

CURRENT LITERATURE

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General and Historical

Kato, Laszlo and Marchand, Jocelyne. Leprosy: "Loathsome Disease in Tracadie, New Brunswick"—a glimpse into the past century. *Can. Med. Assoc. J.* **114** (1976) 440-442.

This interesting account of leprosy begins with the first instance recorded by Father Lafrance in 1944. The oldest settlers of the time, however, stated that the first case occurred about 1817 in a family which had harbored two stranded Norwegian sailors during the winter of that year. The remainder of the account should be read in the original.—O. K. Skinsnes

Loginov, V. K. and Pogorelov, V. N. Achievements in leprology in recent years. *Vest. Dermatol. Venerol.* **9** (1975) 24-30. (In Russian)

This brief review article summarizes recent developments in leprosy, purportedly over the past four to five years, but actually it represents world accomplishments of the past decade and a half. The general areas mentioned include therapy, electron microscopy, cell-mediated immunity, etc. In the areas discussed, the average knowledgeable

leprologist will be well versed. The article is clearly designed as a brief statement for those not familiar with this area of work.—Olaf K. Skinsnes (*From a translation kindly provided by N. Torsuev*)

Rotberg, A. O primeiro passo da prevenção da Hanseníase é a eliminação do milenar problema mítico-social da "lepra"; "auto-apresentação em massa," não "busca de casos." [The first step to Hanseniasis prevention is the solution of the milienary mythic-social problem of "leprosy," "mass self-presentation," no more "case-finding."] *An. Bras. Dermatol.* **50** (1975) 91-93. (In Portuguese)

The meager figures of registered cases, which are probably less than one-fifth of the real number, is the result of our present technic of "case-finding," a remnant of an era of persecution and compulsory segregation. Prevention will commence only when mass uninhibited self-presentation of patients (and contacts) takes place and when their disease becomes "like any other," in fact, not in wishful thinking and platonic declarations.—Author's English Summary

Clinical Sciences

Joshi, P. B. Pilocarpine test in assessment of therapeutic efficacy in maculoanesthetic leprosy. *Lepr. India* **48** (1976) 55-60.

The pilocarpine test has been used for a long time in studying the functional status of sweat glands. This article deals with its use in the assessment of maculoanesthetic patches of leprosy before and after therapy. The test was done in 132 maculoanesthetic leprosy patients; 40% showed improvement of approximately 21-40% at the end of one

year. Twenty-one patients did not show any improvement. Perhaps they had suffered irreversible damage of local cutaneous nerves before they were given therapy. It is desirable to follow the patients further by similar testing at an interval of six months. This being an objective method of testing it eliminates the possible pitfalls in subjective testing of sensations over the affected areas. Therefore, it is recommended that this test should be routinely employed in field work

as its technic is simple.—(*Adapted from author's summary and conclusions*)

Legrand, A. Essai de traitement par auto-hémothérapie de la réaction lépreuse. A propos de 27 cas suivis à l'Institut Marchoux Bamako (Mali). [An attempt to treat leprosy reaction (ENL) by autohemotherapy.] *Med. Trop. (Mars)* **34** (1974) 495-507. (In French)

An uncontrolled trial of whole blood as the sole treatment of *erythema nodosum leprosum* in 27 patients with lepromatous leprosy is reported. In 15 patients the reaction, as judged by the clinical state, was considered to be severe; and in the others moderately severe. The treatment was thought to be effective in all cases of moderately severe reaction, and in 10 out of 15 cases of severe reaction.

The initial dose of whole blood given was 2 ml; daily doses with a 2 ml increment were given until a maximum dose of 10 ml was attained. Thereafter, three fortnightly booster injections of 10 ml were given followed by monthly injections of a similar volume. In the case of relapse, in patients whose initial reaction was successfully controlled by autohemotherapy, a further series of daily injections of 10 ml of whole blood, given for two or three days, sufficed to control the reaction.—S. G. Browne (*From Trop. Dis. Bull.*)

Palande, Dinkar D. Correction of paralytic claw finger in leprosy by capsulorrhaphy and pulley advancement. *J. Bone Joint Surg.* **58-A** (1976) 59-66.

In cases of active leprosy with positive smears, as also in certain cases of lepromatous and borderline leprosy due to excessive tissue response to the trauma of surgery, tendon transfer procedures often do not give excellent results. There are also individual cases of ulnar nerve paralysis, where because of lack of understanding or cooperation on the part of the patient, postoperative integration of a dynamic tendon transfer is inadequate thereby adversely affecting the result of surgery. For such cases a new operation has been tried and found satisfactory.

This procedure is correction of the deformity by metacarpophalangeal capsulorrhaphy and correction of disability by advancement of the fibrous flexor pulley. The overall results for 68 fingers were: good 42, fair 17, and poor 9. The rationale of the procedure, the technic and objective assessments of deformity and disability corrections have been described and discussed.—Author's Abstract

Pedley, J. C. and Geater, John G. Does droplet infection play a role in the transmission of leprosy? *Lepr. Rev.* **47** (1976) 97-102.

Experiments are described aimed at repeating in the context of modern knowledge the long neglected work of Schaffer on the release of *Mycobacterium leprae* from the upper respiratory passages during sneezing, coughing and normal speech. In two Bhutaneese patients large numbers of *M. leprae*, including some of normal morphology, were projected during sneezing up to a distance of 30 cm from the face and small numbers to a distance of 50 cm. None could be recovered during 20 minutes of normal speech. Only patients with untreated or relapsing lepromatous leprosy are implicated, as distinct from borderline cases, the criterion being the presence of a highly bacilliferous nasal discharge.—Authors' Summary

Ranney, Donald A. The superficialis minus deformity and its operative treatment. *Hand* **8** (1976) 209-214.

