

CURRENT LITERATURE

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

General and Historical

Danielssen, D. C. and Boeck, W. Regulations concerning lepers. Translated from *Traite de la Spedalskhed*. Paris: Bailliere, 1848, pp 120-22. Bull. N.Y. Acad. Med. **49** (1973) 567-568.

Lepers were forbidden to go from their retreats into the cities, except on special occasions such as Holy Week, Easter and Christmas. At such times they had to announce their arrival by means of a rattle, by a bell, or by a cask on the back, so that other persons might get out of their way or throw them alms from a safe distance. They themselves were obliged to avoid every person who came toward them and to take a position according to the way the wind blew, so that no one was inconvenienced by their breath and by their body odors. In order to buy something they had to point out the object by touching it with a cane. They might not enter houses but must remain at the door and ask for what they wanted. They might not show themselves in public without their special costume and with bare feet; nor might they go into the churches, the mills, or the bakeries; nor wash their hands or their utensils in fountains and streams; nor touch children or give them something they had touched, or appear at assemblies, or eat or drink with persons who were not lepers. If they undertook pilgrimages to St. Mavins in Brittany they were compelled to attach a woolen sleeve over the chest and on the head so that other persons could recognize them at a distance and keep away. In the cities everyone was forbidden under threat of severe punishment, to receive and harbor lepers. Entire villages were punished for not having reported infractions.

In addition to these general regulations, there were others that were in effect only in certain communities. The old laws of the Scottish towns had several, for example:

"The leper shall not go from door to door but shall sit at the gate of the castle and beg alms of those who enter and leave"; and later this additional passage: "No leper may enter by the gate of our castle. If he happens to enter, he must be taken outside the castle immediately. If one of them violates this regulation, he shall be stripped and his clothes shall be burned and he shall be chased out of the castle naked."

The person who was declared to be a leper was treated like a dead man. All the funeral ceremonies were performed while he was alive. The office of the dead was celebrated over him and he was carried to his dwelling-place. This was done with certain special ceremonies. The priest, dressed in sacerdotal vestments, went with a cross to the leper, who was prepared for this ceremony, and began by encouraging him to bear with resignation the incurable illness that God had sent him. He sprinkled holy water on the man and accompanied him to the church while singing the ordinary hymns for the dead. On reaching the church the leper took off his usual clothes and put on a black robe, prepared for him. He knelt before the altar and heard the mass, the same that is celebrated for the dead. After this he was sprinkled again and was taken to the sacred place reserved for his retreat. On arriving he was again encouraged in resignation by the cleric, who encouraged him and threw a clod of earth at his feet. Lepers were regarded as dead persons among the living.

Goonaratna, C. de F. W. Some descriptions of leprosy in the ancient medical literature of Ceylon. Med. Hist. **17** (1973) 308-315.

The author briefly notes the history of Ceylon from the time of the Portuguese takeover in 1505 A.D., noting that records for Portuguese period of occupation (1505-1658)

are scarce while those of the Dutch period (1658-1815) are good and clearly indicate the presence of leprosy as a problem. The author seeks clues of leprosy presence in the pre-Portuguese period. This is attempted through an analysis of terms used for leprosy and a search for these terms in the medical literature. For this, reference is made primarily to the *Yogārnava* (c. 1273 A.D.) and the *Bhāsajja Manjusāva* (12th cent. A.D.) which are Ceylonese medical compilations derived in some measure from Indian literature. In these, leprosy is clearly described including ulcerative and neurologic manifestations. Depression of the nasal ridge due to bone lesions and ocular and laryngeal lesions were recognized. The author concludes that the compilers of these works would hardly have devoted extensive chapters of their treatises to this subject if leprosy had been nonexistent in the land. —O. K. Skinsnes

Irgens, L. M. and Bjerkedal, T. Epidemiology of leprosy in Norway: the history of the National Leprosy Registry of Norway from 1856 until today. *Int. J. Epidemiol.* 2 (1973) 81-89.

The leprosy registry was the first national patient registry established in Norway. Founded in 1856, it formed a part of the program for the control of leprosy which at that time was a major health problem in the country. Through the collection of detailed case histories on all leprosy patients from 1856 until today, the registry came to play a significant role in the control of the disease in local districts. Analyses of the total registry material made it possible to evaluate trends in prevalence and thus to make plans for medical care facilities and for any changes in the control program that proved

necessary from time to time. The experience gained by the leprosy registry over the years has made a great impact on further developments in disease control in Norway. In particular, the history of the leprosy registry had demonstrated beyond doubt the usefulness of central patient registries in the solution of public health problems.—Authors' Summary

LEPROLOGIA, 18, No. 1 (1973).

The first 1973 issue begins with an editorial by Consigli which reminds one that, in the prevention of leprosy in rural areas, much can be accomplished at the expense of personal energy, and money is not everything. Felix F. Wilkinson follows with a report on his efforts to cultivate *M. leprae*, and Vázquez, Yantorno and Riera report the rheumatoid factor and heterophile antibodies related especially to L-3 cases. Drs. Arguello Pitt *et al* study the value of thalidomide in the treatment of the acute reaction in leprosy, confirm its value, having observed spectacular relief of symptoms, especially those related to nerve involvement. Carranza Goycochea *et al* found that by arteriography of areas supplied by the posterior tibial artery it was possible to predict the degree of compromise of tissues supplied. Early surgery is essential in preventing subsequent mutilating ulcerous lesions. In a study of visceral lymph nodes from 50 autopsied cases, Bernard and Vázquez found changes to be most related to frequent reactive phases, related to cutaneous allergy, suggesting a new entity. Consigli and Blanzari write on endemic leprosy in San Justo department of Cordoba Province; Baliña discusses the panorama of psychology in leprosy; and González del Cerro summarizes the effects of inpatient leprosy institutions in Argentina.—G. L. Fite

Clinical Sciences

Adu, D., Evans, D. B., Millard, P. R., Calne, R. Y., Shwe, Tin and Jopling, W. H. Renal transplantation in leprosy. *Brit. Med. J.* 2 (1973) 280-281.

This article reports renal transplantation in a patient at age 27, who had had leprosy apparently for 16 years, although so inactive at the time of the transplantation that it was

not then recognized. Twenty-three months after the transplantation an acute lepra reaction appeared, and the lepromatous form of the disease was effectively treated with dapsone, and clofazimine. The patient died four years and nine months after transplantation, the transplant having lost most or all of its function, probably because of immune

rejection. The case is interesting because of the loss of cell-mediated immunity in lepromatous leprosy, the success of the graft, and the question of whether immunosuppressive agents might be expected to benefit the lepra reaction as well as the allograft. —G. L. Fite

- ✓ **Agarwal, D. P., Goedde, H. W., Schloot, W., Flatz, G. and Rohde, R.** A note on atypical serum cholinesterase and genetic factors in leprosy. *Hum. Hered.* **23** (1973) 370-373.

Serum cholinesterase variants were determined on the basis of "dibucaine number" in normal and leprosy patients from Ethiopia. No association between atypical cholinesterase variant and leprosy could be established. —Authors' Abstract

- ✓ **Ananthakrishnan, R., Walter, H., Kellermann, G. and Matznetter, Th.** Further studies on associations between leprosy and genetic markers in human serum. *Humangenetik* **19** (1973) 183-192.

Seven serum proteins were typed on a sample of 910 individuals from Angola, Africa. The sample consisted of both leprosy patients and healthy controls from the same geographical area. Significant associations with leprosy were found for the Hp and Pi systems. The results are discussed. —Authors' Summary

- ✓ **Bazex, A., Dupre, A., Christol, B., Salvador, R. and Bazex, J.** Xanthomes au cours d'une lèpre T. [Xanthomas developing in a "T" (? tuberculoid) leprosy patient.] *Bull. Soc. Fr. Dermatol. Syphiligr.* **79** (1972) 577-578. (In French)

Miss R presented a diffuse form of leprosy that had been diagnosed in 1945 when she was 19 years old. She had been treated between 1945 and 1950 by chaulmoogra oil and vitamin C. In 1950 she was put on sulfones until 1964. In 1964, these medications were stopped and Ciba 1906 started at two tablets per day, every other day (?), and concurrently she received a local and systemic medication for her eyes.

We have followed her since 1969. Her skin was completely atrophic, and there were some neural changes which had produced some sequellae of the extremities. Since the latter part of 1969, we have noted the gradient appearance of some yellow plaques of

widely varying sizes, primarily on the face and upper extremities. These spots are hard to see, and of variable dimensions.

Histopathologically, these lesions were diagnosed as xanthomes. The foamy cells filled the dermis, from which the collagen had completely disappeared. There were no Hansen's bacilli in these lesions and the Stefan-sky reaction was normal. Under these circumstances these cells were not considered to be Virchow cells. Several laboratory examinations of the blood were done—total lipids, cholesterol, and triglycerides. All of these were normal. We think that this is only a case of a xanthomatosis resulting from a local physiologic process, such as is seen in scar formation. Perhaps the Ciba 1906 played a role in the appearance of the xanthomatous cells in the scars.

In spite of the physiopathologic uncertainties, our observation has been published because of its iconographic interest (? peculiar nature). —(Translated from French)

- ✓ **Belopasov, V. V., Reshetnikov, V. N., Kozyrkova, E. I. and Verbina, N. K.** Electromyographic changes in patients with leprosy in the phase of exacerbation. *Vest. Derm. Venerol.* **3** (1973) 29-33. (In Russian)

Using the clinical and electromyographic methods of examination in 27 patients with leprosy in the phase of exacerbation, the authors revealed changes indicating involvement of the nervous system in the pathologic process. The possibility of participation in the process of the segmentary apparatus of the spinal cord was demonstrated. Use of the method of "global" electromyography is conducive to detection of pathology in clinically intact muscles, determination of topicity and depth of affection of the neuromuscular apparatus. —Authors' Conclusions

- ✓ **Bhattacharya, S. K., Girgla, H. S. and Singh, G.** Necrotizing reaction in lepromatous leprosy. *Leprosy Rev.* **44** (1973) 29-32.

