

CURRENT LITERATURE

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

Clinical Course

Ridley, D. S. and Waters, M. F. R. Significance of variations within the lepromatous group. *Leprosy Rev.* **40** (1969) 143-152.

A lepromatous subgroup (indefinite leproma, LI) has been identified histologically and clinically. The bacteriologic response to treatment in this group is intermediate between that of LL and BL. LI patients differ from LL in being liable to undergo reversal reaction, though possibly at a later stage of treatment than BL patients; they differ from BL in being very prone to ENL. The LI subgroup has been found among patients of many races, though with varying incidence. It is especially common in Chinese and Malays, among whom it greatly outnumbers LL and BL patients. LI patients are suitable for therapeutic trials under certain conditions. Clinically, they present evidence of having evolved from a pre-existing borderline phase. — **AUTHORS' SUMMARY.**

de los Santos Jerez, E. and Herrera, G. Contribución al estudio de las lesiones cutaneas liquenoides en la lepra. [Contribution to the study of lichenoid cutaneous lesions in leprosy.] *Rev. Dominicana Dermat.* **3** (1969) 116-119.

Case report of borderline leprosy with lichenoid lesions containing leprosy bacilli. This type of leprosy progresses on an anergic background, and more rapidly than minor tuberculoid leprosy. Under DDS therapy the lesions regressed. Tissue studies showed a progressive increase in epithelioid and giant cells and a decrease in histiocytes up to the point of complete disappearance of the cells and their bacilli, showing finally the cellular elements of major tuberculoid leprosy.—(From authors' summary)

Girard, J. and Grupper, Ch. *Maladie de Hansen. Forme tuberculoïde majeure en phase de réactivation subaigue.* [Hansen's disease. Major tuberculoid form in a phase of subacute reactivation.] *Bull. Soc. franc. Dermat. et Syphilig.* **76** (1969) 158-159.

A case of major tuberculoid conjugal leprosy is reported, which occurred 25 years after the healing of disease in the husband of a leprotic patient also suffering from tuberculoid leprosy. A relapse was observed after stopping specific treatment too soon. The authors discuss the role of anticoagulants administered regularly for a cardiac affection (alluding to the antireactional effect of treatment, as noted by Merklen and Rion, by derivatives of vitamin K).—**P. HARTER**

Kundu, S. and Ghosh, S. An unusual form of lepromatous leprosy. *J. Indian Med. Assoc.* **52** (1969) 566-578.

Two cases of lazarine leprosy, a form not infrequent in Latin America, were detected in the Leprosy Research Department, School of Medicine, Calcutta. In each case the disease was fulminant, with unusually severe signs and symptoms, and both patients died. The authors note that the disease is in general progressive and the trend is toward fatality even though a patient may at first appear in good health.—**E. R. LONG**

Boon, J. G. and De Bye, J. H. *Morbus Hansen, een moeilijke diagnose?* [Hansen's disease, a difficult diagnosis?] *Nederl. Tijdsch. voor Geneesk.* **113** (1969) 1686-1687. (In Dutch)

Case report of 42 year-old woman admitted to a hospital orthopedic department because of recurrent metatarsal fractures

and increasing bone destruction. She had been examined by many specialists for 7 years without definitive diagnosis. The diagnosis of leprosy, originally suspected on a radiographic basis, was made by pathologic examination and demonstration of *M. leprae*.—(From authors' summary)

Dutta, A. K. and Mandal, S. B. Advantages of the nicotine test in the diagnosis of leprosy. *Dermat. Internat.* 8 (1969) 68-72.

In clinical practice leprosy is diagnosed on the basis of so-called cardinal signs, i.e., the loss of sensation in lesion patches and limbs, thickening of cutaneous nerves and nerve trunks, and presence of lepra bacilli in skin or mucous membrane smears. Some diagnostic tests (the histamine test, pilocarpine test and Arnold's metacholine test) are considered helpful only in cases of early undiagnosed patches. To avoid the difficulties and discrepancies of the commonly advocated tests for detecting leprotic anhidrosis, we recommend the "nicotine" test. Our studies show the merits of the test, especially its effectiveness on the skin of those in the tropics. Ten nonlepomatous leprosy patients, 5 with distinct maculoanesthetic patches and 5 with well-established tuberculoid patches, were selected to demonstrate the effectiveness of the nicotine test in observing leprotic anhidrosis. We also tested 16 patients whose disease had no definite clinical diagnosis. Of these 16, 8 had isolated macular hypopigmented patches, mostly ill-defined, and the others had raised and mildly erythematous lesions. These patients' ages ranged between 12 and 41 years; half were male and half female. Our preference for this test is based on the following facts: It gives only axon-reflex sweating, free from any ambiguity of local and direct sweating. It shows the integrity of a peripheral autonomic neuron. It provides an opportunity for studying adrenergic pilomotor response simultaneously. It is free from any adverse effect. It is easy to perform and interpretation is relatively free from the possibility of error. It appears preferable to the histamine test in dark-skinned people.—E. R. LONG

Palekar, A. G. and Magar, N. G. Plasma and urinary amino acids in leprosy patients. *Leprosy in India* 41 (1969) 78-85.

Thirteen amino acids were estimated in the plasma of normal persons and lepomatous, major and minor tuberculoid, and maculoanesthetic leprosy patients. Glutathione was detected in the plasma of leprosy patients but not in that of normal persons. In general all of the amino acids were lower in leprosy patients than in normal subjects, and decreased, except for glutathione, with increasing severity of the disease. Glutathione concentration increased with greater severity of the disease. The glutathione results are in accord with the observations of others, and suggest that pathologic changes in the tissues of the body, reflected in the chemical dynamics of the cell, lead to increased concentration of the substance in the blood.—E. R. LONG

Cherian, M. G., Karat, A. B. A. and Radhakrishnan, A. N. Urinary excretion of hydroxyproline in leprosy. *Clin. Chim. Acta* 25 (1969) 395-401.

Urinary excretion of hydroxyproline was studied in patients with different types of leprosy. The mean daily average proved highest in lepomatous leprosy as compared with other types of the disease and normal controls. The most striking feature was a "spiky" pattern of excretion with wide fluctuations in the daily output observed in lepomatous patients in reaction. This pattern was not seen in similar investigations in patients with stable leprosy or in a normal subject. Hydroxyproline occurs in the body almost exclusively in collagen and may be considered an *in vivo* label of collagen. In the absence of an exogenous source the urinary excretion of hydroxyproline in the human adult is more or less constant, reflecting the small turnover rates of collagen in a normal person. Urinary hydroxyproline thus may serve as an index of collagen metabolism. An enhanced turnover of collagen appears to occur in leprosy, as in rheumatoid arthritis and other collagen diseases.—E. R. LONG

Canizares, O. and Andrade, R. Nodular vasculitis-like lesions as the initial manifestation of leprosy. *Dermat. Internat.* 8 (1969) 50-56.

On rare occasions, the onset of leprosy is characterized solely by the development of small, nodular lesions, suggesting to the dermatologist the appearance of nodular vasculitis. They represent a superficial variety of erythema nodosum leprosum. In a case here reported the lesions developed on the extremities during pregnancy. No other clinical signs of leprosy were encountered. This case represents a papulo-nodular eruption such as is seen in nodular vasculitis, rather than a panniculitis as in the classical erythema nodosum leprosum. Acid-fast stains of a biopsy specimen of an early lesion are essential for the diagnosis.—AUTHORS' SUMMARY

Bertrand E., Exiga, J., Aye, H., Lebras, M. and Barabe, P. Existe-t-il 2 types pathogéniques de réaction lépreuse? Conséquences thérapeutiques. [Are there two pathogenic types of leprosy reaction? Therapeutic consequences.] *Bull. Soc. Path. exot.* 62 (1969) 443-451.

On the basis of observations in 3 Africans the authors make a clinical distinction between two types of leprosy reaction. The first is simple and transitory. It is due chiefly to causes it is unable to eliminate. The other is severe and repetitive. It seems

above all to correspond with the terrain. In the latter case the authors advise associated specific and anti-inflammatory (mainly corticoids) and immunosuppressive treatment (cyclophosphamide).—P. HARTER

Scotti, A. T., Mackey, D. M. and Trautman, J. R. Syphilis and biologic false positive reactors among leprosy patients. *Arch. Dermat.* 101 (1970) 328-330.

Of 206 leprosy patients 40% (82) were found to have reactive nontreponemal tests for syphilis. Forty per cent of these patients (33 of 82) were found to have reactive treponemal tests, either fluorescent treponemal antibody absorption test (FTA-ABS), *Treponema pallidum* immobilization test (TPI), or both. It was concluded that at least 16% of the leprosy patients studied had some serologic evidence suggestive of a treponemal infection either in the past or at present. Treponemal diseases may be common among leprosy patients, and may account for some of the reactive serologic tests usually called biologic false-positive BFP. The FTA-ABS test was found to be more frequently reactive than the TPI among those leprosy patients studied. The rapid plasma reagin (RPR) card test was rather insensitive, but seemed more specific than the venereal disease research laboratory test for syphilis (VDRL). Question of false-positive FTA-ABS tests in some of these patients could be neither established nor disproved.—AUTHORS' SUMMARY

Chemotherapy

Fruchard, M. J. and Fruchard J. Traitement d'une maladie de Hansen forme "L" par la rifadine. [Treatment of a case of Hansen's disease of L type by Rifadine.] *Bull. Soc. franc. Dermat. et Syphilig.* 76 (1969) 630.

