CURRENT LITERATURE

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

General and Historical

Lal, S. Leprosy in children. Indian Pediatr. **15** (1978) 373–374. (editorial)

Leprosy is not uncommon in children. Leprosy in children has certain features not usually seen in adults. The disease is rare in children below 2 years of age. There is no significant difference in leprosy prevalence between sexes in children. Lepromatous cases are uncommon before puberty, and the great majority of cases are indeterminate or tuberculoid. The most common type of skin lesion is the hypopigmented macule, followed by infiltrated patches. Neurologic involvement usually manifests itself as thickening of peripheral nerves. Muscular wasting and contracture are infrequent. Leprosy in children should be treated with the same drugs as in adult leprosy, in doses proportionate to the age and body weight of the child. School surveys are recommended to detect new cases when the estimated prevalence among students is in the range of 4–5/1000 or more.—(*Adapted from* the editorial)

Chemotherapy

Balakrishnan, S. and Seshadri, P. S. Drug interaction—The influence of rifampicin and clofazimine on the urinary excretion of DDS. Lepr. India **53** (1981) 17–22.

Indication of an enhancing effect of rifampin on the urinary excretion of DDS has already been reported from this institution. Further observations on this aspect in 25 cases of lepromatous leprosy treated with a 15 day schedule of rifampin at a dose of 600 mg daily along with DDS are presented. The earlier findings that rifampin in the initial phase of administration enhance the urinary output of DDS are confirmed. An estimation of rifampin/creatinine levels in urine done concurrently also showed a quicker elimination of the drug in the earlier phase compared to later phases of the drug administration.

As part of the study of drug interactions, the influence of clofazimine administration on DDS metabolism was also studied. The findings indicate that clofazimine does not exert any influence on DDS excretion by leprosy patients. The findings and their implications are discussed.—Authors' Summary

Baquillon, G., Ferracci, C., Saint-André, P. and Pattyn, S. R. Dapsone-resistant leprosy in a population of Bamako (Mali). Lepr. Rev. **51** (1980) 315–319.

Prevalence of dapsone resistance among 105 previously multibacillary patients living in the vicinity of the Marchoux Institute in Bamako, Mali, was 5.7%. Patients had been treated 10–29 years with a mean of 21 years. It is possible that although the amount of drug administration was only 56% of that prescribed, these long incubation times are the result of a year-long practice of administering dapsone by injections. It is possible that the technique of patient selection did not detect the appearance of resistant relapses at the earliest stages. The need for training in the early diagnosis of relapses is stressed.—Authors' Summary

Boddingius, J. and Stolz, E. Do anti-leprosy drugs reach *Mycobacterium leprae* in peripheral nerves? Lancet **1** (1981) 774–775.

The letter describes the hypothesis that drug sensitive *M. leprae* may persist in multibacillary leprosy, particularly in Schwann cells of unmyelinated peripheral nerve fibers. There seems to be a blood-nerve barrier in peripheral nerves of mice with advanced leprous neuropathy. This barrier may serve to limit the penetration of antileprosy drugs which are bound to plasma proteins into the endoneurium. There is a further possibility that the drug will not penetrate into Schwann cells even in patients with a leaking blood-nerve barrier. The suggestion is made that suitably labeled rabbit antibodies against antileprosy drugs might be useful in determining the precise localization of these drugs and thereby address these possibilities.—(*Adapted from* the letter)

Colin, M. and de Montaigne, E. Traitement de la maladie de Hansen lepromateuse par l'association de rifampicine et isoprodian. (Treatment of lepromatous leprosy with a combination of rifampin and isoprodian.) Méd. Trop. **40** (1980) 157–159. (in French)

Thirty lepromatous patients were treated during 3 months. The clinical condition was notably improved. The bacillary and morphologic indexes remained almost unchanged, and the histopathologic features advanced concurrently to the clinical aspects.—Authors' Summary

Ellard, G. A. Assaying dapsone in mouse diets. Lepr. Rev. **51** (1980) 321–323.

A simple colorimetric method is described for checking that dapsone-containing diets have been correctly prepared for mouse foot pad evaluation of the dapsone sensitivity of strains of *Mycobacterium leprae*.—Author's Summary

Gidoh, M., Sakamoto, Y., Tsutsumi, S., Funazu, T., Koide, S. and Narita, M. Trials for chemoprophylaxis of leprosy by DDS fundamental studies on an artificial DDS-rice. Jap. J. Lepr. **48** (1979) 1–6. (in Japanese)

Thinking about a past trial for the improvement of malnutrition by vitamins annexed to rice grains, artificial rice grains adsorbing DDS and coating with zeinpalmitic acid were prepared. The fundamental studies on the artificial rice grains were performed by employing ^{14}C-DDS and ^{15}S-DDS. The coating effect to prevent the flowing out of DDS during washing of grains was noticed, and the flowing was also not marked in the case of lipoluble medicament. The metabolism of DDS annexed to rice grains was compared with that of DDS by rats and man. The result showed the probable absorption of DDS from stomach wall if it is annexed to rice grains. At the same time, the distribution of DDS to the embryos of rats was examined. The suitable usage of the artificial DDS-rice was discussed.—Authors' Summary

Kasik, J. E. and Monick, M. Comparison of antibacterial and antiimmune effects of certain rifamycins. Antimicrob. Agents Chemother. **19** (1981) 134–138.

Comparison of the *in vivo* and *in vitro* immunosuppressive activities of the five rifamycins with their *in vitro* antibacterial and anti-ribonucleic acid polymerase activities indicated that correlation was poor. Examination of their activities on mitogen-induced blastogenesis in human peripheral blood leukocytes and inhibition of delayed-type hypersensitivity to partially purified protein derivative in immunized mice demonstrated that correlation was usually good. Antibacterial activity in cultures and the activities of the rifamycins inhibiting deoxyribonucleic acid-dependent ribonucleic acid polymerase appeared to correlate well. However, when these two types of activity, antiimmune and antibacterial, were compared, correlation was poor on occasion and indicated that the antiimmune activities and antibacterial activities of the rifamycins are probably not related.—Authors' Summary

Kritzinger, N. A. Adherence to drug therapy. An outpatient survey at the Johannesburg General Hospital. S. Afr. Med. J. **58** (1980) 767–770.

The findings of a survey of 450 patients receiving medicine from the Johannesburg General Hospital who were interviewed regarding their adherence to prescribed medicinal regimens are reviewed. One hundred sixteen of these patients were interviewed at home where, in addition, the remaining tablets were counted; results are reanalyzed and discussed. This study showed that age, sex, financial status, employment status, and type of drug issued played no significant part in predicting nonadherence to medicinal therapy. The highest level of education obtained did influence compliance ($p < 0.04$). Whether the patient saw the same doctor or not did not influence compliance, but significantly more patients who did not adhere to their prescribed therapy complained of lack of explanation from the doctor regarding the medicines ($p < 0.005$). The prescription of more than two tablets ($p < 0.001$) or more than two regimens ($p < 0.001$) or the inclusion of a four-times-a-day regimen ($p < 0.05$) significantly increased the incidence of nonadherence to prescribed therapy as did the removal of tablets from the original container ($p < 0.01$).

