. Since Harada's method gave a much higher positive rate than the Wade-Fite method, the former should be adopted in order to adhere strictly to the criteria for discharging lepromatous cases.

The pathological findings were classified into three groups, namely, small foci of degenerated foam cells, fragments of foam cells, and mild, non-specific inflammation.

Among the 50 discharged patients, there was one case of clinical relapse. Skin biopsies were done in 10 unselected cases and showed no clinical relapse. The histopathological findings were compared with those found at the time of discharge. One case with bacteriological relapse with numerous leprosy bacilli in the nerve was found. Therefore, in the follow-up of discharged lepromatous patients, histopathological re-examination should be done as well as periodic clinical examinations.—Authors' Summary

Zambrano, T., Arenas, R. and Ortiz, S. Reaccion de Mitsuda. Estudio comparativo con lepromina integral humana y de armadillo en cincuenta pacientes de lepra. (Mitsuda reaction. Comparative study with integral human and armadillo lepromin in 50 patients with leprosy.) Dermatologia Rev. Mex. **24** (1980) 200–211. (in Spanish)

The Mitsuda test is a very useful tool to classify leprosy cases although it is difficult to get standardized antigens. Now it is available not only as human lepromin but also as lepromin from armadillos infected with *M. leprae*.

In this paper the authors compare the reactivity of 50 patients from Centro Dermatologico Pascua of Mexico City to both antigens: 11 were lepromatous, 9 tuberculoid, 19 borderline, and 12 indeterminate.

Similar results were obtained with both antigens in polar cases: negative in lepromatous cases and positive in tuberculoid ones. In most indeterminate cases, the results were similar with both antigens but variable from negative to different grades of positivity. On the other hand, in borderline cases there was no concordance between the response to both antigens. In general, induration in the site of injection of the antigens was larger with armadillo lepromin than with human one.—Authors' Summary

Immuno-Pathology

Choe, Jin and Kim, Won Il. A light and electron microscopic study on *Mycobacterium leprae* in nerve lesions in lepromatous leprosy. Scientia Lepro **3** (1980) 55–60. (in Korean)

Peripheral nerve biopsies were obtained from the radial cutaneous nerves of four treated lepromatous leprosy patients and the peroneal nerve of one patient. The biopsy material was examined by light microscopy, phase contrast microscopy, and electron microscopy. *M. leprae* were seen frequently in Schwann cells, macrophages, and perineural cells. The Schwann cell clearly seemed to be the target cell in the nerve infection with *M. leprae*. Long-term treated patients showed nerve lesions with more severe fibrosis and fewer intact bacilli than those in short-term treated patients.—(*Adapted from* Authors' Summary)

Dastur, D. K. and Porwal, G. L. Lepromatous leprosy as a model of Schwann cell pathology and lysosomal activity. Clin. Exp. Neurol. **16** (1979) 277–293.

A brief illustrated account is presented of the light microscopic pathology, histochemistry of lysosomal enzymes, and fine structural changes in the nerves of patients with untreated or treated lepromatous leprosy. Predominant bacillation of the Schwann cells of unmyelinated fibers, degeneration of their axons, prominence of phagolysosomes, and disappearance of these cells with endoneurial collagenosis were observed on electronmicroscopic examination of the index branch of the radial cutaneous nerve. Although there were changes in the blood vessels and proliferation of perineurium, bacillation of endothelial or perineurial cells was much less conspicuous. Intact and degenerating forms of *M. leprae* were found in both treated and untreated patients, fragmenting or crumpled forms being more frequent in the treated. Both groups of patients also showed increased lysosomal enzyme activity, evidenced by single or paired paranodal spots of acid phosphatase and β-glucuronidase in Schwann cells in histochemical preparations of the nerve. There was lesser activity and activity in fewer cells in the case of β-glucuronidase than of acid phosphatase. Diffuse β-glucuronidase activity was found in the wall of empty looking oval chambers of in the Schwann cells, and acid-fast bacilli were seen in these chambers. In teased fiber preparations both axonal degeneration and segmental demyelination were found. In semi-thin araldite sections the myelinated fiber density was either preserved or reduced; large diameter fibers were more frequently depleted with tall peaks of smaller fibers seen on plotting diameter spectra.—Authors' Summary

Dubey, G. K., Joglekar, V. K., Hardas, U. D. and Chaubey, B. S. A study of cell-mediated immunity in leprosy. Lepr. India **53** (1981) 197–203.

