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

Hulse, E. V. The nature of Biblical "leprosy" and the use of alternative medical terms in modern translations of the Bible. Palestine Exploration Quarterly **107** (1975) 87-105.

In older versions of the Bible the Hebrew word *ṣāra 'aṯ* and the Greek word *lepra* are translated as "leprosy." Recent work on the history of leprosy has shown that there is no evidence that leprosy occurred in Palestine and the Middle East in Old Testament times and that in New Testament and earlier times the word *lepra* was not used for leprosy.

Internal evidence of the nature of the disease comes from the Old Testament rather than the New, although Biblical writers obviously used *ṣāra 'at* and *lepra* for the same condition. The long passage on the disease in Leviticus (chapters 13 and 14) can be misleading until it is realized that it was not meant to be a description of the disease but was a list of differential diagnoses and "clinical" tests to guide priests when, for ritualistic purposes, they had to distinguish between *ṣāra 'aṯ* and diseases which resembled it.

The key to understanding the condition comes from passages where it is said to be "as snow" (Exod. 4:6; Num. 12:10b; 2 Kgs. 5:27). This comparison was not used because the skin was white, the phrase "white as snow" is a mistranslation, but because the most characteristic sign was the presence of scales which, when rubbed off the surface of the skin, resembled flakes of snow. One sufferer of the disease is compared to a macerated fetus (Num. 12:12) which confirms that peeling or flaking of the superficial layers of the skin occurred and suggests that the underlying surface was red.

Various desquamating diseases are considered, particularly in relation to the signs enumerated in Leviticus 13, and psoriasis is found to fulfill most of the characteristics of the condition. A special variety of *ṣāra 'aṯ* called *neṯeḳ* in the Hebrew (Lev. 13:31), is most probably favus. Severe cases of some other diseases viz: seborrhoeic dermatitis, patchy eczema, pityriasis rosea and fungus diseases of the skin other than favus, may occasionally have been called *ṣāra 'aṯ*.

Patients with *ṣāra 'aṯ* were segregated because they were cultically unclean and under taboo and it is an anachronism to relate their isolation to modern ideas on the control of infectious disease. The loose scales of *ṣāra 'aṯ* may have been thought to be akin to discharges, which also made individuals unclean.

Various alternatives to "leprosy" have been adopted in modern translations. Some are very unsatisfactory, the worst being the *New English Bible's* phrase "malignant skin disease" for which there is no justification whatsoever. As no single disease is fully appropriate for translation purposes a descriptive phrase such as "a repulsive scaly skin disease" is recommended.—Author's Résumé (*From* Med. Hist.)

Perez Lovelle, R. and Gonzalez Perez, V. Sobre la relacion entre la desviacion social y las enfermedades infectocontagiosas. Informe preliminar. [On the relation between social deviation and contagious diseases.] Rev. Cub. Hig. Epid. **15** (1977) 27-39.

This is an application of epidemiological methodology to the study of social deviation, a much debated pathologic entity coined in socialist countries.

The authors' abstract reads as follows:

> The construction of socialism offers the possibility of eradicating the bad remainders inherited from the old society. Among the latter there is the social deviation known as delinquency. The deviation is a consequence

of the division of society into antagonistic social classes; this phenomenon leads to the appearance of the so-called lazy, who manifests a series of deviated standards and values which are transmitted through socialization. After the analysis of Marxism classics and contemporary Soviet penologists, a series of hypotheses is proposed in order to explain certain aspects of the above-mentioned phenomenon. Results of some preliminary investigations which agree with those hypotheses are exposed: a) a concentration of the phenomenon mainly in certain areas of the city has been detected; b) several types of problems are faced in those areas, i.e., delinquency, syphilis and other contagious diseases; and c) indicators common to the different problems have been found. The future development of the investigation as well as the practical recommendations that may be derived from it are analyzed.

The diseases considered are pulmonary tuberculosis, syphilis, gonorrhea, typhoid fever, meningoencephalitis, leprosy and condylomas. One will be pleased to learn that all these diseases are associated with indicators of deviant behavior (that is death of the father, death of the mother, relatives in jail, alcoholism of the parents, divorce of the parents, illegitimate birth), with the exception of two: typhoid fever and leprosy are not.—M. F. Lechat

Sansarricq, Hubert. Recent advances and present trends in leprosy research. Experientia **15** (1977) 114-119.

Over the last five years, important progress has been made in the field of leprosy research. While the mouse foot pad model has confirmed its value, especially for the assessment of antileprosy drugs, *in vitro* methods for the monitoring of CMI have provided strong support for the concept of the leprosy spectrum developed by Ridley and Jopling. The same methods have also provided evidence that in many instances exposure to *M. leprae* is followed by subclinical infection which, in most cases, will be overcome with only a few of the infected cases developing overt disease. The role of nasal mucosa lesions as the main source of living leprosy bacilli from contagious cases has been proved.

On the other hand, as regards therapy of leprosy, the shortcomings of the well-established dapsone monotherapy have become increasingly apparent, with growing evidence of secondary resistance to the drug and with the recent discovery of the bacterial persistence phenomenon. At the same time, a few new antileprosy drugs have been proposed.

Presently available leprosy control methods require improvement. But it may be possible through clinical trials to develop better therapeutic regimens, especially by combining two or more existing antileprosy drugs. In addition, several groups of new compounds show promise of being active against *M. leprae.*

The generalized experimental infection obtained in the armadillo has opened a source of unlimited amounts of *M. leprae* antigens which, unfortunately, cannot be provided at present by *in vitro* cultivation. This, together with the recent advances in the field of immunology of leprosy, will lead to new investigations aimed at the development of skin tests for subclinical infection, immunotherapeutic methods and, hopefully, a vaccine.

It is, of course, realized that the availability of fully adequate therapeutic and preventive methods for leprosy control will not automatically lead to the reduction of the leprosy problem. The successful application of these methods will depend on the solution of operational problems. But research has to come first.—Author's Conclusions

Clinical Sciences

Chapman, R. S. and Forsyth, A. Tuberculoid leprosy. Practitioner **217** (1976) 270-272.

Potentially, the differential diagnosis of tuberculoid leprosy in a Western context could embrace conditions as diverse as psoriasis, dermatitis and fungus infection. Differentiation from lupus vulgaris and lupus erythematosus might also prove difficult. Sarcoidosis is an especially close mimic of tuberculoid leprosy, histologically as well as clinically. In sarcoidosis, however, there is no invasion of nerve fibers in tissue sections and no sensory loss on testing.

Our patient was fortunate to exhibit the tuberculoid type of leprosy in which there is high host resistance to *Mycobacterium leprae* and, with treatment, progress is usually uneventful. At the other extreme is lepromatous leprosy in which host resistance is low, large numbers of bacilli are present and management can be both protracted and difficult.

The annual reports of the Chief Medical Officer of the Department of Health and Social Security show that new cases of leprosy notified for England and Wales between 1964 and 1973, have ranged from a minimum of 29 to a maximum of 63 for any one year. In 1973 there were 39 notifications of new cases of leprosy.

Of the estimated 15 million individuals with leprosy throughout the world, some 3 million live in the Indian subcontinent whilst the countries of tropical Africa have the highest incidence rate to be found anywhere. The possibility of leprosy should also be considered in patients from the West Indies and countries around the Mediterranean.