Furthermore, the survey showed that the incidence of nonadherence reported at the hospital differed significantly from that when patients were interviewed at home where a simultaneous pill count was conducted ($p < 0.001$). It is suggested that where appropriate: 1) four-times-a-day regimens be avoided; 2) the number of tablets and number of different regimens be kept to a minimum; and 3) the use of a unit dose pack be investigated. In such a pack, each unit would contain those preparations required to be taken at a particular time, and the patient would take everything contained in the single pack prescribed for that occasion; however, the contents may vary so that in practice the patient may be on a single regimen and a single tablet. The importance of doctor-pharmacist-patient communication is emphasized.—Author's Summary

McConkey, B., Davies, P., Crockson, R. A., Crockson, A. P., Butler, M., Constable, T. J. and Amos, R. S. Effects of gold, dapsone, and prednisone on serum C-reactive protein and haptoglobin and the erythrocyte sedimentation rate in rheumatoid arthritis. Ann. Rheum. Dis. **38** (1979) 141–144.*

Sequential measurements of serum C-reactive protein (CRP), serum haptoglobin (Hp), and erythrocyte sedimentation rate (ESR) were made in 209 patients with rheumatoid arthritis (RA); 78 of them were treated with gold, 71 with dapsone, and 60 with prednisone. The results were expressed as proportional changes in the measurements at 28 day intervals after treatment began. The period of study was 140 days. During treatment with gold and dapsone there were statistically significant gradual and progressive falls of similar magnitude in serum CRP and ESR. During treatment with prednisone serum CRP and ESR fell abruptly by 28 days and thereafter altered little. At 140 days prednisone had had the largest proportional effect on both measurements. During gold treatment the fall in serum Hp was similar to that of the ESR. In contrast, prednisone had little effect on Hp levels despite large falls in serum CRP and ESR. Either prednisone stimulates Hp synthesis or the divergence is an expression of the difference in type of effect between gold and prednisone or RA. The effect of dapsone on serum Hp was large and progressive; it partly reflects hemolysis, and since the hemolysis was not progressive, partly improvement in the RA. The results show the relative efficacy of the drugs and suggest that dapsone may be a useful alternative treatment for RA.—Authors' Summary

Menezes, S., Rege, V. L. and Sehgal, V. N. Dapsone haemolysis in leprosy. A preliminary report. Lepr. India **53** (1981) 63–69.

Fifty-one patients with leprosy from the Urban Leprosy Centre, attached to the Department of Dermatology and Venereology, Goa Medical College, on treatment with dapsone, were studied from the point of view of development of hemolysis related to the drug. The findings are described and discussed. Anemia developed in 60.7% of the patients during the course of treatment. It was mild and well compensated. The he-

* Editor's Note: The dapsone dose was 50 mg daily for one week, then 100 mg daily.—RCH

molytic effect of dapsone was related to the dose and duration of treatment, being more manifested in doses above 50 mg daily.—Authors' Summary

Modderman, E. S. M. Dapsone, still first choice in leprosy. Pharmacy International **1** (1980) 198–202.

Noncompliance, resistance, and persistence of viable *M. leprae* are major problems in the fight against leprosy. Although dapsone is an effective drug and has been one of the first choices for the past 30 years, leprosy is still prevalent. The author discusses these problems and some alternative therapies.—Author's Summary

Clinical Sciences

Acharya, B. P. Ocular involvement in leprosy—(A study in mining areas of India). Indian J. Ophthalmol. **26** (1978) 21–24.

A total of 2731 patients already diagnosed by leprologists as leprosy patients were seen at a coal mining area from 1971 to 1975 to find out the ocular affection in these cases. Eye involvement in leprosy was found in 11.3% of the cases. Ocular findings in these patients were noted as per proforma and compared with the findings of other workers in this field.—Author's Summary

El-Beheiry, A., Abou Zeid, S., El-Ghazzawi, E., El-Mansy, E. and Salama, N. The leprous testis. Arch. Androl. **3** (1979) 173–176.

A clinical investigative study of 148 male leprous patients demonstrated the presence of testicular lesions in 35 cases. Semen analysis revealed marked oligo-athenozoospermia in 10 cases and azoospermia in 25 cases. Testicular biopsies from leprous testes showed different histologic patterns, ranging from spermatogenic arrest to complete hyalinization of both seminiferous tubules and interstitial tissue. Histochemical staining for neurovascular supply revealed degenerative nerve change in addition to altered permeability of the testicular capillaries. There was good correlation between the results of semen analyses and histological and histochemical examination of testicular biopsies.—Authors' Summary

Laja, A. O. and Soyinka, F. Isolated plantar and palmar lesions of tuberculoid leprosy. Nigerian Med. J. **9** (1979) 735–736.

A rare and unusual case of isolated lesions of tuberculoid leprosy of the palms and soles was presented. The lesion of the right palm and sole presented as fixed drug eruption while those of the left palm and sole presented as tinea circinata or granuloma multiformes (Leiker). In the differential diagnosis of regional skin manifestation of the palms and soles, leprosy should be considered, especially in the tropics.—Authors' Summary

Lenka, M. R., Ghosh, E. and Panja, S. K. Incidence of Australia antigen in leprosy. Lepr. India **53** (1981) 38–44.

Ninety-seven male patients attending the leprosy clinic of the dermatology outpatient department were studied for the detection of Australia antigen. There was a 20% antigen positivity in patients suffering from lepromatous leprosy and 5.7% in the cases with tuberculoid leprosy. SGPT level was found to be significant in patients with lepromatous leprosy having Australia antigen as compared to other groups.—Authors' Summary

Mehta, L., Kasbekar, V., Apte, N. and Antia, N. H. Evolution of nasal mucosal lesions in leprosy. Lepr. India **53** (1981) 11–16.

Four stages of nasal pathology in tuberculoid leprosy are described. In every atrophic rhinitis case, nasal biopsy is advocated. Rhinoscopic examination should be done in family contacts and in early cases of leprosy.—Authors' Summary

Ottati, S. and Candeias, J. A. N. Subtipos do antígeno Austrália (HB_sAg) em doentes de hanseníase de São Paulo, Brasil. (Subtypes of Australia antigen (HB_sAg) in leprosy in São Paulo, Brazil.) Rev. Saúde Públ. (Sao Paulo) **13** (1979) 366–369. (in Portuguese)

One hundred and thirty-five sera from patients with leprosy were tested for the ad and ay subtypes of HB_sAg. Only three (2.2%) had HB_sAg, and all were ad positive.—Authors' Summary

Pannikar, V. K. and Arunthathi, S. Leprosy in an albino. Lepr. India **53** (1981) 99–103.

A case of complete albinism with borderline lepromatous leprosy is presented as the first report from India of the association of these conditions.—Authors' Summary

Ree, G. H. Ocular leprosy in Papua New Guinea. Papua New Guinea Med. J. **23** (1980) 182–185.