After 2 years of combined treatment (DDS, sulfonamide and Rimifon) the authors substituted Rifadine (Rifampicine) in a dosage of 2-3 capsules (gelules) a day. Improvement already observed with the first treatment appeared to continue.—P. HARTER

Devadason, C. B.663 (Geigy 30.320) in the treatment of leprosy. A preliminary report. *Acta Trop.* 26 (1969) 265-269.

Experiences with B.663 at the Rajah Charles Brooke Memorial Hospital during the past 6 months indicate that B.663 possibly exerts an anti-inflammatory effect on patients with chronic reactions. The dose required to suppress an episode of reaction and in the maintenance of a no-reaction state seems to vary greatly and it is our impression that each patient needs to be evaluated separately. An average of 200

mgm. seems adequate, but further observations are necessary. There may, however, be cases of ENL that either do not respond to B.663 or become refractory after a period of therapy. B.663 definitely has a place in treating nerve swellings that accompany neuritis. It controls the swelling as well as relieves the pain and discomfort of the patient. We had convincing experience that patients with neuritis respond very well to B.663.—(From author's summary)

Karat, A. B. A., Jeevaratnam, A., Karat, S. and Rao, P. S. S. Double-blind controlled clinical trial of clofazimine in reactive phases of lepromatous leprosy. *British Med. J.* 1 (1970) 198-200.

A double-blind controlled trial in 24 lepromatous leprosy patients in reaction showed that clofazimine (Lamprene) controlled symptoms of erythema nodosum leprosum reaction in lepromatous leprosy better than prednisolone. Clofazimine also appeared to be significantly superior in preventing recurrence once the reaction had been controlled. There was a statistically significant rise in serum albumin among inpatients on clofazimine as compared with patients on prednisolone, but no difference in terms of neurologic status, bacterial index, morphologic index, and renal function. Red/black hyperpigmentation was seen among practically all patients on clofazimine. No other side effects or deleterious systemic effects were observed.
AUTHORS' SUMMARY

Crawford, C. L. The effect of out-patient dapsone in an area of endemic leprosy. *Leprosy Rev.* 40 (1969) 159-163.

Following up the work of Charles Ross in Northern Nigeria the author has found that the prevalence of leprosy in one area in this region has fallen from a mean of 40/1,000 of the population in 1952-1955 to 1.6/1,000 in 1967-1968 after a campaign of treatment with dapsone in relatively low dosage. The limitations of the study and previously reported criticisms and drawbacks of sulfone therapy are discussed.—LEPROSY REVIEW EDITOR'S ABSTRACT

Balakrishnan, S. A note on the screening for DDS in urine by spot test. *Leprosy in India* 41 (1969) 77-78.

This report summarizes results of spot tests in urine specimens from contacts in the DDS prophylaxis study by the Epidemiology Division of the Central Leprosy Teaching and Research Institute, Chingleput, India. Approximately 180 contacts receiving DDS or placebo were included. Five hundred and three specimens were examined in the DDS group and 207 in the placebo group. The results revealed only a small percentage of false-positive/negatives. Field tests are recommended.—E. R. LONG

Schulz, E. J. Recent advances in the treatment of leprosy. *South African Med. J.* 43 (1969) 1330.

Concise review.—E. R. LONG

Thomas, G., Karat, A. B. A., Karat, S. and Rao, P. S. S. An open trial of indomethacin therapy in exacerbated phases of lepromatous leprosy. *Indian J. Med. Sci.* 23 (1969) 68-78.

Indomethacin, a nonsteroidal anti-inflammatory drug well known for its favorable effect in arthritis, was administered to 19 lepromatous leprosy patients and one similar patient recently in a phase of exacerbation. There was fairly good response to the drug in all but 3 patients. More than half of the cases showed improvement within the first two weeks. The drug, however, failed to prevent recurrences of exacerbation, and did not reduce the severity of exacerbation when it did occur. Specific antileprosy therapy was carried out simultaneously. In nearly 50% of cases abdominal pain was a disturbing side effect. Vertigo was observed in 35-40%, but was not necessarily attributed to the indomethacin. Headache occurred in 16%. In 8 cases symptoms required discontinuation of indomethacin treatment.—E. R. LONG

Karat, A. B. A., Thomas, G. and Rao, P. S. S. Indomethacin in the management of erythema nodosum leprosum — a double-blind controlled trial. *Leprosy Rev.* 40 (1969) 153-158.

A double-blind controlled clinical trial of indomethacin in the management of erythema nodosum leprosum ("reaction") and its associated clinical features was carried out, using chloroquine as the chief control drug and 2 other drugs also for comparison, namely prednisolone and aspirin. On the whole the therapeutic effect of indomethacin, in terms of its control of ENL, compared favorably with that of chloroquine and was superior to aspirin. Though initial control was most quickly achieved with prednisolone, indomethacin and chloroquine appeared to be slightly superior to the other drugs in decreasing recurrences. In regard to arthralgia and acute exudative arthritis associated with a reaction, there was no significant difference between the responses produced by the 4 drugs. Acute painful neuritis occurring in these patients appeared to respond least to indomethacin. The number of patients in whom specific antileprosy therapy could be reintroduced following subsidence of ENL, was comparable in all 4 test groups. No significant side effects were noted. However, there was a definite improvement in vision among the patients treated with indomethacin, while some patients receiving prednisolone showed a deterioration in vision on refraction.—AUTHORS' SUMMARY

Ing, T. H. Indomethacin in the treatment of erythema nodosum leprosum in comparison with prednisolone. *Singapore Med. J.* 10 (1969) 66-70.

In a one month clinical trial comparing indomethacin in a dose of 75 mgm. and prednisolone in a dose of 15 mgm. daily, overall benefit was seen in 60% of the indomethacin cases and 75% of the prednisolone series. Indomethacin was of value,

however, only in mild or moderate cases of ENL. No improvement was evident in the erythrocyte sedimentation test. Side effects, chiefly nausea and dizziness, occurred in about 38% of patients treated by indomethacin. Epigastric distress was rare in patients treated with prednisolone.—E. R. LONG

La Rosa, P. and Casciano, A. Reazioni lebbrose e talidomide. [Thalidomide in the treatment of lepra reactions.] *Minerva Dermat.* 43 (1968) 166-168.

The authors treated 15 leprosy patients with thalidomide. Six had the lepromatous, 7 the intermediate, and 2 the tuberculoid form. The dose of thalidomide used was 300 mgm./day, 2 tablets of 50 mgm. being given every 8 hours for a period depending on regression (or not) of lepra reactions. No other drugs were given during the thalidomide treatment. When there was repression of the lepra reactions the dose was reduced progressively to 50 mgm./day and continued for up to 30 days, but in the cases where there was no regression of the lepra reactions after 8 days, thalidomide treatment was suspended. The results were: in 6 lepromatous, 3 excellent, 1 moderate, 2 failures; in 7 intermediate, 3 excellent, 2 moderate, 2 failures; in 2 tuberculoid patients treated, both showed moderate improvement. The effects of the drug were usually seen after 24 hours. Side-effects noted were asthenia, loss of appetite and somnolence, but these lessened with improvement in the clinical condition and ceased with reduction in dosage. No changes caused by the drug were seen after the usual laboratory tests on blood, liver function or urine.—(Abstract by W. K. Dunscombe. *Trop. Dis. Bull.* 67 (1970) 46)

Surgery and Surgical Specialties

Bourrel, P. L'opération de Brand, a propos de douze observations personnelles. [The operation of Brand in the light of a dozen personal observations.] *Ann. chir. plastique* 13 (1968) 297-304.

The author points out the advantage of

passing the radial muscle through the carpal canal in the Brand operation. This variant technic allows simultaneously the restoration of thumb apposition, since immobilization in flexion of the wrist is exactly the same in the two operations.—P. HARTER

Bourrel, P. Chirurgie de la lèpre chez l'africain. [Surgery of leprosy in the African.] *Med. Trop.* **29** (1969) 1-33.

On the basis of experience in 580 cases, the author concludes that it is possible to prevent or treat the deformities in 90% of leprosy patients through surgical practice of certain types of neurolysis and 4 types of simple reparative intervention, which he describes clearly.—P. HARTER

Sabin, T. D. Lessons from leprosy. *American J. Occupational Therapy* **23** (1969) 473-478.

The author notes that leprosy is an appropriate subject for a meeting of the National American Occupational Therapy Association. Experimental efforts at Carville, Louisiana, to protect the insensitive hand are described. The well known motor and sensory changes are reviewed, with indication of the basic mechanisms of absorption of bone. To prevent the latter, observations are noted showing that insensitive extremities do not show absorption, even when totally paralyzed. Protection of the extremities from trauma should be the first therapeutic approach. Attention is directed to modification of the environment of activity of the hand, to education of the patient, and to provision of a new warning system by rerouting the transmission of sensory information through vision and hearing.—E. R. LONG

Coutelier, L. and Renders, A. La microradiographie et la microscopie de fluorescence appliquées à l'étude des lésions osseuses de la lèpre. [Application of microradiography and fluorescent microscopy to the study of bone sequelae of leprosy.] *Ann Soc. belge Med. Trop.* **49** (1969) 427-456.

The authors apply certain relatively recent research techniques to study of the osseous sequelae of leprosy, viz., microradiography of nondecalcified sections, and fluorescence microscopy after injection *in vivo* of a marker for osteogenesis and calcification. Descriptions are based on correlation of the data obtained from the two techniques. Only a limited number of specimens with typical

x-ray changes were studied, and reservations are expressed with a view to future research, but certain points of interest are noted, viz., microscopic evidence of bone destruction, character of bone remodelling, pathologic osteogenesis in two patterns, and relations between peripheral erosion of the cortex and deposition in the medullary cavity.—AUTHORS' SUMMARY

Karat, S. The role of microcellular rubber in the preservation of anaesthetic feet in leprosy. *Leprosy Rev.* **40** (1969) 165-170.