On removal of the superficial finger flexor the normal sequence of flexion is greatly disturbed if the proximal interphalangeal joint is hypermobile, and a zig-zag deformity results. The pathomechanics of this problem as described by Landsmeer (1958) is reviewed.

A modification of Littler's lateral band rerouting operation for correction of the intrinsic plus finger deformity has been developed to correct the superficialis minus deformity. This procedure has been successful in correcting the proximal interphalangeal joint hyperextension in five cases and in preventing its development in three others. Terminal interphalangeal joint flexion deformity has not been eliminated.—Author's Summary

Chemotherapy

Ekambaram, V. and Venkatachari, S. A trial of long-acting sulfonamide R.O. 4-4393 (Fanasil) in treatment of cases of lepromatous leprosy with repeated ENL. *Lepr. India* **48** (1976) 24-30.

A trial of long-acting sulfonamide R.O. 4-4393 (Fanasil) in the treatment of lepromatous leprosy patients with repeated ENL is reported in this paper. There were nine patients treated with Fanasil in this trial for a period of two years. The results of the trial have shown that the treatment with Fanasil helps to prevent the occurrence of ENL under treatment with DDS. In addition, even after the completion of treatment with Fanasil, these patients seem to be stabilized and are able to tolerate DDS. But the clinical and bacteriologic progress under Fanasil therapy is not satisfactory.—Authors' Summary

U.S. Leprosy Panel, U.S.-Japan Cooperative Medical Science Program and the Leonard Wood Memorial. Spaced clofazimine therapy of lepromatous leprosy. *Am. J. Trop. Med. Hyg.* **25** (1976) 437-444.

Patients with previously untreated borderline-lepromatous or fully lepromatous leprosy were treated with one of five clofazimine (B663) regimens: 1) 200 mg daily six days per week; 2) 100 mg three times weekly; 3) 300 mg weekly; 4) 600 mg every other

week; and 5) 600 mg on two consecutive days every four weeks. After 24 weeks of treatment, the patients were randomly allocated to treatment either with 200 mg B663 daily six days per week (regimen 6) or with dapsone, beginning with a small dosage and increasing over a period of eight weeks to 100 mg daily six days per week (regimen 7). Death of *M. leprae* was monitored by mouse inoculation with organisms recovered from skin biopsy specimens obtained at intervals during the first 24 weeks. Killing of *M. leprae* proceeded most rapidly in regimen 1 and 2 patients, least rapidly in the patients of regimens 4 and 5, and at an intermediate rate in regimen 3 patients. *Erythema nodosum leprosum* (ENL) was no more frequent nor more severe during treatment with any one of the first-24-weeks regimens. ENL was more frequent in regimen 7 than in regimen 6 patients. Pigmentation of the skin, assessed only during the first 24 weeks occurred in patients of all regimens but was most marked in regimen 1 patients. No evidence of B663 toxicity was noted. Although all of the first-24-weeks regimens were effective in terms of the rate of killing of *M. leprae*, greater effectiveness was associated with more frequent administration of the drug. The B663 that accumulated in the tissues did not appear to be available to exert an antimicrobial effect.—Authors' Abstract

Immuno-Pathology

Faber, W. R., Leiker, D. L. and Cormane, R. H. Immunoglobulin-bearing cells in leprosy. *Acta Dermatol. Venereol.* **56** (1976) 319-326.

Peripheral blood lymphocytes of 28 untreated and 17 treated patients with different types of leprosy were investigated for the occurrence of immunoglobulin (Ig) bearing cells by means of a smear method. Seven healthy Africans served as controls. In a later stage a complimentary study was performed on six tuberculoid and six lepromatous leprosy patients by means of a suspension method. The immunofluorescence technic was used for the detection of Ig-bearing cells. In tuberculoid leprosy an in-

crease of Ig-bearing cells seems to occur during treatment, predominantly expressed by an increase in IgD-bearing cells. In lepromatous leprosy no increased percentages of Ig-bearing cells were observed.—(From *Trop. Dis. Bull.*)

Hastings, R. C., Morales, M. J., Shannon, E. J. and Jacobson, R. R. Preliminary results on the safety and efficacy of transfer factor in leprosy. In: *Transfer Factor. Basic Properties and Clinical Application*, Ascher, M. S., Gottlieb, A. A. and Kirkpatrick, C. H., eds., New York, San Francisco, London: Academic Press, 1976, pp 465-476.

The authors present a detailed evaluation of results of the treatment of four LL and one BB/BL leprosy patient with transfer factor. No toxic effects were noted after 22 to 35 days of treatment. The LL patients developed reactive lesions with focal lymphocytic infiltrates and dramatic reductions in the numbers of acid-fast bacilli. These continued to appear, in one patient for up to 28 months, after treatment was discontinued. The BB/BL patient showed no reactions. All but one patient received concomitant chemotherapy for leprosy. All patients showed clinical improvement. The authors conclude that the transfer factor therapy appears to have an acceptable risk/benefit ratio and that controlled trials are indicated.—Olaf K. Skinsnes

LANCET 1, January 3 (1976) 26. Sarcoidosis and leprosy. (Editorial)