The clinical features and management of a case of major tuberculoid leprosy presenting in the United Kingdom are described. The possibility of encountering tropical disease in one's practice should be remembered.—Authors' Discussion and Summary

Courbil, L. -J., Merrien, Y. and Carayon, A. Réactivation proximale des muscles intrinsèques des doigts dans les paralysies cubitales de la lèpre. [Proximal reactivation of intrinsic muscles in the fingers in cases of cubital paralysis in leprosy.] Bull. Soc. Med. Afr. Noire Lang. Fr. **21** (1976) 425-428. (In French)

In cases of cubital paralysis of leprosy, the authors describe a technic for the reactivation of the intrinsic muscles at the level of the palm of the hand, by sectioning the large palmar muscle at the wrist and its extension by four narrow strips of fascia lata. The authors analyze the technical problems posed by this operation and its results in 12 cases.—English Summary

Deva, Jenny P. Ocular complications in long-standing leprosy patients at the Tampoi Leprosarium, Johore, West Malaysia. Med. J. Malaysia **30** (1976) 201-206.

From this survey of long-standing cases of Hansen's Disease at the Tampoi Leprosarium it can be seen that ocular involvement is quite common and varied. The incidence in the lepromatous and borderline cases was slightly higher than in tuberculoid cases. Among tuberculoid cases the most common conditions were secondary to 7th nerve involvement.

The illustrated cases in the text serve to show the variety in involvement of the eye from its adnexa to its intraocular structures. The findings of this survey give a clear picture of how the eyes are involved in leprosy, either directly, indirectly or secondary to 5th or 7th nerve involvement. They also illustrate the importance of eye examination in leprosy patients in preventing a possibly preventable blindness which may also be the sequela of intraocular leprous infection.

Nonleprous ocular complications also occur in these patients and these are amenable to treatment. It was also noted that blindness in these patients was due to leprosy-induced as well as nonleprous conditions. Ocular complications in the male population seemed to be slightly higher than in the female population.

All in all, it can be said that ocular leprosy can be quite varied in presentation and, if treated or detected early, can be made to respond to treatment before its course becomes uncontrollable leading to complicated cataracts or total blindness.—(*Adapted from* author's summary)

Goergen, T. G., Resnick, D., Lomonaco, A. and O'Dell, C. W., Jr. Radionuclide bone-scan abnormalities in leprosy: case reports. J. Nucl. Med. **17** (1976) 788-790.

Radionuclide bone scans were performed on two patients with leprosy. The resulting scan patterns simulated hypertrophic osteoarthropathy and diffuse arthritis, findings entirely consistent with the primary disease process.—Authors' Abstract

Jacobson, Robert R. and Trautman, John R. The diagnosis and treatment of leprosy. South. Med. J. **69** (1976) 979-985.

Leprosy is a complex disease, but recent research and the Ridley-Jopling classification which emphasize its immunologic aspects have greatly aided our understanding of and approach to the problem. The diag-

nosis should be considered whenever skin lesions and sensory loss occur. Dapsone remains the treatment of choice, but several newer drugs show great promise, especially in those cases whose bacilli have become sulfone resistant. Immunotherapy may play an increasingly prominent role in the future. Reactive episodes continue to be a serious complication, but the availability of thalidomide to control *erythema nodosum leprosum* has markedly improved the prognosis. Physicians of the U.S. Public Health Service Hospital at Carville, Louisiana, are available at all times for consultation on these and other matters related to leprosy.—Authors' Abstract

Marchand, J.-P., N'Diaye, B. and Languillon, J. Léontiasis syphilitique. [Syphilitic leontiasis.] Bull. Soc. Med. Afr. Noire Lang. Fr. **21** (1976) 181-184. (In French)

A 50 year old patient whose lesions might at first sight have indicated a diagnosis of lepromatous leprosy is presented. Serologic and histologic examinations and therapeutic testing demonstrated its syphilitic nature.—(*Adapted from* authors' English summary)

Price, Douglas B. Phantom limb phenomenon in patients with leprosy. J. Nerv. Ment. Dis. **163** (1976) 108-116.

The phantom limb phenomenon (PLP) was studied in 42 patients with leprosy who had limb amputation and/or digital shortening; some of the patients also had another type of limb deformity, such as claw hand or foot-drop, which did not involve significant loss of tissue. Thirty-eight (90%) of the patients reported having at least one phantom limb (PL) for a missing or deformed part. Associated with each of the three types of limb defects, two descriptively and experientially distinct types of PLs were found: the paresthetic or typical (TPL) and the painless or natural (NPL). Descriptions of the TPL and the NPL are given. The findings were compared to various reports, particularly those of Stetter and Frederiks. The leprosy TPL was similar both to the PL of amputees as frequently described in the literature, and to what Stetter and Frederiks termed the PL sensations. A close correspondence, if not identity, was noted between the NPL of leprosy patients and the equivalent categories of Stetter's PL experience and Frederiks' PL as such. Included in these three designations are aspects of the PLP that are associated with the normal, intact limb; these aspects are thought to be usual concomitants of the PLP and to constitute manifestations of the persistence of the normal body image. From our findings, we conclude that for the appearance of a PLP, the actual loss of a part of a limb, whether slow or sudden, is not required, but the loss of its sensorimotor functions is sufficient.—Author's Abstract

Ratton, Jose F. Contribução ao estudo das anormalidades de marcha na lepra. [Contribution to the study of gait abnormalities in leprosy.] Publ. Cent. Estud. Leprol. **16** (1976) 115-172. (In Portuguese)

The author begins the study of this subject by emphasizing the importance of knowledge of gait abnormalities in leprosy, in view of the frequency of leprosy cases that present gait patterns due to the specific pathology of the peripheral nervous system. After pointing out the clinical forms of the disease and the mechanism of gait patterns, he mentions the general medical books and treatises of neurology and leprology that refer to the subject and recognizes that the majority of the authors were not able to study it adequately in depth.

Thirty-two leprosy patients were examined both dermatologically and neurologically. A new and original method "goniometry of the feet" using an apparatus called a "foot goniometer" was utilized.

The author made the following conclusions.

1. The gait pattern is both a common and a peculiar symptom of neural leprosy.

2. The gait pattern is due to a specific neuritis of the fibular nerve and the damage done to the muscular system dependent on it.

3. Tuberculoid leprosy produces the gait pattern more frequently than does lepromatous leprosy.

4. The gait pattern is more often observed bilaterally than unilaterally.

5. The proposed method of "goniometry of the feet" is presented as satisfactory in evaluating muscular weakness responsible for abnormalities of the gait in neural leprosy.

Other kinds of abnormalities of walking in leprosy patients were observed as being due

to diseases of bones and joints and, therefore, belonging to the orthopedic field.—(*Adapted from* English summary)

Schmitt, J., Barrucand, D., Floquet, J., Floquet, A. and Schmidt, C. Névrite hansénienne a forme pseudosyringomyélique. [A pseudosyringomyelic form of Hansen's neuritis. Clinical, diagnostic and therapeutic considerations in connection with 3 cases.] Rev. Neurol. (Paris) **132** (1976) 33-49. (In French)

Three cases of neuropathic leprosy (one Moroccan, two noncolonial immigrants) enable attention to be drawn to two aspects of the problem of Hansen's neuritis.

1. Such cases should no longer be considered exceptional where the infection occurs in an endemic country but becomes manifest years later when the patient may be in another country.