This paper presents a review of 123 cases of leprosy of different clinical types as regards their status of cellular immunity. These 123 cases included 41 fresh cases, 18 cases in reaction, and 64 cases of leprosy taking antileprosy treatment. Out of 41 untreated cases only 11 turned up for follow-up, and their lymphoblastic transformation was repeated 4 to 6 months after initiating the treatment. It was observed that cell-mediated immunity as expressed in terms of percentage of blast cells is definitely depressed in leprosy, the most in LL and least in TT. There is a definite increase in the percentage of blast cells after taking antileprosy treatment. The rise in percentage of blast cells and hence cellular immunity is relatively more in patients treated with Lamprene as compared to those treated with DDS. Reactions also have impact over immunity in leprosy. Thus, most of the patients with ENL show higher values for blast percentage as compared to those with lepra reaction.

It appears that serial lymphocyte cultures, if done in all cases of leprosy undergoing treatment, will help in assessment of individual progress.—Authors' Summary

Gupta, S. C., Bajaj, A. K., Govil, D. C., Sinha, S. N. and Kumar, R. A study of percutaneous renal biopsy in lepromatous leprosy. Lepr. India **53** (1981) 179–184.

Twenty-one patients with lepromatous leprosy were investigated for evidence of renal disease. Histological lesions were observed in 75% of cases. Sixty-two percent of the cases showed a proliferative type of glomerulonephritis. Amyloidosis was present in 14%. The remaining 24% had either nonspecific changes confined to renal tubules or were normal.—Authors' Summary

Han, S. H., Tsai, L. C., Hu, S. C. and Loo, S. T. Conversion of reactions to leprolin and lepromin in patients with lepromatous leprosy by the transfer factor. Chinese J. Microbiol. Immunol. **13** (1980) 1–8. (in Chinese)

Conversion of lepromin and early lepromin reactions was achieved by two injections of transfer factor made of lymphocytes from lepromin-positive tuberculoid leprosy patients. However, the late reaction to lepromin remained unchanged. The importance of the degree of sensitivity of the cell donor was demonstrated, and a booster dose was also found to be useful. The feasibility of using transfer factor in the treatment of lepromatous leprosy is briefly discussed.—Authors' Summary

Hardas, U. and Lele, V. Evaluation of fluorescent microscopy for detection of *Mycobacterium leprae*. Lepr. India **53** (1981) 273–277.

One hundred seventeen smears and 69 biopsies have been studied for evaluating the routine staining methods and fluorescent stain for detection of lepra bacilli. It is seen that in spite of the speed and ease to detect bacilli, the Ziehl Neelsen method and Fite method are better stains to detect all morphological forms of bacilli.—Authors' Summary

Kano, K., Aranzazu, N., Nishimaki, T., Convit, J., Albini, B. and Milgrom, F. Serological and immunohistological studies on lepromatous leprosy. Int. Archs. Allergy Appl. Immunol. **64** (1981) 19–24.

Sera of patients with lepromatous leprosy were studied for the presence of a variety of antibodies and immune complexes (IC). The frequencies of heterophile, Hanganutziu-Deicher, and Forssman antibodies were 61 and 43%, respectively, which were significantly higher than those in other diseases. The frequency of antibodies to cardiolipin was 89%, and the frequency of rheumatoid factor was 34%. Circulating IC were demonstrated in 54% of the patients' sera by Raji-cell test and in 43% by anti-antibody inhibition test. Analyses of immunoglobulin classes of IC revealed that IgG was predominant in IC of patients with lepra reaction (LR) and IgM in patients without LR. Immune deposits were found in and between cells of dermis in skin biopsy specimens of patients with LR.— Authors' Summary

Kim, D. and Hak-Bung, K. Comparative study on various staining methods for *Mycobacterium leprae* in skin smears of leprosy patients. Scientia Lepro **3** (1980) 17–26. (in Korean)

Two staining methods, the carbol fuchsin with acetic acid decolorization and the periodic acid-carbol pararosaniline, were used for demonstrating leprosy bacilli in skin smears of leprosy patients. The skin smears from 308 long-treated patients with lepromatous, borderline, and tuberculoid leprosy were stained with periodic acid-carbol pararosaniline. There were no significant differences in BI and MI determinations compared with classic carbol fuchsin staining; however, slightly higher BI and MI results were observed with the periodic acid-carbol pararosaniline method. With the periodic acid-carbol pararosaniline stain, leprosy bacilli were found in 8 of 324 skin smears in which no bacilli could be seen by the carbol fuchsin stain. It is considered that under the action of antileprosy drugs, some leprosy bacilli may lose their acid-fastness and become chromophobic, and these chromophobic bacilli can have their acid-fastness restored with periodic acid pre-treatment as reported by Dr. Harada, *et al.*—(*Adapted from* Authors' Summary)

Nath, I., Narayana, R. B., Sathish, M., Ahuja, G. K., Bhutani, L. K. and Singh, R. Selective loss of *Mycobacterium leprae* responsiveness of circulating lymphocytes in primary neuritic leprosy. Lepr. Rev. **52** (1981) 79–89.