Classification of the lepra reaction is reviewed. The cutaneous eruptions in the form of vesicles, pustules, or necrosis are indicative of a severe form of the reaction. A case is reported in a woman who presented, for the first time, a lepra reaction. She had systemic symptoms, and cutaneous and mucous membrane lesions leading to palatal perforation. The rarity of lesions of this type and

the difficulty in their categorization into recognized types of lepra reaction are discussed.—G. L. Fite

✓ **Browne, S. G.** Recognition of leprosy. *Trop. Doct.* 3 (1973) 3-5.

This is a brief, two page summary of major clinical findings that might lead to a diagnosis of leprosy.—O. K. S.

✓ **Browne, S. G.** Management of leprosy in the community. *Trop. Doct.* 3 (1973) 5-8.

This brief review presents summary answers to questions as to whether every diagnosed leprosy patient should receive treatment, where the patient should be treated, protection of contacts and treatment of contacts and similar related practical questions.—O. K. S.

✓ **Carayon, A. and Biot, J.** Manifestations articulaires, musculaires et cutanées des états réactionnels au niveau de la main du lépreux. [The articular, muscular and cutaneous manifestations of reactional states in the hands of patients with leprosy.] *Med. Trop.* 33 (1973) 25-41. (In French, English summary)

The authors review summarily the broad pathology of damage to the soft tissues and bones of the hand resulting both from the acute inflammation of the reactional state and from peripheral nerve damage. Their main emphasis is on the structural damage sustained by the skin and subcutaneous tissues and the small joints during "reaction." These clinically observed complications are illustrated by helpful radiographs, which show osteoarthritic changes, periarticular decalcification, progressive destruction of articular surfaces, spontaneous arthrodesis in various positions, and the "intrinsic-plus" (swan-neck) deformity of the fingers. Consequential paralyses and fibrotic contractions of the intrinsic musculature of the hand lead to bony absorption and dislocation of the interphalangeal joints. The skin over the dorsum of the hand, becoming fibrosed, retracts and binds skin and tendon to bone.

The authors provide detailed operative directions for the correction of established deformity, and some useful, but all-too-brief, hints on the prevention of the disabling and stigmatizing conditions they describe so well.

Orthopedic surgeons interested in leprosy

and its surgical pathology will find this paper of stimulating interest.—S. G. Browne

✓ **Chacko, V., Mall, B., Shukla, R. K. and Gupta, A. K.** Assessment of sublimis transfer operation in leprosy. *Leprosy in India* 45 (1973) 148-150.

1. Results of sublimis transfer operation in 32 hands showed that it is suitable for all ages.

2. The patients are more easily rehabilitated and reeducated after sublimis transfer operation than after other operations.

3. Check rein deformity was noticed in a few patients only but in one patient it was severe enough to handicap function.

4. Intrinsic plus deformity was not seen in our follow-up cases.

5. Sublimis minus hand was seen in four cases where the hyper-extension was about 5°. But this was of no consequence.

6. This operation should be done in the presence of a few degrees of fixed contractions at the proximal interphalangeal joint.

—(Adapted from authors' summary)

✓ **Curtiss, Paul H., Jr.** Some uncommon forms of osteomyelitis. In: *Clinical Orthopaedics and Related Research*. Marshall R. Urist, ed., Philadelphia: J. B. Lippincott Company, Number 96, 1973, pp 84-87.

Salmonella osteomyelitis, brucellosis, coccidioidomycosis, blastomycosis, actinomycosis, Madura Foot, lues, leprosy, and bacterioides occur uncommonly but require constant vigilance in patients with bone or joint infections.—Author's Summary

✓ **Davey, T. F. and Barton, R. P. E.** Multiple nasal smears in early lepromatous leprosy. *Leprosy in India* 45 (1973) 54-62.

Multiple smears for *M. leprae* were taken at various sites in the noses of 100 patients suffering from lepromatous leprosy in its earlier stages, with the object of investigating a) the parts of the nasal cavity most intensely involved in early lepromatous leprosy, and b) the concentration of *M. leprae* at sites in the nose as compared with sites in the skin. From four to ten sites were tested in each patient.

The results were profoundly influenced by previous chemotherapy. Among 58 untreated cases of early lepromatous leprosy,

nasal infection was very important, but was concentrated on the inferior and middle turbinates and the septum at a depth of 6 cms rather than in the anterior septal area, which in this series was an unreliable guide to the bacteriological situation in the nose.

At the same time, the BI at sites in the nose exceeded the BI at the most heavily infected skin site tested in 50% out of 100 patients. In this series the nose was an important site of election for *M. leprae*. Nasal infection was not something which developed as the lepromatous condition advanced. It was both present and severe in the early stages.—Authors' Summary

✓ **Dolezalova, V.** Očni projevy lepry. [Eye symptoms in leprosy.] *Cesk. Oftalmol.* 29 (1973) 388-392. (English summary)

The author summarizes the ocular symptoms of leprosy from literature and his own observations as a guide for ophthalmologists, working in countries where this sad chapter of ophthalmology still has its occurrence. With increasing tourism and growth of international cooperation the danger of bringing in of this epidemiologically serious disease even in our countries rises and so it is necessary even for European ophthalmologists to know its symptomatology.

The case of a 27 year old Tunesian is described in whom terminal states of the lepromatous type of ocular leprosy was diagnosed with affliction of all examinable parts of the eyes without chance of functional improvement.—(Adapted from English summary)

✓ **Enna, C.D. and Riordan, D.C.** The Fowler procedure for correction of the paralytic claw hand. *J. Plast. Reconstr. Surg.* October (1973) 352-360.

The Fowler principle is a fundamental one and the described tendon transfer is based upon his concept—for correction of the paralytic claw hand.

The method of insertion of the tendon transfer slips is modified, depending upon the mobility of the finger joints.

Correct tension is essential, because an excessive pull will produce the "intrinsic plus" deformity, while inadequate tension will not fully correct the deformity.

The two main problems of the original Fowler procedure have been analyzed and they can now be overcome.

In addition to the full modified Fowler procedure for the complete claw hand, other small modifications of it are also useful in individual cases. The EIP transfer is effective in correcting the clawed ring and little fingers resulting from ulnar paralysis. In instances of a claw hand due to combined ulnar and median nerve paralysis, where the ring and little fingers are not amenable to tendon transfer but are corrected instead by fusion of the PIP joint (or capsuloplasty of the MP joints), the EIP transfer is used instead to correct the clawed index and long fingers.—Authors' Summary

✓ **Friedmann, P.S.** Dapsone-resistant leprosy. *Proc. Roy. Soc. Med.* 66 (1973) 623-624.

The patient, a woman age 48 years from Guyana, had been living in the U.K. for 15 years. Painless papules had developed on her face, arms and legs over the past four to five months. At first she denied having had any previous illness, but later admitted that she had been treated for leprosy in Guyana at the age of 13 and had been taking dapsone (sent from Guyana), 50 mg twice weekly for at least 20 years. Acid-fast bacilli were present in "vast numbers" in the skin lesions.

In comment on this case presentation, Dr. Stanley Browne said that the long history of self-medication with dapsone, perhaps irregular, and the recent subacute clinical exacerbation with a high proportion of morphologically normal leprosy bacilli in the lesions were very suggestive of a relapse of near-lepromatous leprosy occurring as the result of the emergence of drug-resistant organisms. The small fleshy papules, of no special distribution, were typical of clinical relapse. He also mentioned the value of the mouse foot pad inoculation technic in confirming drug resistance [see *Trop. Dis. Bull.* 65 (1968) abstr. 2828; 68 (1971) abstr. 1013]. All patients hitherto found with dapsone-resistant bacilli have responded to either clofazimine or rifampicin.—F.I.C. Apted (From *Trop. Dis. Bull.*)

✓ **Garner, M.F., Backhouse, J.L., Daskalopoulos, G. and Walsh, J.L.** The *Treponema pallidum* hemagglutination (TPHA) test in biological false positive and leprosy sera. *J. Clin. Pathol.* 26 (1973) 258-260.

The *Treponema pallidum* hemagglutination (TPHA) test was carried out on 274

sera known to show biological false positive reactions to reagin tests for syphilis. The *Treponema pallidum* (TPI) and fluorescent treponemal antibody absorption (FTA-ABS) tests were nonreactive on all these sera. Thirty-one or 11.3% showed reactive results in the TPHA test.

Sera from 267 people who had lepromatous leprosy were also tested in the TPHA test. Fourteen sera were reactive in the TPHA, TPI and FTA-ABS tests and were from people who had both syphilis and leprosy. Biological false positive reactions were shown by 26 of the leprosy sera, of which three or 11.5% were also reactive in the TPHA test. A further four sera in the leprosy group were reactive only in the TPHA test.

The possible cause of false reactive TPHA test results is discussed. It was concluded that where reagin and TPHA tests are reactive in a person who has no history or clinical signs of syphilis, the serum should be referred for TPI and FTA-ABS testing.—Authors' Synopsis

Gottlieb, L.S. and Southgate, M.T. Acute adenopathy in a young man. *JAMA* 224 (1973) 1737-1746.

This is the verbatim record of a case presentation and discussion. The patient, a young Portuguese man, had lived in Angola for six years, until he entered the United States nine months before the onset of his illness. He was admitted to the Boston City Hospital two weeks after the sudden appearance of a tender mass in his groin for which he received penicillin treatment as an outpatient. On admission he was febrile and delirious, with enlargement and tenderness of the lymph glands, especially those in the inguinal and femoral regions. Out of a large number of investigations, only the tuberculin test was positive, with an induration of 20 mm, and treatment for tuberculosis was started, but without beneficial effect. It was noted at this time that lymph node aspiration produced abundant acid-fast material, but this was thought "possibly to be artifactual."

