Volume 46, Number 4
Printed in the U.S.A.

CURRENT LITERATURE

This department carries selected abstracts of articles published in current medical journals, dealing with leprosy and other mycobacterial diseases. Abstracts are supplied by members of the Editorial Board and Contributing Editors, or are reproduced, with permission, from other abstracting journals.

General and Historical

Dubovsky, H. Albert Schweitzer 1875-1965. Practical mystic of Africa. S. Afr. Med. J. **52** (1977) 693-698.

This article presents some interesting insights into the character and motivations of Dr. Schweitzer beginning with the early history of his life. His contributions to and views on theology, philosophy, music (an area in which he had many academic achievements), and civilization are noted.—L. W. Peterson

Freerksen E. Research in the campaign against leprosy. Munch Med. Wochenschr. **119** (1977) 1115-1118. (In German)

"Leprosy Relief Through Leprosy Research" means that the results of researeh are made available for curing and eradicating the disease. The "Marinum Model" and the "plantar test in mice" are, along with the determination of serum activity in healthy test subjects, part of a complex of experiments for the assessment of the therapeutic value of an antimycobacterial substance. This replaces the "controlled studies" which, in their proper form, are scarcely possible for leprosy. With the recently developed forms of combination therapy, the duration of leprosy treatment is reduced to a few years. Because of the relationship of *Mycobacterium leprae* to *Mycobacterium tuberculosis,* certain types of combination therapy can be used in both diseases at the same time.—Author's Abstract

Kerharo, J. La pharmacopée sénégalaise. Note sur quelques traitements antilépreux traditionnels pratiqués dans le Baouar (préfecture de Kebember). [Senegalese pharmacopoeia. A note on a few traditional antileprosy treatment practices in the Baouar (Kebember prefecture).] Bull. Soc. Med. Afr. Noire Lang. Fr. **22** (1977) 321-329. (In French)

Seven methods of treatment are described. Preparations, means used, modus operandi, vernacular names, scientific names and the administration of medicines with the medico-magical character of these operations giving rise to the detailed developments which concern the 1964-1965 investigation are presented.

These two investigations make it appear that the traditional healers have both the knowledge of the properties of antileprous plants, the means of transmitting the knowledge from generation to generation and the evolution of formulae for medical preparations.

Of the 56 drugs appearing in the seven treatments mentioned one finds *Detarium senegalense* and *Jatrophe chevalieri* five times. *Swartzia madagascariensis, Stereospermum kunthianum* and *Trichilia roka* four times, *Maytenus senegalensis* and *Acacia albida* three times, *Calotropis procera, Mitracarpus scaber, Euphorbia balsamifera, Strophanthus sarmentosus, Commiphora africana* and *Capparis tomentosa* each twice while 16 other species are only mentioned once.

In the particular case of information supplied by the traditional healer Daouda Ka, after a thirty year interval, one is able to notice that of 13 drugs employed by him in 1935, and of which he had knowledge at the time of the death of his father the year before, only seven were still used in 1965, six having been discarded and five added in their place.—Author's Summary

McDougall, A. Colin. The work of the Leprosy Study Centre in London: a review of over 13,000 biopsies. Proc. R. Soc. Med. **70** (1977) 731-732.

Following his return to the United Kingdom in 1951, Dr. R. G. Cochrane conceived and implemented the idea of a center in London for the study and teaching of leprosy, while at the same time setting up a registry of histopathology. Early in 1976 it was decided to review the resultant collection of over 13,000 biopsies in a broad sense, subdividing it into those which showed definite evidence of leprosy, those which were normal or nonspecific, and then looking with particular care at biopsies which had in fact revealed some totally different disease.

The period of study was from 1952 to mid-1976, 24 years in which 13,498 sections were examined from approximately 7,500 index cases, the majority coming from Africa, Nepal, South Pacific, United Kingdom and Australia, with smaller numbers from India, Pakistan, New Zealand, Hong Kong and Ethiopia. Most sections are of skin, but there are also many hundreds of biopsies from peripheral nerve and nasal mucous membrane, together with smaller numbers from scrotum, penis, nipple and various joints. From 17 patients coming to post-mortem, most of them lepromatous, a wide range of tissues is available.

The center has through the years contributed data of importance on the exit route of bacilli from the untreated lepromatous patient into the environment, based on biopsies of the nasal mucous membrane, bacilli in nose-blow mucus and debris expelled from the nose (as in nose blowing), droplet transmission from the upper respiratory tract, bacilli in breast milk and nipple. These findings with their obvious implications for the epidemiology of leprosy have come almost entirely from the experience of one doctor working in Nepal (Pedley 1967, 1968, 1970, 1973; Pedley & Geater 1976), who regularly submitted biopsies to the Leprosy Study Centre over a period of 14 years.

Currently the total number of biopsies is well over 14,000. Dr. R. G. Cochrane, the man who conceived the Leprosy Study Center 24 years ago, may take satisfaction from its continued work as a diagnostic, reference and teaching center which must be unique in the field of leprosy.—(*Excerpted from* article)

Monzon, H., Convit, J. and Pinardi, M. E. Leprosy. Acta Cient. Venez. **27** (1976) 235-243. (In Spanish)

After a brief historical appraisal, the authors review current knowledge concerning leprosy emphasizing the possible lines of research more promising in practical results in the fields of epidemiology, control of the disease, etiology, classification, immunology and treatment.

There are many unknown factors related to ways of propagation, routes of entry, mechanisms of transmission and susceptibility but in the last ten years there have been many advances towards the understanding of important epidemiologic and immunologic aspects. The most significant ones are:

1. The experimental transmission of the disease to an animal model.

2. The development of a skin test (CCB Test) to detect susceptibility or resistance to the disease.

3. The preparation of a purified antigen to study the immunologic trends of the infection.

Referring to classification the authors think that, considering the clinical, immunologic and bacteriologic aspects, the most adequate is the Madrid classification with the modifications introduced by Ridley and Jopling for the borderline group: polar lepromatous (LL); polar tuberculoid (TT); indeterminate; and borderline with its varieties (BT, BB and BL).

In relation to specific therapy, DDS is still the drug of choice. Repository sulfones (DADDS) are being evaluated and experience will tell regarding the best dosage and interval of injection. Rifampicin and clofazimine (Lamprene) are discussed as second line drugs. The first one has a faster clinical and bacteriologic effect.—(*Adapted from* authors' abstract)

Sankale, M., Ndiaye, P. and Beye, I. Enquête préliminaire sur l'opinion du noir sénégalais vis-à-vis de la lèpre. [Preliminary enquiry into the opinions held by the Senegalese about leprosy.] Med. Afr. Noire. **24** (1977) 571-581. (In French)

By means of a verbal questionnaire distributed to health workers in contact with a cross-section of African opinion in Senegalese villages, the authors hoped to obtain information on currently held beliefs about leprosy. Out of 1,310 forms distributed, only 532 were returned adequately completed

from healthy people and 100 from patients with leprosy. This highly selective sample is analyzed.

Most of the replies came from one ethnic group, and the background of the individuals composing this group is not given in detail, apart from age and sex structure and district of residence.

Among the healthy, most people seem to know what leprosy is, and fear it as a "great sickness": various equivalents in local dialects are given. The cause of the disease is commonly held to be explicable only in supernatural terms—it is a punishment or a curse (42%), but heredity (29%) or the taking of certain foods, e.g. goat meat, fish, milk, (17%) may also be factors.

About two-thirds of the replies held that leprosy was a hereditary condition, and cited as proof its common appearance among the young in families where there was already a sufferer, but a high proportion (98%) thought that it was contagious, being transmitted by clothing, body secretions (such as sweat, saliva, sputum), sexual relations or other forms of physical contact.

The authors emphasize that physical opinions and attitudes are based on beliefs. Thus the great majority of persons questioned considered that those suffering from leprosy should be segregated, although most of them admitted that the disease was curable—especially by doctors (rather than by medicine men).

To avoid catching leprosy, opinion seemed to advocate: no contact with sufferers from the disease, and maintain high standards of cleanliness and hygiene.

[Despite the relative sophistication of many of those responding to the questionnaire, the prevailing ignorance about leprosy is very obvious, as is the need for health education.]—S.G. Browne (*From* Trop. Dis. Bull.)

Chemotherapy

Almeida Neto, E. and Jorge, M.D. Tratamento da lepra com a associacão sulfamoxol e trimetoprin. Ensaio duplo cego com o DDS em 20 pacientes lepromatosos. [Treatment of leprosy with a combination of sulfamoxole and trimethoprim. Double-blind test with DDS in 20 patients.] An. Bras. Dermatol. **52** (1977) 153-164. (In Portuguese).

Therapeutic effectiveness of the association of sulfamoxole together with trimethoprim as compared to DDS for the treatment of lepromatous patients was studied through a double-blind test over a period of 12 months. The authors concluded that trimethoprim is devoid of therapeutic activity and that sulfamoxole is specifically active but less than DDS.—(*Adapted from* Trop. Dis. Bull.)

Ambrose, E. J., Khanolkar, S. R., Antia, N. H., Chulawalla, R. G. and Koticha, K. K. Rapid test for drug resistance in leprosy. Lancet **2** (1977) 1036. (Letter to Editor).

We have investigated the *in vitro* effect of drugs on purified suspensions of leprosy bacilli under conditions where the bacterial population is similar to that of the original biopsy, and before the emergence of contaminants (Nature 1976). Tritium (^{3}H)-labeled thymidine and dihydroxyphenylalanine (DOPA) have been used to estimate growth potential and bacterial integrity (DOPA, a species-specific label, becomes trapped within the high-permeability barrier of the plasma membrane and is then oxidized *in situ;* this barrier is absent in tissue contaminants and dead bacilli). Replicate cultures in suitable medium are incubated with pulse-labeled thymidine for 24 hours and labeled DOPA for 6 hours. Ratios of scintillation counts at days 6 or 9 to counts on day 0 are calculated. The range of dapsone (DDS) concentrations studied covers the range found in serum of DDS resistant patients. With untreated cases, we also observed responses with a range of lower concentrations of DDS, some samples showing a sensitivity of 100 times greater than that shown by any known contaminant.

Our first DDS resistance tests using labeled DOPA showed that untreated cases gave a ratio at six days of 2.08 ± 0.24 (S.E.); DDS treated cases gave a ratio at six days

of 1.58 ± 0.22 (S.E.). Eleven relapsed cases gave highly variable ratios, some appearing to respond, others appearing resistant, but recent results with improved methods and using ratios at day nine are shown in our table. Untreated case 2, on whom parallel tests with thymidine and DOPA were carried out, showed sensitivity to DDS and rifampicin. Relapsed case 3 responded well in the clinic to rifampicin. Relapsed case 4 received no regular treatment. In 1976 Dr. M. B. Bhide of the Haffkine Institute showed that case 5 was DDS resistant in the mouse foot pad test. Per day, 100 mg DDS was continued till May 1977 when our test showed complete resistance to DDS but sensitivity to rifampicin. This patient has now shown excellent clinical response to rifampicin.—(*Adapted from* authors' letter)

Balakrishnan, S. Monitoring self administration of dapsone by patients. Lepr. India **49** (1977) 364-371.

The urinary/creatinine ratios in the supervised in-patients and out-patients attending the C.L.T. & R.I. clinic were compared. The subjects of this study were receiving dapsone at the daily dosage of 25, 50 and 100 mg or biweekly dosage of 24, 50, 75, 100 and 200 mg. The mean urinary DDS/creatinine ratios from out-patients were significantly lower than those of the in-patients in both dosage schedules of treatment and suggest that a certain percentage of out-patients have been irregular in the intake of dapsone in the period immediately prior to the collection of urine specimens. The estimated percentage of gross irregularity of intake is markedly higher in the biweekly as compared with the daily dosage schedule. The gross irregularity of intake was particularly marked in the higher dosage groups such as 100 mg daily or biweekly and 200 mg biweekly. The implications of the findings are discussed.—Author's Summary

Balakrishnan, S. and Ramu, G. Blood DDS levels and acetylation rates of Sulphadimidine in leprosy patients. Lepr. India **49** (1977) 59-64.