The author states that the prevalence of ocular leprosy varies widely throughout the world and that although a study of patients in Port Moresby showed a prevalence of 12%, little attention had been paid to the type, duration, and activity of the disease. Two hundred thirty-four unselected patients from Port Moresby were therefore examined. The study confirmed the observation of other authors that ocular pathology increases with duration of the disease and that there was a high proportion of significant nerve lesions in borderline leprosy. He notes that there are difficulties in comparison in different geographical areas and that the figures that apply to Port Moresby may not apply in less accessible regions. Since there are 8000 registered cases of leprosy in Papua, New Guinea, it is likely that there are at least 1000 patients with potentially sight-threatening lesions.—J. C. Hargrave

Sharma, S. C., Dhall, K., Kumar, B. and Kaur, S. Leprosy and female genital organs (A preliminary report). Bull. P. G. I. Chandigarh **12** (1978) 198–201.

Fourteen leprosy patients were studied to determine the effect of leprosy on menarche, pregnancy, puerpurium, and menopause. Leprosy was found to have no direct effect on menstruation or fertility. Neither the endometrial tissue nor the menstrual blood showed any evidence of leprous granuloma or lepra bacilli.—Authors' Summary

Sivamani, S., Garg, B. R. and Lal, S. Quantitative DNCB epicutaneous sensitization in leprosy patients and controls. Lepr. India **53** (1981) 45–51.

The status of nonspecific cell-mediated immunity in 49 leprosy patients classified according to the Ridley and Jopling scale and 16 non-leprous controls was studied using epicutaneous sensitization with DNCB and quantitatively grading the degree of sensitization and Mx. test with 1 TU PPD. The effect of dapsone administration on CMI responses was also observed. There was no gross depression of CMI responses as made out by epicutaneous sensitization to DNCB, but quantitative grading of responses revealed a subtle depression of CMI responses progressively increasing from the TT to the LL end of the spectrum. Mx. testing with 1 TU PPD did not appear to be a good parameter to study the CMI status. Dapsone administration did not alter the CMI responses.—Authors' Summary

Troy, J. L., Grossman, M. E. and Walther, R. R. Squamous-cell carcinoma arising in a leprous neurotrophic ulcer. J. Dermatol. Surg. Oncol. **6** (1980) 659–661.

Exophytic neoplasms arise rarely in neurotrophic ulcers of leprosy. When such a lesion does develop, it has clinical resemblance to an indolent and locally invasive epithelioma cuniculatum, may invade deeply, and may metastasize. The case described showed deep invasion and extensive involvement of bone. Exophytic neoplasms in neurotrophic ulcers of leprosy should be considered to be squamous-cell carcinomas, not epitheliomata cuniculata, because of their potential for rapid, deep invasion and metastases.—Authors' Summary

Yokoyama, M., Tseng, C. H., Chao, W. T., O'Donnell, M. J., Hathaway, J. C. and Chandor, S. B. Studies on humoral im-

mune response in leprosy. Kurume Med. J. **26** (1979) 387–395.

This study was undertaken to determine if the humoral immune status of leprosy patients varied with either the type of the disease or the geographical location of the disease. Another variable investigated was whether or not treatment versus nontreatment had any selected effect on the humoral immune status. Serum immunoglobulin levels were determined by single radial immunodiffusion, and other immunoserologic profile testing was performed whenever possible. Immunoglobulin levels did show a difference between the different disease types of leprosy, and the authors also feel that environmental and genetic factors may play a more significant role than previously thought.—Authors' Summary

Immuno-Pathology

Anthony, J., Vaidya, M. C. and Dasgupta, A. Ultrastructure of nerve in erythema nodosum leprosum (ENL). Cytobios **26** (1979) 109–112.

Gross changes of myelinated fibers and Schwann cells at different degenerative stages were present in all five ENL nerve lesions. Besides these changes, infiltrating cells, mainly macrophages, deposition of excessive collagen, and perineural vessel damage were also observed.—Authors' Summary

Bahr, G. M., Rook, G. A. W., Moreno, E., Lydyard, P. M., Modabber, F. Z. and Stanford, J. L. Use of the ELISA to screen for anti-thymocyte and anti-β_2-microglobulin antibodies in leprosy and SLE. Immunology **41** (1980) 865–873.

A report is given of the use of the enzyme-linked immunosorbent assay to measure antibody to preparations of human thymocyte membranes (HTMA) and to β_2-microglobulin. The assay described is simple and rapid and requires only small quantities of an easily stored membrane preparation. The advantages of this technique over conventional methods involving cytotoxicity are discussed. Raised levels of IgM antibody to β_2-microglobulin were detected in sera from active lepromatous leprosy cases but not in sera from SLE patients. Raised levels of IgG and IgM antibody to HTMA were found in sera from most active lepromatous cases. Two of eight sera from SLE patients showed raised IgG anti-HTMA but not raised IgM. An attempt was made to study the subclass of the IgG antibodies found but when checked against purified human IgG myeloma proteins, the available anti-subclass sera were found to lack the necessary degree of specificity in this assay.—Authors' Summary

Brown, C. A., Brown, I. N. and Šljivić, V. S. BCG, *Corynebacterium parvum* or *Mycobacterium leprae* added to cultures of BCG-primed mouse spleen cells cause an enhanced primary antibody response *in vitro*. Immunology **42** (1981) 67–73.

A few weeks after mice were injected i.v. with 10^8 live *Mycobacterium bovis*, BCG, the antibody response of their spleen cells to SRBC *in vitro* was comparable with the response of cells from untreated mice. Addition of BCG organisms to the culture vessels resulted in enhanced antibody-forming cell (AFC) responses by the primed cells but not by the cells from the untreated mice. No evidence was found for a direct stimulation of B cells, and cell depletion experiments suggested macrophages were directly involved. BCG added to the cultures up to 68 hr after they were set up, but no later, still caused enhancement. No enhancement was found when DNP-Ficoll was used as antigen. The ability to stimulate the anti-SRBC response was not restricted to the organism used for priming. Enhancement was also found if *C. parvum* or *M. leprae* were added to BCG-primed cells and if BCG was added to *C. parvum*-primed cells. The relevance of the results to the search for a leprosy vaccine is discussed.—Authors' Summary

Brown, C. A., Brown, I. N. and Šljivić, V. S. Phagosome/lysosome fusion: a possible prerequisite for the enhancement of antibody responses *in vitro* by BCG, *Mycobacterium leprae* and *Corynebacterium parvum*. Parasite Immunol. **1** (1979) 309–316.

Primary *in vitro* antibody responses to SRBC were suppressed in cultures prepared from the spleens of CBA mice injected i.v. 20 days previously with 10^8 live BCG. In contrast, cultures prepared from mice injected with dead BCG showed enhanced responses. *In vitro* spleen cell responses of the mice had returned to normal levels 4–6 weeks after their injection, but if dead BCG, *M. leprae* or *C. parvum* was added to the cultures, responses were enhanced. The enhancing effect of the added bacteria could be removed by also adding suramin, a drug known to inhibit *in vitro* fusion of lysosomes with phagosomes. It is suggested that the different *in vivo* effects of live and dead BCG may relate to differences in their handling by macrophages and more especially that the enhanced antibody forming cell response seen in the restimulated cultures of spleen cells from BCG primed mice depends upon efficient intracellular fusion of lysosomes with the phagosomes containing the added dead bacteria.—Authors' Summary

Carayon, A., Camain, R., Maydat, L. and Discamps, G. Les lésions vasculaires de la lèpre. Leur responsabilité dans certaines atteintes cutanées, nerveuses et viscerales. (Vascular changes in leprosy and their responsibility in skin and nerve changes and visceral lesions.) Méd. Trop. **37** (1977) 457–472. (in French)

Various sites and forms of vascular changes are studied: the vasculitides may be acute and exudative or thrombosing, hemorrhagic, or necrotizing. Microangiopathies observed in ENL are more frequent than arteriolar and arterial vasculitides.