The discussion was led by Dr. F.A. Neva who dealt with the many possibilities in the differential diagnosis and concluded that the patient was suffering from *erythema nodosum leprosum*—the diagnosis of acute lepro-

matous leprosy was subsequently confirmed, and "retrospective examination did indeed reveal the typical cutaneous and neurological lesions of lepromatous leprosy." This discussion, in which a number of experts in tropical medicine and pathology took part, makes interesting reading in the original, and provides details of further clinical and pathological investigations. There are ten photomicrographs in color which show the histology of the lymph glands and of skin and sural nerve preparations. A section of a gland showed "massive numbers" of acid-fast bacilli.

Twelve cases of leprosy have been seen in Boston "in the past year."—F.I.C. Apted (*From Trop. Dis. Bull.*)

Guerrero-Santos, J., Casteneda, A. and Fernandez, J.M. Correction of alopecia of eyebrows in leprosy patients, by José Guerrero-Santos, M.D., Rodolfo Matus, M.D., and Alfonso Vera-Strathmann, M.D. [*Plast. Reconstr. Surg.* 27 (1961) 316]. *Plast. Reconstr. Surg.* 52 (1973) 183-185.

In this brief note, the authors illustrate late results of bipedicle scalp flap grafts used to replace lost eyebrows in two patients, originally reported in the same journal [27 (1961) 316]. After 12 years, the grafts are in excellent condition, and, with good care by the recipients, the final results are splendid. As with hair transplants, the original hairs fell out of the grafted skin, but new hairs grew back after three to four weeks, and the regrowths have persisted.—G.L. Fite

Hertzman, Carl A. Use of Plastazote™ in foot disabilities. *Am. J. Phys. Med.* 52 (1973) 289-303.

The use of Plastazote™ has proven to be a major advance in the treatment of various foot deformities. The properties of the material make it applicable to a wide variety of foot problems. Successful fitting depends on correct prescription and skilled construction of the inlay. It is urged that more physicians become acquainted with Plastazote™ and its uses and that technicians be adequately trained in the construction of the insoles and sandals.—Author's Summary

Hornblass, Albert. Ocular leprosy in South Vietnam. *Am. J. Ophthalmol.* **75** (1973) 478-480.

Fifty-one Montagnards in South Vietnam with proven leprosy were studied ophthalmologically. Of these, 39 had ocular involvement. The cornea was involved in 31 of the 39 patients. About the same percentage of ocular complications were seen in cases of lepromatous leprosy as tuberculoid and the mixed type. Five patients were blind.—Author's Summary

Ivanova, N.N. and Nazhimov, B.N. [Tryptophan and its derivatives in the urine of leprosy patients.] *Vestn. Dermatol. Venereol.* **47** (1973) 32-34. (In Russian, English summary)

Examinations for tryptophan and its derivatives, (5-oxyindolacetic, anthranilic, xanthurenic acids, serotonin, etc.) in the daily urine by the method of paper chromatography with pretreatment of the urine according to the method of Makino (1956) were carried out in 10 practically normal subjects and 60 patients with leprosy (54 with lepromatous, 2 with nondifferentiated types and 2 in the phase of transformation of leprosy from nondifferentiated into lepromatous type). In 23 patients and 2 normal subjects the examinations were carried out both before and after loading with 2.0 DI of tryptophan.

Patients with lepromatous leprosy were found to have disorders of kinurenic and serotonin ways of tryptophan metabolism manifested in appearance of tryptophan derivatives in the urine. In patients in the re-

gressive stage of lepromatosis and with the other types of leprosy such disorders were detected only after tryptophan loading.

Determination of tryptophan metabolites in the urine may serve as an auxiliary test for judging of the functional status of the liver and a kind of additional feature for individualizing antileprosy therapy.—English Summary

Joshi, P.B., Shah, A.H., Agashe, P.K., Bafna, R.G. and Joshi, P.V. Ocular manifestations of leprosy. *Indian J. Med. Res.* **61** (1973) 435-441.

This article lists the eye findings in 654 leprosy patients seen at the dermatology department of the Sassoon General Hospitals in Poona, India, on the west coast south of Bombay. Two-thirds of the patients were in the 20-60 age group, and 84% were nonlepromatous. Ten percent were bacteriologically positive.

Eye changes were seen in 26%, but in half of these patients duration of the disease was four years or less. The overall findings compared well with other reports in groups of patients of comparatively low infectivity, no total blindness having been seen.—G. L. Fite

Lee, J.S. Clinical application of pyridinolcarbamate in leprotic skin ulcers and lepra reactions. *Asian Med. J.* **16** (1973) 337-348.

Pyridinolcarbamate, 750 to 1500 mg daily, was administered to 18 patients. In six of ten with skin ulcers (mostly plantar), a relatively favorable effect was observed. Slight improvement in two of eight cases of lepra reaction appeared but not in the other six.—G. L. Fite

Chemotherapy

Banerjee, D.K. Failure of thiosemicarbazone derivatives and other antitubercular compounds to inhibit *Mycobacterium leprae*. *IRCS (Microb. Parasit. Infect. Dis.; Pharmacol.)* **2** (1974) 1040.

Seven compounds, previously shown by laboratory assessment to have antituberculous activity, were tested for their effect on mouse foot pad inocula of mouse-passage strains of *M. leprae*. The first four of the

drugs named below were tested against one strain, and the other three against a different one. The methods used were in general according to the approach of Shepard and Chang and Shepard. Each drug was incorporated in the diet at a concentration of 0.01% except when this dosage was too toxic to mice. Drug administration was begun 45 days after inoculation and continued for 60 days.

The compounds were as follows: a) *p*-formylacetanilide 4-butyl-3-thiosemicarbazone; b) *p*-isobutoxybenzaldehyde 3-thiosemicarbazone (0.003%); c) *p*-isopropylbenzaldehyde 3-thiosemicarbazone (0.003%); d) isonicotinic acid 1-oxide hydrazide; e) cyanoacetic acid, 2,2-dimethylhydrazide; f) 5-bromosalicyl hydroxamic acid; and g) 6-heptyl-2-thiouracil.

None of the compounds significantly affected the growth curves of *M. leprae* in the mice treated with them as compared with the untreated controls, and it is therefore considered that no useful antileprosy activity was detected under the experimental conditions provided.—(Adapted from author's article)

Burchfield, H.P., Storrs, E.E., Wheeler, R.J., Bhat, V.K. and Green, L.L. Gas chromatographic methods for analysis of sulfone drugs used in leprosy chemotherapy. *Anal. Chem.* **45** (1973) 916-920.

4,4'-diaminodiphenyl sulfone (DDS) and 4-acetamidophenyl-4'-aminophenyl sulfone (MADDS) in human or animal plasma can be measured by gas chromatography at the nanogram level following extraction and derivatization. The meta derivatives of both compounds are added to the samples prior to extraction to serve as internal standards. DDS is converted to 4,4'-diiododiphenyl sulfone (1-DDS) and MADDS to 4-aminophenyl-4'-diiododiphenyl sulfone (1-DDS) and MADDS to 4-aminophenyl-4'-iodophenyl sulfone (1-MADDS). The compounds are separated on 3% Poly-A-103 and measured by an electron capture detector. Acetyl derivatives of DDS can also be measured by reduction of the acetyl groups to alkyl groups, separation of the reduction products on 3% SE-30, and measurement of the nitrogen content of the amines with an electrical conductivity detector.—Authors' Abstract

Hilson, G.R.F. and Banerjee, D.K. The proportional bactericidal test: a method for testing *in vivo* bactericidal action of a persistent drug. *IRCS Biomed. Tech.*; (Microb. Parasit. Infect. Dis.; Pharmacol.) **2** (1974) 1037.

The basic or "reference" test for bactericidal action of an antileprosy drug involves subinoculation of homogenates of infected

tissues of patients or experimental animals treated with the drug into foot pads of mice; these are then sampled at intervals for evidence of infection arising from surviving bacilli. Although it is considered reliable, the tedious characteristics of this approach are well known. The "kinetic method" was devised by Shepard in which the delay in appearance of bacillary growth in mice treated for a limited period after foot pad inoculation as compared with controls is used to deduce the loss of viability. Absence of bactericidal action appears to be reliably shown by this method, but persistence of drug (e.g. clofazimine) or of bacteriostasis after drug administration has ended may render conclusions as to its presence doubtful.

A modified approach has been devised to try to overcome this difficulty and is referred to as the "proportional bactericidal test." It involves inoculating groups of mice with serial dilutions of a bacillary suspension, treating them for a limited period, and then sampling them after a period long enough to allow disappearance of drug or bacteriostasis, and to allow subsequent development of detectable growth arising from one or more surviving bacilli. The assumption is made that the chance of surviving bacilli being present after drug action is related to the size of the original inoculum and the extent of bactericidal action.

A model experiment on these lines has been completed in which, for convenience, *Mycobacterium lepraemurium* was used. The actions of isoniazid (INH), well-known to be bactericidal to this species, and of two riminophenazines were compared. Groups of mice received in one testis an inoculum of 0.02 ml of serial dilutions of a homogenate of infected mouse liver adjusted to contain an appropriate bacillary concentration. The numbers of mice, and the numbers per testis of *M. lepraemurium* (as total AFB) are shown in the table.