Sixteen patients with primary neuritic leprosy characterized by neural involve-

ment in the absence of dermal lesions were studied. Eight healthy contacts from non-endemic areas formed the control group. T and B cell numbers as well as lymphocyte transformation responses to concanavalin A (Con A), phytohemagglutinin (PHA), and PPD were not found to be significantly decreased in the majority of the neuritic patients. However, there was a selective uniform lack of *M. leprae* induced lymphocyte transformation in this group (Median stimulation index—1.05). In three of the patients the antigen specific unresponsiveness was present even after 5 years of chemotherapy. The clinical extent of neural involvement and serum factors did not appear to contribute to the antigen specific deficit observed in this form of leprosy.—Authors' Summary

Ridley, M. J. The mononuclear cell series in leprosy: an ultrastructural report. Lepr. Rev. **52** (1981) 35–50.

Ultrastructural observations have been carried out on the mononuclear phagocytic series, the host cells of *Mycobacterium leprae*, throughout the spectrum of leprosy. The changes seen in these cells at various points in the immunological spectrum indicated differences ranging from the state of nonspecific stimulation which occurs on the entry of *M. leprae* into the macrophage to the more specific activation which takes place in the presence of immune mechanisms. The most highly differentiated of the cell types was the epithelioid cell which appeared when hypersensitivity was maximal in tuberculoid lesions and in positive Mitsuda skin tests. Cells described in the literature as "A" type epithelioid, thought to be an immature epithelioid cell, had much rough endoplasmic reticulum while "B" type epithelioid cells, thought to be an end cell, had numerous smooth lined vesicles. Lepromatous leprosy was characterized by a small undifferentiated immature bacteria-laden macrophage. An intermediate cell stage was seen in BB leprosy. The cells of BB leprosy were activated macrophages with high phagocytic potential. All gradations in the proportion of endoplasmic reticulum to vesicles of macrophages, from the activated cell seen in BB to "A" type epithelioid cells seen in low antigen, high resistance BT to mainly "B" type cells in downgrading BT were encountered. This supported the continuous spectrum of macrophage development seen throughout the spectrum of leprosy.—Author's Summary

Ridley, D. S., Rea, T. H. and McAdam, K. P. W. J. The histology of erythema nodosum leprosum. Variant forms in New Guineans and other ethnic groups. Lepr. Rev. **52** (1981) 65–78.

The histology of erythema nodosum leprosum (ENL) shows some distinctive variations which were considered in relation to ethnic groups in Papua New Guinea, Malaysia, Mexico, and a miscellaneous group of ENL patients. In highland patients of Papua New Guinea the reaction involved the connective tissues of the dermis more than the lepromatous granuloma, and the chief features were edema and fibrinoid necrosis followed by very heavy fibrosis. Infiltration of neutrophils was a subsidiary finding. In Malaysia some of the features of the necrotizing form of ENL, previously described, were detectable fairly regularly even in less severe non-necrotizing lesions. In Mexican patients who developed ENL rather than the Lucio form of reaction, the ENL was of the classic type and did not differ from the ENL seen in the miscellaneous group.

ENL appears to be a complex of reactions whose form may perhaps be modified by ethnic factors as well as by the immune status within the spectrum.—Authors' Summary

Shepard, C. C., Draper, P., Rees, R. J. W. and Lowe, C. Effect of purification steps on the immunogenicity of *Mycobacterium leprae*. Br. J. Exp. Pathol. **61** (1980) 376–379.

In studies aimed at the development of an antileprosy vaccine for use in man, *Mycobacterium leprae* suspensions were prepared from livers of experimentally infected armadillos. The two methods of purification in chief use, carried out after irradiation of the tissue with 2.5 megarads of gamma irradiation from ^{60}Co, involved treatment with 0.1 N NaOH for 2 hr at room temperature, trypsin and chymotrypsin digestion for 24 hr at 37°C and separa-

tion in a 2 phase liquid polymer (dextran : polyethylene glycol) system. All vaccines were autoclaved and injected intradermally in mice. Earlier studies have shown that heat inactivation does not interfere with the immunogenicity of *M. leprae*. Immunogenicity was measured by foot pad enlargement (FPE) after challenge with heat killed *M. leprae* suspensions or by protection against infectious foot pad challenge. The results indicated that the irradiation and 2 phase separation did not decrease immunogenicity, but the NaOH treatment and enzyme digestion did.—Authors' Summary

Stoner, G. L. Hypothesis: Do phases of immunosuppression during a *Mycobacterium leprae* infection determine the leprosy spectrum? Lepr. Rev. **52** (1981) 1–10.