Much shoe leather has been expended on the epidemiology of sarcoidosis in the United States, notably by such pioneers as Max Michael and Paul Beeson, Martin Cummings, Philip Sartwell, and in the admirable surveys of the Veterans' Administration. Evidently sarcoidosis is ten times commoner in American Blacks than in American Whites—an observation which immediately raises the question of its frequency in the Blacks of Africa and the Caribbean. On the basis of published reports and of necropsy and clinical records in the five teaching hospitals of South Africa, Van Lingen concluded that sarcoidosis was equally common in Africans and Europeans, though sarcoidosis did seem to attack the Africans earlier. These findings were in sharp contrast to the American scene, and at the time it seemed that in Africans sarcoidosis was probably going unrecognized because of overshadowing tuberculosis; whereas in America mass miniature radiography, by uncovering symptomless sarcoidosis, was revealing a truer picture. Now fresh information from South Africa indicates that sarcoidosis is ten times more frequent in Blacks than in Whites—just as in the USA. Morrison has reported a series of 18 Bantu patients with sarcoidosis. All had gross skin lesions including lupus pernio, papules, nodules, and plaques (some psoriasisiform); a few had lesions in sites of old injury. Two-thirds had intrathoracic involvement, half had bone cysts, and a third had eye lesions. There were twice as many wom-

en as men, most of them in their fifth decade.

The epidemiologic interest in Morrison's survey is that some of the patients had been in a leprosy institution. The diagnosis of sarcoidosis was entertained when patients had failed to improve on antileprosy, anti-tuberculosis, and antisiphilitic treatment: this is reminiscent of the old days when patients with sarcoidosis were mistakenly incarcerated in tuberculosis sanatoriums, the diagnosis being thought of only when the patient did not respond to antituberculous therapy or when his tuberculin test was negative.

Morrison believes that, as tuberculosis declines in the South African Bantu, sarcoidosis follows in its wake. This happened in Uruguay, and the same trends have been observed in East and West Europe. Clearly, latent sarcoidosis if sought in the right places will be found. One such place is the leprosy institution, where patients with harmless sarcoidosis may be undergoing the wrong diagnostic tests and receiving the wrong treatments. Another is the geographical area where tuberculosis has lately been eradicated: follow-up teams should go in and look for sarcoidosis. It would be interesting to know the incidence in the Caribbean. Sarcoidosis is extremely common in the West Indian population of Britain and in Martiniques living in France; what happens in their home countries? It is possible, too, that sarcoidosis bobs to the surface in the wake not only of tuberculosis but also of leprosy.—Editorial

Ridley, M., Jopling, W. H. and Ridley, D. S. Acid-fast bacilli in the fingers of long-treated lepromatous patients. *Lepr. Rev.* 47 (1976) 93-96.

In over 30 long-treated patients with lepromatous leprosy the fingers were found to be the skin site with the highest bacterial load and with the highest number of solid-staining bacilli. It was also the site at which bacilli, solid or otherwise, were most frequently detected. In these patients the nose, as expected, was not a very productive site for bacilli. No clinical lesions were present on the fingers examined. In one amputation specimen of a finger the only site at which bacilli were seen was in a fibrosed structure thought to be a Pacinian corpuscle.—Authors' Summary

Saul, A., Novales, J. and Wong, A. Lepra histioides (Wade). Comentarios a propósito de un caso. [Histoid leprosy (Wade). Commentary on and presentation of a case.] *Rev. Leprol.* **10** (1976) 489-501. (In Spanish)

The case of a 42 year old man with lepromatous leprosy showing many cutaneous, rounded, reddish, shiny, well-defined nodules resembling fibromas, subcutaneous nodules and infiltrated plaques is reported. The histologic features correspond to those observed in the so-called histoid lepromas of Wade: spindle-shaped histiocytes arranged in whorls, but in this case few bacilli were inside the histoid infiltrate and they did not have the special arrangement (histoid habitus) as has been seen in Wade's cases. This patient had received irregular DDS treatment and he now showed a relapse and possible DDS resistance, in addition to many episodes of lepra reaction. Three months of treatment with rifampicin produced a slight flattening of most lesions.

Some comments about the name (histoid), clinical features and interpretation of this variety of lepromatous leprosy are made. The authors prefer the name "histoid nodules" to "histoid leprosy."—(Adapted from authors' English summary)

Sher, R., Holm, G., Kok, S. H., Koornhof, H. J. and Glover, A. T and CR⁺ lymphocyte profile in leprosy and the effect of treatment. *Infect. Immun.* **13** (1976) 31-35.

Thymus-derived lymphocytes (T lymphocytes) and complement receptor-bearing lymphocytes (CR⁺ lymphocytes) were estimated by using erythrocyte rosettes and erythrocyte-antibody-complement rosettes as markers in untreated lepromatous and untreated tuberculoid patients and in healthy controls. Treated lepromatous cases were also investigated. Ten cases of untreated lepromatous patients were reassessed six months or more after therapy commenced. A significant decrease in both percentages and absolute numbers of CR⁺ cells in the untreated lepromatous leprosy subjects was observed. This decrease showed a return to normal levels after treatment. The percentage of T cells in the untreated lepromatous cases was normal; however, the absolute numbers of T cells and the total lymphocyte count showed a

significant decrease. After therapy, the T cell population was unchanged but the total number of lymphocytes increased significantly with treatment. The absolute number of T and CR⁺ cells was significantly less in the untreated than in the treated lepromatous patients.—(From *Trop. Dis. Bull.*)

Stanford, J. L., Paul, R. C., Penketh, A., Thurlow, S., Carswell, J. W., Barker, D. J. P. and Barot, S. A preliminary study of the effect of contact with environmental mycobacteria on the pattern of sensitivity to a range of new Tuberculin amongst Ugandan adults. *J. Hyg. (Camb.)* **76** (1976) 205-214.