2. Among the various neurologic aspects of neuritis due to Hansen's bacillus, great stress is placed on sensory disorders of the syringomyelic type, with thermalgesic dissociation; although these symptoms have been considered typical (our three cases are an illustration of this), they seem to occur quite rarely and are the cause of difficulties in diagnosis as it is the last thing one would think of.

Treatment of these neural forms is not encouraging in spite of a therapeutic arsenal which in theory is considered effective.—(*Adapted from* authors' English abstract)

Srinivasan, H. Patterns of movement of totally intrinsic-minus fingers. Based on a study of 141 fingers. J. Bone Joint Surg. (Am.) **58-A** (1976) 777-785.

A detailed study of metacarpophalangeal flexion and interphalangeal extension movements of 141 fingers with complete intrinsic muscle paralysis due to leprosy showed that long flexors and long extensors produce movement at the metacarpophalangeal and proximal interphalangeal joints simultaneously and not successively as is generally believed. The amounts of flexion resulting from long flexor activity are almost equal at the two joints and metacarpophalangeal flexion is achieved without excessive flexion of the proximal interphalangeal joint, but this is masked by the claw-finger deformity. The movement resulting from activity of the long extensor is complex and there are three or more qualitatively different patterns of extension. Although the long extensor produces simultaneous extension at the metacarpophalangeal and proximal interphalangeal joints, the latter consistently lags behind the former so that full extension is not achieved at the proximal interphalangeal joint even when the metacarpophalangeal joint is maximally extended. The diverse patterns of extension are not related to duration or degree of clawing or to any particular finger.—Author's Abstract

Srivastava, K. P. and Kesarwani, R. C. Management of trophic ulcers in leprosy patients. J. Indian Med. Assoc. **67** (1976) 250-252.

Thirty-two cases of trophic ulcers of the foot in leprosy patients are reviewed after treatment at the orthopedic department of the S.N. Medical College at Agra, India, using varied procedures. The best long-term results were obtained by local excision combined with metatarsectomy of the pressuring head. [The acceptance of leprosy patients into the wards of a teaching hospital is commendable.]—T. F. Davey (*From* Trop. Dis. Bull.)

Takizawa, Hideo. Studies of the clinical course and prognosis of Hansen's disease during chemotherapy. 2. *Erythema nodosum leprosum* in lepromatous leprosy. Lepro **45** (1976) 167-173. (In Japanese)

Since 1912 when Murata first described the syndrome called *erythema nodosum leprosum* (ENL) as a clinical entity, there have been many papers on this subject. The characteristics of ENL, which were clinically observed in 177 patients with lepromatous leprosy, can be arranged as follows.

1. ENL is essentially the manifestation of antigen-antibody reactions and occurs in the lepromatous and near lepromatous patients. However, some lepromatous cases (49.4%) do not manifest ENL.

2. ENL usually begins several months to 24 months after treatment is initiated.

3. ENL can be graded as slight, moderate or severe in degree. This condition is definitely more frequent and more severe in clinically more advanced and more mature cases than in those with slight lesions.

4. Although ENL has become much more common since the initiation of sulfone ther-

apy, it can be caused by other antileprosy drugs, including chaulmoogra oil.

5. As far as bacterial negativity is concerned, prognosis of patients with severe ENL is not always worse than that of the patients without ENL.

6. Twenty-three of 34 new cases (68%), who took the serologic test for syphilis (STS), showed positive STS at the start of chemotherapy. These biological false positive cases of STS were confirmed by RPCF and TPHA. There was only one case who showed latent syphilis. The correlation between the occurrence of ENL and the positive STS in the lepromatous cases was statistically significant.

7. The leproagglutination test (Ogata), which has antigen made from cardiolipin and lecithin (1:1), is shown in this paper to be a useful test for ENL. The lepromatous cases with a positive leproagglutination test in serum dilutions of 1:64 or greater before chemotherapy were apt to have episodes of ENL in their clinical course ($p = 0.01$).—(*Adapted from* author's English abstract)

Chemotherapy

Barrett, D. F. Lepromatous leprosy: dapsone resistance. Proc. R. Soc. Med. **69** (1976) 391-392.

Dapsone resistance is uncommon in this country (UK) and is most likely to occur in patients with lepromatous leprosy in whom dapsone has been taken for a long time as in my patient (case report). Neither dosage of dapsone, if taken regularly, nor the acetylator status is important in promoting dapsone resistance.

Diagnosis depends on the appearance of new skin lesions in a patient with multibacillary leprosy previously controlled by dapsone and in whom biopsy shows morphologically normal bacilli. It is confirmed by inoculating material from a biopsy of an active lesion into the foot pads of two series of mice: one a control group and the other fed on a diet supplemented by dapsone in standard concentrations. After some months the presence of mycobacteria in the dapsone-fed mice confirms resistance.

The drugs of choice in the treatment of dapsone resistance are clofazimine and rifampicin, the former being given in this case. Some months elapsed before clinical improvement occurred, when the characteristic drug-induced pigmentation was evident. It is described as a reddish color but in my patient resembled exaggerated suntan. Pigmentation is due to deposition of melanin and crystals of the drug which is a dye in the skin.

Neuropathic destruction of the bones of the feet is a recognized complication of leprosy. My patient had the classical presentation of a warm swollen foot though with some deep tenderness; x-rays initially showed only minor bone abnormality, but the changes of early tarsal disintegration appeared six months later. The duration of immobilization is variable, the swelling responding long before x-ray improvement is apparent. A problem is the liability of the anesthetic skin to break down as a result of friction from the plaster.—Author's Comment

Evstratova, V. A. Drug resistance to antileprosy drugs, its development and some methods of preventing it. Sci. Works Lepr. Res. Inst. **9/14** (1976) 110-115. (In Russian)

The comparative analysis of the disease and treatment of 24 leprosy patients with drug resistance and of 48 patients of a control group during the years 1945-1964 are given. There are statistically confirmed relationships between the frequency of drug resistance and initial treatment by noneffective drugs as well as to complications and accompanying disease. When there is drug resistance, combined treatment utilizing Lamprene and Rifadin is recommended and there should be obligatory use of nonspecific treatment (e.g., pyrogenal, methyluracil, gamma globulin).—(*Adapted from* N. Torsuev's translation)

Levy, L., Rubin, G. S. and Sheskin, J. The prevalence of dapsone-resistant leprosy in Israel. Lepr. Rev. **48** (1977) 107-112.

The prevalence of dapsone-resistance among patients with lepromatous leprosy treated in Israel for a minimum of eight years was 3.7 per 100.—Author's Abstract

Sanders, W. Eugene, Jr. Rifampin. Ann. Intern. Med. **85** (1976) 82-86.

In 1971, rifampin was approved for treatment of pulmonary tuberculosis and asymptomatic carriers of *Neisseria meningitidis*. At present, the approved indications remain the same. However, rifampin in conjunction with at least one other antituberculous drug may be of great value in therapy of extrapulmonary tuberculosis and infections due to other susceptible mycobacteria. In addition, results of clinical trials in leprosy have been highly encouraging. Rifampin appears to induce light chain proteinuria in a majority of patients and has been implicated in suppression of both humoral and cell-mediated immune responses. However, these effects appear to have been of little consequence to treated patients. A variety of possibly immunologically mediated reactions to rifampin has been closely associated with irregular administration of the drug. These reactions and hepatic toxicity may be preventable in many patients. Rifampin or one of its congeners, alone or in combination with other antibiotics, may prove useful in treatment of various infectious, and possibly malignant diseases.—Author's Abstract

Terencio de las Aguas, Jose. Nuevas medicaciones en el tratamiento de la lepra. [New drugs in the treatment of leprosy.] Med. Cut. Latino Am. **4** (1976) 365-370. (In Spanish)

Two groups of patients were chosen for this treatment. The first group of 14 patients was treated with a daily dose of 600 mg rifampicin and the second group with rifampicin associated with isoprodian (1-2 tablets). Clinical and bacteriologic improvement was apparent in the first group. This was paralleled by changes in the Bacteriologic and Morphologic Indices. The nasal mucosa of two patients became bacteriologically negative. Tolerance was good and there were leprosy reactions in 65%. In the second group, clinical improvement was good in general but one case presented a continuous polyneuritis and hepatic intolerance. Bacteriologic results were slightly lower than the first group with leprosy reactions in 85%.