Plantar ulceration causing major disability in nearly 20% of leprosy patients will continue to persist in the absence of suitable protective footwear. The management of plantar ulceration should be in terms of long-range care rather than of immediate results, since we are dealing with permanently anesthetic feet. The cause of the initiation and recurrence of plantar ulceration and the principles involved in their prevention are indicated. Apart from the external trauma, mechanical stresses at each phase of the normal gait play an important role in the causation of plantar ulceration. The salient qualities of microcellular rubber, known technically as "microporous compound," are described in detail. The design of a simple "Y" strap microcellular-rubber chappal is presented and its effectiveness discussed in relation to the various grades of severity of plantar ulceration. It is maintained that if plantar ulceration is detected early and the type of chappal described is used regularly, the problem of plantar ulceration can be successfully minimized or even eliminated. (7 informative illustrations). — AUTHOR'S SUMMARY

Tuck, W. H. The use of Plastazote to accommodate deformities in Hansen's disease. *Leprosy Rev.* **40** (1969) 171-173.

Patients with deformed feet, prone to ulceration and with deformities resulting in uneven balance derive great benefit from inch thick Plastazote insoles molded directly to the soles of their feet. Plastazote is readily washable. It can be perforated for ventilation. Plastazote supports are relatively inexpensive and readily made. They

should be supplied in duplicate and worn on alternate days. After a time Plastazote insoles must be reinforced with another quarter inch of the product under depressed areas.—(From author's summary)

Jopling, W. H. Observations on the use of Plastazote insoles in England. *Leprosy Rev.* **40** (1969) 175-176.

The author reports generally good results observed in 14 patients suffering from planar ulceration, in most cases associated with arrested lepromatous leprosy, after their footwear had been expertly fitted with Plastazote insoles. The after-treatment of healed plantar ulcer is also briefly outlined.—LEPROSY REVIEW EDITOR'S ABSTRACT

Mondl, A. M., Gardiner, J. and Bisset, J. The use of Plastazote in footwear for leprosy patients. A preliminary report. *Leprosy Rev.* **40** (1969) 177-181.

A new polyethylene-foam material, Plastazote, has been utilized in making built-up insoles in normal and custom-made footwear for patients with leprosy, subject to all the hazards of anesthetic feet. With the help of this material it is now possible to provide leprosy patients with shoes of normal appearance which give protection to their feet and at the same time are readily accepted by them. Economical to make, and cheaper than ordinary microcellular shoes, Plastazote build-ups may represent a significant advance in the care of the feet in leprosy.—AUTHORS' SUMMARY

Richards, W. W. and Arrington, J. M. Un-suspected ocular leprosy. *American J. Ophthalm.* **68** (1969) 492-499.

Ophthalmic findings suggestive of leprosy include loss of eyebrows and eyelashes, beaded corneal nerves, punctate subepithelial superior limbal corneal opacities, entropion of the upper eyelids, conjunctival hyperemia in the outer canthal area, iris pearls and unexplained unilateral or bilateral 7th nerve palsies. To illustrate these findings 14 case histories are presented. The average time interval between the initial presenting complaint and establishment of the correct diagnosis was 6

years. There is no accurate method of determining the real incidence of leprosy in the United States, but it would appear to be higher than suspected. Ophthalmologists should consider leprosy when examining patients with any of the findings just mentioned, particularly if the patient has associated skin or neurologic findings or nasal stuffiness.—AUTHORS' SUMMARY

Weerekoon, L. Ocular leprosy in Ceylon. *British J. Ophthalmol.* **53** (1969) 457-465.

Differential diagnosis is important in distinguishing ocular leprosy. Anesthesia of the cornea from 5th nerve involvement is not uncommon; it may lead to trophic ulceration, requiring surgical therapy. Episcleritis is the common ocular lesion in leprosy. The iris and ciliary body bear the brunt of the ocular infection; several types of leprotic lesions are seen in them. Thus far DDS has proved rather disappointing in the treatment of ocular leprosy. In the author's cases dependence was placed on local treatment with steroids and mydriatics, especially the latter. Reaction in ocular leprosy responds readily to the antimony preparation anthiomaline. Surgery is of necessity plastic and reparative. Prevention of ocular involvement is most important, demanding a high level of suspicion in the initial examination of cases of known leprosy, and of ocular lesions where leprosy might be a factor.—E. R. LONG

Epker, B. N. and Via, W. F., Jr. Oral and perioral manifestations of leprosy. *Oral Medicine* **28** (1969) 342-347.

Oral and perioral clinical and radiographic manifestations of leprosy are reviewed in this paper. In tuberculoid leprosy sensory and motor nerve involvement of the trigeminal and facial nerves is not uncommon. Actually involvement of all nerves supplying the oral and related structures occurs. Facial and oral involvement occurs in lepromatous leprosy, with ulceration, scarring and functional deformities. Nerve involvement may become manifest if the disease progresses. A case of long duration in an Italian female described in this article showed typical lepromatous facial change, without intraoral pathosis other than

gingivitis and periodontitis. Maxillary and mandibular radiographic changes, not previously described were noteworthy, consisting of changes in the pattern of bone trabeculae, and changes in the lamina dura and the periodontal membrane space.—E. R. LONG

Hidaka, T. and Ikeda, I. Statistical observation on the prosthesis of leprosy patients. *La Lepro* 38 (1969) 49-53. (In Japanese, English summary)

A survey was carried out on 1,582 prosthesis teeth in 1,175 leprosy patients who had undergone prosthesis at the dental clinic of the Nagashima Aisei-en during the decade 1957-1966. Patients and their prosthesis teeth were compared according to sex, age and type of disease. It was found that the proportion of prostheses of the upper central and lateral incisors of leprosy patients was very high as compared with that of normal persons. — AUTHORS' SUMMARY

Pathology

Slotwiner, P., Song, S. K. and Anderson, P. J. Skeletal muscle changes in leprosy: their relationship to changes in other neurogenic diseases affecting muscle. *J. Path. (British)* 97 (1969) 211-217.

The report is based on biopsy studies of 4 leprosy patients (3 females and 1 male) presenting signs of peripheral neuropathy and, in 1 case, myositis. Multiple subcutaneous granulomas were seen in 2 patients, commonly surrounding blood vessels, nerves, hair follicles and sweat glands. Acid-fast bacilli were demonstrated. Extensive granulomatous change, with fragmentation of axons and myelin sheaths, and visible acid-fast bacilli, was noted in peripheral and intramuscular nerves. Inflammation seen in muscles was restricted to perivascular, perineural and intraneural foci and muscle spindles. Segmental atrophy affecting groups of fibers was a consistent change. Sarcoplasmic structural changes included phagocytosis, vacuolar change and basophilia, chiefly in areas remote from inflammation and associated with regions of segmental atrophy. The evidence supports the view that a concurrent myopathic process need not be invoked to explain the sarcoplasmic changes. It was concluded that most of these changes were secondary to leprous neuropathy and consequent denervation.—E. R. LONG

Job, C. K. *Mycobacterium leprae* in nerve lesions in lepromatous leprosy. An electron microscopic study. *Arch. Path.* 89 (1970) 195-207.

The ultrastructure of radial cutaneous nerve biopsies from 5 untreated patients with lepromatous leprosy was studied. *M. leprae* were present in large numbers frequently in Schwann cells, macrophages, and endothelial cells, and occasionally in perineurial cells. Proliferation of the bacilli inside these cells resulted in their foamy degeneration. It is pointed out that the Schwann cell is the target cell in leprous infection of nerves and that the destructive lesions of nerves produced in lepromatous leprosy are essentially the result of Schwann-cell degeneration. *M. leprae* were demonstrated in the lumina of the capillaries as well, and it is suggested that the infection may spread in the body, even into the nerves, through the blood stream. —AUTHOR'S SUMMARY

Miranda, R. N. Phagocytosis of *Mycobacterium leprae* by polynuclear leucocytes. *Publ. Centro Estudos Leprol. (Parana)* 9 (1969) 59-60. (Portuguese version 61-62)

The author records personal observations, first made in 1942, of cases of lepromatous leprosy in reaction. If leprosy bacilli were rare in smears from recent and

closed lesions of reaction they were abundant in pus from such lesions after ulceration, and present particularly within polymorphonuclear leucocytes, but also within histiocytes and outside of cells. Possibly the ulcerated lesion occurred in consequence of mass destruction and elimination of killed bacilli engulfed by polynuclear leucocytes; the phenomena commonly occurred after a long period of improvement. In leprosy reaction increase in blood leucocytes is seen (up to 45,000/cmm.). Nine colored photomicrographs illustrate the paper.—E. R. LONG

Nakamura, K. and Hisai, S. An accelerative growth of *M. leprae* in the foot-pads of the golden hamsters, treated with thymectomy and testosterone-administration. *La Lepro* 38 (1969) 45-48. (In Japanese, English summary)

We have examined the influence of thymectomy and testosterone administration on the growth of *M. leprae* in the foot pads of golden hamsters thymectomized by suction of the thymus at 3 weeks of age. *M. leprae* were incubated in their respective right hind foot pads 1-2 weeks after the thymectomy. Testosterone propionate was injected into each of their hind paws in the daily dosage of 0.2 mgm., continued for 6 days, then at the first week and at 1 and 2 months after the inoculation. Thus, the total dosage was calculated to be 3.6 mgm. per hamster. Survival was good. The inoculum was 2.5×10^4 bacilli (SH-0 passage strain) or 1.7×10^4 bacilli (B2409 P₁₂ passage strain) per foot pad. In sham-thymectomized hamsters, counts of *M. leprae* in each foot pad rose to a plateau level of, at most, 10^6 . However, in the case of thymectomized and the testosterone treated female hamster, counts rose to a level of $1.6-4.3 \times 10^7$ at 24 weeks after

inoculation. Results suggested that counts of *M. leprae* in female exceeded those in male hamsters. Thus it can be said that we have observed not only an enhancement of susceptibility but distinctly increased growth of *M. leprae* in the foot pads of the golden hamsters.—(From authors' summary)

Mathur, I. S., Gupta, S. K. and Parmer, S. S. Succinic dehydrogenase, histidase and acid phosphatase activities of liver homogenates of rats infected with *Mycobacterium leprae murium*. *Indian J. Med. Res.* 57 (1969) 457-464.