The failure of the cell-mediated immune response to *Mycobacterium leprae* in leprosy is amply documented, but the immunoregulatory mechanisms involved are unknown. It is suggested that suppressor mechanisms could explain the spectrum of immunity observed in leprosy, and a primary specific immunodeficiency need not be invoked. Three major phases of suppression can be identified. The primary suppression phase may be a consequence of the neural predilection of *M. leprae* which insures preferential exposure of bacillary antigens to suppressor cells in the spleen rather than to effector cells in the draining lymph node. This view of the leprosy spectrum can accommodate recent findings of an HLA association of tuberculoid leprosy. It also has implications for the interpretation of leprosy vaccine trial data.—Author's Summary

Microbiology

Asselineau, C., Clavel, S., Clément, F., Daffé, M., David, H. L., Lanéelle, M. A. and Promé, J. C. Constituants lipidiques de *Mycobacterium leprae* isolé de tatou infecté expérimentalement. (Lipid constituents of *Mycobacterium leprae* isolated from experimentally infected armadillo.) Ann. Microbiol. (Inst. Pasteur) **132 A** (1981) 19–30. (in French)

Mycobacterium leprae (obtained from experimentally infected armadillo) were submitted to saponification. The liposoluble part was methylated and fractionated by chromatographic methods. Each fraction was studied by gas-liquid chromatography. Cholesterol (from the infected host) and the main fatty acids were identified. Mycolic acids were isolated, and their usefulness in making comparisons of *M. leprae* with some other mycobacteria considered. Some of these comparisons are discussed here. The absence or, at least, the very low level of tuberculostearate suggests comparative studies of *M. leprae* and *M. gordonae*.—Authors' Summary

David, H. L., Clavel, S., Clément, F. and Lesourd, M. Paracrystalline inclusions in *Mycobacterium leprae*. Ann. Microbiol. (Inst. Pasteur) **132 A** (1981) 41–50.

The morphology and organization of paracrystalline inclusions in *Mycobacterium leprae* are described. These ultrastructural observations suggested that the inclusions were formed in association with the bacterial membrane structures.—Authors' Summary

Janczura, E., Leyh-Bouille, M., Cocito, C. and Ghuysen, J. M. Primary structure of the wall peptidoglycan of leprosy-derived corynebacteria. J. Bacteriol. **145** (1981) 775–779.

The cell walls isolated from axenically grown leprosy-derived corynebacteria were submitted to various chemical and enzymatic degradations. The glycan strands of the wall peptidoglycan are essentially composed of N-acetylglycosaminyl-N-acetylmuramic acid disaccharide units. Small amounts of N-acetylglycosaminyl-N-glycolylmuramic acid (less than 10%) were also detected. The muramic acid residues of adjacent glycan strands are substituted by amidated tetrapeptide units which, in

turn, are cross-linked through direct linkages extending between the C-terminal D-alanine residue of one tetrapeptide and the *meso*-diaminopimelic acid residue of another tetrapeptide. Such a structure is very similar to that of the wall peptidoglycan found in the taxonomically related microorganisms of the *Corynebacterium*, *Mycobacterium*, and *Norcardia* groups.—Authors' Summary

Kashiwabara, Y., Nakagawa, H. and Matsuki, G. Phospholipid deacylating activities in murine leprosy bacilli. J. Biochem. **88** (1980) 1861–1868.

The particulate fraction of cultivated murine leprosy bacilli (*Mycobacterium lepraemurium*, rough colonies of the Hawaiian-Ogawa strain) contained phospholipid deacylating activities with acidic pH optima. It hydrolyzed phosphatidylcholine and phosphatidylethanolamine at similar rates and phosphatidylinositol oligomannosides more slowly. It also hydrolyzed 1-acyl- and 2-acyl-GPCs (*sn*-glycerol 3-phosphocholine) more rapidly than phophatidylcholine. Ca^{++} did not stimulate either diacyl- or monoacyl-hydrolase activity.

Triton X-100 and Emulgen 912 had little influence on the hydrolysis of phosphatidylcholine but at rather high concentrations inhibited the hydrolyses of 1-acyl- and 2-acyl-GPCs.

Iron ions strongly inhibited the hydrolysis of phosphatidylcholine but caused little or no inhibition of the deacylations of 1-acyl- and 2-acyl-GPCs.