The skin vascular changes result from ENL with first, morphonuclear infiltration and then a true pan-vasculitis. These changes are caused by a deposition of immune complexes around the vessel.

Microangiopathic neuritis is seen in two cases:

a) in ENL it may be, not frequently, an acute reactional neuritis with sometimes an abscess or more often a slow evoluting neuritis;
b) in borderline leprosy a microangiopathic neuritis is observed after a hook double shift (first a slow downgrading followed by a quick reversal reaction) or in painless and insidious evolution or in partial electrophysiologic changes.

Two types may be observed:

a) a secondary type seen in leprosy patients previously impaired by old neuritis of common site and developing nerve disorders in unusual sites;
b) a primary type occurring in patients without previous nerve impairment. Surgical exploration is necessary, and it shows that the nerve when palpated is thin and soft. The nerve vessels present a vasculitis with lymphocytic infiltration.

Visceral localizations are studied (frequent kidney localizations in ENL).

Venous and lymphatic changes may occur in the legs (deep and superficial phlebitis, localized lymphedema, and elephantiasic leprous dermatitis). Some investigations demonstrated that osteitis of tibia and of fibula may be caused by a deep interosseous lymphangitis.

Stasis of the spermatic flow may give edema, proliferation of Leydig cells, and gynecomastia.

Therapeutic trends are indicated.—Authors' Summary

Ji, Bao-Hong. Immunological study on leprosy. II. Further study on T and B lymphocytes of peripheral blood. J. Clin. Dermatol. **10** (1981) 9–12. (in Chinese)

By means of the Et rosette test, FBC rosette test, PHA and E_G rosette test with preactivation by three kinds of mycobacterial antigen, further study has been made on the immunological state of 25 cases of tuberculoid leprosy and 30 cases of lepromatous leprosy. It was found that there was a decrease of T cells and an increase of B cells in the peripheral blood of patients. E_G rosette formation was below normal, B cells in the peripheral blood of lep-

romatous patients were much greater in number than those of tuberculoid patients, while *M. leprae*-E_G and *M. vaccae*-E_G rosette formation rate of the former was lower than the latter. This shows that these patients do have specific and nonspecific defects in cell-mediated immunity with heightened humoral immunity, which are particularly marked in the lepromatous patients.—Author's Summary

Immunological recognition and effector mechanisms in infectious diseases. Bull. WHO **58** (1980) 671–680.

In recent years it has become clear that several specialized cell types are involved in the induction of the immune response. The way the antigen is presented to the different cell types may be important in deciding, for instance, if a homograft will be rejected or tolerated or if another antigen will preferentially stimulate antibody or a cell-mediated immune response. Different types of immune response may be desirable or harmful during the course of different infectious diseases. The knowledge of how recognition and effector mechanisms operate in different conditions may help in the production of more effective vaccines. In this article the present knowledge of both antibody and cell-mediated responses is reviewed, and recommendations are made for further research.—Authors' Summary

Izumi, S., Sugiyama, K., Matsumoto, Y. and Nagai, T. Numerical changes in T cell subsets (Tγ and Tμ) in leprosy patients. Microbiol. Immunol. **24** (1980) 733–740.

Eighty-six leprosy patients (49 active lepromatous, 24 inactive lepromatous, seven borderline, and six tuberculoid) and nine healthy controls were examined for numerical changes in T cell subsets (Tγ and Tμ) and complement levels in peripheral blood to determine the roles of T cell subsets and complement in the etiology of leprosy.

The percentage and number of Tγ and Tμ cells showed no significant differences among the different clinical groups, but four out of 49 active lepromatous, three out of 24 inactive lepromatous, and three out of seven borderline cases showed a high percentage of Tγ cells.

Serum concentrations of C_4, C_{3c}, and C_3 activator, an important factor in the alternative pathway of complement activation, were not significantly different among the groups. However, C_3 activator and C_{3c} concentrations were significantly high in active lepromatous patients complicated by an immune complex disease called erythema nodosum leprosum (ENL) compared to ENL-free active lepromatous leprosy.—Authors' Summary

Kaplan, M. H. and Chase, M. W. Antibodies to mycobacteria in human tuberculosis. II. Response to nine defined mycobacterial antigens with evidence for an antibody common to tuberculosis and lepromatous leprosy. J. Infect. Dis. **142** (1980) 835–843.

Antibodies to mycobacterial antigen were found in the sera of 33 of 52 patients with active tuberculosis by microimmunodiffusion tests. The highest titered sera were examined by a technique in which sera are placed in an intermediate gel between a reference goat antiserum field and a gel containing the antigens separated by one dimensional electrophoresis. Special patterns caused by the presence of the patient's serum during the two dimensional electrophoresis showed that nine distinct antibodies could be designated by anodal migration of the corresponding nine antigens and the band position with respect to the reference pattern. Six of these antibodies were detected only by sera from selected patients while the other three antibodies, "Lep," "Da," and "USJ 6," were also detected by the goat antiserum. Lep is present in patients with lepromatous leprosy but had never been described in those with tuberculosis. Monospecific human antisera were used to detect Lep and Da, a new antibody, during fractionation of mycobacterial culture filtrate.—Authors' Summary

Kaur, S., Malik, A. K. and Kumar, B. Pathologic changes in striated muscles in leprosy. Lepr. India **53** (1981) 52–56.

Eighteen muscle biopsies from male adult patients with lepromatous and borderline lepromatous leprosy were studied. The BI in the biopsies ranged from 1+ to 3+. There was conspicuous absence of

granuloma except for a collection of foamy histiocytes in the intermysial region and on two occasions in the intermysial nerve endings in LL patients. In places solid staining bacilli were seen in normal looking muscles. None of the biopsies showed loss of muscle striations, fatty change, sarcolemmal changes, fibrosis, and necrosis. Hyaline change was seen in two specimens only. Details of these are discussed.—Authors' Summary

Martínez-Palacios, B. N. Quimiotaxis en lepra. (Chemotaxis in leprosy.) Dermatológia **22** (1978) 26–35. (in Spanish)

Plasma factors of chemotaxis were investigated in 25 leprosy patients and in 25 controls by a modified Boyden's technique. Stimulation was done by *S. albus, M. leprae,* and *M. lepraemurium.* The results of this work have not confirmed the observation of Ward about the existence of an inhibitor of chemotaxis in leprosy patients. *M. leprae* and *M. lepraemurium* were not able to stimulate liberation of chemotaxis factors into the plasma of these patients or in healthy persons. This perhaps explains the persistence of this infection in human beings.—Author's Summary

Rook, G. A. W. The immunogenicity of killed mycobacteria. Lepr. Rev. **51** (1980) 295–301.