Infection with *M. lepraemurium* was found to be associated with changes in the enzyme activities of succinic dehydrogenase, histidase and acid phosphatase. Rat liver homogenates obtained from normal and infected animals were used as the source of enzymes. Decrease in the enzyme activities of succinic dehydrogenase and histidase, and increase in acid phosphatase, were found to be induced during infection. No tissue factor could be demonstrated for restoration of the succinic dehydrogenase factor of the infected rat liver homogenates.—AUTHORS' SUMMARY

Sachdev, J. C., Puri, D. and Bansal, S. Secondary amyloidosis in leprosy. *Leprosy in India* 41 (1969) 73-76.

Three cases of amyloidosis secondary to lepromatous leprosy are reported. Two of them developed a nephrotic syndrome and the third suffered renal failure as a result of amyloid deposit in the kidneys. The diagnosis of renal amyloidosis was established by renal biopsy. Amyloidosis has been regarded as rare in lepromatous patients in India, but efforts toward its detection may occasionally prove rewarding.—(From authors' summary)

Bacteriology and Immunology

Prabhakaran, K., Harris, E. B. and Kirchheimer, W. F. Effect of inhibitors on phenoloxidase of *Mycobacterium leprae*. *J. Bact.* 100 (1969) 935-938.

Previous results have shown that human type leprosy bacilli possess a phenoloxidase, which, when compared with the enzyme from mammalian and plant sources,

seemed unique in the range of substrates utilized and in the nature of the products formed. The effect of several inhibitors on the enzyme in *M. leprae* was tested. Compounds binding copper were more effective than substrate analogs. Diethyldithiocarbamate penetrated the bacillus and completely suppressed its phenolase activity. Diasone (a derivative of diaminodiphenyl sulfone used in the treatment of leprosy) proved to be a potent inhibitor of phenoloxidase of mammalian and plant origin. However, it was less efficient in the case of *M. leprae*. A biochemical peculiarity of *M. leprae* was observed in its ability to metabolize mimosine and penicillamine. These compounds produced total inhibition of tyrosinase in melanoma extract and of mushroom tyrosinase. Nontoxic inhibitors of phenoloxidase in leprosy bacilli may be of value in developing a rational approach to chemotherapy of the disease.—AUTHORS' SUMMARY

Pattyn, S. R. and Verdoolaege-Van Loo, G.
Isolation of a strain of *Mycobacterium lepraemurium* from normal laboratory mice. *Ann. Soc. belge Med. Trop.* 49 (1969) 465-468.

Isolation of a strain of *M. lepraemurium* from "normal" laboratory white mice is reported. Uncultivable acid-fast bacteria isolated from "normal" mice giving rise to liver and spleen involvement after intravenous and foot pad inoculation of mice behave as *M. lepraemurium* (Pattyn, 1965). It is difficult to state precisely at which passage level the strain was actually isolated, i.e., from the original mice started in 1966 or at the first or second passage made respectively in February and December 1967. This shows how carefully each passage level of *M. leprae* in mouse foot pads, as originally described by Shepard (1960), should be controlled. Controls in our laboratory consist of histologic examination of foot pads, examination of Ziehl stains of spleen suspensions of harvested mice, and inoculation of harvests on Loewenstein-Jensen medium. If any doubt remains, intravenous inoculation into mice should be made and elongation in the medium of Hart and Valentine should be

looked for. In one instance of a passage of a *M. leprae* strain we found mice whose foot pads showed histologic lesions incompatible with *M. leprae* lesions, which may have been due to *M. lepraemurium*. That such contaminations of *M. leprae* strains do not occur more frequently is probably due to the fact that at each passage level of *M. leprae* dilutions of harvests are made. The danger of contamination and/or replacement of *M. leprae* strains by *M. lepraemurium* varies perhaps from one laboratory to another and with the mouse strains used. This danger should always be kept in mind.—(From authors' summary).

Monti, G., Nunzi, E. and Bertamino, R.
Aspetti immunologici della lepra. [Immunologic aspects of leprosy.] *Boll. Ist. Sieroter (Milan)* 47 (1968) 263-276.

Study of some immunologic aspects of leprosy carried out in 50 patients, 49 of them suffering from lepromatous and 1 from tuberculoid leprosy made possible a contribution to this field. The study confirmed reports of frequent presence of hyperdysproteinemia in lepromatous leprosy with an increase especially in the alpha-2 and gamma-globulin fractions. No significant data were obtained regarding autoimmunologic phenomena during illness. The Coombs test was persistently negative, as well as the agglutinin reaction. In contrast some positive reactions were observed in antithyroid antibody detection. The positivity of C-reactive protein and the Rheuma test has a completely nonspecific significance. Immunofluorescence might be of interest for diagnostic purposes.—(From authors' summary)

Gear, J. H. S. Immunological aspects of leprosy. *South African Med. J.* 43 (1969) 1297.

General review. Recent studies have shown that different clinical manifestations of leprosy may be largely determined by the immunologic reactions of the patient. Patients with lepromatous leprosy appear to be in a hyporeactive hetero-tolerant immunologic state. Patients with tuberculoid leprosy may be regarded as reacting, often successfully, against the infection. The

acute reactive stage results from an accentuation of the immunologic reactions. This hypothesis suggests the basis of the pathogenesis and different clinical manifestations of leprosy. Its acceptance has important implications in treatment.—(Summary of paper presented at 47th S. African Medical Congress, Pretoria, 6-12 July 1969)

Miranda, R. N. The importance of late intradermal reactions (the Mitsuda phenomenon) *Dermat. Internat.* **8** (1969) 79-82.

In 1953 the writer and other researchers observed late reactions of the Mitsuda type in sporotrichosis patients inoculated with sporotrichin. Histopathologically the reaction is represented by a tuberculoid granuloma, in all respects similar to the Mitsuda reaction. Verification of this and similar facts in different granulomatous diseases, and observation by the writer that there is no specificity in such reactions because different antigens may result in positive reactions in various diseases, confirm the principle that all these reactions are part of the Mitsuda phenomenon.—AUTHOR'S SUMMARY

Goihman-Yahr, M., Raffel, S. and Ferraresi, R. W. Cross reactivities of lepromin. *Internat. Arch. Allergy & Applied Immunol.* **36** (1969) 450-468.

The cross reactivities of lepromin with various mycobacterial preparations were studied in a guinea-pig experimental system. A purified bacillary suspension suitable for use in animals was obtained. Lepromin induced the formation of circulatory antibodies that reacted with other mycobacterial antigens. No antibodies were detected against antigens of human dermal origin or enzymes used in the preparation of the lepromin. Lepromin-sensitive animals did not show a clear-cut tuberculin hypersensitivity. Such animals were sensitive, however, to BCG (whole bacilli) and their fractions, particularly cell walls. These findings suggest that the experimental Mitsuda reaction is similar to responses observed to whole mycobacterial bodies, e.g., the accelerated tubercle formation in tu-

berculosis, and that it is closely related to the reactivity against mycobacterial cell walls that has been noted experimentally.—AUTHORS' SUMMARY

Goihman-Yahr, M., Raffel, S. and Ferraresi, R. W. Effects of methotrexate upon the experimental Mitsuda reaction. *J. Invest. Dermat.* **53** (1969) 217-222.

Guinea-pigs sensitized to a purified preparation of lepromin were treated with methotrexate either during induction or after sensitization had been established. This drug had no detectable effect on established hypersensitivity to lepromin or upon the development of nonspecific granulomatous inflammation produced by incomplete Freund's adjuvant. But it blocked the induction of the granulomatous response to lepromin (Mitsuda reaction). These findings add a facet to the evidence that this reactivity represents a type of hypersensitivity to *M. leprae*. —AUTHORS' SUMMARY

Merklen, F.-P., Cottenot, F. and Gharbi, R. Disparition secondaire de la positivité de la réaction de Mitsuda au cours d'une maladie de Hansen ancienne. [Secondary disappearance of positivity of the Mitsuda reaction in an old case of Hansen's disease.] *Bull. Soc. franc. Dermat. et Syphilig.* **76** (1969) 297-298.

A 35 year old Senegalese leprosy patient treated for 4 years in Bamako discontinued treatment for 6 years. His case was reviewed in 1967, when leprosy of disseminated tuberculoid type appeared, with positive Mitsuda reaction. In spite of a year of treatment with DDS (125 mgm. associated with 375 mgm. sulfamethoxypyridazine) a new progression developed with negative lepromin reaction.—P. HARTER

Oleinick, A. Altered immunity and cancer risk: a review of the problem and analysis of the cancer mortality experience of leprosy patients. *J. Nat. Cancer Inst.* **43** (1969) 775-781.