With 1-[*stearoyl*-^{11}C] phosphatidylcholine and 2-[*olcoyl*-^{11}C] phosphatidylcholine as substrates, both labeled fatty acid and lysophosphatidylcholine were produced. Labeled fatty acid appeared more rapidly from 2-[*olcoyl*-^{11}C] phosphatidylcholine than labeled lysophosphatidylcholine while labeled lysophosphatidylcholine was produced more than labeled fatty acid from 1-[*stearoyl*-^{11}C] phosphatidylcholine in the early stage of incubation.—Authors' Summary

Kusunose, E., Kusunose, M., Ichihara, K. and Izumi, S. Superoxide dismutase in cell-free extracts from *Mycobacterium leprae* grown on armadillo liver. FEMS Microbiol. Lett. **10** (1981) 49–52.

Superoxide dismutase, an enzyme catalyzing the dismutation of superoxide to molecular oxygen and hydrogen peroxide, has been found in significant amounts in cell-free extracts from *M. leprae* grown in armadillo liver. Presumably, this enzyme is important for the survival and multiplication of *M. leprae* by protecting the organism against the lethal effects of superoxide radicals produced by phagocytic cells.

Cell-free extracts of *M. leprae* (supernatants from ultrasonicates of purified *M. leprae*) were found to contain 16 units of superoxide dismutase per mg of protein. The enzyme activity was sensitive to heat. Cyanide had no effect, excluding the possibility of contamination with copper-containing superoxide dismutase derived from armadillo liver. The enzyme was purified by gel filtration to a specific activity of 116 units per mg of protein. It had an apparent molecular weight of 40,000 and was free of catalase activity. Enzyme activity was not affected by 2 hr incubation with 0.5 mM hydrogen peroxide, suggesting that the enzyme was a manganese-containing superoxide dismutase. The enzymes from *M. leprae* showed serological cross-reactivity with superoxide dismutases from *M. lepraemurium*, *M. smegmatis*, *M. phlei*, and *M. tuberculosis*. No cross-reactivity was noted with enzymes from *E. coli* or *Pseudomonas ovalis*.—(*Adapted from* the article)

Pattyn, S. R. and Hébrant, F. Multivariate analysis of the activity of rifamycins against rapidly growing mycobacteria, to define an *in vitro* screening model for their activity against *Mycobacterium leprae*. Arzneim. Forsch. **30** (II) (1980) 2099–2103.

In an attempt to select a group of rapidly growing mycobacteria which could serve as a model for the *in vitro* screening of rifamycin derivatives for their activity against *Mycobacterium leprae*, the MIC values of 237 strains of rapidly growing mycobacteria were determined for four reference rifamycins with known activity against *M. leprae* and 19 rifamycins with unknown activity against *M. leprae*.

Study of the results by a multivariate statistical technique, the principal components analysis, defined a group of 16 rapidly

growing mycobacteria (seven strains of *M. phlei*, four strains of *M. thermoresistibile*, three strains of *M. fortuitum*, and two strains of *M. vaccae*) showing the lowest distance to *M. leprae*. The analysis detected among rifamycin derivatives with different activities against *M. tuberculosis*, compounds which should be active against *M. leprae*, and allows the selection of a limited number of rifamycins for the *in vivo* screening in the mouse model.—Authors' Summary

Prabhakaran, K., Harris, E. B. and Kirchheimer, W. F. Permeability of *Mycobacterium leprae* to dapsone: Alteration by purification procedures. Lepr. India **53** (1981) 160–162.

Permeability of *Mycobacterium leprae* to dapsone *in vitro* was determined by the ability of the drug to inhibit o-diphenoloxidase of the bacilli. Dapsone showed little effect on the enzyme activity of the intact organisms. When the *M. leprae* preparations were washed with trypsin, NaOH, or acetone and ether, DDS penetrated the bacillus to inhibit its o-diphenoxidase. The method might be useful in studying the utilization of added metabolites by purified *M. leprae* suspensions.—Authors' Summary

Wheeler, P. R. and Gregory, D. Superoxide dismutase, peroxidatic activity and catalase in *Mycobacterium leprae* purified from armadillo liver. J. Gen. Microbiol. **121** (1980) 457–464.

Superoxide dismutase has been identified and peroxidatic activity demonstrated in *Mycobacterium leprae*. The superoxide dismutase, shown indirectly to be a manganese-containing enzyme, was present at low activity in the cell-free extract. Peroxidatic activity was detected in a hemoprotein on polyacrylamide gels, but quantitative assay was not possible. Catalase, although present in a cell-free extract, appeared to be a host-derived enzyme, thus emphasizing the importance of establishing the authenticity of enzyme activities in host-derived *M. leprae*. The implications for the growth of *M. leprae in vivo* and its noncultivability are discussed in the light of these findings.—Authors' Summary

Experimental Infections

Lagrange, H. and Hurtrel, B. Local immune response to *Mycobacterium lepraemurium* in C3H and C57B1/6 mice. Clin. Exp. Immunol. **38** (1979) 461–474.