This treatment is considered inferior to that with sulfones and is very expensive. A longer period of time is needed to evaluate the results.—(*Adapted from* author's English summary)

Immuno-Pathology

Anders, R. F., Price, M. A., Wilkey, I. S., Husby, G., Takitaki, F., Natvig, J. B. and McAdam, K. P. W. J. Amyloid fibril protein AA in Papua New Guinean amyloidosis. Clin. Exp. Immunol. **24** (1976) 49-53.

In this study the protein composition of amyloid fibrils isolated from eight patients representative of the spectrum of amyloidosis found in Papua New Guinea has been investigated. All fibril preparations, including three from patients with amyloidosis secondary to lepromatous leprosy and one from an unusual juvenile case of primary amyloidosis, contained the nonimmunoglobulin amyloid protein, protein AA. However, only 44% of 36 amyloid patients had detectable levels of the protein AA-related serum component, protein SAA. Alkali degraded material from each of the fibril preparations failed to react in double immunodiffusion tests with antiserum to the amyloid-related light chain VλV, but evidence was found for this immunoglobulin light chain-specificity in the serum of one patient.—Authors' Summary

Bullock, Ward E., Jr. Perturbation of lymphocyte circulation in experimental murine leprosy. I. Description of the defect. J. Immunol. **117** (1976) 1164-1170.

Infection of Lewis rats with *Mycobacterium lepraemurium* is characterized by granulomatous pathology primarily involving the paracortical areas of lymph nodes and periarteriolar lymphocyte sheaths of the splenic white pulp. Intravenous infusion of radiolabeled thoracic duct lymphocytes (TDL) from normal syngeneic donors failed to produce a significant increase of cell output and radioactivity in the thoracic duct lymph of infected rats as compared with a marked increase in matched control recipients. Conversely, the migration of TDL from infected donor rats was normal in uninfected control rats that had been infused with serum from infected donors.

The onset of the lymphocyte traffic disturbance takes place between two and six weeks after inoculation of viable *M. lepraemurium*. However, inoculation of heat-killed organisms produces little perturbation of lymphocyte circulation. Thus, the abnormal circulation of TDL in rats with active infection appears to be secondary to granulomatous pathology in lymphoid organs that disturbs cell traffic through these organs.—Author's Abstract

Bullock, Ward E., Jr. Perturbation of lymphocyte circulation in experimental murine leprosy. II. Nature of the defect. J. Immunol. **117** (1976) 1171-1178.

Intravenous infusion of radiolabeled thoracic duct lymphocytes (TDL) from normal syngeneic donors to rats experimentally infected with *Mycobacterium lepraemurium* fails to produce a significant increase of cell output and radioactivity within the thoracic duct lymph. Conversely, there is a marked increase in cell counts and radioactivity in the thoracic duct lymph of control recipients.

Splenectomy of infected rats prior to the infusion significantly increased the output of cells and radioactivity from the TD of these rats although it was not restored to normal. Serial quantitation of radioactivity in lymphoid organs of infected rats after infusion of ^{51}Cr-labeled TDL revealed significantly increased uptake by the spleen as compared with the spleens of controls. Thus, the spleen of infected rats was a major trap for recirculating TDL. TDL were also trapped to a lesser extent by the lymph nodes and liver of infected rats.

The circulation of TDL was not disturbed significantly in control rats with massive splenomegaly and red pulp hyperactivity induced by i.p. injection of methyl cellulose. Since murine leprosy preferentially involves the periarteriolar lymphocyte sheaths of the splenic white pulp and paracortical area of lymph nodes, it is suggested that the disturbance of lymphocyte circulation is secondary to pathology within these areas.—Author's Abstract

Bullock, W. E., Evans, P. E., Wyatt, C. and Vergamini, S. Disturbances of lymphocyte circulation and mobilization in granulomatous disorders of the lymphoid system. Ann. NY Acad. Sci. **278** (1976) 19-28.

The defects of lymphocyte circulation and mobilization as described appear to be caused by extensive, nonspecific trapping of recirculating lymphocytes within the lymphoid organs, most of which are involved by granulomatous pathology; some trapping may occur in the liver as well. At present, the mechanism of trapping is unknown. Hypersplenism, per se, does not appear to account for the abnormal traffic of TDL in leprous rats, since the induction of massive splenomegaly and hypersplenism in normal rats by methyl cellulose injection has little effect on lymphocyte migration. Hypersplenism cannot be excluded as a contributing factor to the impairment of lymphocyte mobilization in leprous mice after PMAA injection. However, in view of the normal lymphocyte migration in methyl-cellulose-treated rats and the fact that lymphocyte mobilization after PMAA takes place from the paracortical areas of lymph nodes and white pulp of spleen, it seems far more likely that disturbances of lymphocyte circulation and mobilization are secondary to the rather specific granulomatous pathology involving these traffic areas.

It is possible that granulomata may obstruct a significant proportion of the delicate channels within the reticulin network of the spleen and lymph nodes through which lymphocytes flow, thereby rendering their migration more circuitous. Alternatively, reactive swelling of endothelial cells lining the lymph channels might impair unidirectional lymphocyte flow. It is also possible that humoral factors such as lymphokines produced locally within an infected organ may slow the intrinsic ameboid activity of lymphocytes or act to modify their surface properties, thereby increasing cell-to-cell interactions with a greatly expanded population of macrophages.—(*Excerpted from* text)

Carnus, H., Languillon, J. and Baquillon, G. Étude de la sensibilité comparée à la tuberculine chez des lépreux lépromateux et tuberculoïdes dans la région de Dakar (données préliminaires—février 1976). [Study of comparative sensitivity to tuberculin in lepromatous and tuberculoid cases (preliminary data, Feb. 1976).] Bull. Soc. Med. Afr. Noire Lang. Fr. **21** (1976) 376-382. (In French)

The authors researched the hypersensitivi-

ty to tuberculin of lepromatous and tuberculoid cases of leprosy. They did not notice any significant difference between the two forms of leprosy nor any connection with the length of treatment. However, the existence of a heterogeneous answer, according to the communities of leprosy patients studied, calls for a supplementary investigation.—(*Adapted from* English summary)

Harada, Kiyoshi. Periodic acid-methenamine silver stain for mycobacteria in tissue sections. Stain Technol. **51** (1976) 278-280.

After many trials, we recommend the following modification of the Gomori-Grocott methenamine silver procedure for demonstrating mycobacteria. Pulmonary lesions of human tuberculosis and murine leprosy, and human leprosy skin nodules have been used as test materials in our experiments.

The procedure is as follows.