An analysis of the cancer mortality experience of 848 white and Negro leprosy patients admitted to the U.S. Public Health

Service Hospital at Carville, Louisiana, is presented with a person-years-at-risk analysis and age, sex, race and calendar-specific U.S.A. cancer mortality rates; 19.7 cancer deaths were expected and 21 were observed. Two cases of leukemia/lymphoma were observed when 1.7 were expected.

The results of this study provide no support for the hypothesis that defects of cellular immunity play an important role in the pathogenesis of human malignancies, or that chronic intense stimulation of the lymphoreticular system predisposes to malignant transformation.—AUTHOR'S SUMMARY

Epidemiology and Prevention

Schaller, K. F. Integration of leprosy control into the health centre scheme. *Leprosy Rev.* 40 (1969) 243-248.

Three significant developments make the expansion of leprosy control possible: introduction of the sulfones, importance given to outpatient treatment in combating leprosy, and integration of leprosy control activities into the basic health center scheme. Special efforts should be made to harmonize general planning with new developments in the expansion of rural health services and the integration of the specialized services, such as leprosy control, into the scheme of the general health services. It is indispensable to balance the planned expansion of the health services with the financial potential of the country and its capacity for training public health personnel.—AUTHOR'S SUMMARY

Suresh, K., Mani, R. S., Krishna Rao, A. and Madhava Rao, D. Results after five years of intensive leprosy control work in a highly endemic area. *Leprosy Rev.* 40 (1969) 211-216.

The Leprosy Control Project sponsored by the Danish Save the Children Organization was started in 1962 in 2 highly endemic districts, Srikakulam and Visakhapatnam. The project is assisted by the United Nations Children's Fund (UNICEF) and the governments of Andhra Pradesh and India, and receives technical guidance from the World Health Organization (WHO). It expanded gradually till it reached its present maximum size in 1966, and now covers an area of 2,200 sq. miles (5,630 sq. km.) and a population of 15 lakhs (1,500,000). At present, 33,224 patients are under treatment, of whom 29,675 are living inside the project area, and 3,549

come from outside it. The primary aim of the project is to control leprosy in this part of Andhra Pradesh by treating all existing patients, thus reducing the number of circulating bacilli, and so check the spread of the disease in the community. In the 22 units established in 1963, the case load has remained stationary since 1966, fluctuating at about 10,000. The number of new cases discovered is approximately equal to that of patients released from control. There has been a marked reduction, however, in the number of new cases of lepromatous type, presumably as a result of current early detection of cases, with corresponding prevention of progression to advanced disease. There is an increased trend toward bacterial negativity in treated lepromatous patients. At the end of 1968 the number of inactive patients was 3 times the number of new cases detected, viz., 3,875 inactive cases as compared with 1,133 new cases. The inactive cases are chiefly of tuberculoid type, and will probably soon be released from control. There is a reason to believe that after the reported 5 years of intensive control efforts the incidence of transmission of the disease will decrease substantially.—E. R. LONG

Ekambaram, V. and Gangadhara Sharma, C. S. Epidemiological findings of multiple leprosy surveys in a rural area in Madras State. *Leprosy in India* 41 (1969) 55-72.

This paper presents the findings of multiple epidemiologic surveys of leprosy in a highly endemic area in Madras State. A downward trend of the disease in the area is evident. The improvement is not spectacular, but is believed to prove that the work of the Control Unit in the area has been beneficial, even in the short period of

about 10 years. The detailed study was possible only because of intensive surveys in the area, stressing the need for survey in any control scheme for leprosy. The hope is strengthened that if the entire endemic area is covered by the National Leprosy Control Programme, control of the disease can be effected. If this is aided by properly planned prophylaxis, eradication can perhaps be achieved.—(From authors' summary)

Vellut, C. Leprosy control work at Polambakkam and its critical appraisal. *Leprosy Rev.* **40** (1969) 203-209.

Study of the situation of leprosy in an area where active control work has been in progress for 13 years shows that the incidence of the disease remains at 2/1,000, but among the new cases many are nonlepromatous patients with only a single macule. A small number of cases remain bacteriologically positive even after 12 years of regular treatment. Both the positive and negative aspects of the scheme have been studied.—AUTHOR'S SUMMARY

Heffner, L. T., Jr. A study of Hansen's disease in Ceylon. *Southern Med. J.* **62** (1969) 979-985.

An antileprosy campaign was instituted in Ceylon in 1932. The disease is classified as lepromatous, nonlepromatous or indeterminate. Treatment is based on a standard regimen of DDS; newer agents have not yet been evaluated. Leprosy in reaction is treated by stopping sulfones and administering antimony compounds. Control in Ceylon is difficult, because of limitation of funds, staff and equipment. It is based fundamentally on examination and treatment of contacts. A trial of BCG has been initiated; it is routinely administered to contacts under 15 years of age. Contacts receive hygienic and nutritional care also. The official figures probably greatly underestimate the extent of leprosy in Ceylon. It is believed that the prevalence of the disease has not increased in the last 36 years, but there is some indication that it has become more virulent.—E. R. LONG

Pedley, J. C. A plan of leprosy control in Nepal being carried out in a general hospital. *Leprosy Rev.* **40** (1969) 249-250.

Available evidence indicates that the endemicity level of leprosy in Nepal is not less than 10/1,000 and is probably as high as 15/1,000, in a country with a population of about 10 million. That is to say there may be 150,000 cases. Control is difficult because communications are poor and leprosy laws are repressive. However, a 10 year program in course is encouraging, based largely on outpatient practice. People are cooperative and the treatment of contacts is accepted practice. Nearly 1,000 close contacts of 250 known patients have been put on preventive treatment with DDS. It is too early for a critical appraisal of results.—E. R. LONG

Stone, M. M. Leprosy control in the Teso District, Uganda. A review of the last twenty years. *Leprosy Rev.* **40** (1969) 233-236.

Teso District is in Eastern Uganda, with an area of 4,500 sq. miles (11,500 sq. km.) and a population, based on the 1959 census, of 500,000. All belong to the same ethnic group and speak a language different from that of the Bantu people to the south and the Nilotic group to the north. In a series of surveys prior to 1955 the leprosy prevalence rate was found to be 25/1,000, meaning that the number of patients in Teso at that time was around 12,000; 20% were under the age of 15. About 1950-1951 a major change to more effective treatment became possible when the sulfone drugs were introduced. The fact remained, however, that in the whole of Uganda, with a population of 6 million dispersed over an area of 93,000 sq. miles (238,000 sq. km.) there were between 80,000 and 90,000 patients, only 5% of whom had access to any treatment. The problem in Teso was a reflection of that in Uganda. Dr. J. A. Kinnear Brown was appointed as Consultant to the Uganda Government in 1951 and, after making a large number of surveys, he suggested a village-clinic system to overcome the problems created by the social pattern. This was accepted with enthu-

siasm in Teso and had begun to function by the end of 1955. What exists in Teso is a compromise between the ideal and the practicable. At the end of 1966 there were 8 leprosy assistants based in 7 villages and responsible for 16 other clinics. This has worked well. The number of new patients with lepromatous leprosy coming forward for treatment has shown a marked decline, particularly in the last 5 years. In 1960 a trial of BCG vaccination against leprosy was introduced, with the support of the Uganda Government, the Ministry of Overseas Development, and the British Medical Research Council. This trial gave a new impetus, which seems to have led to reduction in the number of new patients. It is hoped that by treating early cases as they arise it will be possible to reduce the incidence of leprosy to the insignificant level of that of tuberculosis now prevailing in countries where that disease was once a serious problem.—E. R. LONG

Molesworth, B. D. LEPRO Control Project in Malawi. *Leprosy Rev.* **40** (1969) 237-241.

In the agreement drawn up between the Government of Malawi and the British Relief Association (LEPRO) the main objectives of the Leprosy Control Project were laid down as: (1) to demonstrate to the world that, for all practical purposes, leprosy can now be eradicated, and (2) to show how best this can be done. It was also agreed that the duration of the Project would be from 7 to 10 years. The progress to date has justified this imaginative venture undertaken by LEPRO. It is too early as yet to attempt an overall evaluation, but outpatient treatment has been shown to be possible and, with the necessary modifications, applicable to many conditions and lands.—E. R. LONG

Gauntlett, S. L. Leprosy control in the Southern Province of Zambia. *Leprosy Rev.* **40** (1969) 223-232.

The Southern Province covers an area of 33,000 square miles, with a population of slightly under half a million persons, or 14 per square mile. No detailed survey of the

prevalence of leprosy has been made, but records suggest higher rates than elsewhere in several districts. A random sample survey by J. Ross Innes in 1949 led to an estimate of a prevalence of 10.3/1,000 in the Southern Province, as compared with 12.6/1,000 for the country as a whole. The author describes current activities aimed toward case-finding, establishment of regular leprosy clinics in each medical center in the province, assessment of each new patient, and ensurance of uninterrupted therapy for each case. Educational campaigns are under way and provision is made for training personnel. The effectiveness of outpatient treatment is indicated by the fact that in 1967 there was a regular attendance rate of 70% in 55 medical centers in the province. The annual incidence of new cases has declined substantially.—E. R. LONG

Wheate, H. W. Leprosy control in Tanzania. *Leprosy Rev.* **40** (1969) 217-222.