The plasma DDS clearance rates and the acetylation rates of Sulphadimidine were studied in a group of 30 leprosy patients comprising 17 non-responders and 13 responders to DDS treatment. No differences in the acetylator type or in the plasma DDS clearance were seen between the responders and non-responders. Acetylation rate did not bear any relation to the plasma clearance of DDS in the non-responders. The findings indicate that the resistance to DDS therapy in these patients is not related to any abnormal metabolic disposition of DDS.—(*Adapted from* Trop. Dis. Bull.)

Beurey, J., Weber, M., Delrous, J. L. and Chaulieu, Y. *Pyoderma gangrenosum:* thérapeutique par clofazimine. [*Pyoderma gangrenosum:* clofazimine therapy.] Ann. Dermatol. Venereol. (Paris) **104** (1977) 631-634. (In French)

Two patients with *pyoderma gangrenosum* have responded remarkably well to treatment with clofazimine (Lamprene). The first patient, a 68 year old woman, suffered from *pyoderma gangrenosum* of the buttock and left leg and on the incision scar for cancer of the breast. Laboratory findings showed monoclonal dysglobulinemia (alpha 2-kappa 2). A daily dose of 300 mg clofazimine resulted in complete healing within ten days.

The second patient was a 24 year old woman suffering from ulcerative colitis and a rapidly progressing *pyoderma gangrenosum* of the left leg. The lesions were completely healed after two weeks of clofazimine therapy. The dosage was 200 mg daily and was increased to 400 mg daily. Our cases showed decreased cellular immunity and their phagocytic activity was variable.—(*Adapted from* authors' summary)

Desai, A. C. and Bhide, M. B. Hydnocarpus oil as an antileprotic agent in foot pad technique. Lepr. India **49** (1977) 360-363.

Hydnocarpus oil alone and mixed with dapsone in food and fed to mice infected with *Mycobacterium leprae* showed inhibition of the growth of the lepra bacilli, both sensitive and resistant to dapsone. There was an additive inhibitory effect of the combination of dapsone and oil on the growth of bacilli.—Authors' Summary

Digoutte, J. P., Roche, J. C., Brule, M. and Gailhbaud, M. Traitement des lèpres lépromateuses par le BCG itératif à dose

croissante. [Treatment of lepromatous leprosy with repeated increasing doses of BCG.] Bordeaux Med. **10** (1977) 703-706. (In French)

Following Ruscher's research on the treatment of lepromatous leprosy by BCG injected with increasing and repeated doses, a similar experiment was carried out on a group of 21 patients considered as being lepromatous. The treatment with BCG was always associated with a specific chemotherapy comprised, first of all, of a daily absorption of rifampicin followed by a treatment with Disulone and Lamprene. Each patient received BCG injections every fortnight over a period varying from 15 to 18 months. Tolerance to treatment was good. At most, a few necrotic lesions were observed at the point of injection which rapidly disappeared.

The clinical results were good: out of 21 patients, only 1 did not show any marked improvement, 14 were blanched, and 6 presented a few bacilli that were greatly altered. On the immunological plane based solely on interpretation of the Mitsuda reaction, only five reactions were positive. On the other hand, histologic results carried a more varied interpretation, as even after the color change of a Mitsuda reaction, three of five patients maintained an interpolar aspect of their lesions upon final biopsy. We have recently given patients with an indeterminate negative Mitsuda form the benefit of this therapy with encouraging results.—(*Adapted from* Trop. Dis. Bull.)

Feldman, Marvin F. and Moses, Robert A. Corneal penetration of rifampin. Am. J. Ophthalmol. **83** (1977) 862-865.

We tested the corneal penetration of rifampin in four vehicles: dimethylsulfoxide, polyethylene glycol, an ocular lubricant, and a rifampin ointment. We measured drug concentrations in the aqueous humor in rabbits after topical instillation of 1% and 2.5% rifampin according to two dosage schedules. Drug concentrations in the aqueous humor were bactericidal to *Mycobacterium leprae*. Since leprosy of the cornea, iris, and ciliary body may develop despite standard systemic bacteriostatic treatment, treatment of leprotic involvement of the anterior eye may be enhanced by intensive topical application of rifampin.—Authors' Summary

Freerksen, Enno and Rosenfeld, Magdalena. Fortschritte in der Tuberkulosebehandlung. [Advances in antituberculosis therapy.] Prax. Pneumol. **30** (1976) 489-502. (In German)

A number of antimycobacterial agents are more effective if they are used in combination than they are if given alone. Among these drugs are rifampicin, isoniazid, prothionamide and diaminodiphenylsulfone. As this potentiation depends on a definite proportion of the ingredients in the combination, the use of preparations that contain a fixed dose of each agent is advisable. The combination of isoniazid, prothionamide and diaminodiphenylsulfone, available as Isoprodian, is the first in antimycobacterial therapy to make practical use of the potentiating effect. Fixed-dose combinations have the advantage that treatment is simplified and that the regular taking of the necessary drugs is made more certain.

The correct choice of suitable drug combinations makes it possible to simplify and reduce the time of treatment; it also lessens the risk of intolerance. A variety of highly effective drug combinations are now available either for purely oral administration or for the rare cases which require parenteral medication.

Antituberculosis therapy can nowadays generally be given out of the hospital and is becoming increasingly the domain of the general practitioner. Special regimens for the short-term treatment of problem cases are now also available. Antituberculosis treatment is in the process of becoming antimycobacterial therapy directed not only against tuberculosis but also against other mycobacterial infections such as leprosy.—(*Adapted from* authors' summary)

Ghosh, S., Hazra, S. K., Kundu, S. and Choudhury, S. Clinical trial with rifampicin in the treatment of leprosy. Final report. Lepr. India **49** (1977) 339-343.

A controlled trial of rifampicin plus dapsone has been in progress for two years in the Department of Leprology, School of Tropical Medicine, Calcutta. Interim results of this trial after six months treatment were reported in 1976. The present paper is the final report of the study after two years of treatment. The study reveals that with ri-

fampicin, the M.I. falls rapidly after six months, but changes in the B.I. are not better than in the DDS group. As a matter of fact, regarding B.I., treatment with DDS has given better results as two cases have become negative in the DDS group while no case has become negative in the rifampicin group. It is, therefore, concluded that clinical improvement with rifampicin is similar to that with DDS.—Authors' Abstract

Hanauske-Abel, H. and Gunzler, V. Inhibition of human prolyl hydroxylase as common biochemical denominator of the nonsedative effects of thalidomide in man. Z. Naturforsch. **32** (1977) 241-248.

The two main nonsedative effects of thalidomide (2-phthalimido-glutarimide) in man are embryopathy, which finally forced termination of its use as a sedative, and its excellent efficacy in leprosy reactions, for whose prevention and treatment alone the drug is still available. Both effects can be explained on a molecular level by assuming that a nonsedative metabolite of thalidomide mediates inhibition of human prolyl hydroxylase, as suggested by steric considerations and correlation to known data. This metabolite may well be a suitable model compound for drugs designed for selective fibrosuppression and selective immunosuppression. —(*Adapted from* authors' abstract)

Iyer, C. G. S., Balakrishnan, S. and Ramu, G. A comparison of low and conventional dosages of dapsone in the treatment of lepromatous leprosy. Lepr. India **49** (1977) 372-386.

A therapeutic trial using two dosages of dapsone with a schedule of administration of the drug once a week was undertaken at the Central Leprosy Teaching and Research Institute, Chingleput. Adult males with active lepromatous leprosy who were either previously untreated or who had no specific treatment for at least three months immediately prior to their inclusion in this study were the subjects of this trial. Two dosages, *viz.*, 10 mg per kg body weight/week and 3.3 mg per kg body weight/week, were employed in this trial.

It was found that dapsone administered orally as a single dose once a week was therapeutically effective in most of the patients, and improvement, clinical or bacteriologic, was directly related to the duration of treatment, irrespective of the dosage of dapsone. Blood levels of dapsone in these patients were in general commensurate with the dose of the drug in either group. No adverse effects on any of the visceral functions were encountered during the prolonged use of this schedule of treatment with dapsone.—(*Adapted from* authors' summary)

Naik, S. S. and Pandya, S. S. Dapsone in wheat flour as a possible method of therapy in leprosy. Lepr. India **49** (1977) 516-520.

The preparation of chapatties from wheat flour to which DDS is added does not alter the structure of DDS. Administration of DDS through wheat flour chapatties does not affect the palatability of the food and the patterns of absorption and excretion of the drug compare well with those from conventional therapy. DDS added to wheat flour in the proportion 400 mg/kg gives blood levels corresponding to 50-100 mg of conventional dapsone therapy/day for adults and corresponding levels are obtained in children, provided the estimated amount of wheat flour is consumed. The acceptibility of this mode of administration of the drug has to be tested in families of infectious leprosy patients, where chemoprophylactic and therapeutic considerations are important.—(*Adapted from* authors' abstract)

Noordeen, S. K. Long term effects of chemoprophylaxis among contacts of lepromatous cases. Lepr. India **49** (1977) 504-509.

An eight and a half year follow-up was carried out on contacts of lepromatous cases who had had treatment with either dapsone or placebo earlier, and whose "treatment" had been terminated following their index cases becoming inactive. The declaration of inactive state was based on a bacteriologic negative state maintained for at least three years as verified through six half-yearly skin smear examinations. The follow-up showed that contacts who were originally taking dapsone continued to receive protection even after termination of treatment, as compared with the controls. It is difficult to explain this "carry over" benefit from chemo-

prophylaxis, unless it is hypothesized that contacts studied consisted mostly of infected persons without manifest disease and chemoprophylaxis contributed to the aborting of infection in those persons without at the same time interfering with the development of immune capability.—(*Adapted from* author's conclusion)

Pattyn, S. R. The chemotherapy of leprosy from a microbiological standpoint. Lepr. India **49** (1977) 526-539.

The increased knowledge concerning microbiology and chemotherapy of leprosy is exposed. Great stress is put on the knowledge of chemotherapy of tuberculosis that has accumulated during the last two decades and the guidelines that are equally valid for the chemotherapy of leprosy. The problems of the chemotherapy of the different forms of the disease are exposed and future lines of research indicated.—Author's Summary

Santos, I. Tetramisol em Hanseníase. I. Viragem lepromínica. [Tetramisole in leprosy. I. Effect on lepromin reaction.] An. Bras. Dermatol. **52** (1977) 165-173. (In Portuguese)

Tetramisole was administered to 30 lepromatous patients and 10 healthy lepromin-negative persons, in a daily dosage of 160 mg during 30 days. An activation of the Mitsuda reaction was obtained in 19 lepromatous patients and in six healthy people.—(*From* Trop. Dis. Bull.)

Clinical Sciences

Antia, N. H. and Pandya, N. J. Surgical treatment of the nasal deformities of leprosy; a 16 year review. Plast. Reconstr. Surg. **60** (1977) 768-777.

The stigmata of leprosy are the persistent deformities and the most evident of these are on the face. Perhaps the depressed nose is the most distressing deformity in leprosy and the one most likely to attract public attention. The nose is involved in 25% of all the cases with facial deformities and the problem may vary from a minor depression of the cartilaginous bridge line to almost total absorption of the bony and cartilaginous famework.

The deformities of the face in leprosy are the result of direct damage to tissues in the course of lepromatous disease. The patient is bacteriologically positive, as noted by nasal and skin smears, for a long period of time (up to several years). However, the recent work of Shepard tends to show that the morphologic index (number of bacteria) falls to zero after about three months of treatment. Although bacilli may still be present, they are nonviable ones (as demonstrated by the foot pad inoculation technic). It is reasonable, therefore, to operate on these patients after a couple of years of treatment—when the bacteriologic index is about one or two plus and when all signs of acute disease (such as ulceration of the nose) have subsided.—(*Adapted from* authors' abstract)

Antony, P. Polambakkam splint for treatment of plantar ulcer in leprosy. Lepr. India **49** (1977) 521-525.

An open type of short leg splint is described and illustrated for the treatment of plantar ulcers in leprosy. Its fabrication, method of application, advantages and disadvantages are discussed as compared to the other methods of immobilization. In our short experience we have found that with the use of this splint, ulcers heal in a period of about six weeks and in many cases even earlier than this period.—Author's Summary

Ayanru, J. O. The problem of uveitis in Bendel State of Nigeria: experience in Benin City. Br. J. Ophthalmol. **61** (1977) 655-659.