	Inoculum sizes (AFB per testis):					
	10 ⁶	10 ⁵	10 ⁴	10 ³	10 ²	10 ¹
Control	5/5*	5/5	5/5	5/5	3/5	1/5
B663	9/10	5/10	3/10	2/8	2/10	0/10
B1912	8/10	7/9	7/10	5/9	4/9	1/9
INH	2/10	2/9	1/10	0/8	0/9	0/7

*No. of testes showing growth/No. harvested.

Seven days after inoculation, dietary treatment with 0.01% of INH, B663 (clofazimine) or B1912 respectively was begun (a dosage 10-30 times higher than the minimum inhibitory dosage of the riminophenazines for this organism). Treatment was continued for 60 days. Six months after inoculation the testes were harvested, and slides prepared for AFB counting on homogenates. Generally obvious growth or no growth could be recorded. The results are shown in the table.

The results were analyzed by the 50% endpoint (ID_{50}) determination of Reed and Muench as applied to neutralization of serial dilutions of virus suspensions by a single concentration of antiserum. The analysis indicated reductions in infectivity to 0.6% for B663, to 3.3% for B1912, and to 0.005% for INH. Thus the expected powerful bactericidal action of INH was found, and a moderate action due to B663 and B1912. The approach therefore appears to be valid; refinement and adaptation to the problems posed by the assessment of *M. leprae* growth will, however, be needed.—(Adapted from authors' article)

Jacobsen, P. L., Ng, H. and Levy, L. The susceptibility of mycobacteria to hydnocarpic acid. *Am. Rev. Resp. Dis.* **107** (1973) 1022-1029.

To learn whether the therapeutic effect of chaulmoogra oil in leprosy represented a direct antimicrobial effect or an indirect effect on host defenses, the activity *in vitro* of hydnocarpic and chaulmoogric acids—cyclopentenyl fatty acids and major constituents of chaulmoogra oil—was studied against 47 mycobacterial strains representing 16 species. The acids, isolated in 98% purity from chaulmoogra oil, inhibited multiplication of 38 strains in a concentration of 30 $\mu\text{g/ml}$. Strains of *M. gordonae* and *M. intracellulare* were most susceptible. Hydnocarpic acid was slightly more active than chaulmoogric acid. Several straight-chain fatty acids and dihydrochaulmoogric acid were inactive. Hydnocarpic acid therapy could be considered in the treatment of disease caused by strains of *M. intracellulare* resistant to the action of all other antimicrobial agents. More important, new compounds with analogous structures may provide an important new class of antimicrobial agents.—Authors' Abstract

Kenwright, S. and Levi, A. J. Impairment of hepatic uptake of rifamycin antibiotics by probenecid, and its therapeutic implications. *Lancet* **2** (1973) 1401-1405.

Rifampicin, an important but expensive drug in the treatment of tuberculosis, is largely metabolized by the liver. The possibility that the hepatic uptake of rifampicin could be depressed by treatment with probenecid was investigated in rats and man. Rifamycins and probenecid were shown to have similar effects in depressing the hepatic uptake of bromsulphthalein and bilirubin in rats. These effects were not due to competition for binding to ligandin and Z acceptor proteins, and possibly involve competition at the plasma membrane. Probenecid significantly depressed the hepatic uptake of rifamycins in rats. In man, peak serum-rifampicin levels were raised by 86% after oral probenecid. Mean serum increases of approximately 100% were also found at 4, 6, and 9 hours. These studies may have considerable therapeutic implications because the use of rifampicin is often limited by cost. The results also throw fresh light on the mechanisms of selective hepatic uptake in general.—Authors' Summary

Klücken, Norbert and Wente, Willy. Indications for thalidomide therapy for leprosy. *Int. J. Dermatol.* **13** (1974) 20-25.

In treatment of lepra reactions and lepromatous leprosy itself, thalidomide therapy has led to new discoveries. Because of its immunosuppressive effect thalidomide can improve the resistance of the macroorganism to *Mycobacterium leprae*. It does not have direct chemotherapeutic effect on the bacilli, although treatment often results in disappearance of skin symptoms in cases of lepromatous leprosy.

The mechanism of effectiveness of thalidomide therapy is discussed. The lysosomes of the cells, lepra cells in particular, are the fields of action of thalidomide. It acts on these organelles, being associated with phagocytosis and intracellular digestion of the leprosy bacilli. Their lipoprotein membrane is preserved, and synthesis of their enzymes is prevented.—Authors' Conclusions and Summary

Immuno-Pathology

- ✓ **Bhuyan, U.N. and Ramalingaswami, V.** Immune responses of the protein-deficient guinea pig to BCG vaccination. *Am. J. Pathol.* **72** (1973) 489-502.

Two groups of guinea pigs were maintained on high-protein and low-protein diets and immunized with intradermal BCG. Protein deficiency was accompanied by marked inhibition of local and systemic immune responses: a) The BCG nodule was poorly formed. There was marked delay and deficiency in the mobilization of macrophages; b) The draining lymph node was atrophic and showed little or no proliferation of lymphoid cells in the paracortical area. Macrophage accumulation occurred late but became diffuse and marked, in contrast to its consistent scarcity in the BCG nodule; c) In either location epithelioid cell transformation was retarded. Well-formed mature epithelioid cell granulomas were not seen; d) Bacilli persisted for a long time in the skin and lymph node lesions; e) Tuberculin sensitivity was greatly impaired in one-fifth of animals and absent in others. These findings were suggestive of macrophage dysfunction and depression of cell-mediated immunity to BCG in the protein-deficient guinea pig.—Authors' Abstract

- ✓ **Bullock, W. E., Callera, M. L. and Panner, B. J.** Immunohistologic alteration of skin and ultrastructural changes of glomerular basement membranes in leprosy. *Am. J. Trop. Med. Hyg.* **23** (1974) 81-86.

Immunofluorescent "banding" of the dermal-epidermal junction of skin was demonstrated in three of seven patients with lepromatous leprosy by direct immunofluorescence microscopy. The "banding" was caused specifically by deposition of IgM. Within the glomeruli of one patient, dense, amorphous deposits in subendothelial and intramembranous position were also demonstrated by electron microscopy. These preliminary findings suggest that lepromatous leprosy may be associated with immunologic disturbances of both skin and glomerular basement membranes.—Authors' Abstract

- ✓ **Bullock, W. E., Evans, P. D. and Wyatt, C. R.** Depletion of lymphocyte subpopulations in the spleen by murine leprosy. *Fed. Proc.* **33** (1974) 732.

Murine leprosy is a chronic granulomatous infection of lymphoid tissues and involves periarteriolar lymphocyte sheaths of the spleen. C₃H mice were inoculated intravenously with 1×10^8 *Mycobacterium leprae*. At 8, 16 and 23 weeks post-inoculation, infected and age-matched control mice were sacrificed. Whole spleens were prepared for total nucleated and differential cell counts. Lymphocytes bearing the θ -iso-antigen were quantitated by a ^{51}Cr release cytotoxicity assay and the response of spleen cells to phytohemagglutinin P (PHA) was measured. Mean numbers of nucleated cells increased to a maximum of 3.1×10^8 at 16 weeks in infected spleens but had declined by 23 weeks (1.6×10^8 cells) to near control levels (1.4×10^8 cells). The proportion of lymphocytes by differential count in infected spleens at 23 weeks was 15-24% vs 58-70% in normal spleens. Frequencies of θ -positive cells (% lysis) declined after the 8th week of infection to a mean of 6.4% vs 23.4% in control spleens at 23 weeks. Responses to PHA by cells from infected spleens were also markedly decreased at 23 weeks. The results indicate that murine leprosy causes progressive loss of lymphocytes including T-cell subpopulations from the spleen.—Authors' Abstract

- ✓ **Drutz, D. J., Cline, M. J. and Levy, L.** Leukocyte antimicrobial function in patients with leprosy. *J. Clin. Invest.* **53** (1974) 380-386.

Patients with lepromatous leprosy are unresponsive to lepromin skin test material and possess defective lymphocyte function *in vitro*, including impaired mitogenesis in response to antigens of *Mycobacterium leprae*. It has been claimed that their macrophages cannot digest *M. leprae in vitro*; such a defect could explain both lepromin nonreactivity and impaired lymphocyte function on the basis of failure of the afferent limb of

the immune response (i.e., defective macrophage "processing" of *M. leprae*).

The present studies indicate that macrophages from patients with lepromatous and tuberculoid leprosy and from normal donors do not differ in their ability to digest heat-killed *M. leprae* *in vitro*, or in their ability to sustain the viability of *M. leprae* in tissue culture; that monocytes, macrophages, and polymorphonuclear leukocytes of leprosy patients and controls possess equivalent microbicidal activity against *Listeria monocytogenes*, *Escherichia coli*, *Proteus vulgaris*, *Staphylococcus aureus*, and *Candida albicans*; and that polymorphonuclear leukocytes from patients with lepromatous leprosy iodinate ingested bacteria normally. Whether the basic immune defect leading to the development of lepromatous leprosy resides in the lymphocyte or in the macrophage remains to be determined. However, the present study shows that phagocytic cells from patients with either principal form of leprosy function normally in a variety of sophisticated tests of antimicrobial function.—Authors' Abstract

Drutz, D.J. and Gutman, R.A. Renal manifestations of leprosy: glomerulonephritis, a complication of *erythema nodosum leprosum*. *Am. J. Trop. Med. Hyg.* **22** (1973) 496-502.