This article reviews the pioneer leprosy control work in East Africa by J. Ross Innes, who estimated a prevalence of 100,000 leprosy cases in Tanganyika in 1950. Since then many surveys of different areas have been carried out, and several schemes have been planned to ensure higher standards of leprosy control. An effective program has been pursued by the Swedish-Norwegian Save the Children Campaign in the West Lake Region, but after 6 years complete control of leprosy has not been achieved. The Geita District campaign on the southern shore of Lake Victoria Nyanza has brought many patients under treatment, and at the same time has made clear the numerous difficulties that have to be overcome in engaging special staff, covering the large territory, and ensuring continued attendance by patients. Experience seems to indicate that it is comparatively easy to bring half of the estimated case load of an area under control, but there are many problems in covering the other half successfully.—E. R. LONG

Davey, T. F. Rural leprosy control problems in Biafra and Central India: a comparison. *Leprosy Rev.* **40** (1969) 197-201.

A comparison between leprosy control problems in Eastern Nigeria and in Central India reveals the determining influence that social factors have in deciding the success or failure of a leprosy control program. Stress is laid on the need for social studies, adaptability in applying methodology to local conditions, and also the need for high-class patient care. The importance of integrating leprosy work with the general health services is also emphasized.—

AUTHOR'S SUMMARY

Brubaker, M. L., Binford, C. H. and Trautman, J. R. Occurrence of leprosy in U.S. veterans after service in endemic areas abroad. *Publ. Hlth. Rept.* 84 (1969) 1051-1058.

Before 1940, 83 cases of leprosy were reported in U.S. veterans. Thirty of these cases were considered to be the result of exposure to the disease outside the continental United States during the Spanish-American War. From 1940 through 1968, 240 cases of leprosy were reported in U.S. veterans. As indicated in a resume of their cases, 46 veterans were considered to have service-connected leprosy as a result of their exposure outside the United States. No study has been reported of contacts of veterans with leprosy. However, one situation was brought to our attention in which leprosy was diagnosed in the wife and three children of an infected veteran. The family lived in a nonendemic area. Delay in the early diagnosis of leprosy is caused by the failure of both patients and physicians to suspect the disease. Early diagnosis and treatment assure the best possible opportunity for arresting the disease and preventing disability and further spread by reduction of the infectious reservoir.—

AUTHORS' SUMMARY

Bogaert Diaz, H., Herrera, G. and Fernández Henríquez, M. La lepra en la región

este u oriental de la Republica Dominicana. [Leprosy in the east or oriental region of the Dominican Republic.] *Rev. Dominicana Dermatol.* 3 (1969) 105-115.

A study is being made of leprosy in the eastern region of the Dominican Republic, which indicates the prevailing index of cases and number of cases per 100 square kilometers in the regions studied. The prevalence is highest in the province of San Pedro de Macoris, where the index of prevalence is 2.14 cases/1,000 inhabitants and the number of cases/100 square kilometers is 13.11. The public health problem in this region is large. Better preparation of medical and paramedical personnel is imperative for control of contacts in the region.—(From authors' summary)

Ricart, E. E. Consideraciones historicas sobre la lepra en Santo Domingo. [Historical considerations of leprosy in Santo Domingo.] *Rev. Dominicana Dermat.* 3 (1969) 120-134.

Reprint of paper by Dr. Ricart published in the *Revista Medica Dominicana* 1 (1942) No. 2. The paper is too detailed for abstract, taking up leprosy in remote periods, study of the disease in past epochs, leprosy in colonial times, hospitals, legislation on leprosy in early times, construction of a national leprosy hospital, and legislation in more recent times.—E. R. LONG

Temime, P., Oddoze, L., Privat, Y. and Marchand, J.-P. Lèpre lepromateuse autochtone? [Autochthonous lepromatous leprosy?] *Bull. Soc. franc. Dermat. et Syphilig.* 76 (1969) 438.

Report of a third case of lepromatous leprosy in a Corsican village. The first case was registered in 1953. The role of contagion from troops debarking in 1944 is discussed.—P. HARTER

Genetics

Ketkar, Y. A., Kulkarni, P. N. and Patil, P. N. Leprosy in twins. *Leprosy in India* 41 (1969) 85-88.

A report is made of tuberculoid leprosy in a pair of identical twins, aged 15 years. There was no family history of leprosy, nor

was any specific contact recognized. The pair shared the same environment. Blood groups, iris color and other characteristics were identical. *M. leprae* were not found in either patient. The duration and course of the disease were similar. In each case there was a severe initial response to DDS treatment followed by good response. The observations support views, many times expressed, on the role of genetics in leprosy.—E. R. LONG

Vogel, F., Krüger, J., Song, Y. K. and Flatz, G. ABO blood groups, leprosy, and serum proteins. *Humangenetik* 7 (1969) 149-162.

The authors investigated the associations between ABO blood groups, the type and clinical features of leprosy, and serum protein fractions, in 683 self-selected patients suffering mainly from multibacillary (lepromatous or borderline) leprosy in North Thailand. Within the limits imposed by the investigation, the authors found a slightly higher proportion of patients with A or AB blood groups than in healthy control subjects, and A blood group patients showed a tendency toward more severe clinical manifestations of leprosy and, in particular, eye involvement. They also found that al-

pha-1 and alpha-2-globulins were slightly decreased in blood group A patients aged over 40 years.—(Abstract by S. G. Browne, *Trop. Dis. Bull.* 66 (1969) 1120)

Pinto, W., Jr. and Beiguelman, B. Taxa de ilegitimidade e lepra. [Frequency of illegitimacy and leprosy.] *Rev. Paulista Med.* 71 (1967) 267-270.

The frequency of nonpaternity in the offspring of lepromatous patients was analyzed by determining the ABO, MNLs and Rh systems of blood groups. Two samples of families were studied. One represented lepromatous patients living in leprosy sanatoria in the State of São Paulo (Brazil), and the other included affected parents who were never maintained in those hospitals but had outpatient medical care. In the former group the theoretic frequency of nonpaternity was estimated at 31.2%. This frequency is markedly higher than that calculated for the families whose affected parents did not live in leproseries (4.5%). The value in the former sample is 3 times higher than the values calculated for normal populations with the highest frequencies of extramarital children.—AUTHORS' SUMMARY

General and Historical

Jamison, D. G. Modern trends in leprosy. *Postgraduate Med. J.* 45 (1969) 408-414.

General review. Leprosy is being regarded more and more as a subject in the field of general medicine. The problems of infectivity, animal inoculation and cultivation remain to a large extent unsolved. The recent successful inoculation of infected tissue in irradiated mice is a major advance, which may prove a means for testing new drugs, confirming claims of successful cultivation, and determining the viability of organisms. Great hope for progress in the understanding of leprosy lies in current studies of the phenomena of delayed hypersensitivity, and application of current new knowledge in the field of

autoimmune processes and immunosuppression.—E. R. LONG

Browne, S. G. Leprosy—a clinical and pathological challenge. *Ulster Med. J.* 38 (1969) 123-128.

Review, noting that superstition and prejudice have given way before the advances of medical science, although relatively scant notice is given to the disease in spite of the fact that it is the world's greatest crippler. The statement is made that 5 million people have been cured of leprosy, but 15 million victims remain. It is expected that within the next 5 years another million will develop the disease, and a quarter of them will be crippled.—E. R. LONG

Other Mycobacterial Diseases

Le Cat, F., Darasse, H., Maurin, X. and Veunac, J. A propos d'un ulcère a *Mycobacterium ulcerans*. [Ulcer due to *Mycobacterium ulcerans*.] Bull. Soc. franc. Dermat. et Syphilig. **76** (1969) 612-614.

Case report. Three months after a sojourn by the patient in the Congo a phlyctenular patch appeared on the thigh followed by necrotic ulceration, without collateral adenopathy. Histologic examination revealed only inflammatory necrosis and very numerous mycobacteria of *M. ulcerans* type. All therapeutic medication proved inefficacious; cure was attained only after wide and deep surgical excision.—P. HARTER

Reisner, R. M., Hutchinson, E., Thompson, S. and Hirose, F. Swimming pool granuloma. Arch. Dermat. **100** (1969) 780.

A 27 year old Samoan woman developed a deep nodule on the dorsum of her left foot in 1957 before leaving Samoa. While in Hawaii, new nodules developed on the inner aspect of the left knee and ulcerated. In the past year, nodules have reappeared on the left foot; some have ulcerated and discharged purulent material. On examination there were firm erythematous ulcerated nodules over the proximal phalanges of the left third and fourth toes and two similar nodules on the dorsum of the foot. *M. marinum* was identified in the lesions. There was no palpable adenopathy.—AUTHORS' SUMMARY

Miller, R. Fish tank granuloma. Arch. Dermat. **100** (1969) 780.

A 39 year old married woman cut her left index finger on an aquarium tank in November 1968, and, within a few weeks, a nodule formed. Biopsy and culture yielded *M. balnei* (*marinum*) with the following sensitivities: streptomycin, 50% resistant; para-aminosalicylic acid, 25% resistant; and isonicotinic hydrazide, 30% resistant.—AUTHOR'S ABSTRACT

Ferguson, S. H., Wallace, L. J., Dunbar, F. and Cacciatore, R. *Mycobacterium intracellulare* (Battey bacillus) infection in a Florida wood duck (*Aix sponsa*). Some epidemiologic considerations. American Rev. Resp. Dis. **100** (1969) 876-879.