Subcutaneous foot pad inoculation of living *M. lepraemurium* (LMLM) induced in high responder C57B1/6 mice a local granulomatous reaction associated with the production of effector cells which stopped the multiplication of bacilli in the draining popliteal node with the concurrent development of 24–48 hr delayed type hypersensitivity (DTH). The thymus-dependent local reaction did not occur after the injection of heat-killed *M. lepraemurium* (HKMLM) or after the inoculation of LMLM in nude mice. However, the HKMLM injection interfered with the onset of the local reaction and enhanced acid-fast bacteria (AFB) counts in the draining node. In low responder C3H mice, LMLM produced a local and delayed foot pad swelling, but no restriction of bacilli multiplication in the draining node was observed. This unresponsiveness was not due to an overloading of the inoculum doses since doses ranging from 3×10^4 to 3×10^7 MLM did not produce any granulomatous local reaction as in C57B1/6 mice. The injection of dead bacilli in the contralateral foot pad of subcutaneously (s.c.) infected C3H mice revealed Arthus-like and 18–24 hr delayed reactions.

When 10^6 LMLM per mouse were injected intravenously (i.v.), systemic infection, measured in the spleen, was found to be less restricted in C57B1/6 than in C3H mice. Moreover, in C57B1/6 mice, low doses of LMLM injected i.v. delayed the local reaction at first, then enhanced foot pad swelling and AFB counts in the draining nodes, indicating some acquired defect of peripheral immunity.

When a high dose of LMLM (2×10^8/

mouse) was injected i.v., C57B1/6 mice died sooner than C3H mice, indicating certain discrepancies between local resistance and systemic responsiveness.—Authors' Summary

Lefford, M. J. and Logie, P. S. Induction and suppression of cross-reactive antituberculosis immunity after *Mycobacterium lepraemurium* infection of mice. Infect. Immun. **31** (1981) 1023–1033.

Mice immunized with 10^8 live *Mycobacterium lepraemurium* in the foot pad showed increased resistance to infection with BCG or *M. tuberculosis* R1Rv. The resistance could be transferred adoptively with lymphoid cells, signifying that the immunity was cross-reactive rather than nonspecific. Adoptive cross-reactive immunity to *M. tuberculosis* was also conferred by spleen cells from mice immunized with large doses of living or dead *M. lepraemurium* intravenously, a route of immunization that suppresses the induction of cell-mediated immunity to that organism. The presence of specific suppressor activity was sought in mice immunized intravenously with *M. lepraemurium*. It was found that mice preimmunized intravenously with living or dead *M. lepraemurium* and then infected with BCG did not confer levels of adoptive antituberculosis immunity as high as those conferred by mice immunized with BCG alone. Similarly, a mixture of BCG-sensitized and *M. lepraemurium*-sensitized cells did not convey as much immunity as BCG-sensitized cells alone, signifying suppression of the effector lymphocytes.—Authors' Summary

Løvik, M. and Closs, O. Effect of BCG vaccination on *Mycobacterium lepraemurium* infection in a highly susceptible inbred mouse strain. Acta Pathol. Microbiol. Scand. (Sect. C.) **89** (1981) 133–138.

Upon infection with *Mycobacterium lepraemurium* (MLM) C3H mice develop a disease that has features in common with lepromatous leprosy in man. Intraperitoneal vaccination with a single dose of BCG four weeks before inoculation with MLM in the footpad significantly reduced the total bacillary load of the animals. In vaccinated animals there was a delay in the dissemination of bacilli to the popliteal lymph node, liver, and spleen. The growth rate of MLM in the foot pad and the popliteal lymph node was not altered by BCG vaccination. Reduced dissemination of the bacilli seems to be a sensitive parameter of resistance in murine leprosy. The mechanism of the resistance observed is discussed mainly in relation to non-specific macrophage activation and T-cell mediated responses to cross-reactive antigens.—Authors' Summary

Epidemiology and Prevention

Chaudhary, R. C. A clinico-social study in leprosy cases of Rajasthan. Lepr. India **53** (1981) 259–265.

A community survey was carried out in the area of a primary health center in Western Rajasthan to know the prevalence rate. A prevalence rate of 0.5 per thousand was found. Most of the cases were above 40 years, and only 22.6% gave the history of contact with other members of the family. Most of the cases had tuberculoid (N) leprosy showing maculoanesthetic patches over the upper and lower extremities. The face was involved in nine cases, and three cases had lost their toes.—Author's Summary

Kim, Do-Il. Current situation of leprosy control in Korea. Scientia Lepro **3** (1980) 85–90.