Although *Mycobacterium leprae* does not invade the renal parenchyma, there are many reports of "nephritis" in patients with leprosy. Glomerulonephritis has been observed in autopsy studies, but the relationship to leprosy has never been clearly established. In the present study, we found urinary abnormalities consistent with glomerulonephritis in 11 of 636 leprosarium inhabitants; there was a strong correlation with a history of *erythema nodosum leprosum* (ENL). Seven of eight noninstitutionalized patients with active ENL also had urinary findings suggestive of glomerulonephritis. In two patients with ENL, one of whom had alterations of serum complement suggestive of complement consumption, renal biopsies revealed proliferative glomerulonephritis. ENL has been considered to reflect, in part, the deposition of circulating immune complexes throughout the body. These studies suggest that patients with lepromatous leprosy may experience glomerulonephritis as

one manifestation of ENL, and are consistent with recent observations of immune complex deposition in the glomerular capillary walls of the kidneys of patients with leprosy.

—Authors' Summary

Gelfand, E.W., Bauml, R., Huber, J., Crookston, M.C. and Shumak, K.H. Polyclonal gammopathy and lymphoproliferation after transfer factor in severe combined immunodeficiency disease. *New Engl. J. Med.* **289** (1973) 1385-1389.

Transfer factor was administered to a ten month old infant with severe combined immunodeficiency disease in an attempt to stimulate cell-mediated immunity. No change in thymus-dependent lymphocyte function was observed. However, three weeks after transfer factor there was a marked increase in the leukocyte count, with the appearance of mature plasma cells in the peripheral blood and bone marrow. The serum IgM rose to 2,000 mg per 100 ml; several blood group antibodies, including anti-i, became detectable. Although the relation of transfer factor to the polyclonal gammopathy may be coincidental, the administration of transfer factor to patients with severe combined immunodeficiency disease may induce uncontrolled B-cell proliferation.—Authors' Abstract

Grabosz, J.A.J., Derblom, H. and Godal, T. IgE serum levels in leprosy. *Acta Pathol. Microbiol. Scand. [B]* **81** (1973) 806-807.

In this study, IgE serum levels in lepromatous leprosy patients do not differ significantly from those in patients with tuberculoid leprosy or from healthy leprosy household contacts. However, the staff members whose socio-economic backgrounds differed had significantly lower IgE levels in serum ($p < 0.01$). The difference is most likely dependent on different exposure to intestinal parasites which are known to give rise to high levels of IgE. This study shows also the importance of control groups which, as regards socio-economic background, must be closely matched whenever IgE serum levels are to be studied in developing countries such as Ethiopia.—Authors' Conclusion

Gutman, R.A., Lu, W.H. and Drutz, D.J. Renal manifestations of leprosy: impaired acidification and concentration of urine

in patients with leprosy. *Am. J. Trop. Med. Hyg.* **22** (1973) 223-228.

Forty-seven patients with leprosy were studied to determine whether or not elevated concentrations of serum globulins are related causally to abnormal distal renal tubular function. In nine patients, urinary pH did not decrease appropriately in response to NH_4Cl . Two of these patients and five more without defective acidification were unable to adequately concentrate the urine after water deprivation and vasopressin administration. These defects were unrelated to the type of leprosy, to the concentrations of serum globulins or individual immunoglobulins, to the presence of rheumatoid factor or cryoglobulins, or to the administration of diaminodiphenylsulfone. Renal biopsy specimens from six patients with impaired urinary acidification and/or concentration showed no interstitial inflammatory cell infiltrates or other abnormalities.—G. L. Fite

✓ **Job, C. K.** Mechanism of nerve destruction in tuberculoid-borderline leprosy. An electron microscopic study. *J. Neurol. Sci.* **20** (1973) 25-38.

The ultrastructural changes in radial cutaneous nerve biopsies from three tuberculoid and fourteen tuberculoid-borderline patients were studied. In tuberculoid leprosy the nerve parenchyma was almost entirely replaced by tuberculoid granuloma. In nerves from borderline-tuberculoid leprosy many axons showed segmental demyelination and Wallerian degeneration. The nerve tissue was gradually replaced by proliferating collagen fibrils and inflammatory granulomata. *M. leprae* were rare and when present they were found in phagolysosomes of Schwann cells and macrophages. Schwann cells were surrounded and occasionally infiltrated by lymphocytes and macrophages. It was suggested that "sensitized Schwann cells" were the target of a hypersensitivity reaction resulting in their degeneration or death which in turn produced segmental demyelination or Wallerian degeneration.—Author's Summary

✓ **Kelkar, S. S., Niphadkar, K. B., Khare, P. M. and Junnarkar, R. V.** Hepatitis B antigen in a leprosy hospital. *Bull. WHO* **48** (1973) 555-558.

A survey of hospital patients with lepro-

matous and with tuberculoid leprosy showed 5% of the former and 6.3% of the latter to be carriers of hepatitis B antigen. These findings contradict the hypothesis of a genetically determined predisposition; opportunity for infection appears rather to be the determining factor. It was also found that 1) the number of carriers was higher among patients staying longer in hospital; 2) titers of antigen in patients with lepromatous leprosy were higher than in those with tuberculoid leprosy or in controls; and 3) antigen titers measured twice at an interval of four months indicated that the carrying of hepatitis B antigen in patients with leprosy is stable and persistent.—Authors' Summary

✓ **Koshy, T. S. and Karat, A. B. A.** Assessment of pituitary-adrenal function in lepromatous leprosy. A preliminary communication. *Leprosy in India* **45** (1973) 12-16.

This study reports the findings in relation to pituitary-adrenal functions in 35 lepromatous leprosy patients, 14 of whom had active, uncomplicated lepromatous leprosy, 8 with cured lepromatous leprosy, and 13 with active lepromatous leprosy complicated by chronic *erythema nodosum leprosum* (lepra reaction) for a minimum of 12 months. While the basal pituitary-adrenal functions were within normal limits in all the three groups, the patients with chronic lepra reaction were found to have poor adrenal reserve as judged by subnormal metapyrone and synacthen response.—Authors' Summary

✓ **Kroll, J. J. and Shapiro, L.** The histoid variety of lepromatous leprosy. *Int. J. Dermatol.* **12** (1973) 74-78.

A 16 year old Dominican-born girl with previously untreated lepromatous leprosy of the histoid variety was observed in New York. This type of leprosy, first described by Wade in 1963, has certain histologic and clinical features which set it apart from lepromatous leprosy of the usual variety. Originally observed only in patients with long-standing treated lepromatous leprosy, the histoid variety has more recently been reported in young patients who have received no prior antileprosy therapy. To the best of our knowledge, this is the first such patient with previously untreated histoid leprosy seen in the United States.—Authors' Summary

Languillon, J., Linhard, J., Diebolt, G. and Peyrot, N. Maladie de Hansen et génétique. Recherches sur l'association entre différents facteurs génétiques et la lèpre chez l'Africain. [Leprosy and genetics. A study on the relation between some genetic factors and leprosy in African patients.] *Med. Trop.* 33 (1973) 9-18. (In French, English summary)

The authors used various genetic markers in an unsuccessful attempt to resolve the confusion in reported series of patients suffering from leprosy. The small groups (235 suffering from lepromatous leprosy, and 245 from the tuberculoid form) of West Africans investigated showed no association between blood group O and leprosy, nor between Rh factor and leprosy. No relation was found between either abnormal hemoglobins or G6PD deficiency and leprosy. The existence of G6PD deficiency had no bearing on the severity of leprosy, the incidence of reaction (in lepromatous disease) or the effect of treatment.

The only interesting (and unoriginal) finding from this investigation was the higher proportion of patients with lepromatous leprosy whose sera contained antigens to hepatitis B (Australia antigen) compared with those with tuberculoid leprosy or healthy persons.

[The absence of references to authors cited in the text is a regrettable oversight.]—S.G. Browne

Lechat, M., Prehn, L.M., Blumberg, B.S. and Moris, R. Australia antigen in Zaire. Studies on leprosy. *Ann. Soc. Belg. Med. Trop.* 53 (1973) 173-178.

A higher prevalence of hepatitis B antigen in sera obtained from patients with lepromatous leprosy than in sera from patients with tuberculoid leprosy had been reported from some geographical regions. The reason invoked for this observation was depression of the cell-mediated immune response in lepromatous leprosy. However, similar findings were not recorded from other regions [reviewed in: *Hepatitis-Associated Antigen and Viruses*. Amsterdam: North-Holland Publishing Co., 1972, pp 149-151] nor was this association found to hold true in Zaire. Two hundred eighty-six serum samples were collected from patients with lepromatous leprosy, 361 from patients with tuberculoid leprosy and 191 from visitors or other patients without leprosy in the leprosarium area in Mbandaka. The sera were tested by the immunodiffusion technic.

No differences were found in the prevalence of hepatitis B antigen in the patients with lepromatous leprosy compared with either patients with tuberculoid leprosy or the control groups.

It is noted that the size of the control sample was small and that an insensitive technic was used, the prevalence of the antigen being 5.8% (11 of 191) in control sera compared with 2.4% (20 of 838) in patients with leprosy.—A.J. Zuckerman (*From Trop. Dis. Bull.*)

Microbiology

Barksdale, L., Convit, J., Kim, K.S. and Pinnardi, M.E. Spheroidal bodies and globi of human leprosy. *Biochem. Biophys. Res. Commun.* 54 (1973) 290-296.

From the plasma and/or buffy coats of 80% of 38 cases of (tuberculoid and lepromatous) leprosy have been isolated in pure culture a group of spheroidal organisms (spheroidal bodies of leprosy, SPBL) showing on various media a versatility of differentiation ranging from naked protoplasts to globi containing acid-fast rods. The acid-fastness of the latter, like the unique acid-fastness of leprosy bacilli from lepromatous leprosy, can be extracted with C_5H_5N . Inoculation

of chick embryos with SPBL elicits the nodular response evoked by homogenates of lepromatous tissue. From these nodules SPBL can be recovered in pure culture. SPBL appears to be the long sought etiologic agent of leprosy.—Authors' Summary

Bergel, Meny. Cultivo-Inoculación del *Mycobacterium leprae* en tejidos-órganos en estado de Necrobiosis-necrosis. [Culture-inoculation of *M. leprae* in tissues and organs in necrobiosis-necrosis conditions.] *Rev. Leprol.* 9 (1973) 129-141. (In Spanish, English summary)

A new orientation is stated in the culture-

inoculation study of *M. leprae*, using it for tissues and organs in necrobiosis-necrosis conditions, as much *in vivo* as *in vitro*. *M. leprae* multiplication in the necrobiotic tissues of mouse foot pad and necrobiotic graft of lepromas is described, as well as *M. leprae* multiplication in necrotic testis of the mouse provoked by cadmium chloride.