A range of new Tuberculin prepared from extracts of living organisms belonging to 12 mycobacterial species has been used to assess the effect of BCG immunization and contact with environmental mycobacteria on Ugandan adults. A total of 2,456 tests was carried out on 562 people, 86% of whom came from three areas selected for special study. These areas were chosen on the basis of occurrence of leprosy and *M. ulcerans* infection and on data concerning the distribution of environmental mycobacteria. It was found that the effect of BCG was small compared with that previously observed amongst Kenyan schoolchildren, but that the effect of geographical origin was considerable. There was some correlation between the percentages of reactivity to the reagents and the frequency of mycobacteria in the environment.—Authors' Summary

Wilhelm, Gunther and Sellier, Jean Louis. Presence of antibodies reacting with a ribonucleoprotein from *Mycobacterium tuberculosis* in sera from leprosy patients. *Zentralbl. Bakteriolog. Hyg.* **234A** (1976) 68-71.

Antibodies reacting with a ribonucleoprotein isolated from *M. tuberculosis* could be found in sera of leprosy patients (lepromatous type of disease). The antibody titers are very high. There is a highly significant difference between the titers of leprosy patients and tuberculosis patients. This renders our finding important for diagnostic purpose.—Authors' Abstract

Microbiology

Kronvall, G., Stanford, J. L. and Walsh, G. P. Studies of mycobacterial antigens, with special reference to *Mycobacterium leprae*. *Infect. Immun.* **13** (1976) 1132-1138.

Eight individual antigens were detected in soluble antigen preparations from *M. leprae* bacilli by using pools of serum samples from lepromatous leprosy patients as antibody reagents in crossed immunoelectrophoresis. Two of these antigens were analyzed further. Antigen no. 1 gave an elution pattern on Sephadex G-200 corresponding to a molecular weight of 285,000. This antigen was also present in three slow-growing and eight fast-growing mycobacterial species. There was a reaction of complete identity in immunological tests using lepromatous serum pools as well as with rabbit antisera raised against *M. leprae* and *M. smegmatis*. Antigen no. 21 of *M. leprae* showed antigenic heterogeneity when compared with other species. Three types of antigenic determinants were detected; one, called 21A, was shared by all mycobacteria; another, called 21B, was limited to antigen no. 21 of *M. leprae*; a third, called 21C was present in all mycobacteria except the leprosy bacillus. This submolecular heterogeneity may indicate a separate taxonomic position of *M. leprae* among the mycobacteria.—Authors' Summary

Levy, L., Hom, C. and Murray, L. P. Enumeration of *Mycobacterium leprae* stained with and without prior periodate oxidation. *Lepr. Rev.* **47** (1976) 185-191.

Slides prepared with suspensions of *Mycobacterium leprae* recovered from skin biopsy specimens obtained from treated lepromatous leprosy patients and oxidized with periodate contained on the average 36% more acid-fast bacteria (AFB) than did duplicate slides stained by the standard acid-fast stain. By contrast, slides prepared with suspensions of *M. leprae* recovered during logarithmic multiplication in mouse foot pads and treated with periodate contained on the average 16 or 33% fewer AFB than did duplicate slides stained by the standard technic. These results are inconsistent with a nonacid-fast stage in the growth of *M. leprae*.—Authors' Abstract

Prabhakaran, K., Harris, E. B. and Kirchheimer, W. K. Survival of *Mycobacterium leprae* in tissues kept frozen at -80°C . *Microbios Letters* **1** (1976) 193-195.

Intact organs obtained from armadillos experimentally infected with *Mycobacterium leprae* were kept frozen at -80°C . After approximately ten months of storage, suspensions of *M. leprae* were prepared from these tissues. When inoculated into foot pads of mice, the organisms showed multiplication characteristic of the leprosy bacilli. The results demonstrate that a proportion of *M. leprae* occurring in infected organs are able to survive prolonged exposure to ultra-cold temperatures.—Authors' Abstract

Saito, H., Yamaoka, K. and Kiyotani, K. *In vitro* properties of *Mycobacterium leprae-murium* strain Keishicho. *Int. J. Syst. Bacteriol.* **26** (1976) 111-115.

The morphologic, biochemical, and drug susceptibility characteristics of the Keishicho strain, supposedly a strain of *M. leprae-murium*, are compared with these same characteristics of representative strains of other slow-growing mycobacterial species. The Keishicho strain is quite distinct from all other mycobacteria. Special media and very large inocula are needed for *in vitro* growth; growth is exceedingly slow. The inter-taxon similarity coefficients were low; the highest, only 63%, was to *Mycobacterium tuberculosis*.—Authors' Summary

Shukla, R. R., Massalski, W. K. and Lewenstein, W. Culture of *M. leprae* with help of desiccated thyroid. *Lancet* **II** (1976) 363-364. (Letter to Editor)