The current prevalence rate of leprosy is estimated to be approximately 1.3 per thousand population in Korea. The number of leprosy patients in Korea is estimated to be approximately 48,000, of which 28,000 cases are registered, while about 20,000 are still undetected. The detection rate of leprosy patients has been decreasing each year, and 612 patients were detected in 1979. Of these newly detected cases, 67% have already received antileprosy treatment before being detected. Among the

28,000 registered patients, 57% are lepromatous. Of the 28,000 registered patients in Korea, 48% are outpatients, 35% reside in 94 settlement villages, and 17% are inpatients in the National Leprosy Hospital (Sorok-do) and five voluntary leprosaria. Of the registered patients, 47% have disabilities; 82.4% live in the southern part of the country.—(*Adapted from* the article)

Levis, W. R. and Hedrick, J. L. Rising incidence of leprosy in the United States. N. Engl. J. Med. **304** (1981) 1363. (Letter)

This Letter to the Editor points out that the incidence of leprosy in the continental United States has risen from 50–60 cases per year 20 years ago to nearly 200 per year today. There are apparently 20–30 cases per year diagnosed in Staten Island, New York. Since generally effective drugs are available for leprosy, it is particularly important for physicians to be aware of the disease in the United States and to be certain that effective therapy is instituted.—(*Adapted from* the letter)

Park, E. S., Suh, J. H., Song, J. Y., Chae, J. R. and Shin, D. H. Histocompatability antigens in leprosy. Korean Lepr. Bull. **13** (1980) 67–74. (in Korean)

Results of HLA typing of 40 leprosy patients (2 tuberculoid, 38 lepromatous) and 50 normal Koreans living in Japan are presented. HLA antigens were determined by the microdroplet lymphocyte toxicity method (Teraski). The frequency of A2 and Bw4 antigens were decreased among the patients compared to the normals (corrected $p < 0.05$). Bw6 antigen showed the most remarkable deviation. The frequency of this antigen in leprosy patients was 0%, and that in the normal subjects of the control group was 50% (corrected $p < 0.02$).—(*Adapted from* Authors' Summary)

Park, K. W., Chung, S. M., Ko, Y. H. and Kim, D. I. Survey on the incidence of leprosy in Geoje Island. Scientia Lepro **3** (1980) 73–84. (in Korean)

Examinations were performed on 18,675 school children and 140 family contacts of known leprosy patients. No cases were found among the school children, but five early cases of leprosy were detected among the contacts (2 tuberculoid, 3 indeterminate, all male). The incidence of leprosy in Geoje Island was 0.27 per thousand population surveyed. The number of known leprosy patients registered has been decreasing, and the incidence of leprosy has deen decreasing in Geoje Island. Contact examinations are more effective than school surveys in detecting early leprosy cases in this location.—(*Adapted from* Authors' Summary)

Rehabilitation

Behere, P. B. Psychological reactions to leprosy. Lepr. India **53** (1981) 266–272.

The study was conducted to find out the psychological reactions to leprosy, to correlate psychological symptomatology with duration of leprosy, and to find out suicidal attempts among leprosy patients. Twenty-four patients were randomly selected from "Kashi Kutsth Swasth Shala and Punarvas Mandir." They were administered the Hindi adaptation of Middlesex Hospital Questionnaire. Fourteen patients verbalized suicidal ideas, and two have had suicidal attempts. Psychological symptomatology was less reported by those whose duration of illness was longer, and more symptoms were reported by those whose illness was of shorter duration. The various findings are discussed in length.—Author's Summary

Jesudasan, S., John, S. P., Jesudasan, K., Christian, M. and Fritschi, E. P. An analysis into the trends of reconstructive surgery in Gudiyatham Taluk, a leprosy control area. Lepr. India **53** (1981) 213–320.

The trends in reconstructive surgery in Gudiyatham Taluk, an area where an effective leprosy control program has been in progress since 1963, were analyzed. During

the years 1962–79, it is shown that there is a decline from the control area even though the new case detection rate and the total number of operations from both control and non-control areas remained high. The decline in the amount of reconstructive surgery on patients from a control area provides a reliable index to judge the efficacy of a leprosy control program.—Authors' Summary

Kushwah, S. S., Govilla, A. K., Upadhyay, S. and Kushwah, J. A study of social stigma among leprosy patients attending leprosy clinic in Gwalior. Lepr. India **53** (1981) 221–225.

The present study is a longitudinal study and was undertaken from November 1977 to January 1979. The study included 344 cases of leprosy patients from different areas. The data was collected, tabulated, and analyzed, revealing the following salient features.