Enumerated is a large list of actual experiences related to this idea. General considerations are made about *M. leprae* reproduction in tissues and organs in necrobiosis-necrosis conditions.—(Adapted from English summary)

Dhople, A. M. and Hanks, J. H. Quantitative extraction of adenosine triphosphate from cultivable and host-grown microbes: calculation of adenosine triphosphate pools. *Appl. Microbiol.* **26** (1973) 399-403.

Existing data on adenosine triphosphate (ATP) pools in microbes are deficient for two reasons: a) incomplete extractions of ATP, and 2) the failure to take into account that the adverse effects of extracting procedures on standard ATP exert analogous effects on the ATP released from bacterial cells. Methods for correcting observed yields and calculating ATP pools have been demonstrated. Three bacterial species were used in the studies on extraction of ATP: *Escherichia coli*, *Mycobacterium phlei*, and *Mycobacterium lepraemurium*. Perchloric acid and n-butanol were disqualified because of their failure to extract total bacterial ATP even from *E. coli* and because of inconvenient procedures. The new extraction procedure had minimal effects on standard ATP, liberated 100% of the ATP pools from the three representative species of microbes, and caused no ionic imbalance or quenching of bioluminescence. This method involves vortexing all cell suspensions for 10 s with 23% chloroform (vol/vol), heating at 98°C for the required time (*E. coli*, three minutes; *M. phlei*, five minutes; *M. lepraemurium*, ten minutes) and then one minute at 98°C with vacuum to dry the samples. Heat or chloroform alone may suffice for some microbes and release total ATP from plant and animal cells.—Authors' Summary

Draper, P. and Reese, R. J. W. The nature of the electron-transparent zone that surrounds *Mycobacterium lepraemurium* in-

side host cells. *J. Gen. Microbiol.* **77** (1973) 79-87.

Liver and spleen tissue from mice infected four to five months previously with *Mycobacterium lepraemurium* has been examined in the electron microscope by negative staining, freeze-etching and ultrathin sectioning. Part or all of the electron-transparent zone seen around sectioned bacteria is composed of parallel fibrils wrapped longitudinally around the bacteria. It was isolated from homogenates of infected livers and spleens using urea density gradients and contained a mycoside of type C, a peptidoglycolipid known to occur in some other species of mycobacteria. The mycoside therefore forms a capsule around the bacterium to protect and insulate it from the host cell and its lysosomes.—(From Trop. Dis. Bull.)

Fisher, C. A. and Barksdale, L. Cytochemical reactions of human leprosy bacilli and mycobacteria: ultrastructural implications. *J. Bacteriol.* **113** (1973) 1389-1399.

Leprosy bacilli harvested from freshly biopsied tissue from cases of lepromatous, borderline and histoid leprosy were, in conjunction with *Mycobacterium lepraemurium* and representative mycobacteria, examined cytochemically with and without their pyridine-extractable acid-fastness. Unlike the mycobacteria, unextracted leprosy bacilli failed to give a positive response to the periodic acid Schiff test or to take up Sudan black B, toluidine blue O, alkaline methylene blue or safranin O. Once their acid-fastness was removed with pyridine, leprosy bacilli were stained by all of the foregoing dyes except Sudan black B, under this condition they remained gram positive. While permanent loss of acid-fastness from leprosy bacilli always resulted in a loss of acid hematein-fixing material (Smith-Dietrich-Baker tests), the reverse was not true. Mild aqueous saponification, bromination, or sequential treatment with lipase and phospholipase D resulted in a loss of acid hematein-positivity but not acid-fastness. After pyridine extraction, bromination, or aqueous saponification, true mycobacteria lost neither their acid hematein-positivity nor their acid-fastness. The acid hematein-positive material and the acid-fastness of both leprosy bacilli and mycobacteria were lost after treatment with alkaline ethanol. These cytochemical find-

ings are discussed in the light of what is known of the ultrastructure of leprosy bacilli and mycobacteria, and of the occurrence of a DL-3, 4-dihydroxyphenylalanine oxidase in leprosy bacilli but not in mycobacteria. An effort is made to explain the rather unique cytochemical properties of leprosy bacilli. Since pyridine-extractable acid-fastness (and acid hematein-positivity) serve to distinguish human leprosy bacilli from *M. lepraemurium*, one or the other, or both, are suggested as bases for differentiating these two organisms in animal experiments designed to show the *in vivo* propagation of human leprosy bacilli.—G. L. Fite

Harada, Kiyoshi. Effect of prior oxidation on the acid-fastness of mycobacteria. *Stain Technol.* **48** (1973) 269-273.

Oxidants which attack ethylenes to form aldehydes were effective in increasing the acid-fastness of mycobacteria. Potassium permanganate, performic acid, and peracetic acid were found to be effective. With the permanganate Ziehl-Neelsen stain, acid-fast bacilli seemed to be more strongly stained and more numerous than they did with the unmodified Ziehl-Neelsen method. Moreover, as a practical advantage, the bacilli could be discerned at lower magnification.—Author's Abstract

Jacobsen, P. L. and Levy, L. Mechanisms by which hydnocarpic acid inhibits mycobacterial multiplication. *Antimicrob. Agents Chemother.* **3** (1973) 373-379.

Recent work in this laboratory has shown that hydnocarpic acid (HA) a principal constituent of chaulmoogra oil, inhibits multiplication *in vitro* of a number of mycobacterial species. This activity of HA was not shared by several straight-chain fatty acids and by dihydrochaulmoogric acid. A study of the interaction of HA with biotin has been undertaken, based on a structural analogy between biotin and the cyclopentenyl fatty acid. The multiplication of a strain of *Mycobacterium intracellulare* susceptible to 2 μ g of HA/ml was measured turbidimetrically in Dubos medium, in the presence and absence of biotin and several other compounds. Biotin and, to a lesser extent, adenine plus guanine, palmitic acid, and linoleic acid antagonized growth inhibition by HA. Des-thiobiotin, thioctic acid, and succinic acid

did not block inhibition of bacterial multiplication by HA. HA may act by blocking the coenzymatic activity of biotin, or it may inhibit microbial biotin synthesis. Resumption of multiplication of *M. intracellulare* after a period of inhibition by HA in broth culture was found to be accompanied by reduction of the effective concentration of the drug; this could have resulted from metabolism of HA or production of an antagonist to HA by the organisms. Also, those organisms that multiplied in the presence of HA were found to represent HA-resistant mutants of *M. intracellulare*.—Authors' Summary

Kato, Laszlo. Autotrophism of an "intracellular parasite" *Mycobacterium leprae*. *Can. J. Public Health* **64** (1973) 42-46.

Purified suspensions of *Mycobacterium leprae* were isolated from human lepromata. The cell-free extract contained high ribulose diphosphate carboxylase (RuDC) activity. The tricarboxylic acid cycle was deficient with the absence of alpha-ketoglutarate dehydrogenase. NADH oxidase was present only in traces. This metabolic profile indicates that *Mycobacterium leprae* has genetically autotrophic characteristics similar to the soil microorganisms. The presence of RuDC shows that *Mycobacterium leprae* might utilize carbon dioxide as its sole source of carbon. The absence of alpha-ketoglutarate dehydrogenase and low level of NADH oxidase activity shows that the tricarboxylic acid cycle is not a respiratory pathway in these microorganisms but serves biosynthetic purposes. The autotrophic characteristics of *Mycobacterium leprae* suggest that this parasite utilizes only inorganic substrates in the host cell, thus offering an explanation of the undisturbed host parasite relationship so characteristic for lepromatous leprosy. We propose that *Mycobacterium leprae* with its enzymatic chemoautotrophic properties might retain viability and infectivity in the soil and consequently soil or dirt might play an important role in the epidemiology of the disease.—Author's Summary

Kato, L., Ajdukovic, D., Donawa, A. and Ishaque, M. Implications of chemoautotrophism in *Mycobacterium leprae*. *Nature New Biol.* **242** (1973) 179-180.

This brief article reports that cell-free extracts of *M. leprae* contain high amounts of ribulose diphosphate carboxylase. Researches of the senior author have indicated the absence of a dehydrogenase and the presence of a carboxylase in cell-free ex-

tracts, which suggest that *M. leprae* probably is an autotrophic microorganism. The writers propose that *M. leprae* lives in the host cell, excluding itself from hostile environments, growing "autotrophically in a unique manner."—G.L. Fite

Experimental Infections

Closs, O. and Haugen, O.A. Experimental murine leprosy. I. Clinical and histological evidence for varying susceptibility of mice to infection with *Mycobacterium lepraemurium*. Acta Pathol. Microbiol. Scand. [A] 81 (1973) 401-410.

To propagate bacilli, a suspension of *Mycobacterium lepraemurium* (MLM) was injected intravenously into 40 outbred albino mice. Pronounced differences were observed in the rate of progression of the infection, and eight mice representing the clinically observed extremes were histologically examined. Poor clinical condition was found to correlate with the presence of many granulomas and few or no surrounding lymphocytes, indicating weak or absent cell-mediated immunity (CMI). Good clinical conditions correlated with smaller and fewer granulomas with less bacilli and a pronounced infiltration of small lymphocytes. These observations strongly suggest that outbred mice differ in their susceptibility to MLM-infection. The basis for this heterogeneity, which bears some resemblance to the spectrum in human leprosy, is assumed to be the varying capacity of individual mice to mount a cell-mediated immune response against the mycobacterium.—Authors' Abstract

Evans, M.J., Newton, H.E. and Levy, L. Early response of mouse foot pads to *Mycobacterium leprae*. Infect. Immun. 7 (1973) 76-85.