A review of 1,987 patients with uveitis seen over an 11 year period in the Bendel State of Nigeria has been undertaken; 56% of cases had a posterior/midperipheral uveitis, 15.1% a panuveitis and 21.5% an anterior uveitis. Acute anterior uveitis with classical symptoms was rarely seen. Its comparative rarity is presumably due to the absense of HL-A27 in Africans and altered immunologic states from malaria and parasitic infections.

Identified etiologic factors in anterior uveitis were leprosy (1 patient), tuberculosis

(1 patient), herpes zoster (16 patients), and onchocerciasis (3 patients). The great majority of cases of posterior uveitis were of presumed toxoplasmic origin. Further studies are needed to demonstrate its mode of transmission in a population in which toxoplasmosis is endemic. Forest onchocerciasis is not a major cause of uveitis in southern Nigeria in the same way as savanna onchocerciasis is in northern Nigeria. Syphilis seems to play no part in the causation of uveitis in southern Nigeria. Better diagnostic facilities are required to determine the role of sarcoidosis and other possible causative factors. Uveitis is a major cause of blindness in Nigeria.—(*Adapted from* author's summary)

Bourrel, P., Rey, A., Blanc, J. F., Palinacci, J. C., Bourges, M. and Giraudeau, P. Tarsal canal syndrome with reference to 15 "pure" cases and 100 cases "combined" with leprosy or diabetes. Rev. Rhum. Mal. Osteoartic. **43** (1976) 723-730. (In French)

The authors have observed 15 cases of the tarsal canal syndrome: the 14 cases operated on showed compression of the nerve by bone fragments resulting from trauma, by local varices, by a muscular anomaly, or as a result of enclosure by post-trauma fibrosis. Surgery resulted in ten cures and considerable improvement in two other cases.

In addition to these 15 "pure" cases the authors report their experience of neurolysis of the posterior tibial nerve and of the plantar nerves of the tarsal canal in the treatment of perforating plantar lesions in leprosy (88 cases) and diabetes (12 cases). The good results in these cases indicate the value of extending this therapy to the treatment of perforating plantar lesions in cases of large nerve neuritis.—Authors' Abstract

Carrie, J. Lèpre et fécondité. [Leprosy and fecundity.] Afr. Med. **16** (1977) 369-373. (In French)

Interviews with 352 patients (279 in hospitals) suggest that severe forms of leprosy reduce fertility. This is more pronounced in males, especially when onset of the disease was at a young age. The number of pregnancies and children are lower in women with leprosy. This seemingly is not associated with deformities and trophic lesions.—(*Translation by* M. F. Lechat)

Chugh, K. S., Singhal, P. C., Sharma, B. K., Mahakur, A. C., Pal, Y., Datta, B. N. and Das, K. C. Acute renal failure due to intravascular hemolysis in the North Indian patients. Am. J. Med. Sci. **274** (1977) 139-146.

Acute renal failure due to intravascular hemolysis is a common clinical problem in North Indian patients. It constituted 21.5% of 325 patients dialyzed for acute renal failure over an 11 year period at Chandigarh. Thirty patients have developed acute intravascular hemolysis in association with erythrocyte glucose-6 phosphate dehydrogenase (G-6PD) deficiency, 17 due to copper sulfate intoxication and 8 due to envenomation by snakes. Less frequent causes were insect stings, incompatible blood transfusion, intake of an antileprosy drug—dapsone in non-G-6PD-deficient patients, and mercuric chloride toxicity in two patients each; naphthalene poisoning in one; and uncertain causes in six patients. Renal histology was available in 55 patients. Acute tubular necrosis was seen in 54 and bilateral diffuse cortical necrosis in one patient. Fifty patients (71.43%) survived and 20 (28.6%) died. G-6PD erythrocyte deficiency, which is present in 4.5% of the North Indian population, was the most frequent cause of acute renal failure in this group.—Authors' Abstract

Chung, T. H., Song, J. Y. and Hong, S. S. Inhibitory effect of tuberculo-protein complex, Tubercin-3, on three cases of lepromatous leprosy. Yonsei Med. J. **17** (1976) 131-135.

Three cases of leprosy were successfully treated with a tuberculo-protein complex, Tubercin-3, which was prepared from *Mycobacterium tuberculosis* by Chung (J. Korean Med. Assoc. **17** [1974] 427-431) and no noticeable side effects were observed. The three cases were brought to us without leprosy medication since their disease was recently diagnosed. Daily inoculations of Tubercin-3, 1.0 microgram on the forearm, subcutaneously for eight months in Case 1, seven months in Case 2, and six months in Case 3, cleared them of their lepromatous lesions.—Authors' Abstract

Hasan, S. A survey of leprosy deformities among the patients of Hyderabad City. Lepr. India **49** (1977) 393-399.

Neuropathic deformity is a major problem among the patients of Hyderabad City. Nearly 44.3% of the patients have one or the other kind of deformity of the hand, foot or face; 29.1% of the upper limbs, 30.7% of the lower limbs and 5.2% of the faces were affected. The patients with lepromatous leprosy showed a greater tendency toward deformity (66.4%). Patients with simple anesthesia in hands and feet formed the majority of the deformity cases, a total of 41.6%. Education of the patients in hand and foot care is an essential feature of the clinic physiotherapy technician.—(*Adapted from* author's summary)

Isaacson, C. Idiopathic neurotrophic feet in Blacks. S. Afr. Med. J. **52** (1977) 845-848.

The pathologic findings in tissues obtained from six patients with idiopathic neurotrophic feet are described. The salient features were those of a neuropathy characterized by gross demyelinization and marked changes in the distal blood vessels. The vascular changes included medial and intimal hypertrophy with luminal narrowing. It is proposed that both the neural and the vascular changes were secondary to chronic alcoholism.—Author's Summary

Jolliffe, D. S. Leprosy reactional states and their treatment. Br. J. Dermatol. **97** (1977) 345-352.

Leprosy reactions can be broadly classified into two etiological groups. Type 1 (lepra) reaction is the result of changes in cell-mediated immunity and Type 2 (ENL) reaction is probably due to formation of immune complexes. Therapy must at all times include effective antibacterial drugs to which specific reaction suppressants should be added. Prednisolone and clofazimine are effective in suppressing both types of reaction and thalidomide only in the treatment of Type 2 reaction.—Author's Conclusion

Jopling, W. H. Clinical similarities between Kaposi's sarcoma and lepromatous leprosy. Trans. R. Soc. Trop. Med. Hyg. **71** (1977) 554. (Letter to Editor)

In his paper on the differential diagnosis of Kaposi's sarcoma (KS) (Trans. R. Soc. Med. Hyg. **71** [1977] 352-354) Dr. Auty has omitted lepromatous leprosy. This is surprising, for when skin lesions in KS have a bilateral distribution there is a strong resemblance to lepromatous leprosy. These two diseases share the following features in common: 1) the highest incidence is in tropical Africa; 2) the patient is usually an adult male between 20 and 50, but children may be affected; 3) nodules have a firm consistency on palpation; 4) nodules may ulcerate; 5) skin lesions favor feet and lower legs, less commonly hands and arms; 6) when the face is involved there is usually simultaneous involvement of legs; 7) edema of legs may be the first manifestation; 8) the presence of skin lesions on limbs is likely to be associated with chronic edema of the affected limb, and when legs are affected they have a feeling of hardness when palpated; and 9) skin lesions do not show any sensory change. Only in long-standing lepromatous leprosy are skin lesions on limbs likely to be insensitive, and that is because of underlying "glove and stocking" anesthesia resulting from peripheral nerve fibrosis.—(*Adapted from* author's letter)

Louvet, M., Saint-Andre, P. and Giraudeau, P. Traitement médical des maux perforants plantaires lépreux. (A propos de 34 observations). [Medical treatment of perforating ulcers of the foot in leprosy (Remarks on 34 observations).] Med. Trop. **36** (1976) 429-433. (In French)

Following a short clinical description of neuropathic plantar ulcerations, all too commonly seen as a late complication of tuberculoid leprosy, the authors briefly refer to the etiologic factors (nervous, vascular and traumatic) and the appropriate treatment (neurolysis, periarterial sympathectomy and protection, respectively). They then summarize the results obtained in an uncontrolled series of 34 patients suffering from plantar ulcers. In addition to bed rest, local treatment, and plaster of Paris immobilization, they considered that the administration by injection of extract of *Centella asiatica* (Madecassol) accounted for the good results obtained, healing of three-quarters of the ulcers in an average of 45 days. [This conclusion is not supported by the evidence given.]—S. G. Browne (*From* Trop. Dis. Bull.)

Nigam, P., Goyal, B. M., Mishra, D. N. and Samuel, K. C. Reaction in leprosy complicated by filariasis. Lepr. India **49** (1977) 344-348.

Five cases of reaction in leprosy with filariasis have been presented to emphasize the coexistence of the two conditions in the areas endemic to filariasis and leprosy. One may modify the clinical features of the other. Necessity of recognizing filariasis as an important precipitating factor for lepra reaction in tropical countries has been highlighted for proper management of rather protracted and resistant cases.—Authors' Summary

Palande, D. D., DeSevery, C. and Rajagopalan, M. S. Plantar ulcers with osteomyelitis underneath. A bacteriological study. Lepr. India **49** (1977) 322-329.

Thirty-nine consecutive cases of plantar ulcers with underlying chronic osteomyelitis admitted to the Sacred Heart Hospital during 1975-1976 were studied for the infecting organisms and their sensitivity to easily available antibiotics. A single organism was isolated in only ten cases, the infection in the rest being a mixed one. The most common organisms were staphylococcus, streptococcus and proteus mirabilis. In a few cases pseudomonas and *E. coli* were also isolated. In general, chloramphenicol was the most effective antibiotic and streptomycin the least. Of the staphylococcus strains isolated, 70% were found to be resistant to penicillin. Empirical use of antibiotics, especially penicillin and streptomycin, is hence deprecated.—(*Adapted from* authors' abstract)

Papy, J. J., Languillon, J., Papy-Temime, M. and Cournil, C. Les multinévrites hanséniennes. Signes électrophysiologiques, infracliniques et diagnostic. [Leprous polyneuritis; electrophysiological signs of subclinical and diagnostic importance.] Med. Afr. Noire **23** (1976) 693-696. (In French)

The great rarity of specific alterations in nerve trunks pathognomonic of leprosy induced the authors to search for a series of indications that would together make the diagnosis of leprosy most likely in patients in whom skin lesions were absent or equivocal. They selected patients with only a single nerve apparently damaged and proceeded to investigate the other main peripheral nerve trunks. In these 59 patients, they determined the following three values: qualitative electrodiagnosis, electromyogram, and measurement of the motor conduction velocity.

They found that the motor conduction velocity was the most sensitive indication of nerve damage in the absence of any clinical evidence of such damage. They insist that examination of a length of nerve (e.g., the median) should be done segment by segment since examination of the whole nerve may not disclose considerable local damage. They adduce some evidence that the initial site of damage may be in the vicinity of the fibro-osseous tunnels along the course of the nerve. It is regretted that no investigative apparatus exists for the precise measurement of sensory loss; in leprosy, such loss generally precedes gross motor deficit. As a matter of practical advice, the authors suggest that when a patient presents with evidence of ulnar nerve damage in the absence of unequivocal indication of the cause, the nerve conduction velocity of the contralateral ulnar nerve and other nerve trunks should be investigated.—S. G. Browne (*From* Trop. Dis. Bull.)

Singh, T., Kaur, S., Kumar, B., Sawhney, B. B. and Chopra, J. S. A study of motor and sensory nerve conduction in leprosy. Indian J. Med. Res. **65** (1977) 632-639.

Motor and sensory nerve conduction velocities were studied in ulnar, median, lateral popliteal and posterior tibial nerves in 40 leprosy patients and compared with 50 age-matched controls. The conduction velocity was found to be decreased in all varieties of leprosy and in all segments of the nerves. The lateral popliteal nerve was found to be the most frequently involved nerve. A clinico-electrophysiological correlation was found between nerve involvement clinically in the form of thickening of nerve weakness and wasting of muscles supplied by the nerve and the degree of conduction abnormality. Motor and sensory nerve conduction velocities were found to be equally affected in the neuropathy of leprosy. The study did not substantiate the presumption that for an evaluation of the severity of leprosy poly-

neuritis, nerve conduction velocity and distal delay especially for the motor nerves should both be tested.—(*Adapted from* authors' abstract)

Immuno-Pathology

Bapat, C. V., Modak, M. S., DeSouza, N. G. A. and Chulawalla, R. G. Comparative study of skin reactions in leprosy patients to *M. leprae*-lepromin and to ICRC-IN, an antigen from cultivable acid-fast bacilli from *M. leprae* isolated from lepromatous nodules. Lepr. India **49** (1977) 472-484.