The variable effect of killing on the immunogenicity of different mycobacterial species is clearly trying to tell us something fundamental about the biology of the organisms. It is therefore essential to build up an accurate picture of how *Mycobacterium leprae* compare with other species.

1) The immunogenicity of killed *M. leprae* is not in itself unique (although it has unusual features). There is a huge neglected literature on the ability of killed mycobacteria to evoke both skin test positivity and protection.

2) It is possible that killing *M. leprae* causes qualitative changes in the type of response evoked. This is true of pathogenic members of the slow-growing subgenus which, when killed, evoke less of the necrotizing component. We therefore need to know more about the relevance to protection of these different components. However, the response to killed *M. leprae* in mice resembles that evoked by several nonpathogenic members of the fast-growing subgenus rather than the response to pathogenic slow-growers.

3) We know that BCG, a living vaccine, can protect man against leprosy. There is at present no evidence that killed *M. leprae* are immunogenic (skin-test positivity or protection) in people not previously exposed to living leprosy bacilli, but a review of the literature involving killed mycobacteria suggests that it will be. It remains, nevertheless, an act of faith.—(*Adapted from* the article)

Rook, G. A. W., Bahr, G. M. and Stanford, J. L. The effect of two distinct forms of cell-mediated response to mycobacteria on the protective efficacy of BCG. Tubercle **62** (1981) 63–68.

Evidence has been presented elsewhere that prior exposure to some environmental mycobacteria enhances the protective efficacy of BCG, whereas exposure to other species opposes it and suggests that these different species act by evoking one of two types of cell-mediated responses of different protective efficacy.

This paper reviews past evidence for the existence of these two types of response and suggests that both can be demonstrated in mice. The type of response evoked in mice by environmental species correlates with their effect on the efficacy of BCG in man and with the type of proliferative response evoked in human peripheral blood lymphocytes by their soluble antigens *in vitro.* Preimmunization of mice to give one type of response can block subsequent induction of the other. We therefore present a model based on this principle for the interaction of contact with environmental mycobacteria with subsequent BCG vaccination.—(*Adapted from* authors' summary)

Sinha, S., Sengupta, U., Ramu, G. and Desikan, K. V. Assessment of Dharmendra antigen. (IV) Antigenic analysis of lepromins. Lepr. India **53** (1981) 6–10.

In order to pinpoint the active portion of the skin antigens, including Dharmendra and other lepromins, a study was carried

out by subjecting the antigens to electrophoretic and immunoelectrophoretic analysis. These analyses identified two components, anionic and cationic, in lepromin sonicates. The anionic component was stainable with a protein stain whereas the cationic component formed precipitin arcs on immunoelectrophoresis with sera from lepromatous leprosy patients. BCG sonicate could also be resolved into two similar components. The cationic component of BCG, apparently a glycoprotein, cross-reacted with cationic component of lepromin and also showed a reaction of identity in gel diffusion. The specificity of anionic (proteinaceous) component of lepromin remains to be established.—Authors' Summary

Stanford, J. L., Rook, G. A. W., Samuel, N., Madlener, F., Khamenei, A. A., Nemati, T., Modabber, F. and Rees, R. J. W. Preliminary immunological studies in search of correlates of protective immunity carried out on some Iranian leprosy patients and their families. Lepr. Rev. **51** (1980) 303–314.

Multiple skin-testing, lymphocyte transformation tests, and enzyme-linked immunosorbent assay of antibodies to mycobacterial antigens have been carried out on patients and their healthy children living in Baba Baghi Leprosy Sanitorium in Iran. The data reported show a remarkable correlation between responses to *Mycobacterium leprae* and *M. vaccae* in all three test systems.

The percentage of positive responders to skin tests with Leprosin A among the children is higher than has previously been found, and BCG has been shown to enhance the capacity of the individual to recognize *M. leprae* in this way. Finally, the majority of a small number of children considered to be protected from leprosy has been shown to possess lymphocytes that transform in the presence of *M. leprae* and *M. vaccae* antigens but little antibody to *M. leprae* by the enzyme-linked immunosorbent assay. Of the three types of tests assessed here only skin-testing appears to be of any value as a measure of protection, but whether even this will prove useful at the individual level is far from certain.—Authors' Summary

Stanford, J. L., Shield, M. J. and Rook, G. A. W. How environmental mycobacteria may predetermine the protective efficacy of BCG. Tubercle **62** (1981) 55–62.

A proposal is made that there are two mechanisms of cell-mediated immune response to mycobacteria, both of which produce positive tuberculin tests and that one of them is more protective against mycobacterial infection than is the other. These are referred to respectively as the *Listeria*-type and the Koch-type of responses. Contact with environmental mycobacteria will induce one or the other of these types of response, and BCG vaccination will enhance it. Thus in those places where the environmental species prime for the *Listeria*-type of response, subsequent BCG vaccination will afford good protection from both tuberculosis and leprosy. Where the Koch-type of response frequently results from environmental contact, BCG will be ineffective. Evidence is presented that a large contact with *Mycobacterium scrofulaceum* is prejudicial to at least one marker of BCG efficacy in Burma.—Authors' Summary

Thomas, J., Joseph, M., Ramanujam, K., Chacko, C. J. G. and Job, C. K. The histology of the Mitsuda reaction and its significance. Lepr. Rev. **51** (1980) 329–339.

The lepromin test was done on 38 leprosy patients belonging to the various classifications of the disease. The "delayed" or "Mitsuda" reaction was assessed clinically and histologically at 21 days. The tuberculoid, borderline tuberculoid, and all but one of the indeterminate patients showed a tuberculoid histology on lepromin biopsy. The agreement between the histological reaction to lepromin and the histopathology of the skin lesions was near complete in tuberculoid and borderline tuberculoid patients. In indeterminate leprosy the tissue response to lepromin gives a clear indication of the progress of the disease in that patient. The histology of lepromin in the lepromatous and borderline lepromatous groups was nonspecific and demonstrated large numbers of the injected bacilli. Further, in these patients minimal nodular reaction may be produced by a nonspecific response of fibroblastic proliferation. In ad-

dition to the clinical reading, histologically evaluated lepromin reaction is an important procedure to assess the immunological status of a leprosy patient.—Authors' Summary

Microbiology

Dhople, A. M. and Hanks, J. H. Role of sulfhydryls in *in vitro* growth of *Mycobacterium lepraemurium*. Infect. Immun. **31** (1981) 352–357.

In an attempt to evaluate various factors that influence the growth of *Mycobacterium lepraemurium* in NC-5 medium, the effects of sulfur and –SH compounds were investigated. Cysteine could be replaced by equimolar concentrations of other –SH compounds containing carboxyl group, and at lower concentrations by nonpolar sulfhydryl compounds. The oxidized form of sulfhydryls, as well as certain organic and inorganic reducing agents, did not support growth. The results suggest that the function of sulfhydryl compounds is to maintain low reducing potential in the medium and also to participate in metabolic or biosynthetic pathways or both. A combination of dithiothreitol and thioglycolate gave better results than when these compounds were incorporated individually in the medium. This suggests the protective action of dithiothreitol in preventing oxidation of monothiols.—Authors' Summary

Grange, J. M. Recent European research activities in mycobacteriology. Tubercle **61** (1980) 259–268.