Sir: Following Biswas's suggestion (*Lancet* **II** [1975] 716), we have tried to cultivate *Mycobacterium leprae* on medium supplemented with extract of desiccated thyroid gland. The material for culture was taken from a 16 year old Zairian boy admitted to the University Clinic at Lubumbashi on 11 March 1976. A clinical diagnosis of lepromatous leprosy was confirmed by direct microscopic examination of nasal smears (Ziehl-Neelsen) and by biopsy of a nonulcerated nodule from the patient's forearm (Prof. R. Parmentier, Brussels). Direct smears were

also done on biopsy material from an ulcerated nodule and stained with Gram and Ziehl methods. Acid-fast organisms, morphologically indistinguishable from *M. leprae*, blue-stained spores, and mycelia of *Blastomyces* and staphylococci were seen. The acid-fast bacilli were grouped in clumps (globi) or separated, some of them adherent to the mycelium and terminal spores. Biopsy material was inoculated on two sorts of Sabouraud medium—one with penicillin and streptomycin only, the other with these antibiotics and desiccated thyroid. After five days colonies had grown on the two Sabouraud media and the staining with Ziehl-Neelsen showed sparse and separated acid-fast bacilli and *Blastomyces*. In the subsequent smears of these two media done four weeks after inoculation we found numerous Hansen bacilli grouped in globi around the spores (ascospores) of *Blastomyces* and even inside the mycelia. The culture on the medium which contained extract of the desiccated thyroid was approximately three times more abundant. Identical results were obtained in two other cases of leprosy.

Aqueous extract of thyroid hormones was prepared from "Thyranon" (Organon), each tablet containing 50 or 100 mg of desiccated thyroid with 0.3% of organically bound iodine. Five hundred mg of thyroid gland (5 or 10 tablets) was suspended in 20 ml of dis-

tilled water and shaken for one hour and kept at 4°C temperature. After 24 hours, it was filtered by Seitz EK filter. Then we mixed 1 ml of the filtrate with Sabouraud medium in a Petri dish.—(Abbreviated from authors' letter)

Tarnok, I. and Rohrscheidt, E. Biochemical background of some enzymatic tests used for the differentiation of mycobacteria. *Tubercle* 57 (1976) 145-150.

The breakdown of benzamide, acetamide, malonamide and allantoin in *M. smegmatis* was investigated. It has been stated that the uptake of liberated NH_3 into the cells, favored by the presence of an organic acid, occasionally results in a negative NH_3 determination. This difficulty can be overcome by an increase of the substrate concentration from 0.8 up to 4 mM.

All antoinase activity in mycobacteria can be demonstrated only by an NH_3 determination, when all the enzymes necessary for the complete breakdown of allantoin are present. Bacteria containing allantoinase but not urease will be negative in this test.

Using high amide concentrations (4 mM) some doubtful results concerning the degradation of acetamide, benzamide, nicotinamide and pyrazinamide can be eliminated as could be demonstrated for different strains of mycobacteria.—Authors' Summary

Experimental Infections

Kirchheimer, Waldemar K. Recent advances in experimental leprosy. *South. Med. J.* 69 (1976) 993-996.

Within the last 15 years we have learned to identify *M. leprae*, determine its viability, screen the efficacy of antileprosy drugs, and monitor the bacilli for drug sensitivity. We have evidence that subclinical infections occur frequently among contacts of patients with leprosy and that the different manifestations of leprosy reflect differences in resistance to *M. leprae*. We are developing hypotheses about the mechanism of these differences. We have experimentally transmitted lepromatous leprosy to normal armadillos, and from these we can obtain amounts of leprosy bacilli which fully substitute for harvests from *in vitro* cultures. Furthermore,

if susceptibility of armadillos can be determined without infecting them and if we can breed them under controlled conditions, we would have an animal model for investigating fundamental and applied areas of leprosy which otherwise are intractable. How much our knowledge has advanced is illustrated by a project of the World Health Organization, which calls for the preparation of pure, specific antigens from the now available abundance of leprosy bacilli, which might become valuable as diagnostic and epidemiologic tools and as immunoprophylactic and even immunotherapeutic weapons.—Author's Abstract

Levy, Louis. Studies of the mouse foot pad technic for cultivation of *Mycobacterium*

leprae. 3. Doubling time during logarithmic multiplication. *Lepr. Rev.* **47** (1976) 103-106.

The doubling time of a strain of *Mycobacterium leprae* during logarithmic multiplication in the mouse foot pad was estimated by inoculating mice with serial dilutions of a bacterial suspension and measuring the time from inoculation to multiplication to 10^6 organisms per foot pad. The doubling time was found to be 11.1 ± 1.92 (mean \pm 95% confidence limits) days, about 15% shorter than an earlier estimate based on measurements of the slopes of many single growth curves of *M. leprae*.—Author's Summary

Levy, Louis and Murray, Lydia P. Studies of the mouse foot pad technic for cultivation of *Mycobacterium leprae*. 2. The relationship between incubation period and generation time. *Lepr. Rev.* **47** (1976) 13-23.

The results were reviewed of mouse inoculation with *Mycobacterium leprae* recovered from 417 skin biopsy specimens. The incubation period (IP), the number of months between inoculation and the first appearance of a significant number of AFB in a monthly section, was found to be closely related to the generation time (G), the average number of days per doubling. Specimens from treated patients gave larger values of IP and G, consistent with killing of *M. leprae* during effective treatment. Forty-four specimens are described that appeared to provide inocula only marginally sufficient to infect a mouse. The results of this review confirm the validity of the use of the IP and G as criteria of infectivity of inocula of *M. leprae* for the mouse foot pad, and justify the practice of employing both measurements in the conduct of the technic.—Authors' Abstract

Mehra, N. K., Vaidya, M. C. and Dasgupta, A. Syngeneic neonatal thymic grafts in leprosy infected mice. *J. Anat. Soc. India* **25** (1976) 74-80.