Skin test antigens (Dharmendra type) were prepared from fresh *Mycobacterium leprae* (lepromin) and from a culture of strain C-44 ICRC bacilli (ICRCin) grown *in vitro* from *M. leprae* isolated from lepromatous nodules. Comparative study of skin reactivity to lepromin and ICRCin—both "early" and "late" reactions in 76 leprosy patients was conducted. In 29 lepromatous (LL) cases, 25 exhibited totally negative reaction at the end of the third week. In tuberculoid (TT), 22 and 23 out of 31 were positive (>4.5 mm) at three weeks to lepromin and ICRCin respectively. In the 16 BB group, the reactions were comparable in the same patient. The cellular reaction in tuberculoid cases consisted of lymphocytic infiltration, epithelioid giant cells and Langhan type cells and were indistinguishable from each other. This data with characteristic total lack of reaction in 25/29 lepromatous leprosy cases and identical cellular reaction in TT patients, provides strong evidence that ICRC bacillus strain C-44 is antigenically identical with *M. leprae.*—(*Adapted from* authors' summary)

Barnetson, R. StC. and Bryceson, A. D. M. Cutaneous leishmaniasis and leprosy. Trans. R. Soc. Trop. Med. Hyg. **72** (1978) 160-163.

Eight patients who had concomitant leprosy and leishmaniasis are described. Two patients with lepromatous leprosy had high resistance leishmaniasis, implying that the immune deficiency in lepromatous leprosy is specific to *Mycobacterium leprae.*—Authors' Summary

Barr, Ronald J. and Herzlinger, David C. Nevi in leprosy. Arch. Dermatol. **113** (1977) 1131-1132. (Letter to Editor)

Indeterminant leprosy may be a difficult diagnosis to make due to the paucity of organisms in skin biopsy material. Observations on a recent case suggest that biopsy specimens of cellular nevi may facilitate diagnosis, since the organism has an affinity for nevus cells. We were unable to find any previous references to this effect; however, this observation is apparently well known to many leprologists (oral communication with Dr. Samuel Moschella, Aug. 27, 1976).

The discovery of *Mycobacterium leprae* within an otherwise normal cellular nevus was not expected, but its occurrence seems reasonable due to the well-known affinity that the organism has for neural crest cells, particularly Schwann's cells. As previously stated, a biopsy should have been taken from normal skin at the time of the removal of the nevus, but the patient was unavailable. It is still unlikely that this finding was just a coincidence since, with the exception of lepromatous leprosy, organisms are not usually found in uninvolved skin. Although this represents only a single case, it is hoped that physicians who see many patients with leprosy will consider examining nevi when organisms may be difficult to find in skin lesions, which is frequently the case in indeterminant or tuberculoid varieties. Such a procedure is considerably less traumatic than nerve biopsies and possibly may prove to be just as useful.—(*Excerpted from* authors' letter)

Bedi, T. R., Kaur, S., Singhal, P. C., Kumar, B. and Banerjee, C. K. Fatal proliferative glomerulonephritis in lepromatous leprosy. Lepr. India **49** (1977) 500-503.

A patient having lepromatous leprosy with recurrent *erythema nodosum leprosum* developing acute renal failure proving fatal within eight weeks is reported. The renal lesion demonstrated acute proliferative glomerulonephritis. Its pathogenesis in relation to ENL is discussed.—Authors' Summary

Calas, E., Bonerandi, J.-J., Castelain, P.-Y., Breton, A., Pene, P. and Blanc, F. Maladie de Hansen type L a évolution histoïde.

[Lepromatous Hansen's disease with histoid evolution.] Ann. Dermatol. Venereol. **104** (1977) 246-247. (In French)

A case of lepromatous leprosy with histoid lesions is described in a patient from Corsica. The patient had never been to countries endemic for leprosy, and had no identifiable contact with patients. The history of the patient is reviewed with regard to diagnosis, type of clinical lesions, evolution and treatment. The typical pathologic aspect of histoid lesions described by Wade has been observed. Smears taken from ear lobe show many bacilli. The Mitsuda test is negative. Other tests (tuberculin, *C. albicans;* trichophytin) show a depressed cellular immunity. —M. F. Lechat

Chogle, J. B. and Khanolkar, S. R. T and B lymphocytes in the spectrum of leprosy. Lepr. India **49** (1977) 36-43.

The percentage of T and B lymphocytes were estimated in 52 leprosy patients by "E" and "EAC" rosette technics. The mean percentage values for "T" lymphocytes were significantly lower in the lepromatous group as compared with that of the tuberculoid and borderline groups. Also, a significant difference was observed in the mean percentage values of T and B lymphocytes of the borderline and tuberculoid patients and of the normal control group. These findings were correlated with skin smears and lepromin testing.—(*Adapted from* Trop. Dis. Bull.)

Choudhury, S. B. Roy and Srinivasan, H. Nerve abscess in lepromatous leprosy. A case report and a discussion of pathogenesis. Lepr. India **49** (1977) 330-338.

An instance of nerve abscesses developing in a patient with lepromatous leprosy is reported. The pathogenesis of nerve abscess in lepromatous leprosy is briefly discussed. It appears that such abscesses may develop 1) from an ENL lesion in the nerve during ENL reaction, 2) because of exacerbation on existing lepromatous lesion, 3) arise as an "exacerbation nodule," 4) due to quiet necrosis in a lepromatous granuloma, or 5) it may be iatrogenic.—Authors' Abstract

Cruickshank, J. G. and Ellis, B. P. B. Leprosy and the serodiagnostic test for tuberculosis. J. Clin. Pathol. **30** (1977) 728-730.

Sera from patients with leprosy agglutinated killed H37Rv *Mycobacterium tuberculosis* to varying degrees. Higher titers were found in association with active disease but there was no difference between patients at the lepromatous or at the tuberculoid ends of the clinical scale. A sharp rise in titer occurred during the active phase of an episode of *erythema nodosum leprosum.*—Authors' Summary

Ekambaram, V. and Sithambaram, M. Self-healing in nonlepromatous leprosy in the area of the ELEP Leprosy Control Project Dharmapuri (Tamil Nadu). Lepr. India **49** (1977) 387-392.

A study to assess the evolution of the disease in nonlepromatous group, who have taken no treatment in a six year period 1970-1975, was undertaken. Among the 714 patients who did not take treatment, only 432 cases (60.5%) could be examined. The majority of these patients (425) had single lesions. The study revealed that nearly 74% of these "N" patients became self-healed.—Authors' Summary

El Shiemy, S., El Hefnawi, H., Fattah, A. A., El Hawary, M. F. and Fares, R. Muscle involvement in leprosy and its correlation with serum aldolase activity. Int. J. Dermatol. **16** (1977) 587-593.

Thirty-six leprosy patients underwent muscle biopsy; the specimens were studied for serum aldolase activity. The authors concluded that muscle degeneration occurs only in lepromatous leprosy due to direct invasion by leprosy bacilli increasing serum aldolase activity during the active degenerative phase of the muscle fibers.—Authors' Abstract

Harboe, M., Closs, O., Bjorvatn, B. and Bjune, G. Antibodies against BCG antigen 60 in mycobacterial infection. Br. Med. J. **2** (1977) 430-433.

A sensitve specific radioimmunoassay was developed to measure antibodies against BCG antigen 60, a prominent antigenic component of BCG bacilli which cross-reacts with similar components in many mycobacterial species including *M. leprae* and *M. tuberculosis.* A lepromatous serum pool had anti-BCG-60 activity with a titer of 10^5 and the tuberculoid pool a titer of 10^4. Test-

ing of individual sera showed striking variations within groups of patients with lepromatous and tuberculoid leprosy. In 5 of the 20 tuberculoid leprosy sera the anti-BCG-60 activity was above the median for the lepromatous group. The current view that antibody formation against mycobacterial antigens is very low in tuberculoid leprosy thus no longer appears to be tenable. Sera from eight patients with active pulmonary tuberculosis also showed a striking variation in anti-BCG-60 content, and the median value of this group was even higher than in those with lepromatous leprosy.—Authors' Summary

Job, C. K., Chacko, C. J. G. and Taylor, P. M. Electron microscopic study of histoid leprosy with special reference to its histogenesis. Lepr. India **49** (1977) 467-471.

Biopsies from two patients clinically diagnosed and confirmed by histopathologic studies as histoid leprosy were examined using an electron microscope. The cells that form the nodule are found to contain far more solid bacilli and much less electron transparent substance than those in lepromatous lesions. They have the characteristics of both macrophages and fibroblasts. It is reasonable to conclude that they are histiocytes produced by local multiplication in response to stimulation by rapidly proliferating *Mycobacterium leprae* rather than from accumulation of blood monocytes at the site of inflammation as in lepromatous lesions.—(*Adapted from* authors' summary)

Kaur, S., Yumnam, I. S., Kumar, B., Banerjee, A. K. and Rastogi, G. K. Evaluation of thyroid functions in leprosy. II. Histopathology of the thyroid. Lepr. India **49** (1977) 492-494.

Open thyroid biopsies from seven patients of bacilliferous leprosy were studied for leprous granuloma or amyloid deposition. None of the patients had clinical evidence of thyroid involvement. Histopathology did not reveal any specific abnormality.—Authors' Summary

Kolonel, Laurence N. and Hirohata, Tomio. Leprosy and cancer: a retrospective cohort study in Hawaii. J. Natl. Cancer Inst. **58** (1977) 1577-1581.

We used data collected on a retrospective cohort of 1,123 leprosy patients living in Hawaii between 1940 and 1970, to test the hypotheses that patients with lepromatous leprosy, who have an impairment in their cellular immune response, would have an increased risk for cancer and that patients with tuberculoid leprosy, who are immunologically competent, would have a normal or even a reduced cancer risk from beneficial stimulation of their cellular immune system by exposure to the *Mycobacterium leprae* organisms. Based on a survival analysis method, the results of the study supported the predicted increase in cancer cases among the lepromatous leprosy patients (19 observed, 12.7 expected; risk ratio = 1.5) and the predicted decrease among the tuberculoid leprosy patients (14 observed, 17.8 expected; risk ratio = 0.8); in both groups, the findings were consistent across the five racial categories of the study. However, none of these differences between observed and expected cases was statistically significant at the 5% level. The study provided no support for the alternate hypothesis that chronic antigenic stimulation by the *M. leprae* organisms might lead to an increase in tumors of the lymphoreticular system.—Authors' Abstract

Lieberman, Jack and Rea, Thomas H. Serum angiotensin-converting enzyme in leprosy and coccidioimycosis. Ann. Intern. Med. **87** (1977) 423-425.

Serum angiotensin-converting enzyme levels were found to be elevated in 71.4% of 42 leprosy patients, both treated and untreated, but in only one of thirteen patients with disseminated coccidioimycosis. The elevations with leprosy were present in association with each of the three major categories: lepromatous, borderline, or tuberculoid. Sulfone therapy had no immediate effect on the elevated serum levels, although long-term sulfone therapy appeared to result in lowering of the level. Corticosteroid therapy had a more immediate and dramatic effect on reducing the elevated angiotensin-converting enzyme level in leprosy. This assay cannot distinguish between sarcoidosis and leprosy or between the various categories of leprosy, but it can help differentiate sarcoidosis from

fungal or tuberculous disease. Elevated levels of serum angiotensin-converting enzyme have now been associated with three disease states: sarcoidosis, Gaucher's disease and leprosy.—Authors' Abstract

Malik, R., Khandpur, R., Chandra, K. and Singh, R. A clinicopathological study of 244 cases of leprosy with special reference to histoid variety. Lepr. India **49** (1977) 400-405.

A statistical evaluation of 244 cases of leprosy is given. A detailed clinicopathological study of histoid leprosy is described.—Authors' Summary

Marsh, W. Laurence. The Kell blood group, Kx antigen, and chronic granulomatous disease. Mayo Clin. Proc. **52** (1977) 150-152.