The purpose of these experiments was to study the early response of mouse foot pads to *Mycobacterium leprae*. To accomplish this, mice were inoculated in both foot pads with large and small numbers of organisms. The animals were sacrificed at intervals from two hours to 27 days after inoculation. The microscopical results, which utilized normal BALB/c and thymectomized-irradiated B6C3F₁ mice, showed that the tissue re-

sponded first with an influx of polymorphonuclear cells and later lymphocytes and monocytes. The latter formed a diffuse infiltrate in the tissues. Under conditions where growth normally occurred, the mononuclear cell infiltrate did not persist. The organisms were found within phagocytic cells and the interstitial space. They were always contained within a phagosome and often fused with lysosomes. Most of the organisms appeared to be degenerating at all of the times studied. No organisms were observed in striated muscle fibers of tissues studied.—Authors' Summary

Gauga, J.M., Allison, A.C., Chesterman, F.C., Rees, R.J.W. and Hirsch, M.S. Immunological control of polyoma virus oncogenesis in mice. Br. J. Cancer 27 (1973) 10-17.

Adult CBA mice thymectomized, treated with antilymphocytic globulin (ALG) and inoculated with human leprosy organisms were accidentally infected with polyoma virus and all developed tumors. After cessation of ALG administration, some animals were given spleen cells from syngeneic donors immunized with polyoma virus; none developed tumors. Similar results were obtained in mice deliberately infected with polyoma virus but not with leprosy organisms. Passive transfer of antibody before but not after virus inoculation prevented tumor formation in immunosuppressed recipients. Virus infection in thymectomized, lethally irradiated and bone marrow reconstituted mice resulted in only a very low incidence of tumors. These results emphasize the role of immunological surveillance in preventing polyoma tumor formation under natural conditions.—Authors' Summary

Job, C.K. Culture study of *M. leprae* in mice in tropics with and without controlled environmental air temperature. Indian J. Med. Res. 61 (1973) 1485-1488.

In five experiments multiplication of *M. leprae* in the foot pads of mice kept in ordinary room temperature in South India varying from 18°C to 38°C was compared with that in mice kept in air-conditioned rooms with constant temperature of 22°C. Although bacillary growth was found in the foot pads of mice kept in both conditions, the growth was inconsistent and the number of bacilli harvested was significantly lower in animals kept in non-air-conditioned rooms. It is recommended that the mice used for the culture of *M. leprae* especially in tropical countries be kept in air-conditioned rooms at 20-22°C to obtain consistent and maximum possible multiplication.—Author's Summary

✓ **Karat, A.B.A., Samuel, I., Albert, R. and Kumar, A.S.J.** Experiments in cultivation of *M. leprae* in monkeys and in foot pads of mice—an interim report of six years of study. *Leprosy in India* **45** (1973) 138-142.

Attempts to obtain multiplication of *M. leprae* in various tissues in young monkeys was uniformly unsuccessful both in untreated, normal monkeys as well as in monkeys rendered immunologically incompetent by thymectomy and total body irradiation. Neither could any histological lesions typical of leprosy be demonstrated in experimental monkeys, suggesting that monkeys have a high degree of natural immunity against *M. leprae*.

Successful, consistent multiplication of *M. leprae* in the foot pads of mice following local injection of 5,000 *M. leprae* in ordinary laboratories in South India without the aid of thermo-regulation, is reported. No consistent relationship between Morphological Index and viability of *M. leprae* could be demonstrated. Lamprene 100 mg daily was found to be as effective as 100 mg of dapsone daily in killing *M. leprae* in man with lepromatous leprosy. No specific predilection of *M. leprae* to either cooler parts of the body or to special tissues, such as Schwann cells and sarcolemmal tissue could be demonstrated. *M. leprae* appeared to multiply with equal facility in the interstitial, connective tissue in the foot pads, nerves and muscles. Widespread hematogenous dissemination of *M. leprae* to different parts of the body (both cooler and hotter parts) was seen in normal, untreated mice as well as in the

thymectomized mice and thymectomized, irradiated mice. *M. leprae* in human liver and human bone marrow appeared to be not only viable but remained viable for significantly longer periods as compared with *M. leprae* in human skin among lepromatous leprosy patients on specific antileprosy therapy with either 100 mg of Lamprene or 100 mg of dapsone administered orally daily. Histological lesions in the various organs and in skin in mice were very similar to those seen in human lepromatous leprosy lesions. *M. leprae* have been kept in continuous passage for five generations so far without loss of virulence or viability in mice.—Authors' Summary

Kirchheimer, W.F. and Sanchez, R.M. Leprosy-susceptibility testing of armadillos. 1. Cellular responses to intradermally inoculated heat-killed leprosy bacilli. *Microbios* **7** (1973) 31-35.

Armadillos susceptible to developing systemic leprosy (lepromatous) were assumed to respond with development of lepra cells and persistence of the bacilli in cutaneous sites of deposition of lepromin. Resistant armadillos should mount an epithelioid cell response with relatively speedy disappearance of the bacilli. Twelve normal armadillos received lepromin injections in two skin sites. In keeping with the prediction of the genetic hypothesis of susceptibility to leprosy ten armadillos had an epithelioid cell response 30 days later. After three to six months no acid-fast bacteria were seen in the epithelioid cell granulomas. Two armadillos had lepra-cell responses with many bacteria. One of these animals was biopsied again five months later. Well-staining leprosy bacilli persisted in the lepra cells. The armadillos have now been infected with viable leprosy bacilli to validate the assumption that the lepra-cell reactors are susceptible to systemic leprosy and epithelioid cell reactors are not.—Authors' Abstract

Kirchheimer, W.F. and Sanchez, R.M. Leprosy-susceptibility testing of armadillos. 2. Late cell and bacterial responses at inoculation site of living leprosy bacilli in 'resistant' armadillos. *Microbios* **8** (1973) 241-246.

Seventeen nine-banded armadillos which had given cell and bacterial responses of

resistance to tests with heat-killed leprosy bacilli were infected with viable *M. leprae* in the abdominal skin. After 14 months the infection sites were biopsied. Their histopathologic study showed that the typical cell population of the granulomas which had developed consisted of epithelioid cells and lymphocytes. Few or no acid-fast bacteria were seen at those sites. In some instances the tissue in the center of these granulomas was necrotic. No intact bacteria were found in the necrotic areas. No signs of direct extension of the infection into adjacent skin or through hematogenous seeding into remote sites like the outer ear were present. Bacteremia was not observed. The possibility of the presence of viable leprosy bacilli in the tissues is being explored by mouse foot pad inoculation. These findings show that so far "resistant"-testing armadillos seem to resist disseminated infection with leprosy bacilli.—G. L. Fite

Kubica, G. P., Dunbar, F. P. and Kim, T. H.
Response of hypersensitive mice to the foot pad injection of living homologous or

heterologous mycobacteria. Preliminary report. *Appl. Microbiol.* **25** (1973) 718-723.

Mice sensitized by the injection of viable mycobacteria into one of the hind foot pads responded to a second injection of mycobacteria (three to four weeks later), introduced into the contralateral foot, with a degree of foot pad swelling that was both accelerated and exaggerated beyond that observed after the first inoculation. The degree of specificity of this reaction (i.e., response to homologous versus heterologous mycobacteria) was comparable to that previously reported for dermal reactions of hypersensitive guinea pigs to tuberculin or tuberculin-like antigens from mycobacteria. In preliminary studies it was impossible to achieve this state of specific sensitization by vaccinating mice subcutaneously with water-in-oil emulsions of heat-killed mycobacteria; reasons for the failure are discussed. It is suggested that this tool could prove useful in both taxonomic and immunological investigations. Advantages and disadvantages of the mouse foot pad test in relation to the dermal skin test in guinea pigs are discussed.—Authors' Summary

Epidemiology and Prevention

Bechelli, L. M., Garbajosa, P. G., Gyi, Mg Mg, Uemura, K., Sundaresan, T., Martinez Dominguez, V., Matejka, M., Tamondong, C., Quagliato, R., Engler, V. and Altmann, M. BCG vaccination of children against leprosy: seven-year findings of the controlled WHO trial in Burma. *Bull. WHO* **48** (1973) 323-334.

A controlled study of the efficacy of BCG vaccination for the prevention of leprosy began in Burma at the end of August 1964. This paper presents the findings after seven years, i.e., the results of six annual follow-up examinations up to the end of June 1971. The incidence rate in BCG-vaccinated children 0-4 years of age at intake was lower than that in children in the control group. The protection conferred by BCG was relatively low (44%) and applied only to early cases of leprosy, the great majority tuberculoid cases. BCG vaccination did not protect household contacts or children 5-14 years of age who were not exposed in the household. This reduction must be interpreted in the

light of several factors: form of leprosy, bacterial status, lepromin reactivity, evolution of cases, and level of endemicity. Consequently it does not seem probable that the reduction in incidence would substantially affect the pattern or trend of the disease in an area similar to that where the study is being carried out; the probability would be much lower if not nil in regions of relatively low endemicity (1-2 per 1,000 or less).—Authors' Abstract

Bechelli, L. M., Garbajosa, P. G., Gyi, Mg Mg, Uemura, K., Sundaresan, T., Tamondong, C., Martinez Dominguez, V. and Walter, J. Some epidemiological data on leprosy collected in a mass survey in Burma. *Bull. WHO* **48** (1973) 335-344.