Since there is a significant depression of cell-mediated immunity or lymphocyte dysfunction in leprosy, experiments have been designed to upgrade immunity by the use of neonatal thymus grafts with or without the combination of B lymphocytes obtained from the normal health donors. Leprosy was induced in the inbred mice of CBA/J strain

by the standard method of inoculating *Mycobacterium leprae* obtained from the skin biopsies of human patients with active lepromatous leprosy. Implantation of the syngeneic thymus obtained from the new born healthy donors into the recipients with full grown leprosy infection did not reveal any change in the lesions with respect to lymphocyte infiltration and fall in the Bacteriologic and Morphologic Indices of the lepra bacilli. On the other hand, recipients with a combination of the thymic grafts and bone marrow-derived or nonthymus processed lymphocytes showed a marked improvement in the clinical status of the disease, and the histology of the tissues from the specific sites of infection simulated the "reversal type of reaction" with upgraded immunity as seen in man. The results, while suggesting the bicellular cooperation of lymphocytes, elucidate the institution of immunotherapy in leprosy by the use of lymphoid cellular transfer.—(Adapted from authors' abstract)

Morrison, Norman E. and Collins, Frank M. Restoration of T-cell responsiveness by thymosin: development of antituberculous resistance in BCG-infected animals. *Infect. Immun.* **13** (1976) 554-563.

T-cell depleted (adult thymectomized, lethally irradiated, bone marrow-reconstituted [THXB]), sham-thymectomized (SB) and normal control mice were injected daily with three milligrams of calf thymosin for 16 days. On day eight of the treatment, the mice, together with untreated controls, were infected intravenously with 4×10^6 viable *Mycobacterium bovis* (BCG Montreal). Growth of the BCG in the lungs and spleens was compared quantitatively for up to 100 days. Thymosin treatment reversed the progressive weight loss seen in BCG-infected THXB mice and prevented their death due to the ongoing mycobacteriosis that developed in the T-cell depleted animal. There was a late-developing antimycobacterial response in the thymosin treated THXB mice, which resulted in a progressive decline in viability for the lung and spleen populations over the 40- to 80-day period, when the corresponding counts for the untreated THXB mice remained relatively constant. The histopathology of the lung and the increased antibacterial activity seen in the thymosin treated THXB mice correlated

with decreased [^3H]deoxyribonucleic acid levels seen in the lungs and spleen compared with that present in the T-cell depleted controls.—Authors' Summary

Seab, John C. and Burns, Thomas A. Myoglobin: quantification in the nine-banded armadillo (*Dasypus novemcinctus*). Comp. Biochem. Physiol. **54B** (1976) 351-356.

1. Myoglobin from the nine-banded armadillo (*Dasypus novemcinctus*) was purified on Sephadex G-75. The absorption spectrum and extinction coefficients for HbCO and MbCO were determined between 520 and 590 nm and used to quantify myoglobin within the heart, diaphragm, thigh, triceps and gastrocnemius in six adults and one juvenile.

2. Mean values, in mg myoglobin/gm wet muscle wt in the adults were: heart, 6.68 mg/gm; diaphragm 7.09 mg/gm and the pooled skeletal muscle, 8.04 mg/gm. There was no significant difference ($p > 0.05$) between muscle groups in the adults.

3. Quantities in the juvenile were lower, with the heart containing 3.41 mg/gm, diaphragm 0.91 mg/gm and skeletal muscle 1.87 mg/gm.

4. Disc electrophoresis revealed three distinct myoglobin protein bands.

5. The increased myoglobin content suggests an adaptation related to the armadillo's fossorial existence and tolerance to hypoxia during feeding and burrowing.—Authors' Abstract

Sevilla, Claude and Lagarrigue, Jean-G. Étude comparée des hémocyanines de *Ligia italica* et d'*Armadillo officinalis* (Crustacés, Isopodes, Oniscoïdes). [Comparative study of the hemocyanins in *Ligia italica* and *Armadillo officinalis* (Crustacea, Isopoda, Oniscoidea). (In French)]

At first sight, it's impossible to differentiate on total serum electrophoresis the hemocyanic fraction observed in *Ligia italica* from that observed in *Armadillo officinalis*. Nevertheless, by modifying the elution pH we have shown that a specific dissociation of the principal hemocyanic takes place yielding several subunits.

At pH 7, which is close to the pH of the Oniscoides hemolymph, dissociation is lim-

ited. This phenomenon may indicate the true behavior of the molecule in the hemolymph of the animal *in vivo*, or it could be the result of the temporary change of this pigment to pH 9.1 during the electrophoretic migration. On the other hand, there is an important dissociation when elution is made at pH 9.1.

Under these experimental conditions, we were able to show that *Ligia italica* and *Armadillo officinalis* hemocyanins are closely related protein macromolecules. They are, however, different from the structural point of view since their dissociation is different with respect to the number of subunits as well as to the proportions of each of those. According to our results, a correlation seems to exist between the morphologic modifications of the respiratory organs and the structural modifications of the hemocyanin during the Oniscoides evolution.—Authors' Résumé and Conclusions (Translated by M. F. Lechat)

Ueda, K., Yamazaki, S. and Someya, S. Experimental mycobacterial infection in congenitally athymic "nude" mice. J. Retrovirology. **19** (1976) 77-90.