The Kell blood group has 18 associated red cell antigens. One, named Kx, is the product of an X-linked gene and appears to be a precursor in the Kell biosynthetic pathway. Lack of Kx on red cells, caused by inheritance of a variant allele at the X-linked locus, results in gross changes in Kell antigenicity, an effect called the McLeod phenotype. Such cells also show striking morphologic changes. Normal phagocytic leukocytes lack Kell antigens but have strong Kx. The leukocytes of boys with X-linked chronic granulomatous disease lack Kx antigen and have defective bactericidal function. The fundamental defect in chronic granulomatous disease appears to be failure to inherit the X-linked gene that determines Kx synthesis. The enzymatic and functional disorders of the leukocytes, and the structural changes in the red cells are consequences that follow.—Author's Abstract

Mehra, N.K., Dasgupta, A., Ghei, S.K., Rao, M.S. Nilakanta and Vaidya, M.C. HLA antigens and leprosy. Microbios **3** (1976) 79-83.

The incidence of 11 HLA alleles of the first and second loci were typed in leprosy patients in an area where the disease is endemic, and compared with the normal controls of the same age and ethnic group. The frequency of HLA-B5 was found to be decreased in both lepromatous as well as nonlepromatous leprosy patients. Other antigens did not reveal any significant differences between the total patients and the controls. However, the most significant deviation in the present study was the decreased frequency of HLA-A9 with consequent increase of HLA-B12 in the nonlepromatous leprosy patients as compared to that in the lepromatous group. This evidence may suggest an association of HLA antigens with the precipitation of leprosy in man.—Authors' Abstract

Nath, I., Curtis, J., Sharma, A.K. and Talwar, G.P. Circulating T cell numbers and their mitogenic potential in leprosy—correlation with mycobacterial load. Clin. Exp. Immunol. **29** (1977) 393-400.

The effect of treatment and mycobacterial load on circulating T cell numbers and their functional ability was investigated in 41 patients with leprosy. Both early binding T cells and their responses to phytohemagglutinin (PHA), concanavalin A (Con A) and pokeweed mitogen (PWM) were profoundly and uniformly depressed in untreated and partially treated bacilliferous lepromatous leprosy (LL) patients as compared with normal subjects and tuberculoid patients. On elimination of mycobacteria, subsequent to chemotherapy, LL patients regain normality in T cell numbers and their functions. On the other hand, the specific response of lymphocytes to *M. leprae* did not alter with decrease in mycobacterial load. It appears that the decrease in T cell numbers and the deficit in their mitogenic potential is a secondary consequence of disease and is related to the antigenic load in patients with lepromatous leprosy.—Authors' Summary

Rai, V., Singh, G., Singh, R.H. and Udupa, K.N. Blood histamine and histaminase in leprosy patients—a short communication. Indian J. Med Res. **66** (1977) 978-982.

Blood levels of histamine and histaminase were studied in 91 patients with different types of leprosy and compared to matched normal controls. The leprosy patients showed markedly raised levels of both histamine and histaminase as compared to the controls. This rise was more pronounced in cases of leprosy with a history of longer duration. Patients with leprosy in reaction showed the maximum levels whereas tuber-

culoid, borderline and lepromatous cases showed moderate levels and others minimum changes.—(*Adapted from* authors' abstract)

Rea, Thomas H. and Taylor, Clive R. Serum and tissue lysozyme in leprosy. Infect. Immun. **18** (1977) 847-856.

Mean serum lysozyme values were found to be elevated in untreated leprosy patients. Statistically significant elevations were present in each of the three major categories of leprosy, tuberculoid, borderline, and lepromatous. Values were particularly high in patients with severe reversal reactions or Lucio's phenomenon. Prolonged sulfone therapy was associated with a fall in serum lysozyme values. With an immunoperoxidase method to localize lysozyme in leprous tissues, two distinct staining patterns were found, granular and saccular. The granular pattern of lysozymal staining was found in epithelioid cells and in giant cells, and the intensity of staining showed a positive correlation with serum lysozyme levels. Conversely, a saccular pattern of lysozymal staining was found in lepromatous histiocytes, but the intensity of staining was unrelated to serum lysozyme levels; the saccular structures contained dense aggregates of *M. leprae*. These two patterns of staining probably represent different functional responses of monocyte-derived granuloma cells, whereas the serum levels reflect, to a varying degree, both the absolute number of such cells and the rate of secretory activity of this cell population as a whole.—Authors' Abstract

Reichlin, M., Pranis, R.A., Gelber, R.H., Rees, R.J.W., Taverne, J. and Turk, J.L. Correlation of euglobulin immunoglobulin G levels with *erythema nodosum leprosum* in lepromatous leprosy. Clin. Immunol. Immunopathol. **8** (1977) 335-344.

Quantitative study of euglobulin fractions of serum samples from patients with lepromatous leprosy who had *erythema nodosum leprosum* revealed the presence of high concentrations of immunoglobulin G (IgG) which was shown by sedimentation velocity experiments to be largely monomeric with an S value near 7.0. The amounts present in serial samples from individual patients fluctuated greatly. Patients with lepromatous leprosy but without signs of *erythema nodosum leprosum* had lower levels of euglobulin IgG and there were smaller fluctuations among samples from each individual.—Authors' Abstract

Shetty, V.P., Mehta, L.N., Antia, N.H. and Irani, P.F. Teased fiber study of early nerve lesions in leprosy and in contacts, with electrophysiological correlates, J. Neurol. Neurosurg. Psychiatry **40** (1977) 708-711.

A teased fiber technic was used to study 19 biopsies of the index finger branch of the radial cutaneous nerve of leprosy patients and contacts. These were compared with four normal nerves. Five nerves were from patients with preclinical nerve lesions, five from leprosy patients with minimal sensory nerve impairment, and five from contacts of lepromatous leprosy. The extent of demyelination in preclinical nerve lesions in leprosy and in contacts of leprosy is recorded. The usefulness of nerve conduction velocity studies in early leprosy patients and in contacts is discussed.—Authors' Summary

Shield, M.J., Stanford, J.L., Paul, R.C. and Carswell, J.W. Multiple skin testing of tuberculosis patients with a range of new tuberculins, and a comparison with leprosy and *Mycobacterium ulcerans* infection. J. Hyg. (Camb.) **78** (1977) 331-348.

Four hundred and seventy tuberculosis patients were each skin tested with 4 of a range of 17 mycobacterial reagents in four countries in all of which tuberculosis and leprosy were endemic. Sixteen of the reagents were new tuberculins prepared from extracts of living mycobacteria disrupted by ultrasonic disintegration and the last was PPD, RT23.

The effect that tuberculosis exerted on the delayed-type skin test response to these antigens was assessed by comparing results for tuberculosis patients with those for tuberculin positive and tuberculin negative control populations. Tuberculosis patients on rifampicin therapy showed no difference in their skin test responses to any of the antigens from those patients on other forms of anti-tuberculosis treatment.

Amongst the normal population it was found that possession of tuberculin positivity was associated with an enhanced response

to all the other mycobacterial antigens with the exception of A*-in which demonstrated a reciprocal relationship with tuberculin in Burma. It was noted also, in Burma particularly, that sensitization to mycobacterial species other than *Mycobacterium tuberculosis* especially to the slow growers, plays a role in determining responses to different mycobacterial species.

In tuberculosis patients enhanced skin test responses were also seen but only in those countries, e.g., Libya, where the prevalence of mycobacterial species was low. Where mycobacteria were common, as in Burma, the converse was true and tuberculosis was associated with a diminished skin test response to each antigen. The high prevalence of A*-in positivity in Burma, its reciprocal relationship with tuberculin there and the results for all the antigens in the tuberculosis patients indicate that the cell-mediated skin test response may have a threshold. If this is exceeded the skin test becomes negative so that nonreactors then include those who have been excessively sensitized as well as those who have not been sensitized. Despite this, a greater percentage of tuberculosis patients in each country responded to the specific reagent tuberculin than did the control populations and their mean positive induration sizes were consistently larger. Nevertheless, amongst the tuberculosis patients in Burma 13% were complete nonreactors to tuberculin and this apparent anergy also applied to the other reagents with which these individuals were tested.

This differs from lepromatous leprosy where the anergic state pertains exclusively to *M. leprae* and a few seemingly closely related species. The breadth of anergy in *M. ulcerans* infection has not been measured but it is known to effect both Burulin and the PPD, RT23.

Just as in leprosy and *M. ulcerans* infection, tuberculosis can be shown to have a disease spectrum here detected by multiple skin testing. The significance of this spectrum and its similarities with and differences from that of the other mycobacterioses is discussed.—Authors' Summary [*Virtually every disease, from the common cold on, has a "disease spectrum". Neither tuberculosis nor* M. ulcerans *infection, however, include in their usual spectra a lepromatoid segment represented by the virtual absence of ability to develop effective enhanced immunity.—Ed.*]

Tung, K.S.K., Kim, B., Bjorvatn, B., Kronvall, G., McLaren, L.C. and Williams, R. C., Jr. Discrepancy between Clq deviation and Raji cell tests in detection of circulating immune complexes in patients with leprosy. J. Infect. Dis. **136** (1977) 216-221.

Samples of serum from 45 patients with different clinical forms of leprosy and from 17 patients with systemic lupus erythematosus were studied in parallel for circulating immune complexes with use of two different *in vitro* tests adjusted to the same degree of sensitivity. The Clq deviation test relied upon the reaction of the complement component Clq with immune complexes. The Raji cell test detected complement-fixed immune complexes that bound to the complement receptors on cultured, bone marrow-derived lymphocyte-like Raji cells. Thirty (67%) of 45 patients with leprosy showed immune complexes according to the Clq deviation test; however, only two (7%) of the 30 samples of sera with positive Clq test results were positive by the Raji cell test. In contrast, 54% of 13 samples of sera from patients with systemic lupus erythematosus positive by the Clq test were positive according to the Raji cell test. Since Clq is known to react with DNA as well as with bacterial antigens, the Clq reaction may in fact be detecting antigenemia in many instances. Considerable caution is warranted in application of sensitive screening tests for assay of circulating immune complexes in various states of infectious diseases.—Authors' Abstract

Vachharajani, S.D., Rastogi, D.S., Arora, P. N. and Sohi, A.K. Leprosy in tuberculosis. Indian J. Tuberc. **24** (1977) 135-136.

The present article reports four cases of leprosy, one lepromatous and three tuberculoid types. In all these cases, the leprosy was detected in confirmed cases of pulmonary tuberculosis who were on antituberculous drugs for varying intervals of 8-20 weeks.

It is presumed that leprosy became active and manifest while pulmonary tuberculosis was active and being treated. This perhaps casts doubt about the antigenic similarity between the tubercle and leprosy bacilli. It is

emphasized that in a T.B. Hospital, careful search for detecting leprosy among its patients should be made periodically, even though the association of the two diseases is not very frequent.—(*From* Trop. Dis. Bull.) [*In seven reported autopsy series on patients with leprosy, tuberculosis was given as the cause of death in 11.7% to 54.7%. In India tuberculosis was the cause of death in 29.2%. —Ed.*]

Verma, K.C., Chugh, T.D. and Chaudhary, S.D. Tissue lipids in leprosy. Lepr. India **49** (1977) 510-514.

A total of 30 cases of leprosy (15 lepromatous and 15 tuberculoid) were studied by histochemical procedures for lipids in the morbid skin. The possible origin and relation of lipids to the presence of lepra bacilli in the lepra cells is discussed.

In the present study it has also been demonstrated that the fatty substances found in the lepra bacilli and lepra cells were similar in nature. Serial staining of the slides for bacilli and fatty substances further revealed that these substances were present only in those lepra cells where lepra bacilli were present and also the location and concentration of these fats corresponded to the location and the number of bacilli in the cells. Hence it may be concluded that the tissue lipids in the lepra cells were not due to fatty infiltrations of degeneration of the lepra cells but were most probably due to the lipids confined to the lepra bacilli.—(*Adapted from* authors' summary) [*This confirms the findings of a number of prior studies, some dating back to the time of Dr. Mitsuda.—Ed.*]

Wahal, P.K., Tandon, R.K., Gupta, M.C., Patney, N.L., Agarwal, B.M., Raizada, S.N. and Saraswat, R.L. Nephrotic syndrome complicating *erythema nodosum leprosum* (ENL). A case report. J. Assoc. Physicians India **25** (1977) 423-426.