A case of extensive infection in a wild Florida wood duck (*Aix sponsa*) by the Howell serotype of *M. intracellulare* (Battey bacillus) is reported. The strain manifested no pathogenicity for chickens, limited pathogenicity for rabbits, and high pathogenicity for mice. The patient from whom this serotype originally was obtained has had pulmonary disease since 1955, which has advanced steadily in spite of surgical resection and three hospitalizations. The wood duck was picked up within 100 miles of this patient's residence.—AUTHORS' SUMMARY

Bailey, R. K., Wyles, S., Dingley, M., Hesse, F. and Kent, G. W. The isolation of high catalase *Mycobacterium kansasii* from tap water. American Rev. Resp. Dis. **101** (1970) 430-431.

Eleven samples of tap water taken from the Martinez, California, water system at different times of the year were cultured for acid-fast bacilli. Ten samples yielded scotochromogens and 8 yielded high catalase-producing *M. kansasii*. Two samples of tap water taken from a point in the East Bay Municipal Utility District water system did not yield acid-fast bacilli. It is not clear how *M. kansasii* got into the city's water system, although soil is a possibility.—AUTHORS' SUMMARY

Virtanen, S. and Markkanen, T. Folate metabolism and virulence of mycobacteria. Tubercle (London) **50** (1969) 369-376.

The pteroyl glutamic acid content of 141 *M. tuberculosis* strains was determined with the aid of *L. casei*. Seventy-one drug-sensitive cultures on Finlayson's egg medium averaged 1,633 pg./mgm. of moist

weight and 50 drug-resistant cultures 1,632 pg./mgm. The yield was 5 times higher on Löwenstein-Jensen medium. Ten strains were PGA-negative and showed strongly attenuated virulence in the guinea-pig test. No significant difference in PGA content was found between *M. tuberculosis*, *M. bovis*, BCG, *M. avium*, several mycobacterial type strains and atypical mycobacteria.—AUTHORS' SUMMARY

Takagi, A., Esumi, I. et al. A strain of scotochromogenic atypical mycobacteria isolated from a preauricular subcutaneous abscess. *Kekkaku* 44 (1969) 315-320. (In Japanese)

The writers isolated a strain of atypical mycobacteria from a preauricular subcutaneous abscess in a 4 year old boy. Cultured repeatedly from the pus obtained by aspiration, the bacilli formed smooth yellowish colonies which grew best at 37°C. The niacin and urease tests and cord formation were negative, but the catalase test was strongly positive. The neutral red test was negative after extraction with 50% methanol and positive after extraction with absolute methanol. The Kf value (boiling fastness) was 1.5 minutes. The bacilli were pathogenic to mice when an inoculum of 8 mgm. was given intravenously. An outstanding characteristic of this strain was that it was susceptible to streptomycin. The

patient was treated with streptomycin, isoniazid, and later with kanamycin, and the abscess became sterile in 8 months.—(Abstract by I. T. Ebisawa. *American Rev. Resp. Dis.* 101 (1970) 478-479)

Vanek, J. and Schwarz, J. Demonstration of acid-fast rods in sarcoidosis. *American Rev. Resp. Dis.* 101 (1970) 395-400.

In 30 consecutive cases of sarcoidosis, including 18 of American origin, acid-fast bacilli were found microscopically in every instance. Patients with progressive healing and patients with caseous necrosis were excluded. The acid-fast bacilli were seen either as isolated bacilli or in groups. The staining properties and morphologic features of the observed bacilli were representative of mycobacteria. In 17 cases the diagnosis of sarcoidosis was based on involvement of at least two organ systems, usually lymph nodes and lungs, on lack of reaction to PPD, and on laboratory and histologic findings universally accepted as diagnostic of the disease. In 13 cases, the diagnosis was based mainly on histologic features, even though bilateral adenopathy existed in several of these patients and skin tests for tuberculosis gave no reaction. Cultural verification by modern methods and identification of the mycobacterial species should be attempted systematically.—AUTHORS' SUMMARY

Leprosy Research in the U.S.S.R.

The following account of leprosy research in the U.S.S.R. was sent to THE JOURNAL recently by Professor N. Torsuev, Contributing Editor:

In May 1969 a scientific-practical conference of leprologists and dermatovenereologists of Karakalpak ASSR was held in Nukus. Papers presented revealed the following:

At present 1,028 leprosy outpatients are under treatment in the Republic. In Nukus in 1963 leprologic branches of the Uzbek dermato-venereologic institute were opened in 4 districts. Antileprosy consulting rooms and antileprosy dispensaries with 25 beds were opened in Muynak. A

dispensary with 25 beds was opened in Nukus in 1964. Complex and combined treatment is conducted. Relapses were registered in 8.5% (N. N. Ivanova *et al.*). Analyzing the cause of relapses, G. N. Tchutchelin noted their equal frequency in men and women and their preferential appearance in winter and spring. Their main cause appeared to be insufficient treatment and concomitant disease. N. A. Vdovine and Y. P. Tyurin, in the majority of lepromatous leprosy patients, but especially in exacerbation phases, found an increased level of sialic acid content; this decreased to normal after disappearance of leprosy reactions. G. N. Tchutchelin *et al.*

recommended Ciba-1906 for patients who had received some courses of Solusulphone. Y. P. Tyurin reported some cases of resistance to sulfone preparations. P. S. Sobolev showed that oscillographic indices in treated patients with trophic ulcers improved, just as did electrothermometry indices. G. N. Tchutchelin, using an intradermal test with Congo red, showed that the resorbing ability of the skin is highest in lepromatous leprosy patients; in the phase of leprosy reaction it is usually depressed, just as in middle stages of sulfone treatment, a fact indicating the need to prescribe nonspecific, stimulating therapy at the same time as the usual antileprosy remedies. According to L. S. Sobolev, it is advisable to use vitamin complexes in the treatment of trophic ulcers in leprosy patients at the same time as antileprosy treatment, especially in combination with antibiotics. Determination of pain time and of specific reactivity with alcohol-chloroform, as practiced by Rosenthal, permitted early detection of tendency to the development of relapse. In tuberculoid, in contrast to indeterminate and especially to lepromatous patients, high nonspecific skin reactivity was noted (G. N. Tchutchelin). G. N. Tchutchelin and Z. F. Kadantseva found a clear decrease of antitoxic liver function in leprosy patients up to the end of treatment courses with Solusulphone; for this reason they recommended preparations to improve liver function in the second half of the course.

L. M. Tchernycheva studied histomorphologic changes at the site of lepromin injection in guinea-pigs and albino rats after BCG vaccination. He found that in such cases the reaction of guinea-pigs showed signs of allergic type, with increase in phagocytosis of mycobacteria by macrophages; in albino rats the phagocytic activity of macrophages remained unchanged. According to observations of G. N. Tchutchelin in lepromatous patients with active and progressing processes and also in patients at the end of Solusulphone treatment, there are decreased functional reserves of adrenal cortex; for this reason it is advisable to give small doses of corticosteroid preparations under the control of the

Torn test at the same time as antileprosy treatment. In such cases uropepsin determination may be important for prophylaxis against possible complications of steroid therapy (G. N. Tchutchelin). I. I. Pototsky recommended more extensive and different functional tests for control of reactivity status.

According to N. M. Goloshchapov, in patients who received pyrimidine derivatives and corticosteroid preparations with the usual antileprosy therapy, the course of leprosy reactions is milder, and they had somewhat fewer relapses. V. T. Snytko described vegetative-vascular paroxysms in patients long ill with leprosy (not less than 10 years) against a background of complicating diseases. G. B. Maksudov found by means of dynamic roentgenographic observations that bone lepromata regress only in rare cases; osteologic processes continue to progress in 78% of cases. According to the data of N. M. Goloshchapov *et al.*, pyrimidines stimulate protein metabolism in leprosy patients and accelerate formation of plastic material compensating for lost cells and tissues. They contribute to the formation of more tender scars and accelerate the healing of trophic ulcers.

N. A. Ivanova described a case of abortive tuberculoid leprosy with fast restoration of sensitivity and 2 cases of self-healing (T and L?) with presence of mycobacteria. R. A. Zaytsev reported that while inoculating some cell cultures with Stefan's mycobacteria he observed the appearance and reproduction of acid-sensitive diptheroids, a fact possibly pointing to the ability of some *M. lepraemurium* to change their tinctorial characteristics to the side of acid-resistance and to acquire ability to propagate on laboratory media.

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In September 1969, the usual regular symposium of Soviet leprologists, attended by 250 physicians and medical workers, was held in Kzyl-Orda. Seventy-five reports on three problems were presented: epidemiology and prophylaxis of leprosy, clinics and treatment, and laboratory-experimental investigations.

R. V. Kozyreva and V. S. Sim reported that in Kazakh SSR from 1955 on, 70,000 persons were vaccinated with BCG and 2,000 members of leprosy patients' families received preventive treatment. After 1958 the reported incidence of leprosy in the Republic decreased more than 5-fold. In the Rostov region in the 5 years from 1961 to 1966 the disease rate decreased more than 8-fold, in comparison with 1947-1951 (K. K. Harabadzhahov). In Turkmen SSR in 1968 relapses were registered in 4.3% of patients (L. F. Pekelnik), while in the Rostov region their number decreased from 4% in 1959-1963 to 2.2% in 1964-1968. In Tajik SSR all students in the fourth year of the medical institute go for some days into leprosaria (F. A. Kiyamov) for acquaintance with leprosy clinics. Out of 174 members of leprosy patients' families not receiving any preventive treatment, 10 persons fell ill (I-4, T-6), as compared with one case from 170 preventively treated (B. V. Zhutikova).