1. Fix tissues in 10% formol for 24-48 hours, dehydrate, block in paraffin and section at 6 μ as usual.

2. Deparaffinize sections in xylene and take to water through alcohols.

3. Oxidize in 10% aqueous periodic acid for 24 hours.

4. Wash in running water, rinse in three changes of distilled water.

5. Place sections in Coplin jars containing freshly prepared methenamine—silver solution and put in a 60° C (paraffin) oven for 1½-2 hours or more, until sections turn brown to dark brown.

The methenamine silver solution is prepared according to Grocott (1955). Add 5 ml of 5% silver nitrate to 100 ml of 3% methenamine to prepare stock solution. For use add 2 ml of 5% borax to 25 ml of stock methenamine silver and 25 ml of distilled water.

6. Rinse in two or three changes of distilled water at 60° C and then in several changes of distilled water successively closer to room temperature.

7. Place in 0.1% aqueous gold chloride for five minutes.

8. Rinse in distilled water.

9. Remove unreacted silver with 2% sodium thiosulfate for two minutes.

10. Wash in tap water and counterstain as desired, e.g., in dilute pyronin Y for one minute.

11. Dry in air, clear in xylene and mount in resin.

The effects of extraction with pyridine at 60° C for 24-48 hours on this procedure were tested.

Results. With methenamine silver for 1-1½ hours, leprosy bacilli including non- or poorly acid-fast bacilli were selectively stained black, while tubercle or murine leprosy bacilli were stained brown to black if at all. As much as a two hour exposure to methenamine silver is needed for demonstrating *M. tuberculosis* and *M. lepraemurium*, and even that is not sufficient to stain all murine leprosy bacilli. Collagen fibers could not be stained, but elastic fibers stained intensely. Bacilli appear as rod forms. *Candida* is stained black. Overstained sections show weakly stained nuclei and melanin.

After pyridine extraction at 60° C for 24-48 hours, tubercle or murine leprosy bacilli increased their staining while leprosy bacilli reduced their staining.—(*Excerpted from* article)

Hernandez Angulo, M., Fernandez Baquero, G. and Fraguela Rangel, J. V. Informe preliminar sobre una forma histopatológica atípica de una lepra lepromatosa. [Preliminary report of an atypical histopathological picture in lepromatous leprosy.] Rev. Cuba Med. Trop. **28** (1976) 93-100. (In Spanish)

A patient with lepromatous leprosy whose atypical histopathologic picture involved giant vacuoles and cell atypia is presented. The summary of his clinical record is given, and the bibliography is reviewed.—(*From* Trop. Dis. Bull.)

Languillon, J., Carnus, H. and Roux, G. Le test de transformation lymphoblastique chez les lépreux. Sa signification comme indicateur de l'immunité cellulaire. [The lymphoblastic transformation test in leprosy. Its significance as an indicator of cellular immunity.] Bull. Soc. Med. Afr. Noire Lang. Fr. **21** (1976) 419-424. (In French)

The authors give a useful summary of cellular and humoral immunity in the various types of clinical leprosy, correlating them in immunologic and histopathologic terms.

In an attempt to resolve the discordancies in published investigations on the subject, they report the results of their studies of the lymphoblastic transformation test in leprosy.

The subjects, Africans under treatment in Dakar (Senegal) included: 54 with tuberculoid leprosy (all Mitsuda-positive); 91 with lepromatous leprosy (all Mitsuda-negative), composed of 48 in a reactional state and 43 nonreactional; and 10 with borderline ("interpolar") leprosy (Mitsuda reaction was negative or doubtful). They found no difference between these groups in the lymphoblastic transformation test, or between the reactional and nonreactional subgroups in patients with lepromatous leprosy. In addition, patients with borderline leprosy showed a similar scatter of reactivity towards phytohemagglutinin.

They conclude that their results support the supposition that the depression of cellular immunity in leprosy is associated with a limited and specific antigenic structure possibly present on the surface of *Mycobacterium leprae*.—S. G. Browne (*Adapted from* Trop. Dis. Bull.)

Lapin, N. N., Bogdanov, Yu., Leschuk, S. I. and Remorchuk, A. A. Isolation of the Australia antigen in leprosy patients. Vest. Dermatol. Venerol. 7 (1975) 32-35. (In Russian)

The test-system "Immuno" (Austria) was used by the authors to determine the Australia antigen in 28 patients by the immunoelectrophoretic method according to Pesendorfer *et al* (1970). At the same time the transaminase level was defined by Roitman and Frenkel's micromethod and the thymol test was performed. Ten patients had antileprosy therapy for less than five years. There were 24 patients having lepromatous leprosy, 2 tuberculoid and 2 with indeterminate leprosy who were studied. Four patients were carriers of the Australia antigen. Antibodies were found in one patient. Repeated investigations with the test-system, which was worked out in the Irkutsk Scientific Research Institute of Epidemiology and Microbiology, showed the same results. All the antigen-positive patients had had leprosy for more than ten years. They were all more than 50 years old; three of the four patients were lepromatous. The authors account for the fact that the Australia antigen is often found in patients with chronic anicteric hepatitis by noting the possibility of some immunobiologic defect in connection with the chronic morphologic changes in the liver.—(*Adapted from* N. Torsuev's translation)

Levinsen, A. I. et al. Immunologic aspects of leprosy. Int. J. Dermatol. **16** (1977) 103-112.

Leprosy is a spectrum disease characterized by a melange of abnormal immune responses. The outcome of infection is dependent upon the integrity of the host's specific cellular immune response to *M. leprae*. An impaired response, perhaps genetically controlled, results in development of the disseminated lepromatous form; an intact response confers "high resistance," reflected in the tuberculoid form. In lepromatous leprosy, this initial selective immunodeficiency may become more broad-based through a process of immunologic attrition.

Antibody responses are also abnormal in leprosy. Specific antibody directed against *M. leprae* is correlated with antigenic load. As yet no protective role has been demonstrated. On the contrary, antibody may have deleterious effects on the host as manifested by reactions such as *erythema nodosum leprosum*. Whether anti-*M. leprae* antibody somehow thwarts the development or expression of the cell-mediated immune apparatus against this antigen is an issue that warrants further investigation.

A better understanding of the contributions of the immune system to the pathogenesis of leprosy has led to new therapeutic insights. Preliminary attempts at immunologic reconstitution of lepromatous leprosy patients have spawned systematic controlled studies on the efficacy of immunotherapeutic agents like transfer factor. The outcome of these studies is eagerly awaited.—Authors' Conclusion

Mansfield, Richard E. and Binford, Chapman H. The histopathologic diagnosis of leprosy. South. Med. J. **69** (1976) 986-993.

The objective of this paper is to encourage histopathologists to recognize and diagnose leprosy so that it can be treated effectively at the earliest stage possible, before irreversible deformities result. Recognition of the earliest form of leprosy—indeterminate—is emphasized. Histopathologic descriptions are made and illustrated for the principal types of leprosy. Emphasis is placed on 1) the need for dependable acid-fast staining of leprosy bacillus, 2) the nonspecific infiltrate in indeterminate leprosy, and 3) the involvement of nerves in all types of leprosy.—Authors' Abstract

Meyruey, M., Nicolas, J. P., Goudineau, J. A., Ambroise-Thomas, P. and Bellut, D. Les IgE sériques dans la lèpre. [Serum IgE levels in leprosy.] Rev. Fr. Allergol. **17** (1977) 23-25. (In French)

The levels of serum IgE measured in 49 leprosy patients were very high. While it may well be that the associated parasitoses contribute in part to this elevation, the disease itself does seem to be accompanied by hyper IgE. Further studies are needed for a better appreciation of the levels of serum and tissue IgE in various forms of leprosy as a function of development, complications and treatment.—(*Adapted from* authors' English summary)

Morley, J. E., Distiller, L. A., Sagel, J., Kok, S. H., Kay, G., Carr, P. and Katz, M. Hormonal changes associated with testicular atrophy and gynecomastia in patients with leprosy. Clin. Endocrinol. **6** (1977) 299-303.