A case of lepromatous leprosy who developed renal amyloidosis with nephrotic syndrome as a complication of *erythema nodosum leprosum* (ENL) reaction has been described. The remission and exacerbation of the clinical and biochemical picture of nephrotic syndrome coincided with subsidence and recurrence of lepra reaction. The case report emphasizes the importance of early detection and treatment of ENL episodes in lepromatous leprosy in an attempt to possibly prevent the development of this irreversible grave complication in these cases.—(*Adapted from* Trop. Dis. Bull.)

Weddell, Graham. Disorders of peripheral cutaneous nerves. J. Invest. Dermatol. **69** (1977) 130-135.

The histopathology of leprosy is described with particular reference to its effects on peripheral cutaneous nerves. *Mycobacterium leprae* invade the Schwann and perineurial cells of peripheral cutaneous nerves preferentially. The organisms are eventually destroyed with their host cells by a cell-mediated immune response. The effect is a dying-back phenomenon without the formation of neuromata. The sensory effects are gradually increasing anesthesia and localized nerve trunk pain but seldom any peripheral sensory reference or parasthesias. Peripheral nerves are shown to be zones where there is some degree of immunologic privilege for *M. leprae.*—Author's Abstract [*Nevertheless, formication, a form of paresthesia, is common enough to have achieved notice in the Chinese folklore regarding leprosy and is not rarely referred to by Chinese patients.—Ed.*]

Westerhof, W. A possible dysfunction of melanosome transfer in leprosy: an electron microscopic study. Acta Dermatol. Venereol. **57** (1977) 297-304.

An EM study was carried out to investigate whether *Mycobacterium leprae* occur intracellularly in epidermal melanocytes. As this could not be confirmed, the selective killing of melanocytes by cytotoxic lymphocytes could not explain the hypopigmentation in types of leprosy with a relatively good immune response. There were indications that these hypopigmented lesions resulted from a disturbed transfer of melanosomes from melanocytes to keratinocytes. Further research in progress.—(*Adapted from* Trop. Dis. Bull.)

Youngchaiyud, U., Chandanayingyong, D. and Vibhatavanija, T. The incidence of HLA antigens in leprosy. Vox. Sang. **32** (1977) 342-345.

HLA antigens were studied in 36 patients with leprosy; 20 cases of lepromatous and 16 cases of tuberculoid type. Eleven of thirty-six (30.55%) had BW40 as compared to 9.33% of 150 controls. The frequency of BW40 in tuberculoid patients (31.25%) was not different from that in lepromatous cases (30%).—Authors' Abstract

Yumnam, I.S., Kaur, S., Kumar, B. and Rastogi, G.K. Evaluation of thyroid functions in leprosy. I. Thyroid function tests. Lepr. India **49** (1977) 485-491.

Twenty-six patients of different types of leprosy were studied for radioactive iodine uptake (I^{131}) and serum levels of triiodothyronine (T_3), thyroxine (T_4) and thyroid stimulating hormone (TSH). None of the patients had clinical evidence of thyroid involvement. No significant difference was found between the values obtained in patients and normals and in different varieties of leprosy.—Authors' Summary

Yumnam, I.S., Sehgal, S., Kaur, S., Kumar, B. and Rastogi, G.K. Evaluation of thyroid functions in leprosy. III. Circulating auto-antibodies against thyroid and nuclear components. Lepr. India **49** (1977) 495-499.

Sera from 26 patients of various types of leprosy were tested for the detection of circulating auto-antibodies and nuclear components against thyroid using various methods. Four patients having lepromatous leprosy had higher levels of thyroid auto-antibodies by latex agglutination. Three patients showed the presence of antinuclear antibodies, two belonged to the TT and one to the LL group.—Authors' Summary

Microbiology

Desai, A. C., Apte, S. N. and Bhide, M. B. The infectivity of drug resistant cases. Lepr. India **49** (1977) 54-58.

Growth curves in the mouse foot pad of *Mycobacterium leprae* derived from untreated patients with lepromatous leprosy are compared with those of proved dapsone-resistant *M. leprae* derived from patients after more than five years of dapsone therapy. The close similarity between the respective growth curves suggests to the authors that dapsone-resistant bacilli are as infective as their dapsone-sensitive counterparts.—(*From* Trop. Dis. Bull.)

Dharmendra. Recent advances in microbiology in leprosy. Lepr. India **49** (1977) 10-35.

A review with 70 references.—(*From* Trop. Dis. Bull.)

Draper, Philip and Misell, Derek L. Determination of the mass of *Mycobacterium leprae* by electron microscopy. J. Gen. Microbiol. **101** (1977) 207-209.

The mass of *M. leprae*, obtained as a pure suspension from tissues of infected armadillos, was measured electron microscopically using a technic that avoids the need for standards of mass. The mean mass of an individual bacterium was 3.9 ± 1.0 (S.D.) $\times 10^{-14}$ gm. Comparative measurements were also made on a small sample of *M. lepraemurium* (whose mass is known). Calculation of the mass of an individual bacterium allows numbers of bacteria in samples to be estimated by direct weighing rather than by counting.—Authors' Abstract

Ichihara, K., Kusunose, E., Kusunose, M. and Mori, T. Superoxide dismutase from *Mycobacterium lepraemurium*. J. Biochem. **81** (1977) 1427-1433.

M. lepraemurium strain Hawaii, grown on 1% Ogawa egg yolk medium containing hemin, was extremely rich in superoxide dismutase [EC 1.15.1.1]. This enzyme accounted for at least 7% of total proteins in the crude extracts, as determined by immunological procedures. The enzyme was purified about 18.5-fold from the crude extracts by streptomycin treatment, ammonium sulfate fractionation, and Sephadex G-100 gel filtration. The homogeneity of the purified enzyme was established by polyacrylamide gel electrophoresis, analytical ultracentrifugation, and immunodiffusion. The molecular weight of the enzyme was estimated to be approximately 45,000 by sedimentation equilibrium analy-

sis, whereas that of the subunit was 22,000 as determined by sodium dodecylsulfate-polyacrylamide gel electrophoresis. The enzyme was found to contain 1.29 gm atom of manganese per mol by atomic absorption spectroscopy. In addition, a small but significant amount of iron was found. The amino acid composition was similar to that of the superoxide dismutase from *M. smegmatis*. Superoxide dismutase is the first enzyme which has been isolated and characterized from *M. lepraemurium*.—Authors' Abstract

Kazda, Jindrich. Die Bedeutung der Moorbiotope für die Ökologie von Mykobakterien. [The importance of *sphagnum* bogs in the ecology of *Mycobacteria*.] Zentralbl. Bakteriol. (Orig. B) **165** (1977) 323-334. (In German)

From 1974 to 1976 ten investigations with a total of 147 samplings have been carried out in four different *sphagnum* bogs in the northwest of Germany and in the Harz region, during which 110 *Mycobacteria* strains have been isolated from the *sphagnum* association. The most frequently occurring *Mycobacteria* form a homogeneous group which was regularly found in the analyzed moor biotopes. It was not possible to classify these 72 strains according to the existing properties as one of the known *Mycobacteria* species. They are acid-alcohol-fast polymorphous rods without branching which in four to seven days develop smooth orange-yellow 1-2 mm large colonies on Middlebrook 7H10-medium enriched with beef serum. Nitrate reductase and Tween hydrolysis are positive; urea is catabolized regularly, pyrazinamide in 85%, other amidases in the amide row are negative. Out of 13 tested carbohydrates the catabolism in the strains is positive in 95% of inosite, 68% of fructose, 44% of mannitol and 14% of glucose, the remainder are negative. The chromatographic comparison of mycolic acids indicates the association to the genus *Mycobacterium*. Their homogeneity could be proven by means of the Jones-Mote reaction in 52 strains chosen at random. One strain has been tested which turned out to be nonpathogenic for rabbits, guinea pigs and mice. These strains can be considered habitat microflora as they have been isolated during different seasons regularly in the *sphagnum* bogs biotopes. *Sphagnum* biotopes also certainly play an important role in the ecology of *M. chelonei*-like strains which have been isolated in 26 strains in seven of ten investigations. Due to the limited number, definite evidence as to the moor biotope of further isolated strains cannot be given (e.g. *M. flavescens*-like strains and ten different *Mycobacteria* species).

Optimum growth of these *Mycobacteria* is reached at 31°C during which the accumulation of the solar radiation directly beneath the *sphagum* surface is of great importance. During sunshine this layer can be 16° to 26.8°C warmer than the air at 1 m height. The relatively high humidity in the *sphagnum* vegetation, which circulates vertically, thus provides transport of the nutritive substances. These substances most probably originate from the microbial decomposition of the low *sphagnum* particles and also from exogenous and endogenous residues of the fungi microorganisms. They are carbohydrates (fructose) and numerous amino acids (mainly glutamic- and asparaginic acid) which can be utilized by mycobacteria as sources of C and N. It is to be supposed that the acidification of the environment of the ion exchanger in the *sphagnum* cell wall creates selective conditions which might be favorable for the relatively slow growing *Mycobacteria*.—(*Adapted from* author's abstract)

Matsuo, Y. and Utsunomiya, S. Viability of *Mycobacterium leprae* pretreated with rifampicin. Lepro **45** (1976) 174-176.

Suspensions of *Mycobacterium leprae* were incubated at 4°C or 30°C for 60 minutes with rifampicin at a concentration of 2 mg/ml. Before inoculating of mice, halves of the suspension were repeatedly washed with a balanced salt solution. The unwashed bacilli did not multiply in mouse foot pads regardless of the exposure temperatures to the drug. The washed ones pretreated at 4°C multiplied normally. The organisms treated with the same procedure but at 30°C resulted in a significant growth delay.—(*From* Trop. Dis. Bull.)

Olitzki, A. L. Further potential sources of energy modifying the multiplication of *Mycobacterium leprae*. Boll. Ist. Sieroter. Milan **56** (1977) 384-386.

The multiplication of *Mycobacterium leprae* was modified by graded dilutions of organic acids: 0.01%-0.05% gluconic acid inhibited its multiplication; 0.005% of it promoted the growth of two out of six strains; 0.2%-1.0% glucuronic acid promoted the multiplication of the majority of strains; 2.0% inhibited their multiplication, and 0.05% promoted the growth of one strain. Galaturonic and pyruvic acids were active in 0.2%-2.0% concentrations, while the activity of citric acid was mainly noted at 1.0% and 2.0% concentrations.—(*Adapted from* Trop. Dis. Bull.)

Epidemiology and Prevention

Freerksen, Enno and Rosenfeld, Magdalena. Leprosy eradication project of Malta. Chemotherapy **23** (1977) 356-386.

This is the first publication of the initial five year period of the eradication program since its introduction in the Maltese Islands in the second half of 1972.

All patients were treated with a combined drug regimen, its chief components being rifampicin (RMP), prothionamide (PTH), isoniazid (INH) and diaminodiphenylsulfone (DDS). To simplify the therapeutic technic, PTH, INH and DDS were given as a fixed combination. Other medications, such as DDS-free regimens, were also given as fixed combinations whenever possible. Fixed combinations not only make treatment simpler, but also guarantee a more reliable acceptance of the medication and the adherence to the dosage proportions which play an important role with regard to the effectiveness.

For an eradication program the classification into the different leprosy types plays a not too important role. Rather, it was our goal to cure each single patient so as to eliminate him as a possible source of infection. Whether or not this goal has been reached was as far as possible related to the results of the bacteriologic assessment. Of the originally recorded 210 patients, 206 were included in the first part of the program (groups I-III). By the end of five years, a total of 20 patients had left the program (death or emigration) so that 186 patients remained registered per June 1977. In 180 cases treatment has been discontinued; six patients are still under therapy. The relapse-free observation periods are for more than two years in 160 patients, more than three years in 120 patients, and more than four years in 12 patients. Thirty-one patients joined the program when it was already under way; namely eleven in 1973, nine in 1974, six in 1975, and seven in 1976. These newly registered cases were grouped separately (group IV). Twenty-seven patients were found to be bacteriologically positive; ten of them are still negative, and eleven are still being treated. Nineteen are under observation without therapy and one patient died of nonspecific disease in 1976.