The subject of mycobacteriology is becoming an increasingly popular and complex one, and the contribution by European scientists has been considerable. The important areas of research include taxonomy and the improvement of identification methods; biochemistry, including enzymology, metabolic regulation, lipid chemistry, iron uptake and metabolism, pigment synthesis, and DNA chemistry; genetics and bacteriophages; ecology, including the effect of contact with environmental bacteria on the mammalian immune response; immunology; and the association of disease and cell-wall-free mycobacteria and studies of the leprosy bacillus. The European Society of Mycobacteriologists has recently been founded to unite workers in these disciplines and to promote and disseminate knowledge in this subject.—Author's Summary

Kusunose, E., Kusunose, M., Ichihara, K. and Izumi, S. Occurrence of superoxide dismutase in *Mycobacterium leprae* grown on armadillo liver. J. Gen. Appl. Microbiol. **26** (1980) 369–372.

The authors have earlier reported that *M. lepraemurium* contains large amounts of superoxide dismutase, the enzyme accounting for at least 7% of the total proteins of a crude extract of *M. lepraemurium* grown on Ogawa's egg yolk medium. Superoxide dismutase was found to be one of the major proteins in *M. leprae* as well. The enzyme from *M. leprae* gave a precipitin line with antibody against the enzyme from *M. lepraemurium*, indicating that the superoxide dismutases from these organisms share some common antigenic determinants. These results emphasize that superoxide dismutase may be very important in the survival and multiplication of obligate intracellular parasites such as *M. leprae* and *M. lepraemurium* against the killing effect of superoxide radical produced by phagocytic cells.—(*Adapted from* the article)

Sengupta, U. and Nakamura, M. A relationship between the length of bacilli and the log phase of growth of *Mycobacterium lepraemurium* in cell-free liquid medium. Lepr. India **53** (1981) 29–33.

A relationship between the early phase of growth of *M. lepraemurium in vitro* in

NC-5/ND-5 media and elongation of bacteria has been noted. The doubling time in NC-5 is 3.06 days whereas it is 1.97 days in ND-5 medium. In ND-5 medium, *M. lepraemurium* elongates earlier to that in NC-5. Furthermore, in ND-5 the peaks in elongation of bacteria are more frequently noted than in NC-5 medium. Morphological observations have shown all stages of bacterial cell division. At later stages of cultivation (21st and 24th day) *M. lepraemurium* often shows terminal swelling in ND-5 medium which also revealed stages of cell division.—Authors' Summary

Sengupta, U. and Nakamura, M. Growth of *Mycobacterium lepraemurium* in cell-free liquid medium containing soluble starch: evaluation by generation time and morphological observation. Lepr. India **53** (1981) 23–28.

A stimulatory effect of soluble starch on the growth of *M. lepraemurium in vitro* cell-free culture system has been noted. In this medium bacteria elongated gradually without manifesting any significant peak in elongation as has been noted in NC-5 medium. The maximum average elongation of bacteria was 2.84 μ on the 24th day in NCS-5 medium. In contrast, in NC-5 bacteria elongated maximum on the 6th day (2.32 μ). All the stages of bacterial cell division were noted. An hypothesis has been suggested for continuous multiplication of *M. lepraemurium* in NCS-5 medium.—Authors' Summary

Young, D. B. Identification of *Mycobacterium leprae:* Use of wall-bound mycolic acids. J. Gen. Microbiol. **121** (1980) 249–253.

A simple method for extraction and analysis of wall-bound mycolic acids from small samples of mycobacteria is described. Separation of mycolic acid classes according to their functional groups by thin-layer chromatography showed a difference between *Mycobacterium leprae* and a number of strains of acid-fast bacilli cultured from leprosy bacilli *in vitro*. This technique is proposed as a convenient preliminary test in the identification of possible cultures of *M. leprae*.—Author's Summary

Experimental Infections

Alexander, J. Effect of cyclophosphamide treatment on the course of *Mycobacterium lepraemurium* infection and development of delayed-type hypersensitivity reactions in C57Bl and BALB/c mice. Clin. Exp. Immunol. **34** (1978) 52–58.

Pretreatment of *Mycobacterium lepraemurium* susceptible, BALB/c and resistant, C57Bl, mice with cyclophosphamide markedly altered the development of delayed hypersensitivity during foot pad infections with this organism. A tuberculin-type response demonstrated by untreated C57Bl mice was significantly intensified after week 3 in cyclophosphamide pretreated mice although this response had returned to normal levels by week 8. A Jones-Mote-type response demonstrated throughout experiments by untreated BALB/c mice was considerably increased in magnitude by week 3 in cyclophosphamide pretreated mice. By week 6, this response had become considerably protracted and was of the tuberculin type. By week 8, however, this response had started to diminish and by week 12 cyclophosphamide treated and untreated BALB/c mice produced similar Jones-Mote-type responses when skin tested. Cyclophosphamide pretreatment had no effect on the growth of *M. lepraemurium* in C57Bl mice over 12 weeks. In BALB/c mice, however, cyclophosphamide pretrated mice demonstrated considerable resistance to infection at weeks 8 and 10 after infection but not thereafter. Whereas the magnitude of the delayed hypersensitivity response in C57Bl mice could not be correlated with resistance, such a relationship could be demonstrated in BALB/c mice.—Author's Summary

Ganguly, N. K., Kumar, B., Kaur, S., Sharma, S., Kaur, M. and Chakravarti, R. K. BCG induced immunity to *Mycobacterium leprae* in mice. Lepr. India **53** (1981) 57–62.

One to three BCG vaccinations were given to various groups of mice, 25 to 2 days preceding challenge with *M. leprae*. Harvesting of *M. leprae* was done every month up to a period of 7 months. Lymph node enlargement was taken as an indicator of successful vaccination. An increasing degree of protection was noted in BCG immunized mice as observed by a reduced number of bacilli harvested. Protection afforded was proportional to the number of doses of BCG given.—Authors' Summary

Navalkar, R. G. Immune response to *Mycobacterium leprae*: further studies on the assessment of humoral immune response in mice. Zbl. Bakt. Hyg. **247** (I. Abt., Orig. A.) (1980) 364–373.

Immunocyte proliferation in the spleens of mice given both a primary and a second infection sixty days later was detected soon after the second challenge was administered. Plaque-forming cell assay for both the direct and developed plaques indicated that all cells producing antibody of both immunoglobulin classes were present in the animals when they were administered the second challenge. Hemagglutinating antibody determinations indicated that IgG antibodies are recognizable at a time when the bacilli reach a stage of maximum multiplication in the mouse host. The IgM antibodies, however, become detectable within a short time after infection in animals given either a single infection or a dual infection, one fifteen days later and the other sixty days after the first infection. It is proposed that the low level of circulating antibodies and antibody-producing cells despite continuous, as well as enhanced, antigenic challenge could be due to the fact that in the mouse footpad *M. leprae* may be intrinsically less antigenic than organisms that cause systemic infection. Quantitative immunoglobulin assays tended to confirm the observations on the HA studies.