Basal LH, FSH, 17β-estradiol and testosterone and the gonadotrophin responses to luteinizing hormone releasing hormone (LHRH) were studied in male patients with leprosy (24 lepromatous, 6 tuberculoid). The mean basal LH and FSH was significantly elevated in the lepromatous group and was associated with an excessive response of both gonadotrophins following LHRH administration.

The mean basal testosterone and 17β-estradiol values of the lepromatous group were significantly lower than those of the tuberculoid and control groups.

The abnormal gonadotrophin and sex steroid values in the lepromatous group are in keeping with the testicular atrophy and gynecomastia accompanying this form of leprosy. However, the lack of a significant correlation between basal FSH and testicular atrophy should be noted. In addition, no correlation between any of these hormonal values and gynecomastia could be demonstrated.

The patients with tuberculoid leprosy had essentially normal hormonal profiles (except for two who had raised 17β-estradiol values). This is compatible with the lack of gonadal involvement in these patients.—(*Adapted from* authors' summary)

Petchclai, B., Vilaiprasert, S., Hiranras, S. and Ramasoota, T. Serum IgE levels in leprosy. J. Med. Assoc. Thai. **60** (1977) 19-21.

Serum IgE levels were determined in 23 cases of tuberculoid and 19 cases of lepromatous leprosy, to see if there was any increase corresponding to the increase in other immunoglobulins. Significantly increased levels were found in both groups. The levels were higher in the lepromatous group but there was no statistical significance. Great fluctuations in serum IgE levels were observed in some tuberculoid patients having two collections 15 months apart. The results suggest a hyperactive IgE forming system which is occasionally influenced by and which responds to stimuli other than leprosy bacilli.—(*From* Trop. Dis. Bull.)

Ramu, G. and Balakrishnan, S. Plasma fibrinogen levels and fibrinolytic activity in lepromatous leprosy. J. Assoc. Physicians India **25** (1977) 133-138.

A longitudinal study was carried out on plasma fibrinogen levels in patients with lepromatous leprosy in different phases with varying clinical manifestations. Significant increases were noticed in plasma fibrinogen levels in cases with lepra reaction particularly those manifesting necrotizing skin lesions, kidney lesions and sclerodermic lesions. The increase in fibrinogen level was associated with a decrease in fibrinolytic activity. Treatment with steroids lowered the plasma fibrinogen levels. A direct correlation between increase in the plasma fibrinogen level and ESR was noticed. The significance of those findings in relation to prognosis of the disease and treatment of lepra reaction is discussed.—(*From* Trop. Dis. Bull.)

Ratnakar, K. S. and Mohan, Madan. Amyloidosis of the iris. Can. J. Opthal. **11** (1976) 256-257.

Amyloid accumulates in many organs in various ways. Several classifications are used to indicate the system involved, the microscopic distribution and the causative factor. With secondary to chronic infections, amyloid is frequently laid down in a connective tissue matrix, and the liver, spleen, kidney and adrenal glands are commonly involved. The lids and conjunctiva are common sites of ocular amyloidosis, usually of the

secondary type. Trachoma and allied chronic infections are considered to be responsible. Involvement of other ocular structures is infrequent. A case of ocular lepromatous leprosy with secondary amyloidosis of the iris is here reported.—(*Excerpted from* text)

Reichart, P., Ananatasan, T. and Reznik, G. Gingiva and periodontium in lepromatous leprosy. A clinical, radiological, and microscopical study. J. Periodontol. **47** (1976) 455-460.

Thirty patients with lepromatous leprosy of long duration were examined for gingival and periodontal changes. All patients presented with chronic gingivitis and periodontitis of an unspecific type. Etiologic factors affecting the development of gingival and periodontal changes in this disease are: lack of oral hygiene with severe plaque and calculus formation due to the inability of the patients to perform oral hygiene, mouth breathing, specific granulomatous infiltrations, and a possible specific drug action. Specific changes in form of "facies leprosa" are not pathognomonic of lepromatous leprosy but may be found in 20% of the cases among Thai and Chinese patients. Occurrence and pathogenesis of "facies leprosa" is described.—Authors' Summary

Rook, G. A. W. Immunological responses to infections. Proc. R. Soc. Med. **69** (1976) 442-444.

This paper contains discussion of a number of mechanisms which may explain the suppression of the cell-mediated immune response during the phase of dissemination of mycobacterial infection in mice and men. However, it is not yet possible to evaluate the relative importance of these mechanisms, or even to say which are the causes and which are the consequences of that dissemination.—Author's Summary

Skene-Smith, Hilary. Forearm bone destruction in leprosy. Australas. Radiol. **20** (1976) 270-272.

This report presents a patient with progressive bone destruction, which can occur in an anesthetic limb following infection. The bone destruction occurred over a ten year period and although there has been no evidence of infection for six years, the bone reabsorption has continued and is remarkable for its extent and involvement of both forearm bones.

The loss of digits is not uncommon in leprosy, nor is the neuropathic change in the foot, although it is especially marked in this patient.—Author's Conclusions

Wahi, P. L., Kauvr, S., Vadwa, M. B., Sodhi, J. S. and Chakravarti, R. N. Peripheral arteriographic studies in leprosy. Clin. Radiol. **27** (1976) 365-370.

Arteriographic and histopathologic studies have demonstrated the frequent presence of vascular changes in small and large size arteries, arterioles, capillaries and venules. These changes must be playing an important role in contributing to the mutilation and deformities of hands and feet in leprosy.—Authors' Conclusion

Whittaker, M., Lowe, R. F. and Ellis, B. P. B. Serum cholinesterase variants in African leprosy patients resident in Rhodesia. Hum. Hered. **26** (1976) 372-379.

Blood samples from 580 African leprosy patients living in Rhodesia have been phenotyped for the plasma cholinesterase variants. The Africans have been grouped according to country of origin and tribal affiliation. We have found no individual with an E_1^a gene and are unable to resolve the contradictory evidence for an association between this gene and leprosy. The frequency of the E_1^f gene is higher than that usually found in Caucasian populations, being 0.046 in lepromatous leprosy patients and similar to the 0.056 found in healthy African controls. In tuberculoid leprosy patients the frequency is, however, significantly lower at 0.019. On the other hand, the frequency of the C_5+ variant is essentially the same for the tuberculoid leprosy patients and the healthy controls (4%) while for the lepromatous leprosy patients it is about 7% approaching the 10-15% found in many Caucasian populations.—Authors' Abstract

Microbiology

Avila, J. L., Convit, J., Pinardi, M. E. and Jacques, P. J. Loss of infectivity of mycobacterial and protozoal exoplasmic parasites after exposure *in vitro* to the polyenzymic cocktail "PIGO." Biochem. Soc. Trans. **4** (1976) 680-681.