Of cases studied, 26.4% were having one or more than one type of social stigma from their neighbors; 62.64% cases were having stigma for touch; 30.77% cases were in age group of 45–54 years. Males were more victims of social stigma than females. The social stigma was more prevalent in illiterates and low socioeconomic group patients; 69.03% of the cases were in need of social rehabilitation.—Authors' Summary

Palande, D. D. and Gilbie, S. G. The deformity of thumb in ulnar paralysis. Lepr. India **53** (1981) 152–159.

The flexion/extension angles at the metacarpophalangeal and interphalangeal joints of the thumb in positions of rest and pinch were studied in 68 thumbs of ulnar paralysis. In two thumbs the flexor pollicis brevis was not paralyzed. Twenty-five normal thumbs were used as controls for comparison. During the resting position the metacarpophalangeal joints showed less flexion and interphalangeal joints more flexion than normal. During the pinch position metacarpophalangeal hyperextension and interphalangeal flexion, the Z deformity, was seen in about 60% while marked interphalangeal flexion was seen in all thumbs of ulnar paralysis. It is suggested that this muscular imbalance is likely to affect thumb joints in time because of abnormal stresses due to altered forces, and this can be prevented by restoring the muscle balance by surgery.—Authors' Summary

Raj, V., Garg, B. R. and Lal, S. Knowledge about leprosy among leprosy patients. Lepr. India **53** (1981) 226–230.

A study on "knowledge of leprosy patients" was conducted in the dermatology outpatient department of JIPMER. The study has shown that a good percentage of leprosy patients possess proper knowledge of leprosy in respect of its awareness, nature of treatment, consequences of lack of treatment, and prevention of disease. Knowledge regarding the cause and mode of spread of disease and duration of treatment was lacking in the majority of patients. These areas should be given more concentration in educating the leprosy patients. It was found that literate patients possessed better knowledge than illiterate patients.—Authors' Summary

Other Mycobacterial Diseases and Related Entities

Crovato, F. and Levi, L. Clofazimine in the treatment of annular lupus erythematosus. Arch. Dermatol. **177** (1981) 249–250. (Letter)

This Letter to the Editor consists of two case reports involving the use of clofazimine to successfully treat annular lupus erythematosus. The first case was a 52-year-old female with widespread, scaly, annular lesions that tended to coalesce on exposed aspects of the body. The patient was treated for one month with topical steroids, up to 60 mg per day of oral prednisolone, and 400 mg per day of hydroxychloroquine sulfate without substantial benefit. This treatment was stopped and the patient given 100 mg per day of clofazimine. The le-

sions cleared within a few weeks. The second patient was a 60-year-old woman with red, well-defined, scaly patches with hyperkeratosis, involving the face, scalp, neck, chest, and shoulders. The patient was treated for 4 years with topical and oral steroids and with antimalarial drugs without effect. The patient was treated with thalidomide 300 mg daily, initially, and then tapered to 50 mg daily for 1 month with partial benefit. The patient was then treated with 100 mg daily of clofazimine, and the lesions completely cleared within 1 month. Clofazimine, which has been used in the treatment of the usual pattern of discoid lupus erythematosus, thus proved effective also in the treatment of annular lupus erythematosus. Its mechanism of action in lupus erythematosus is unknown.—Authors' Summary

Rosario, V. Cloning of naturally occurring mixed infections of malaria parasites. Science **212** (1981) 1037–1038.*

Clones have been established from a cultured isolate of *Plasmodium falciparum* characterized by two electrophoretic forms of glucose phosphate isomerase. Cultures initiated from diluted samples containing an estimated 1.0 or 0.5 parasite showed microscopically visible parasites after 21 days. Most of these cultures were characterized by only single enzyme forms.—Author's Summary

Yangco, B. G., Eikman, D. A., Solomon, D. A., Deresinski, S. C. and Madden, J. A. Rapid radiometric method for determining drug susceptibility of *Mycobacterium avium-intracellulare*. Antimicrob. Agents Chemother. **19** (1981) 534–539.

A rapid radiometric method for susceptibility testing of *Mycobacterium avium-intracellulare* to eight chemotherapeutic agents was compared with a conventional method. Results were available within 72 hr by radiometric testing in contrast to 21 days by the conventional method. The radiometric and conventional methods agreed in 61% of the tests, but growth inhibition of $\geq$50% was detectable only by radiometric testing in an additional 36.5% of the tests. In only 2.5% of the tests was the radiometric method unable to detect complete inhibition shown by the conventional method. Quantifiable increases in inhibition with increasing concentration of isoniazid were more frequently detectable by the radiometric method than by conventional testing. The radiometric method is a simple, rapid, and quantitative test for drug susceptibility of mycobacteria and warrants further investigation.—Authors' Summary

* Editor's Note: It is interesting to speculate that "mixed infections" with different strains of *M. leprae* may also occur.—RCH