In the WHO Leprosy BCG Trial in Burma a mass survey was undertaken to determine whether children had been exposed to patients with leprosy and, if so, the form of the index case. This paper presents the most important epidemiological data collected in

this survey. The prevalence rate was 31.6 per 1,000. It seems that even if the prevalence rate is very high the L rate does not increase accordingly. The high T rates in areas of high endemicity seem to be related mainly to the degree of spreading of leprosy, even to persons who react to lepromin. Comparison of the results with data available for the area before the survey was made shows that 87% of the L cases had already been detected and that 54% of the T cases had not. There was a tendency for high L rates to be associated with high prevalence rates. The results do not suggest that any particular age group has greater susceptibility or resistance; the prevalence rates seemed to be related mainly to the age when exposure occurred. A higher prevalence of leprosy in males started to appear in the 10-14 year age group, and after the age of 15 the difference became impressive. Biological, socio-economic, and environmental factors seem to be responsible for the level of endemicity, which does not seem to be essentially or primarily related to ethnic origin.

—Authors' Abstract

Bechelli, L.M., Garbajosa, P.G., Gyi, Mg Mg, Uemura, K., Sundaresan, T., Tamondong, C., Martinez Dominguez, V., Sansaricq, H. and Walter J. Proposed method for estimating leprosy prevalence based on rates in children. *Bull. WHO* **48** (1973) 502-503.

The authors suggest that, where leprosy prevalence data for the entire population are lacking, the prevalence in schoolchildren may be a valuable index for estimating the magnitude of the problem in areas where leprosy is endemic.—Authors' Abstract

Crawford, C.L. Leprosy—an alternate viewpoint. *Trop. Doct.* **3** (1973) 137. Letter to the Editor.

Crawford adds some notes on preventive aspects of the disease, especially referring to lowered incidences of new cases in India and Uganda among unprotected child contacts of lepromatous patients. He notes that chemotherapy is the cause of these declines, chemoprophylaxis making an added contribution... Prevention of nerve damage can also be effected, and steroid treatment, if given early enough can restore sensory loss and reduce edema.—G.L. Fite

Cross, A.B. An account of a leprosy village and its place in the treatment of leprosy. *Leprosy Rev.* **44** (1973) 22-28.

Of four leprosy villages once present in the British Solomon Islands, the single one at Ombufau remains. "As might be expected, the fortunes of the village have fluctuated over the years with the inevitable changes of staff and the waxing and waning of enthusiasm for leprosy work at both medical and council levels."

The writer presents an objective factual account of the surviving village, noting the doubts that visiting physicians have entertained about the advantages. Ombufau is small and difficult of access, whereas the incidence of leprosy in the British Solomons' population of 52,000 may be as high as one percent.—G.L. Fite

Das, M. and Saha, P.K. Leprosy in Rourkela. *Leprosy in India* **45** (1973) 68-72.

Study of 1,105 leprosy cases who attended Ispat General Hospital is presented—number of increases annually, with old cases already under treatment.

More males come for treatment. Families of patients are away in their native places due to lack of accommodations; so the number of children and females are less. The percentage of cases belonging to the State of Orissa is 68.8%. There are more cases among the nonworker population. They cannot afford the treatment in this hospital so they are not included in the study.—Authors' Summary

Ganapati, R., Naik, S.S., Sane, A.B. and Parikh, A.C. Leprosy among schoolchildren in greater Bombay. Results of surveys. *Leprosy in India* **45** (1973) 151-162.

Judging from figures available at the Acworth Leprosy Hospital, the city of Greater Bombay should be considered a hyperendemic area for leprosy, and as per the recommendations of WHO, most energetic casefinding methods are called for which should include surveys of captive segments of population like schoolchildren.

About 50% of approximately ten lakhs of schoolgoing children in Bombay attend municipal schools. Approximately 50,697 students, representing about 10% of the child population in municipal schools, were surveyed after making the selection of schools

by random sampling. The prevalence of rate of leprosy was 3 per 1,000.

A separate survey of 2,932 children in municipal schools situated in an area in the city, known to be endemic for leprosy, gave a prevalence rate of 11 per 1,000.

An examination of 10,460 children attending 14 municipal and private schools situated in a colony in the city showed the least rate of prevalence, namely 2.4 per 1,000.

The significance of these findings in relation to the control of leprosy in the city is discussed. The urgent need for undertaking surveys of schools giving priority to those situated in endemic areas is stressed.—Authors' Summary

✓ **Harding le Riche, W. and Lenczner, M.M.**

New migration pattern increases incidence in Canada of diseases common in tropical areas. *Can. Med. Assoc. J.* **109** (1973) 546-547.

We do not know how many cases of leprosy have slipped into Canada since 1967. From discussions with colleagues we know that more cases are being found than before. Dermatologists, particularly, are discovering new instances of this condition. However, diagnosis may be difficult and all physicians should be on the lookout for this disease, particularly in patients coming from endemic areas, mainly in the tropics and subtropics, but also from Greece, Portugal and Spain.

Leprosy is not highly infectious and can be effectively treated with dapsone and other drugs.

In our view provincial and federal governments, medical and hospital authorities, schools and others should realize that new

diseases have been introduced into Canada and that active steps should be taken to treat and to prevent the spread of such conditions.—(Adapted from text)

✓ **Jogan, B. and Rogers, I.** "Mobile" leprosy control in the Luapula Province of Zambia. *Leprosy Rev.* **44** (1973) 120-126.

This is a brief report on the progress of a LEPRO project in the Luapula Province of Zambia. The period from the start of the project in September, 1970, until the end of 1972 is reviewed. The operational methods employed are described and the results of the projects so far are reported, with pertinent statistics and comments.—Authors' Summary

✓ **Koticha, K.K.** Regular treatment is essential for controlling leprosy with dapsone. *Leprosy in India* **45** (1973) 75-77.

The discovery of a drug, more potent and quicker-acting than sulphones, though always desirable, is not a *sine qua non* for eradicating leprosy, for, the chief obstacle in the control is defaulting in treatment. Contrary to the belief expressed in some quarters, the disease can be controlled with the help of sulphone therapy, if the defaulting is reduced to a minimum. Though augmented educational efforts can diminish this defaulting, a minority of patients, particularly of the lower social status, remains insusceptible to all educational technics. This section considers treatment, "a form of interference"; and for them the treatment should be made compulsory.—Author's Summary

Other Mycobacterial Diseases & Related Entities

✓ **Barker, D.J.P. and Carswell, J.W.** *Mycobacterium ulcerans* infection among tsetse control workers in Uganda. *Int. J. Epidemiol.* **2** (1973) 161-165.

Forty-five cases of *Mycobacterium ulcerans* infection were recorded among 170 Ugandan tsetse control workers and their families during a period of 43 months. There was a higher incidence of the disease in families using swamps as a domestic water source than in families using boreholes. In those using permanent swamps the incidence

was higher than in those using seasonal swamps. These findings may be interpreted as showing an association between the frequency of the disease and the frequency with which people go to swamps; and they accord with the hypothesis that the disease is transmitted to man by contact with vegetation in and around swamps.—G.L. Fite

✓ **Chamoiseau, G.** *Mycobacterium farcinogenes* agent causal du farcin du boeuf en Afrique. [*Mycobacterium farcinogenes*

causal agent of bovine farcy in Africa.] *Ann. Microbiol.* **124A** (1973) 215-222. (In French, English summary)

In western, central and eastern Africa, bovine farcy is rife with the same clinico-pathological and immunological features. The causal agent is an actinomycete. On first relation, this actinomycete was believed to be *Nocardia farcinica* on account of its microscopical likeness with the causal agent of bovine farcy in the West Indies. Careful studies showed that the African actinomycete is a mycobacterium and isolates from eastern and central Africa are somewhat distinct from those obtained in the west of the continent. It is not possible to assimilate these organisms to *Nocardia farcinica* Trevisan 1889. For these reasons the causal agents of bovine farcy in Africa are named: *Mycobacterium farcinogenes*, var. *senegalense* and *M. farcinogenes* var. *tchadense*.—Author's Summary

Cortez, L.M. and Pankey, G.A. *Mycobacterium marinum* infections of the hand. *J. Bone Joint Surg.* **55-A** (1973) 363.

Three chronic granulomatous *Mycobacterium marinum* infections of the hand, the result of direct inoculation in a watery environment, are described and the pertinent literature is reviewed. Biopsy revealed caseating and non-caseating granulomas or an intense inflammatory reaction with Lang-

han's and foreign-body giant cells, and epithelioid cells. Acid-fast stains, when positive, showed bacilli somewhat larger and longer than *Mycobacterium tuberculosis*. The diagnosis was established by culture on Lowenstein-Jensen medium at 30°C. Treatment included debridement and synovectomy combined with antituberculous therapy. On the basis of available *in vitro* and clinical evidence it was concluded that the preferred antimicrobial therapy is a combination of rifampin and ethambutol and that surgical excision is often necessary.—G.L. Fite

Dorozhkova, I.R. and Zemskova, Z.S. Forms of persistence of *Mycobacterium tuberculosis* in the organism of persons unaffected by tuberculosis. *J. Microbiol. Epidemiol. Immunobiol.* **1** (1973) 115-119. (In Russian, English summary)

Minor residual post-tuberculous lesions (accidental autopsy findings) were studied pathomorphologically and microbiologically in 50 cadavers of persons unaffected by tuberculosis. Prolonged persistence of typical and altered *M. tuberculosis*, atypical and L-forms of mycobacteria were revealed in various scars, healed foci and lymph nodes; these bacteria served as a potential danger of endogenic relapses in case of reduction of immunobiological reactivity of the macro-organism.—English Summary