The parasites were briefly exposed to "PIGO" (peroxidase, iodide, glucose, type II-oxidase and oxygen) *in vitro* (5 minutes at 37°C for *L. braziliensis,* 20 minutes at 26°C for *T. cruzi,* and 15 minutes at 27°C for *M. lepraemurium*) and then immediately inoculated into susceptible animals (in the rear foot pads of hamsters for *L. braziliensis;* intraperitoneally into mice, for both *T. cruzi* and *M. lepraemurium*). The animals were checked daily for mortality, regularly biopsied and finally killed after a suitable time (4, 1 or 7 months respectively for *L. braziliensis, T. cruzi* and *M. lepraemurium*). Parasites were counted in various organs (foot pads for *L. braziliensis*-infected hamsters; heart and blood for mice inoculated with *T. cruzi;* liver and spleen for mice infected with *M. lepraemurium*).

Comparative survival index and tissue-parasite counts at the end of the experiment are reported in the table. The infection proceeded well in all three populations of animals inoculated with untreated parasites. By contrast, brief exposure *in vitro* of the parasites to PIGO in the presence of 20 mM-phosphate buffer at pH 6.0, restored normal mortality rates and resulted in parasite-free tissues. These results remarkably parallel those obtained when tests of viability *in vitro* were directly applied to the similarly treated parasites (Jacques *et al,* 1975; R. J. W. Rees and P. J. Jacques, personal communication). The validity of these criteria, as well as the rapid germicidal activity of PIGO on the three exoplasmic parasites under study, is thus further established.—(*Excerpted from* article)

Campo-Aasen, I. and Convit, J. Histochemical identification of nonculturable mycobacteria (*M. leprae* and *M. lepraemurium*). II. Dopa-oxidase. Histochemie **35** (1973) 63-66.

The possibility of the histochemical demonstration of the dopa-oxidase reaction to *Mycobacterium leprae* from the lepromas of untreated cases of human lepromatous leprosy was studied. Fresh frozen sections were taken, fixed for one hour, and incubated with DOPA (3, 4-dihydroxyphenylalanine) for two hours at pH 6.8 at 37°C. The results were negative for leprosy bacilli in all of seven patients. This was also true when the bacilli were extracted with pyridine for 1, 4, 12, or 24 hours in an attempt to enhance penetration of bacterial lipids. The histochemical method did not demonstrate dopa-oxidase activity in leprosy bacilli though adjacent cells which are usually dopa-positive yielded positive reaction. The authors postulate that the possibility of absorption of dopa-oxidase active enzymes on the surface of mycobacteria during the biochemical process of isolation might be responsible for the results reported by Prabhakaran. They considered it probable that such dopa-oxidase activity thus might derive from other cells in the leprosy lesions.—O. K. Skinsnes

Delville, J., Huybrechts-Godin, G. and Jacques, P. J. Germicidal activity of the PIGO system on *Mycobacterium leprae in vitro.* Arch. Int. Physiol. Biochem. **84** (1976) 604-605.

Increasingly frequent cases of resistance to sulfones were reported over the last few years (e.g., Bechelli and Guinto, 1970; Pearson *et al,* 1975) and point to the necessity of selecting or marshalling new antileprotic drugs. We therefore decided to ascertain whether the free-radicals enzymic-generator PIGO would display cidal activity on *M. leprae in vitro,* as it readily does on various cultivable mycobacteria (Demoulin-Brahy *et al,* 1975) and on *M. lepraemurium* (Rees and Jacques, unpublished results).

The source of *M. leprae* was a mouse foot pad-adapted strain isolated from a leproma obtained at Addis Ababa. The harvest from seven mice contained some 10^7 acid-alcohol-fast bacteria (AFB), of which nearly 12% were uniformly stained. The mycobacteria were further freed of residual tissue debris through brief exposure to 0.5 M NaOH, and concentrated by centrifugation.

After resuspension in the PIGO cocktail supplemented with 0.1% w/v Triton X-100, two pellets were incubated at 36°C in aerobiosis and at pH 5, either for a few seconds

or for one hour. The control was incubated for one hour in the same conditions, except that iodide and the two enzymes were omitted. The preparations were then spun in the cold; the pellets were washed in saline and resuspended in Dubos medium lacking Tween. For each preparation, a sample containing 5500 AFB was injected in each of the two rear foot pads of 15 mice. Between the 6th and 14th month after inoculation, foot pads were collected on six occasions, for the counting of AFB.

When contact between PIGO and *M. leprae* had lasted for one hour, AFB counts were invariably zero. In contrast, bacterial multiplication was normal in the controls and was temporarily delayed in the series where contact had been limited to a few seconds. These results allow the inclusion of *M. leprae* among the many and varied exoplasmic parasites which define the wide spectrum of PIGO cidal activity. In view of ascertaining the possible therapeutic value of PIGO in leprosy, the drug association shall be rendered lysosomotropic to infected macrophages, by means of adequate galenic presentations, e.g., nanoencapsulation (Jacques, 1976).—(*Adapted from* authors' communication)

Hirata, Tsunehiko. Cytomorphologic study of *Mycobacterium lepraemurium* in the murine leproma. Lepro **45** (1976) 153-161. (In Japanese)

The observations reported here are concerned with the cytomorphologic studies on the cellular organelles of *Mycobacterium lepraemurium* (Hawaiian strain), and the capsular structure around the bacilli in the host cells. At the peripheral parts of the bacilli the capsular structure, the cell wall and the cytoplasmic membrane were clearly observed. In the cytoplasm of the bacilli, two kinds of typical organelles, i.e., the intracellular membranous organelle and the electron dense or homogenous granules, were generally found. Large electron dense and homogenous bodies were found in murine leproma cells and there were also small electron dense granules in these bodies.

In the process of cell division, the division site on the surface of the cell wall became weak, and the cytoplasmic membrane adjacent to this wall site retracted towards the center of the cytoplasm. Thus, septum formation occurred and some of the intracellular membranous organelles arranged parallel to the edge of the septum. These membranous organelles, at this time, seemed to play a role in the process of cell division.

After the development of the septum, the old wall around the two new halves of the new cell separated and was released from the new cell wall. These disrupted old walls seemed to remain as thin layers becoming amorphous substances. From these findings it appears that the capsular structure around *M. lepraemurium* originates predominantly from the bacilli themselves.—(*Adapted from* author's English abstract)

Matsuo, Yoshiyasu and Utsunomiya, Setsuo. Attempts at cultivation of *Mycobacterium leprae* in cell cultures. Jap. J. Microbiol. **20** (1976) 471-473.

M. leprae from cutaneous nodules of lepromatous patients and mouse foot pads were inoculated, in a concentration of 10^7 to 10^9 acid-fast bacilli, into 50 ml culture bottles containing mouse foot pad cell cultures by technics previously reported for *M. lepraemurium*.

Although an increase in the number of acid-fast bacilli at harvests in the primary culture was obtained in 5 of 14 experiments, no evidence of successive bacterial increase was observed in any of the subcultures. In two of these experiments, however, *M. leprae* was found to have survived in the MFP cell cultures for at least 54 and 70 days, respectively, as confirmed by the mouse foot pad technic. The intracellular patterns of the bacilli were quite similar to those of *M. lepraemurium* previously reported, but it is not likely that *M. leprae* actually multiplied in this cell culture system for the following reasons: 1) the subcultures completely failed; 2) with a few exceptions, the acid-fast bacilli harvested did not multiply in the mouse foot pads even in cases showing a significant bacterial increase in the cell culture system; and 3) an increase in the number of bacilli in the primary culture might have resulted from release of a single bacillus from small bacterial clumps or fragmentation during the course of the cell culture.