Nude (nu/nu) and heterozygous (nu/+) littermate mice were infected with three strains of mycobacteria: *Mycobacterium bovis* strain Ravenel, *M. bovis* BCG and *M. avium* strain Flamingo. Growth curves of these mycobacteria in various organs and the production of lesions in the liver and other organs were examined. A higher bacterial count was observed in the organs of nu/nu mice compared to nu/+ mice 12 to 17 days following Ravenel infection and 28 days following BCG infection, suggesting that a restriction of bacterial growth had begun in nu/+ mice by this time. Following infection with *M. avium*, however, no difference in growth curves was seen between nu/nu and nu/+ mice within the experimental period (56 days). In nude mice granuloma formation was poor and the lesions were characterized by either necrotic-exudative changes after infection with *M. bovis* Ravenel or a proliferation of bacilli-loaded cells after BCG infection. Growth inhibition of both *M. bovis* strains in the liver seemed to be correlated with the development of granulomas in this organ. After infection with *M. avium* well developed granulomas

were seen in the liver of nu/+ mice, whereas very poor granuloma formation was seen in nu/nu mice. This suggested a lack of correlation between growth inhibition of organ-

isms and granuloma formation in avian type tubercle bacillus infections in mice.—Authors' Abstract

Epidemiology and Prevention

Ganapati, R., Naik, S. S., Acharekar, M. Y. and Pade, S. S. Leprosy endemicity in Bombay: an assessment through surveys of municipal schools. *Lepr. Rev.* **47** (1976) 127-131.

Leprosy surveys of randomly selected municipal schools in Greater Bombay during 1970-1971 revealed the existence of pockets where the endemicity was expected to be high (of the order of 10 per 1,000). It became possible to identify these pockets, essentially located in the northern suburbs of the city, by arbitrarily grouping some schools in which a prevalence rate of more than 5 per 1,000 was encountered.

This experience led to a second phase of intensive surveys of all the schools situated in ten such endemic pockets. Results of these surveys form the subject of this presentation. Out of 83,413 children on the rolls, 67,857 (81.4%) were available for examination, among which 733 leprosy cases could be identified. The overall prevalence rate of 10.8 per 1,000 has confirmed our impression gained through previous surveys as regards the high endemicity in these localities.

In our opinion intensive surveys of schools located in presumably endemic zones should be given high priority in urban control programs.—Authors' Summary

Ganapati, R., Naik, S. S. and Pandya, S. S. Leprosy among schoolchildren in greater Bombay: clinical features. *Lepr. Rev.* **47** (1976) 133-140.

Clinical observations on 1,265 cases identified as suffering from leprosy in the course of four studies based on surveys covering a total population of nearly 180,000 schoolchildren are presented.

Of the cases, 94.1% were of the nonlepromatous type. While 75.3% had early single lesions, 24.7% had either the potential to develop into progressive forms in view of the multiplicity of lesions or were already in an advanced stage of the disease. Polyneuritic

leprosy together with intermediate and lepromatous types representing 5.8% of all cases (24 cases were confirmed to be smear positive) belonged to the groups posing therapeutic as well as public health problems. In general the morbidity due to the disease was more marked in children attending municipal schools as compared to private schools.

Analysis of 953 cases with single lesions revealed greater frequency of distribution (58.4%) of patches in parts of the body which are generally covered. It is striking that 26.4% of the solitary lesions were found in the gluteal region and thighs emphasizing the need for thorough examination of these parts during surveys.—Authors' Summary

Hirshman, J. H. Communicable disease in the South Pacific islands, 1. *Med. J. Aust.* **2** (1976) 758-760.

An outline is given of the pattern of communicable disease in the South Pacific, as far as it is known. Surveillance and research are incomplete and the WHO is assisting in carrying these out. Reporting and laboratory diagnosis of communicable diseases are inadequate and sometimes inaccurate. This is being improved. Medical checks for intending migrants from the South Pacific are, in a number of cases, inadequately performed in the country of origin and this situation should be altered. The risks to surrounding developed countries from migrants, temporary workers and returning travelers are not tremendous but they cannot be neglected and vigilance has to be maintained. Tuberculosis importation does present risks, as does that of typhoid. Malaria importation carries risks for Northern Australia. Leprosy poses little real risk to Australia or New Zealand and neither does filariasis. Cholera would have to be watched closely should there ever be a South Pacific outbreak, but the developed countries around the South Pacific which are cholera-non-receptive can control occasional cases. Other than malaria,

tuberculosis, typhoid and possibly dengue, problems are thus mainly in the diagnosis and treatment of individuals.—Author's Summary

Hirshman, J. H. Communicable disease in the South Pacific islands, 2. *Med. J. Aust.* 2 (1976) 794-798.

Leprosy incidence appears to be declining in much of the South Pacific, but the disease is still of major importance in parts of Papua New Guinea and East Timor. The general South Pacific picture is improving, but case finding is by no means perfect and when one looks closely, cases are found. In a recent survey in Western Samoa, preliminary results indicate a surprisingly high prevalence of 3 per 1,000 of population. Cases are still found in almost all of the South Pacific, including Australia. This disease, with its long incubation period, should not be forgotten.

Leprosy really poses little threat to developed countries like Australia and New Zealand when the occasional case is discovered in an island migrant or temporary worker, but treatment should be prompt and effective, generally on a domiciliary basis. Only newly discovered patients with a positive result on smear test and those with lepra reaction should be admitted to the hospital. Treatment is generally with dapsone, acedapsone, rifampicin, and others, but leprosy treatment should be left to experienced hands whenever this is feasible. BCG vaccine is a leprosy-preventive adjunct, although divergent results have been obtained in different trials. DDS or DADDS has been used for partial prevention in household contacts.—(From text)

Louvet, M., Saint-Andre, P. and Bernard, L. *Epidémiologie de la lèpre en Afrique de l'Ouest.* [Epidemiology of leprosy in West Africa.] *Med. Trop. (Mars)* 36 (1976) 121-125. (In French)