Present studies have once again confirmed our previous observations viz. that the number of plaques in the spleens of mice infected with *M. leprae* increases on secondary stimulation, whether it is administered within a very short time after the primary infection or given later in the course of infection. They have also indicated that an IgG response will occur in the infected animals at a time when the bacillary multiplication enters the logarithmic phase of growth of *M. leprae*. They have, however, not permitted the placement of the mouse model in the overall spectrum of human leprosy.—Author's Summary

Navalkar, R. G. and Kanchana, M. V. Immune response to *Mycobacterium lepraemurium:* assessment of the humoral immune response in mice. Zbl. Bakt. Hyg. **248** (I. Abt., Orig. A.) (1980) 110–119.

Intraperitoneal infection of mice with *Mycobacterium lepraemurium* produced a primary immune response as represented by direct (IgM) plaque-forming cells at the splenic level within a short period after infection. This response was enhanced when animals were administered a second infection fifteen days after the first one. An identical situation was observed with the developed (IgG) plaques, although the magnitude of these plaques in animals given the second challenge was of a higher order than those given only one infection. In both instances, the number of plaques declined within a very short time after reaching a peak.

Higher levels of both direct and developed plaques in animals given second infection was a consequence of the dual effect of antigenic stimulus offered through the extracellular organisms in the second challenge and intracellular organisms from the previous challenge. The rapid decline indicated a dampening of the immune response through restricted antigenic stimulus, not only due to all organisms becoming intracellular during the course of infection but also due to structural alterations in the spleens, caused by extensive proliferation of the infecting pathogen.

Comparative analysis of the humoral immune response in animals infected with *M. leprae, M. marinum* and *M. lepraemurium* indicated similarities in terms of the latent period of induction and decline of the im-

mune response and some very distinct differences in other respects. These differences could be attributed to various factors, such as the site and dose of infection, nature of the disease induced in the animal host and the ability of the respective organisms to become intracellular. Based on these observations, it is suggested that neither the *M. lepraemurium* nor the *M. marinum* models can fully satisfy the requirements, at least immunologically, needed to consider these models as possible substitutes for evaluation of the host-parasite interactions in *M. leprae* infection of mice, although such a concept has been proposed previously, especially in regard to the *M. marinum* model.—Authors' Summary

Prabhakaran, K., Harris, E. B. and Kirchheimer, W. F. Failure to detect *o*-diphenoloxidase in cultivable mycobacteria obtained from feral armadillos. Lepr. Rev. **51** (1980) 341–349.

We reported earlier that *Mycobacterium leprae* separated from lepromatous human as well as armadillo tissues contain an unusual form of *o*-diphenoloxidase which oxidized several diphenols, including D- and L-dopa (3,4-dihydroxyphenylalanine) to quinones *in vitro*. It was not known whether any other species of mycobacteria separated from infected armadillo tissues would show *o*-diphenoloxidase activity. Recently, a few feral armadillos with mycobacterioses caused by cultivable bacteria became available. The data presented in this report demonstrate that cultivable mycobacteria obtained from the tissues of wild-caught armadillos did not contain the enzyme. Two species of nocardia tested converted dopa to pigment, but this reaction was found to be nonenzymatic, being unaffected by heating. On the other hand, *o*-diphenoloxidase of the leprosy bacilli was sensitive to higher temperatures. Visual evidence on the occurrence of the enzyme in *M. leprae* is also presented.—Authors' Summary

Epidemiology and Prevention

Castro Díez, M. C., García Basterrechea, J. M., Jiménez Guillén, J., López Soriano, F. and Orihula Calatayud, M. C. La lepra en la region murciana. Aspectos ambulatorios y hospitalarios. (Leprosy in Murcia Province. Ambulatory and hospital aspects. Rev. Fontilles **22** (1980) 715–725. (in Spanish)

Results of clinical examination of 172 leprosy patients made in Murcia Province (Spain) are presented. Health-social parameters are evaluated in order to establish clearly the present situation of the disease in that province. A brief survey of certain aspects of hospitals caring for this type of patient is presented.—(*Adapted from* Authors' Summary)

Ganapati, R., Revankar, C. R., Pandya, S. S. and Acharekar, M. Y. Prevalence of leprosy among in-patients in general hospitals—A survey in Bombay. Lepr. Rev. **51** (1980) 325–328.

Screening of 11,505 adult inpatients admitted in various general hospitals (for complaints other than leprosy) revealed that 101 had leprosy with a prevalence of 8.8/1000. Ten of these were found to be smear positive (prevalence rate 0.9/1000). Such surveys provide a quick and convenient method of screening the urban population, especially adults who usually are not available during mass surveys.—Authors' Summary

Guha, P. K., Pandey, S. S., Singh, G. and Kaur, P. Age of onset of leprosy. Lepr. India **53** (1981) 83–87.

The age of onset of leprosy is merely subjective information based upon the memory, intelligent appreciation, and awareness of the patient and his relatives in the absence of a more reliable method. In the present study a modification of the conventional method, which we named the "complemented recall" method was adopted to

determine the age of onset of 400 leprosy patients in an attempt to collect better approximate data. The mean age of onset according to the disease type and percentages among different age groups in other Indian series reported earlier have been compared.—Authors' Summary

Jayam, S., Sekhar, K., Ramasekar, K. and Ganapati, R. Childhood leprosy—A study in an urban slum. Indian Pediatr. **15** (1978) 375–378.

In spite of the alarming endemicity of leprosy and reportedly high prevalence rates among children, the problem of leprosy is not sufficiently appreciated by pediatricians. A whole population survey of a somewhat isolated group of tenements in South Madras, housing 2039 subjects belonging to a low socio-economic group, was undertaken. The prevalence rate was found to be 35 per 1000 among 1362 subjects available for examination. Four adults were found to be suffering from lepromatous leprosy, and 13 out of the total of 48 cases detected were below 14 years of age. These observations, which are discussed in the light of published figures from Bombay and Madras, highlight the importance of leprosy in childhood.—Authors' Summary

Marshall, J. T., Amar, D. S. and Ramesh, H. C. Prevalence of leprosy among slum dwellers. Lepr. India **53** (1981) 70–82.

The distribution of leprosy among slum dwellers in two areas of Bangalore City was studied. Out of a random sample of 483, it was found that 150 were suffering from leprosy; 74 tuberculoid and 25 lepromatous cases were detected; the remainder showed as borderline and polyneuritic types. The important socio-economic features and the consequences of this chronic disease are discussed.—Authors' Summary

Nalli, G. A. and Pearson, D. A. A model for the coordination of international donor activities with national governmental health services. J. Health Polit. Policy Law **3** (1979) 235–250.

This study is a descriptive analysis of an attempt to coordinate donor agency and government activities in the national leprosy control program of the Philippine Islands. A twofold strategy is employed to realize this purpose: 1) the evolution of the present coordinated program as recorded in both published and unpublished documents is described, and 2) an opinion survey of Philippine personnel active in the present leprosy control program is reported.