In continuation of the program we are aiming at a) conclusive treatment of the rest of the patients who are still under therapy, b) conclusive treatment of the patients according to group IV, c) regular observation of all cases for the absence of relapses, and d) search for new cases and inclusion of such eventually newly identified cases in the program. Further scientific evaluation of the material, chiefly in the bacteriologic, clinical, pathologic and genetic fields, will require lengthy investigations on which we are working. A larger quantity of well examined and well classified material has accumulated since the start of the program. The material is also at the disposal of all colleagues outside the Borstel Institute. Up to the present, we have collected approximately 30,000 histopathologic slides, representing all stages of leprosy, i.e., from the period before, during and after treatment (about 5,000 biopsies).

The article explains the prerequisites for an eradication program which in principle can serve as a model for similar projects, but which cannot be carried out everywhere in exactly the same way. The course the program has taken justifies the hope that eradication programs are basically feasible. Even if in the future one case or another will be discovered, it can be assumed that, provided the program can continue without interruptions with its termination, the problem of leprosy will also be solved for the State of Malta.—(*Adapted from* authors' abstract)

Ganapati, R., Pandya, S. S., Naik, S. S., Dongre, V. V. and Desouza, N. G. A. Assessment of school surveys as a method of case detection in an urban area endemic for leprosy. Indian J. Med. Res. **66** (1977) 732-736.

The study was conducted to determine whether school survey and examination of family contacts is an effective method of case detection in a community where leprosy is endemic as compared to whole population survey. The results showed that although school and family contact examination was more economical with regard to time, money and personnel involved, it did not result in the identification of a significant number of cases in the community, either in numbers or in the proportion of infectious cases. This observation implied that most children detected to have leprosy in the school were infected from sources outside the home. The whole population surveys revealed a serious shortcoming in that only 60% of the adult male group was covered, a lacuna which is of potential epidemiologic importance.—(*Adapted from* authors' abstract)

Gurd, C. H. Leprosy in the Northern Territory. Med. J. Aust. **2** (1977) 652. (Letter to Editor)

Sir: I would like to make a few comments about your leprosy editorial (Med. J. Aust. **2** [1977] 345). In your interesting review you made two statements concerning the leprosy situation in the Northern Territory. First, you maintained that a highly endemic situation with regard to leprosy persists in the Northern Territory. Second, you also stated that no accurate figures were available. I would like to make it clear that both these statements are inaccurate and, in this context, I would like to provide the following information for those readers who may be interested.

By way of explanation, a source of confusion with leprosy statistics from the Northern Territory in the past few years has been the method of operating our register of leprosy cases. Contrary to the situation in many developing countries, it has been the practice in the Northern Territory to keep leprosy patients on the register indefinitely. This has had the advantage of enabling rehabilitation follow-up, but the large numbers of mainly inactive cases on our register are often quoted to indicate the size of the problem.

In fact, the leprosy epidemic in the Northern Territory has largely been brought under control by the use of three principal control measures: (i) the early detection of leprosy cases (carried out by rural health center staff in conjunction with a leprosy control section in Darwin); (ii) simple, effective and acceptable treatment of leprosy cases (the availability in the past few years of injectable, long-acting antileprosy preparations has revolutionized leprosy treatment); and (iii) surgical and self-help care of deformities for those people afflicted (East Arm Hospital is the center for this activity).

Epidemiological surveillance is carried out by the documentation of all cases on a register held in Darwin. Three principal statistics are derived from this register (bear in mind that leprosy is a chronic illness which can have permanent disabilities). They are: (i) the total number of cases on the register (695 Aboriginals in 1975); (ii) the number of cases on the register in which the disease is still active (10 Aboriginals in 1975); and (iii) the number of new cases notified each year (6 Aboriginals in 1975).

The latter figure of incidence is the important figure in terms of epidemic control, and new notifications over the past decade are shown below in Table 1.

TABLE 1. *Leprosy notifications in the Northern Territory 1966 to 1976.*

	Year										
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Aboriginal	24	41	32	10	7	11	16	12	13	6	4
Other	5	5	7	5	5	2	5	1	3	—	2
Total	29	46	39	15	12	13	21	13	16	6	6

It is clear that control has largely been effected. The Department's main concern is to closely watch the edges of the endemic area, to see if leprosy is continuing to spread through the territory. A research program is currently being considered to measure (in immunological terms) the vulnerability of these marginal areas.—Author's Letter

Verma, O. P. Some epidemiological features of leprosy in a rural area of Hooghly District. Lepr. India **48** (1976) 371-381.

An intensive leprosy survey of five contiguous villages in the Hooghly District of West Bengal, India is reported, in an area where the prevalence of leprosy was thought to be negligible. Coverage was 92.8% (males 91.2%, females 94.8%). A leprosy prevalence rate of 4.5 per thousand out of 3,314 people surveyed was obtained; over 60% of cases were in children of school age and 75% of cases had developed in the two years preceding the survey. Only one lepromatous case was found and the distribution of cases led to the conclusion that contact investigation on its own cannot suffice to bring to light either total cases or total people susceptible. —T. F. Davey (*From* Trop. Dis. Bull.)

Experimental Infections.

Bradley, D. J. and Kirkley, J. Regulation of *Leishmania* populations within the host. I. The variable course of *Leishmania donovani* infections in mice. Clin. Exp. Immunol. **30** (1977) 119-129.

The course of infection with *Leishmania donovani* was followed in seven strains of laboratory mice with measurement of the liver parasite burdens over 20 weeks. The acute parasite population growth rate varied greatly between, but not within, strains. Four strains were relatively resistant with less than an eightfold increase while the three acutely susceptible strains showed over an eightfold increase in the first month. Thereafter, one initially susceptible strain showed a dramatic fall in parasite numbers with histological liver damage while another strain maintained an immense parasite load for up to two years involving mononuclear phagocytes thought the body. The system provides a model for studying genetic control of resistance to intracellular infection and the range of responses is compared with human leprosy and cutaneous leishmaniasis.—Authors' Summary

Bullock, W. E., Evans, P. E. and Filomeno, A. R. Impairment of cell-mediated immune responses by infection with *Mycobacterium lepraemurium*. Infect. Immun. **18** (1977) 157-164.

The effect of chronic infection with *M. lepraemurium* upon cell-mediated immune responses was studied in Lewis rats. Rats infected for 40 to 175 days were completely protected from attempted induction of experimental adjuvant disease and the severity of experimental allergic encephalomyelitis in leprous rats was markedly attenuated. Full manifestations of each autoimmune disease were expressed in littermate control groups. Skin homograft rejection by infected rats was significantly impaired ($p<0.001$) as was the delayed-type hypersensitivity response to sheep erythrocytes ($p<0.02$). It is suggested that chronic infection with *M. lepraemurium* exerts a nonspecific inhibitory effect on cell-mediated immunity by perturbation of normal lymphocyte recirculation and by induction of immunosuppressor cell activity.—Authors' Abstract

D'Addamio, G. H., Roussel, J. D. and Storrs, E. E. Response of the nine-banded armadillo (*Dasypus novemcinctus*) to gonadotropins and steroids. Lab. Anim. Sci. **27** (1977) 482-489.

Adult male and female nine-banded armadillos were treated with exogenous gonadotropins and steroids to induce mating in captivity. Gonadotropin treatment induced follicular development and ovulation in the female but failed to enhance semen quality in the male. The number of ovarian follicles increased as the dosage of pregnant mare serum gonadotropin increased; ovulation rate appeared to be inversely related to dose. Mating behavior was not detected in any of the trials, but a pattern of cyclic cytological

changes in urogenital smears, which could be used to detect the follicular phase of the estrous cycle, was observed. The modal duration of the estrous cycle was found to be four days.—Authors' Summary

Donham, Kelley J. and Leininger, Joel R. Spontaneous leprosy-like disease in a chimpanzee. J. Infect. Dis. **136** (1977) 132-136.

The clinical and laboratory findings of a spontaneous disease, resembling human leprosy, in a chimpanzee are described. The disease was a chronic progressive dermatitis characterized by nodular thickenings of the dermis and involving the ears, eyebrows, nostrils and lips. A maculopapular rash was also present. Numerous acid-fast organisms were found in nasal swabs and in dermal lesions, including nerves. Attempts to culture acid-fast organisms in artificial media have failed. At this time, the only features of the etiologic agent of this disease that are inconsistent with those of *Mycobacterium leprae* are failure of the organisms to oxidize 3,4-dihydroxyphenylalanine and failure of pyridine to remove the acid-fast staining property of the bacilli.—Authors' Abstract

Harboe, M., Closs, O., Bjorvatn, B., Kronvall, G. and Axelsen, N. H. Antibody response in rabbits to immunization with *Mycobacterium leprae*. Infect. Immun. **18** (1977) 792-805.

Mycobacterium leprae purified from liver tissue of an infected armadillo (the A/10 preparation) was tested for antigenic composition by immunization of rabbits and characterization of the antibody response by crossed immunelectrophoresis. The rabbit antisera detected seven distinct components in the *M. leprae* preparation. This number is far lower than in similar experiments with other mycobacteria. The *M. leprae* sonic extract gave far fewer lines after polyacrylamide gel electrophoresis and staining with Coomassie brilliant blue than sonic extracts prepared from BCG, *M. smegmatis*, and *M. phlei* adjusted to the same protein concentration based on the Folin assay. The seven components detected in *M. leprae* cross-reacted extensively with *M. avium*, BCG, *M. lepraemurium*, *M. smegmatis*, and *Nocardia asteroides*. The seven components are involved in immune reactions in leprosy; antibodies against all of them were demonstrated in sera from patients with lepromatous leprosy, but the specificity of the antibodies varied from patient to patient. The reason for the demonstration of so few antigenic components and some of the implications of these findings for the use of armadillo-grown *M. leprae* to develop specific skin test reagents and in other aspects of leprosy research are discussed.—Authors' Abstract

Jacobs, John J. and Monroe, Kevin D. A scanning electron microscopic survey of the brain ventricular system of the female armadillo. Cell Tissue Res. **183** (1977) 531-539.

The scanning electron microscope was used to survey the brain ventricular system of the female armadillo *(Dasypus novemcinctus)* with emphasis on the third ventricle. The walls of the lateral ventricles, aqueduct, and fourth ventricle are covered by long cilia. In the lateral ventricle, the cilia are arranged in groups; but in the aqueduct and fourth ventricle, they are evenly placed over the cellular surfaces. The ependymal cells of the third ventricle are densely ciliated except for the *organum vasculosum* and infundibular recess. The nonciliated luminal surface of these areas has a pebblestone appearance punctuated by numerous microvilli and two types of supraependymal cells. —Authors' Summary

Kirchheimer, W. F. Occurrence of *Mycobacterium leprae* in nature. Lepr. India **49** (1977) 44-47.

The discovery of a leprosy-like disease in wild armadillos in southern Louisiana was reported in 1975 (Trop. Dis. Bull. **73** [1976] Abstr. 896), but other workers have not so far confirmed the natural occurrence of leprosy in these animals. Three hundred and nine armadillos from Louisiana, Florida and Texas were examined at Carville. A histopathological study of lymph nodes, spleens, livers and other organs was made on 164 of these; blood buffy coat and ear-clip examinations were done on 159, and in 14 both kinds of examination were performed. No evidence of "mycobacteriosis" was found. The negative results of other studies in Co-

lombia and in Paraguay are reported. A mycobacterium cultured from an armadillo caught in Louisiana was typed as *Mycobacterium peregrinum.*—F.I.C. Apted (*From* Trop. Dis. Bull.)

Lefford, M. J. and Mackaness, G. B. Suppression of immunity to *Mycobacterium lepraemurium* infection. Infect. Immun. **18** (1977) 363-369.

After injection of 10^8 live *Mycobacterium lepraemurium* (MLM) into the left hind foot pad of mice, there is development of local swelling attributable to a granuloma of the cell-mediated immunity type. Concomitant intravenous inoculation of live MLM delays and may even suppress foot pad swelling, the effects being proportional to the intravenous dose of organisms. Concomitant foot pad infection and intravenous inoculation of 10^9 dead MLM also delays foot pad swelling, but over a period of months the feet become excessively swollen. The excessive swelling is due to local enhancement of infection as evidenced by an increase in the number of MLM per foot pad. Attempts were made to prevent such immunosuppression by splenectomy or treatment with BCG. Splenectomy was entirely without effect, but 10^7 live BCG administered intravenously two or four weeks before dead MLM prevented enhancement of infection. The mediator of the immunosuppressive mechanism that results in enhanced infection remains to be elucidated, but it is unlikely to be antibody or immune complexes.—Authors' Abstract

Lefford, M. J., Patel, P. J., Poulter, L. W. and Mackaness, G. B. Induction of cell-mediated immunity to *Mycobacterium lepraemurium* in susceptible mice. Infect. Immun. **18** (1977) 654-659.