According to official statistics in the French-speaking countries of West Africa, there has been little reduction recently in the total numbers of leprosy patients under treatment. Either the excellent and costly leprosy service (inaugurated in 1957) is not as successful as it was thought to be, or the figures are suspect. Basing their conclusions on detailed investigations in Mali, and opin-

ing that a similar state of affairs would be disclosed in the Ivory Coast, Dahomey, Upper Volta, Niger, Senegal and Togo, the authors suggest that the antileprosy campaign has indeed been much more successful than the official figures indicate. Many patients have had treatment for up to 18 years for tuberculoid leprosy; the medical auxiliaries show a reluctance to discharge such patients from treatment, or to place them "on observation without treatment"; they also have a lackadaisical attitude towards the compilation of reports and the furnishing of statistics; they are, in a sense, "too competent" in their assiduity in giving treatment and too conscientious in continuing treatment. Thus, the total figure of patients under treatment for leprosy in these countries, now officially 437,041 (representing a prevalence rate of 14 per 1,000) should be reduced considerably. As a consequence, the medical auxiliaries attached to the leprosy control service could be redeployed and absorbed in the general medical service for the control of endemic diseases, including such activities as treatment of tuberculosis and onchocerciasis and examination of schoolchildren in their daily round, as well as continuing their important case-finding of patients suffering from early leprosy.—S. G. Browne (*From Trop. Dis. Bull.*)

Louvet, M., Saint-Andre, P. and Giraudeau, P. *Place de la chimioprophylaxie dans la prévention de la lèpre.* [Role of chemoprophylaxis in the prevention of leprosy.] *Med. Trop. (Mars)* 36 (1976) 153-156. (In French)

In view of the disturbing observation that leprosy appears to be increasing in many countries as their population increases, the possibility of prevention of the spread of the disease should be reexamined. The authors review the role of temporary and voluntary segregation, the use of rifampicin as a mycobactericidal drug in selected situations, the efficacy of dapsone in mass treatment schemes in slowly reducing the size of the reservoir of infection, the need to improve standards of environmental and personal hygiene, the value of BCG vaccination in the control of tuberculosis, and the possibility that it might concurrently and nonspecifically enhance resistance to leprosy infection. In a group of 57 children studied in the Ba-

maki Leprosy Institution (Mali Republic) for a period of from one to ten years (average $2\frac{1}{2}$ years), prophylactic dapsone was considered to be a factor in their remaining entirely free from all signs of leprosy, despite the fact that all were exposed for a long time to a person suffering from lepromatous leprosy in the household—a parent or sibling. The dose of dapsone varied from 25 to 100 mg weekly. Mention is made of the other factors that undoubtedly played a role in this highly satisfactory accompaniment of sulfone prophylaxis, i.e., drug treatment of the index case, health education, improvement in domestic hygiene. In this group of 57 children, the tuberculin reaction was positive in 28, and the Mitsuda positive in 34; of the remaining 23 children, some were considered to be too young to show their immunologic polarity, but in the unknown number in this group who would be persistently Mitsuda-negative, prophylactic dapsone might prevent the development of clinical signs of multibacillary leprosy.

[This study illustrates the difficulty of isolating and evaluating the role of chemoprophylaxis in the prevention of leprosy in an exposed child population.]—S. G. Browne (*From Trop. Dis. Bull.*)

Saikawa, Kazuo. An epidemiologic study of leprosy in the Ryukyu Islands. II. The geographical status. *Lepro* 44 (1975) 150-162. (In Japanese)

The leprosy epidemiologic status in four areas of the Ryukyu Islands, mainland Okinawa, Okinawa Islands, Miyako Archipelago and Yaeyama Archipelago, is analyzed by means of the leprosy prevalence rate (PR), incidence rate (IR), lepromatous incidence rate (LIR), lepromatous ratio (L. Ratio), and percentage of onset age, which were collected from 1931-1974. The assessment of the data shows that different epidemiologic situations are observed in the four areas. The average PR and IR in the islands is 1.81% and 2.28%. The PR, IR, and L. Ratio of Irabu Village in the Miyako Archipelago (the highest leprosy endemic village) in 1974 were 10.10%, 2.0% and 0.44%. In contrast, these rates in Ginowan City in the central part of mainland Okinawa were 0.38%, 0.01% and 0%. Generally, at the present time, the decline in leprosy occurrence has been observed in three of the areas, not having been observed in the Miyako Archipelago. The epidemiologic situation in Nakazato Village on Okinawa Island has been much improved since 1966, i.e., its IR was 0.84% and LIR 0.44% in 1950, but its IR was 0.27% and LIR 0.05% in 1974. The highest leprosy endemic area in the islands is the Miyako Archipelago where, in 1975, the PR was 6.47%, IR 0.45%, LIR 0.18% and L. Ratio 40%. Leprosy in the Miyako Archipelago is one of the most important problems and its control program should be carried out at the level of the public health services.—(*Adapted from author's English summary*)

Rehabilitation

Fleshman, K., Hill, P. and Fritschi, E. Rehabilitation by amputation. *Lepr. Rev.* 47 (1976) 41-49.

A retrospective study of lower limb amputation in leprosy patients at ALERT is reported. Charts were reviewed and patients were interviewed. Surprisingly, there was very high patient acceptance of both the am-

putation and of even rather mediocre prosthesis. In addition almost all patients became independent and self-supporting by a culturally acceptable means. Prior to amputation most had been totally dependent. It is therefore concluded that amputation is acceptable rehabilitative surgery for those whose feet have become so mutilated as to prevent full weight bearing.—Authors' Abstract