The most significant finding in terms of relating the Philippine experience to other areas of donor-recipient exchange is the emergence of a model of coordinated effort where a donor agency's assistance to a foreign national government is transmitted through a third indigenous and intermediary organization. By advancing the interests of both donor and recipient organizations, this approach has the potential of promoting a successful coordination of activities which might not otherwise be attained.—Authors' Summary

Surveillance of communicable diseases in the Caribbean, 1979. Hansen's disease (leprosy). Wkly. Epidemiol. Rec. **55** (1980) 285.

This is the first attempt at the Caribbean Epidemiology Centre (CAREC) to provide information on Hansen's disease (leprosy). This is due to the gross limitations of the information available until recently due to:

a) New areas of the disease not being required to be regularly notified to CAREC.
b) The diagnostic difficulties involved in this disease resulting in many countries giving gross overstatements of their prevalence of the disease.
c) Active case detection and subsequent follow up not having been performed in many Caribbean countries and hence the resultant gross understatement of the prevalence.

While these limitations still exist, surveys and investigations performed by consultant leprologists in 1979 have provided more reliable information on the prevalence of the disease in several countries. Also the most recent data were collected by national statistical officers and presented at the surveillance statistical officers' workshops in 1979. The combination of these two sources of information is presented.—(*Adapted from* the article)

Rehabilitation

Teixeira, A. C. Reconstructive surgery of facial deformities in leprosy. Ann. Plast. Surg. **4** (1980) 111–114.

Surgical techniques for correction of the facial deformities of leprosy are discussed. It is urged that surgery be undertaken only on patients who have had a negative smear for at least 2 years.—Author's Summary

Other Mycobacterial Diseases and Related Entities

Desowitz, R. S. and Miller, L. H. A perspective on malaria vaccines. Bull. WHO **58** (1980) 897–908.

The data obtained with adjuvant-antigen vaccines against asexual malaria parasites in different host-parasite systems are reviewed. From these data the problems associated with antimalarial vaccine development and testing are considered. The requirement for an adjuvant to induce immunity and the type of adjuvant required depends primarily on the host. Since the immune response of man to malaria vaccines is unknown, it is impossible to predict which animal infection is most likely to be a faithful model of malaria in man although it is generally assumed that the monkey is the most appropriate analog. Therefore, careful studies of the immune response of monkeys to purified malarial antigens are needed to develop vaccines for testing in man.—Authors' Summary

Fenske, N. A. and Millns, J. L. Resistant cutaneous infection caused by *Mycobacterium chelonei*. Arch. Dermatol. **117** (1981) 151–153.

Induration of the lower parts of the legs with abscess and ulcer formation occurred in a 60 year old woman. *Mycobacterium chelonei,* a ubiquitous, saprophytic pathogen that uncommonly causes human disease, was cultured from biopsy material. Although spontaneous healing usually occurs in a few months with such infections, our patient's disease persisted for more than 2 years until control was achieved with minocycline hydrochloride.—Authors' Summary

Kardjito, T. and Grange, J. M. Immunological and clinical features of smear-positive pulmonary tuberculosis in East Java. Tubercle **61** (1980) 231–238.

The immunological and clinical features of 90 Javanese patients with smear-positive pulmonary tuberculosis were investigated. Many of the patients had advanced disease at the time of diagnosis and hemoptysis was common, especially in patients with cavitating lesions. Most patients had a significant elevation of one or more nonspecific indicators of inflammation (erythrocyte sedimentation rate, third complement component, factor B and C-reactive protein). Rheumatoid factor was detected in 21% of the patients and was significantly associated with high levels of antibodies to *M. tuberculosis* in the IgM class.

Five distinct responses were elicited by tuberculin testing; the most marked occurred at 24 hr. The degree of reaction at 6–8 hr correlated significantly with the levels of specific antibodies in the IgG and IgA classes, and the 48 hr response correlated, although less markedly, with specific antibodies in the IgG class. Neither the degree of skin test reactivity nor the level of specific antimycobacterial antibodies correlated with the extent of the disease as assessed radiologically. Nine percent of the patients were skin-test negative at 48 hr but did not differ clinically as a group from tuberculin positive patients.

It was not possible to place the cases in a spectrum of immunological responses similar to that occurring in leprosy, and it is postulated that this is due to differences in the relevance to protection of the various immunological mechanisms in the two diseases. The need to establish more rigorous criteria for assessing the immune responses in tuberculosis and for studying the interactions between the protective and nonprotective reactions is stressed.—Authors' Summary

Thompson, E. J., Little, P. B. and Cordes, D. O. Observations of cat leprosy. N. Z. Vet. J. **27** (1979) 233–235.

Over a period of 4 years, 179 cases of cat leprosy were diagnosed in New Zealand Animal Health Laboratories, and 156 of these were in the North Island. There was an increased incidence during the winter months. Sixty-eight percent of affected cats were less than 3 years old. Variations in the number of bacilli and the nature of the granulomatous skin reaction probably reflect the host's degree of resistance to the cat leprosy organisms.—Authors' Summary

Vandiviere, H. M., Melvin, I. G., Narain, R., Harris, W. D. M. and Chaparas, S. D. Profiles of skin test reactivity to antigens of various mycobacterial species in a human population and in experimental infections. Tubercle **61** (1980) 245–267.

Sensitivity profiles to six mycobacterial skin test antigens prepared from *Mycobacterium tuberculosis, M. kansasii, M. scrofulaceum, M. intracellulare, M. avium,* and *M. fortuitum* were obtained in six groups of guinea pigs, each infected with one of the six mycobacterial species. Each group of animals showed the greatest sensitivity towards the homologous antigen. A second infection with a different species was superimposed 2 months after the skin tests; the sensitivity towards the second species usually became dominant.

Sensitivity profiles with the six antigens in a large random sample of the population of a district of Haiti resembled closely the sensitivity profiles for all the guinea pigs infected with two mycobacterial species. This suggested that the Haitian population consisted of a mixture of persons infected with one or more mycobacteria.

Haitians with the largest reaction to an antigen, which was at least 6 mm in diameter and at least 2 mm larger than the reaction to any other antigen, were assumed to be infected with the corresponding mycobacterial species. Sensitivity profiles of these persons resembled closely the sensitivity profiles of guinea pigs infected with the same species.

In the Haitian population, prevalence of infection with other mycobacterial species was much more common than infection with *M. tuberculosis*. In spite of this, after 15 years of age only the tuberculosis infection rates increased with age, suggesting that allergy produced by *M. tuberculosis* infection was stronger and subject to much less waning than allergy produced by other mycobacterial infections.—Authors' Summary

Wendt, S. L., George, K. L., Parker, B. C., Gruft, H. and Falkinham, J. O., III. Epidemiology of infection by nontuberculous mycobacteria. III. Isolation of potentially pathogenic mycobacteria from aerosols. Am. Rev. Respir. Dis. **122** (1980) 259–263.

Nontuberculous mycobacteria (21 isolates), biochemically similar to those that are recovered from humans, were recovered from rainwater and from natural river waters and their aerosols in the area of Richmond, Virginia, U.S.A. Field experiments have confirmed the existence of a natural mechanism for the transfer of significant numbers of mycobacteria from water to air. These findings support the hypothesis that aerosolization of potentially pathogenic mycobacteria from waters of the southeastern United States may be a major pathway for human infection.—Authors' Summary