According to observations of A. M. Demina primary signs of leprosy were ephemeral in 35 out of 80 patients. These were cutaneous hypochromic or hypochromic erythematous patches with normal sensitivity; histologically, small perivascular round cell infiltration was seen. Primary disorders of vasomotor function in some sites of apparently healthy skin were expressed by increased vasodilatation and permeability of vessels, and a variety of other changes, including response to nicotinic acid, mechanical irritation, and the histamine test (N. I. Fedorov). According to observations of B. M. Azova in patients with facial nerve neuritis of nonleprosy etiology there was no partial damage of single muscles; sometimes there were pathologic dyskinesias, which are absent in leprosy; in leprosy neuritis there were no pains in damaged nerve.

V. T. Snytko reported that asthenic symptoms prevailed in the structure of leprosy psychoses, including anxiety-depressive, paranoid and depressive-paranoid symptoms, which were associated with vegetative disturbances.

According to material of G. S. Novak, an active lepromatous process leads to a

marked increase of basal metabolic rate, one of the indices of which is hyperventilation of the lungs as a sign of increased tissue respiration. Ch. A. Abdirrov, A. D. Dzhumanazarov and I. I. Podoplelov studied blood group factors and found that in leprosy patients $O > A > B > AB$; in the majority of patients (i.e., 315 out of 340) there were M- and N-antigens in the blood; they were absent in 24 out of 25 patients. The Rh-factor was negative in 4.2% of investigated patients, who were for the most part lepromatous. On the basis of variations in the intensity of skin vegetative test indices I. I. Pototsky confirmed different grades of functional disorder of the central nervous system in leprosy patients.

V. A. Evstratova *et al.* reported that injections of an oil suspension of Ciba-1906 are less effective than sulfone treatment and can be used only as a supplement in combined treatment. In early phases of leprosy neuritis good results followed intramuscular injections of Boyko mixture (Prozerin, vitamin B₁ and B₁₂, analgin and novocaine) up to 20 injections in one course, together with local thermal procedures, ultra-high frequency currents and irradiations with the mercury-quartz lamp. If there are nerve thickenings perineural or endoneural injection of a mixture of lidase solution in 0.5% novocaine with hydrocortisone suspension, 1.5-2.0 ml. per day (V. V. Bogun), is recommended. For prevention and treatment of neuritis parallel with general antileprosy treatment Y. L. Yoffe *et al.* recommended injections of steroids and hyaluronidase. O. I. Ryskulov reported successful operative treatment of paralysis of posterior foot flexors by displacement of the tendon of the posterior tibial muscle. While studying motor and sensory chronaxy before and after complex treatment of chronic foot ulcers in leprosy patients, P. S. Sobolev came to the conclusion that in these patients incomplete destruction of nerve stems occurs. V. K. Loginov and Z. A. Sluvko showed the possibility of intensive treatment of patients simultaneously with 2 or 3 antileprosy preparations in full doses, using different non-specific remedies that stimulate liver function, and also of general tonic preparations and a diet that "protects" the liver.

L. M. Luneva and P. P. Kulagin reported on the hepatotoxicity of modern antileprosy preparations. After investigating 48 patients with clinical relapses of lepromatous leprosy, R. K. Usmanov did not find any case of specific damage to the upper respiratory tract. Sh. I. Shapiro recommended that all lepromatous patients after terminating the outtreatment take, periodically, some courses of antirelapse therapy. According to the observations of V. V. Abrosimov, lepromatous damage in the mouth cavity was now found 4-5 times more rarely than in the presulfone period. E. S. Novak and Z. F. Kadantsev found that in all patients with an active lepromatous process the red cell count and hemoglobin content were decreased; during strong exacerbational reactions 2.2-2.4% of reticulocytes were found; blood saturation with oxygen was decreased.

U. V. Sididkov and M. N. Shneiderman studied the lepromin test and Mantoux reaction in 1,222 inhabitants of the Shaartuz district, Tajik SSR. The per cent of positive Mitsuda reactions was higher (32.3%) than that of early Fernández reactions (14%) and increased with age. Positive Mantoux reactions were found in 35.7%. Coincidence of positive Fernández and Mantoux reactions was found in 69% and Mitsuda and Mantoux reactions in 62.7%. Negative Fernández and Mantoux reactions were seen in 59.9% of investigated cases, and Mitsuda and Mantoux reactions in 52.3%. According to V. N. Pogorelov *et al.* tuberculin sensitivity in leprosy patients has a two-phase wavy character in its development; during exacerbation it is increased and in a greater degree reflects nonspecific sensitization and may have "latent" antigen determinants of mycobacterial antigens. In the exudate of the "cantharidin bladder" of leprosy patients V. A. Evstratova *et al.* found a much higher content of antihistamine factor than in blood serum; the antibody content in the exudate was lower than in the serum.

N. N. Ivanova and B. Nazhimov demonstrated that in leprosy patients, especially nontreated or in an exacerbation phase, tryptophane and some of its derivatives are found in the urine. According to the material of M. B. Parkhomenko, the level of

general cholesterol in the blood serum of patients during progressive disease is decreased, and the quantity of lipid phosphorus tends to increase in the majority of cases. In most leprosy patients with active manifestations, the content of sialic acids in blood serum is increased up to 220-420 units of optical density (V. K. Steklovsky). Z. V. Badovskaya reported on reflex changes of Na and K excretion of kidneys in leprosy patients, especially with active lepromatous disease, proving disturbance of nerve-humoral regulation of water-salt metabolism.

V. Y. Kurilov suggested that electron-dense inclusions in leprosy cells carry out lysosome functions; they are a heterogeneous group of cytoplasmatic organoids and give the leprosy cell digestive and lytic properties. A. A. Onishenko found crystallo-form inclusions in human leproma cells, which in ultrathin section had the form of oval bodies, bordered, as a rule, by a elementary membrane and consisting of alternating dark and light stripes with a repetition period of approximately 100 Å units. In rat leprosy they are absent. In most human and rat leproma cells containing mycobacteria, mitochondria are swollen, crypts are shortened and reduced to the point of complete disappearance with lightening of matrix; occasionally accumulation of electron-dense material in mitochondria with cell debris was seen. According to N. A. Vdovin powdered particles and silver granules revealed by the Giron-Leblond method in lepromatous granulomata have a mycobacterial origin. According to G. F. Zhuravleva increase in enzyme activity in the Krebs cycle in the skin of active lepromatous leprosy patients is the result of metabolic disorders, pointing to an active life of leprosy cells; depression of these enzymes in the regressive phase of the disease is one of the signs of normalization of oxidation-reduction processes. By histochemical and histoenzymologic methods, F. E. Vishnevetsky demonstrated a pronounced decrease of intensity of oxidative metabolism in granuloma formations in the liver, in comparison with skin granulomata. Preliminary adaptation of mycobacteria to a decreased level of oxidation-reducing processes explains the resistance of liver

granulomata to antileprosy treatment. G. F. Zhuravleva *et al.* investigated the activity of some oxidative-reducing enzymes in the skin of leprosy patients during exacerbation of lesions of erythema nodosum type, and found numerous changes in cell metabolism, especially in aerobic oxidation. L. I. Kosolapkina studied the histopathologic picture of peripheral nerves in patients with regressing leprosy and confirmed the opinion of some authors that Schwann cells are the site of biologic accumulation of disease agents. N. A. Vdovina and P. S. Sobolev investigated chronic ulcers of the lower extremities in leprosy patients morphologically and histochemically, and came to the conclusion that deep degenerative changes occur with weak reactivity of connective tissue.

Ch. A. Abdirov and N. S. Suleymanov studied the human leprosy agent in cell cultures of 7-11-week-old human embryos and observed the greatest phagocyte activity in embryo cultures; in interwoven lines it was 2-3 times weaker. In experimental cultures infected with mycobacteria on the 7-10th day dystrophy and degeneration of the cells usually occurred, and control cell cultures survived much longer without changes. O. V. Pervukhin reported on biologic characteristics of many mycobacteria isolated by several authors from leprosy patients. He studied them morphologically and culturally and suggested that all were saprophytic.

Using the cytochemical stain of C. Lack (1953), S. V. Androsova found that *M. lepraemurium* stained by malachite-green-fuchsin to a green color, provoked generalization of infection during passage in mice;

in cases where mycobacteria were for the most part red, the development of infection was retarded considerably. Under the influence of chemotherapy the quantity of red mycobacteria increased. F. H. Ibraghimov, after inoculating 66 albino rats with human leprosy mycobacteria by Shepard's method, found single mycobacteria only in those in which the vitamin E level in the liver varied from 2.08% to 4.16%. In animals without mycobacteria this index varied from 4.16 to 20.83%. He reported also that albino rats receiving vitamin E in an ambient temperature of 15°C showed decreased oxygen consumption. While studying possible causes of alopecia of some rodents, I. P. Druzhinina *et al.* found nematode larvae in diseased skin in infected and noninfected animals. N. Y. Ryzhova found changes in respiratory enzyme activity and liver endogenous respiration intensity in rat leprosy. Solusulphone injections in infected animals, especially with ecmoline, regulated endogenous respiration and increased activity of the respiration enzymes succinodehydrogenase and cytochromoxidase for 32-52 weeks after injection of the preparation. Later on liver tissue respiration decreased. M. N. Dyachina suggested that the appearance of γ -2-globulin in sera of rats with rat leprosy may not be connected with leprosy process specificity, but its level permits judgment on the phase of disease development. I. P. Druzhinina and E. I. Chekalina showed an effect of 2.5 and 5% solution of chloramine and 48% ethyl alcohol for 24 hours at room temperature on rat lepromin suspension leading to loss of ability of these mycobacteria to cause the disease in albino mice.—N. TORSUEV