A mouse strain (CB6) that is highly susceptible to *M. lepraemurium* was infected with 10^8 bacilli into the hind foot pad. These mice developed cell-mediated immunity to *M. lepraemurium*, as expressed by the development of a granulomatous lesion at the site of inoculation in normal but not in T lymphocyte-depleted mice, a proliferative response in the paracortical zone of the draining lymph node, delayed-type hypersensitivity to a sonic extract of *M. lepraemurium*, and immunopotentiation of the delayed hypersensitivity response to sheep erythrocytes. Resistance to a second challenge infection with *M. lepraemurium* was not demonstrated.—Authors' Abstract

Poulter, L. W. and Lefford, M. J. Development of delayed-type hypersensitivity during *Mycobacterium lepraemurium* infection in mice. Infect. Immun. **17** (1977) 439-446.

Various preparations of *M. lepraemurium* were used to elicit delayed-type hypersensitivity in the foot pad of mice infected with this organism. With a sonicated preparation of the mycobacterium, a significant increase in foot pad swelling was elicited in mice infected with *M. lepraemurium* five weeks previously, but not in BCG-infected animals or uninfected controls. This foot pad reaction was shown to peak at 24 hours and to be associated with an infiltration of mononuclear cells. The kinetics of foot pad swelling, its association with lymphoproliferation, and its dependence on T lymphocytes were each examined. The results support the hypothesis that this is a delayed-type hypersensitivity reaction. The ability to transfer this reactivity to normal mice with cells but not serum offers further confirmation that this hypersensitivity is dependent on cell-mediated immunological mechanisms rather than humoral antibody. The relevance of this to the study of the immunological response of mice to murine leprosy is discussed.—Authors' Abstract

Shepard, C. C., Van Landingham, R. and Walker, L. L. Effect of levamisole on *Mycobacterium leprae* in mice. Infect. Immun. **16** (1977) 564-567.

Levamisole, an antihelminthic drug that is capable of enhancing immune responses in mice and in humans, was tested in experimental *Mycobacterium leprae* infections in mice by a number of schedules. Intermittent schedules were used, and administration of the drug was started 1) around the time of inoculation with *M. leprae*, 2) when the *M. leprae* population was approaching the plateau level, 3) after the onset of the plateau phase, or 4) after BCG vaccination 28 days following the inoculation with *M. leprae*. No effect of the drug could be discerned with any of the schedules.—Authors' Abstract

Shepard, C. C., Youmans, A. Y. and Youmans, G. P. Lack of protection afforded by ribonucleic acid preparations from *Mycobacterium tuberculosis* against *Mycobacterium leprae* infections in mice. Infect. Immun. **15** (1977) 733-736.

Mycobacterial ribonucleic acid preparations from H37Ra, an attenuated strain of *Mycobacterium tuberculosis*, provide their usual marked protection against *M. tuberculosis* challenge; however, they provided no protection against *Mycobacterium leprae* challenge. Suspensions of intact H37Ra were not effective against *M. leprae*. Suspensions of BCG gave their usual distinct protection against *M. leprae* challenge.—Authors' Abstract

Weaker, Frank J. Spermatogonia and the cycle of the seminiferous epithelium in the nine-banded armadillo. Cell Tissue Res. **179** (1977) 97-109.

The cycle of the seminiferous epithelium of the nine-banded armadillo can be divided into ten stages. As in most mammals, only one stage is observed per tubular cross-section. The process of spermiogenesis can be divided into 13 steps according to the development of the acrosomal system and the flagellum. Four generations of spermatogonia are observed in the germinal epithelium:1) stem cells, 2) type "A", 3) intermediate, and 4) type "B" spermatogonia. The stem cell is characterized by a highly irregular nucleus and the presence of glycogen in its cytoplasm. The type "A" spermatogonium contains an oblong nucleus with one or two shallow infoldings of the nuclear membrane. The intermediate spermatogonium contains an ovoid nucleus characterized by one or two nuclei and heterochromatin scattered in the nucleoplasm. The nucleus of the type "B" speratogonium is more spherically shaped with a centrally placed nucleolus and heterochromatin associated with the nuclear envelope.—Author's Summary

Weaker, Frank J. The fine structure of the interstitial tissue of the testis of the nine-banded armadillo. Anat. Rec. **187** (1977) 11-28.

The interstitial tissue of the testis of the nine-banded armadillo is composed of blood vessels, clusters of Leydig cells, the usual connective tissue elements and a network of lymphatic sinusoids. The endothelial walls of the sinusoids are separated from the peritubular contractile cell layer surrounding the seminiferous tubules by a thin layer of collagen. The peritubular contractile cell is characterized by filaments and dense bodies within the cytoplasm, whereas the endothelial cells lack these structures. Within each cluster several Leydig cells surround one or more blood vessels. Adjacent Leydig cells are joined by 2-3 nm wide gap junctions and desmosome-like specializations. The Leydig cell is polygonal in shape with an ovoid nucleus. The cell is characterized by an abundance of smooth endoplasmic reticulum which appears as sheets of membranes, concentric whorls around vacuoles, and a random tubular network. Only a few short cisternae of rough endoplasmic reticulum are observed. Centrioles are closely associated with the Golgi apparatus. Rodlike mitochondria with tubular cristae are scattered throughout the cytoplasm. In addition, the cells contain vacuoles resulting from lipid extraction, filaments, microtubules, and glycogen. The surfaces of the cell exposed to the intercellular spaces exhibit numerous pinocytotic vesicles and cell processes which indicate active movement of material across the plasma membrane. In comparison to other mammalian species, the ultrastructural organization of the interstitium and the fine structure of the Leydig cell of the armadillo resemble those of the guinea pig.—Author's Abstract

Wu, Albert M. and Pigman, Ward. Preparation and characterization of armadillo submandibular glycoproteins. Biochem. J. **161** (1977) 37-47.

The nine-banded armadillo (*Dasypus novemcinctus mexicanus* Peters) was chosen for this study so that a comparison could be made of the salivary mucus glycoproteins of an ancient mammalian species with those derived from previously studied, more highly evolved, species. Two mucus glycoproteins, armadillo submandibular glycoprotein A and armadillo submandibular glycoprotein B, were prepared from the armadillo submandibular gland by a modification of the method of Tettamanti and Pigman (Arch. Biochem. Biophys. **124**, 41-50). The composition of glycoprotein A is the simplest

one among the known mucus glycoproteins. Six amino acids constitute 98.5 mol/100 mol of the protein of glycoprotein A and 82 mol/100 mol of that of glycoprotein B. These are serine and threonine (which make up 40% to 50% of the molar amino acid composition), glutamic acid, glycine, alanine and valine. Proline is absent from glycoprotein A and comprises only 2.3% of glycoprotein B. For both glycoproteins, the protein content, as determined by the method of Lowry, Rosebrough, Farr and Randall (J. Biol. Chem. **193** [1951] 265-275), with bovine serum albumin as standard, was nearly 60% higher than when determined by the sum of the amino acids. The ratios of total mol of amino acid/total mol of carbohydrate are 1:0.63 for glycoprotein A and 1:0.68 for glycoprotein B. *N*-Acetylneuraminic acid and *N*-acetylgalactosamine, in a molar ratio of about 0.35:1.00, are the principal carbohydrates present in both glycoproteins. Neutral sugars seem to be absent from glycoprotein A, but galactose and fucose are present in glycoprotein B. The carbohydrate side chains in glycoprotein A are composed of about two-thirds monosaccharide and one-third disaccharide residues, whereas those of glycoprotein B are more complex. For both glycoproteins, essentially all of the *N*-acetylgalactosamine was attached *O*-glycosidically to the hydroxyamino acid residues of the protein core. The linkage of *N*-acetylneuraminic acid in glycoprotein A was extremely sensitive to dilute acid and neuraminidase. Glycoprotein B has chemical properties similar to those of glycoprotein A. However, whereas glycoprotein A was susceptible to both *Clostridium perfringens* and *Vibrio cholerae* neuraminidases, only the latter enzyme had an effect on glycoprotein B at pH 4.75. Both glycoproteins were homogeneous by cellulose acetate electrophoresis and ultracentrifugal analyses. The apparent molecular weights of glycoprotein A and glycoprotein B were 7.8×10^4 and 3.1×10^4 respectively.—Authors' Abstract

Rehabilitation

Frist, T. A study of community attitudes and knowledge in relation to leprosy. Hansen. Int. **1** (1976) 184-190.

A study of community attitudes and knowledge in relation to leprosy was undertaken in the Bauru Region of the Brazilian State of São Paulo as preparation for an integration project in the region. A representative sample of approximately 500 persons was interviewed in seven municipalities by 15 psychology students. The results of the study showed that the level of knowledge about leprosy in the region is very low with the mean score on a basic knowledge test being 37.5% correct. While results showed the existence of a "leprosy stigma" in the region, they also demonstrated a considerable degree of acceptance on the part of the general population to maintaining close work and friendship relationships with patients under treatment. Other answers to questions in the study indicated that the roots of the "leprosy stigma" lie more in the fear of "contagion" and the disease's effect on social relationships than in the fear of physical problems such as pain and deformities. The author is left with a feeling of cautious optimism as to the success of integration efforts when these are accompanied by health education activities with those with whom the patient is to maintain close contacts.—(*From* Trop. Dis. Bull.)

Other Mycobacterial Diseases and Related Entities

Daniel, T. M. and DeMuth, R. W. Immunochemical analyses of a major antigen of *Mycobacterium szulgai*. J. Infect. Dis. **135** (1977) 778-786.

Unheated culture filtrate of *Mycobacterium szulgai* and a homologous goat antiserum were prepared. Immunoelectrophoretic analysis demonstrated a dominant anodal antigen in the culture filtrate. By the use of diethylaminoethyl-cellulose chromatography, a fraction designated MSP, which was rich in this anodal antigen, was recovered. The major antigen of MSP was demonstrated to

have partial identity with reference mycobacterial antigen 6, and evidence was obtained for separate shared and specific antigenic determinants. MSP was found to be a potent, delayed skin-test antigen of considerable specificity when used in sensitized guinea pigs. Arthus reactions were also observed and were not specific.—Author's Abstract

Marks, J., Jenkins, P. A. and Tsukumura, M. *Mycobacterium szulgai*—a new pathogen. Tubercle **53** (1972) 210-214.

M. szulgai is a newly-recognized species superficially resembling *M. gordonae* but quite distinct in lipid structure and by certain biochemical tests. Seven patients are reported in whom the organism appeared to be responsible for infection. In four the disease simulated pulmonary tuberculosis, two had olecranon bursitis and one had cervical adenitis. No isolates considered non-significant have been recognized but this may be due to the previous dismissal of such strains without a full examination.—Authors' Summary

Schaeffer, W. B., Wolinsky, E., Jenkins, P. A. and Marks, J. *Mycobacterium szulgai*—a new pathogen. Serologic identification and report of five new cases. Am Rev. Resp. Dis. **108** (1973) 1320-1326.

Mycobacterium szulgai was identified serologically by agglutination in *M. szulgai* antisera, and five new strains were isolated from patients with chronic pulmonary disease. The pulmonary disease was characterized by occurrence in middle-aged men and women, the presence of pulmonary cavities usually with thin walls, and a relatively good response to triple drug therapy. All of the isolations reported so far have been in association with human disease.—Authors' Summary

Selva-Sutter, E. A., Silcox, V. A. and David, H. L. Differential identification of *Mycobacterium szulgai* and other scotochromogenic mycobacteria. J. Clin. Microbiol. **3** (1976) 414-420.

Strains of scotochromogenic mycobacteria were studied by using numerical taxonomy methods in an attempt to more clearly define *Mycobacterium szulgai* and to find tests useful in identifying the species. In this study all strains of *M. szulgai* were strong reducers of nitrate, were slow in hydrolyzing Tween 80, and gave a high semiquantitative catalase reaction. Results obtained indicate that the use of increased pigmentation after one hour of light exposure at 25°C and that the use of arylsulfatase activity are of questionable diagnostic value in separating the species from other scotochromogenic mycobacteria.—Authors' Abstract