The results showed that *M. leprae* failed to multiply in the present cell culture system but survived for several weeks in the cells in

some instances. Fieldsteel and McIntosh (1972) also reported relatively longer survival of *M. leprae* in cell cultures of mouse origin. A successful cell culture of this recalcitrant organism does not seem a vain expectation for the future.—(*Excerpted and adapted from* text)

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

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

Nakamura, Masahiro. Multiplication of *Mycobacterium lepraemurium* in cell-free liquid medium. 10. Factors involved in the starting material of *M. lepraemurium* for the growth *in vitro* and *in vivo*. Lepro **45** (1976) 203-210. (In Japanese)

Factors involved in the inoculum of *M. lepraemurium* for the growth in NC-5 medium as well as in mice were studied and the results obtained are as follows.

1. Significant multiplication of *M. lepraemurium* obtained from infected subcutaneous tissue, liver and spleen in NC-5 medium was observed. Therefore, it is obvious that the growth of bacilli in NC-5 medium is independent of the source of the materials used. The multiplication ability of the bacilli in NC-5 medium is retained for two months at -20°C.

2. No effects of treatment with 0.1% trypsin, 0.2% pronase, and 0.1% desoxycholate at 37°C for 60 minutes on the growth potential in NC-5 medium were recognized. The treatment with petroleum ether somewhat destroyed the growth potential.

3. The growth rate of purified bacilli was superior to that of crude isolate.

4. The growth potentials of *M. lepraemurium* in NC-5 medium as well as in mice were completely destroyed by treatment with a pH below 6 at 37°C for 60 minutes and by heating at 50°C for 30 minutes. On the other hand, complete destruction of the growth potential of the bacilli in NC-5 medium was produced by UV irradiation for 2.5 minutes, whereas the leproma producing ability in mice was maintained even with irradiation for 60 minutes.—(*Adapted from* author's English abstract)

Nakamura, Masahiro. Multiplication of *Mycobacterium lepraemurium* in cell-free liquid medium. 11. Establishment of the ND-5 medium. Lepro **45** (1976) 211-216. (In Japanese)

In order to improve the NC-5 medium, Dubos medium (pH 7.3) was used as a basal medium, instead of Kirchner medium. The complete medium thus prepared is referred to as ND-5 medium. In this medium, *Mycobacterium lepraemurium* multiplies quickly by binary fission without an extraordinary elongation. Possible generation times were calculated by repeated experiments as being 1.4 to 2.6 days. Slightly degenerative changes in the cells during prolonged cultivation was observed by electron microscopy. This medium has some advantages for inhibiting other bacterial contaminations. Serial subcultivation has not been tested yet.—(*Adapted from* author's English abstract)

Nakamura, M., Itoh, T. and Waki, C. Isolation of a cultivable mycobacterium from an armadillo subcutaneous tissue infected with *M. leprae* and characterization of this isolated strain. Lepro **45** (1976) 217-222. (In Japanese)

A strain of acid-fast bacilli was isolated from a leproma of an armadillo infected with *M. leprae* during the cultivation trial. Colonies were easily formed on Ogawa egg medium one to two weeks after inoculation; these were yellow in color. This isolated mycobacterium was identified as a type of scotochromogen which belongs to Group II atypical mycobacterium by biologic and biochemical characterizations.—(*Adapted from* authors' English abstract)

Saito, Hajime. Present status of classification of "atypical mycobacteria." Kekkaku **51** (1976) 233-239. (In Japanese)

In the past ten years, classification of mycobacteria, especially of "atypical acid-fast bacilli" which have not been classified, has developed remarkably. Recently, most of the strains of mycobacteria of this type have been given a separate species name. In addition, the pathogenic behavior of each species to man has been clarified. Contributions by the International Working Group of Mycobacterial Taxonomy (IWGMT) to the development of study in this area have been great. In this paper the present status of classification of "atypical mycobacteria" is reviewed.

For convenience, genus *Mycobacterium* may be divided into three groups: slow growers, rapid growers and a group of organisms which have special growth requirements or have not been cultivated *in vitro*. A description of the species in each group is given. Among the slow growers, the well established groups are: *Mycobacterium kansasii, M. marinum, M. scrofulaceum (M. marianum), M. gordonae, M. avium, M. xenopi, M. ulcerans* and *M. gastri*. Taxa needing further investigation in order to be recognized as an established species are: *M. simiae, M. asiaticum, M. szulgai, M. paraffinicum, M. terrae, M. nonchromogenicum, M. triviale, M. shimoidei* and *M. intracellulare*.

Among the rapid growers, the well established species are: *M. fortuitum, M. smegmatis, M. phlei, M. flavescens, M. vaccae* and *M. chitae*. Species which are not yet well established are: *M. chelonei (M. borstelense), M. chelonei* susp. *abscessus (M. abscessus), M. peregrinum, M. salmoniphilum, M. farcinogenes, M. lacticola, M. parafortuitum, M. diernhoferi, M. aurum, M. neoaurum, M. aichiense, M. obuense, M. tokaiense, M. rhodesiae, M. duvalii, M. gilvum, M. gadium* and *M. thermoresistibile*. Two species, *M. paratuberculosis* and *M. lepraemurium*, belonging to a group of organisms which have special growth requirements need further studies in order to be established.

Future research projects on the classification of mycobacteria are needed. Among these are: standardization of biochemical tests; establishment of a definition of genus *Mycobacterium* from the related taxa; studies on speciation of genus *Mycobacterium;* studies on the characteristics useful for a definition of genus *Mycobacterium;* immunologic studies, especially analysis of each test in relation to its possible value at different taxonomic levels viz., generic, subgeneric, specific, subspecific and infraspecific; and taxonomic studies of new or problem species.

The International Committee on Systematic Bacteriology has adopted 1980 as the year for starting bacterial nomenclature anew, thus eliminating the need for searching of prior literature in problems of nomenclature. Its Subcommittee on Mycobacteria is trying to complete the necessary work for this purpose. By that time the taxonomic problems remaining will be dissolved and further progress in the classification of mycobacteria is expected.—(*Adapted from* author's English abstract)

Experimental Infections

Cuba-Caparo, Alberto. Some hematologic and temperature determinations in the seven-banded armadillo *(Dasypus hybridus)*. Lab. Anim. Sci. **26** (1976) 450-455.

Hematologic values were determined for 10 male and 16 female seven-banded armadillos *(Dasypus hybridus)*, known as the "mulita" in Argentina. Values for females and males, respectively, were: PCV 40.47 ± 1.26 and 39.67 ± 1.40 ml/dl; sedimentation rate 15.3 ± 3.26 and 10.6 ± mm/hr.; RBC 6.001 ± 0.128 and 5.963 ± 0.170 × 10^6/mm^3; WBC 8.425 ± 1.417 and 10.084 ± 1.001 × 10^3/mm^3; hemoglobin 16.14 ± 0.66 and 16.84 ± 0.52; MCV, MCH, MCHC, and differential leukocyte count were also determined. An ultrastructural study of neutrophilic leukocytes and sex chromatin was made. Rectal temperatures ranged from 29.5–32°C. These results were compared with findings for the nine-banded armadillo *(Dasypus novemcinctus)*.—Author's Summary

Hirata, Tsunehiko. Cell-biological study on the acid-fast organisms isolated and cultivated from leprosy patients. 2. Pathogenic behavior of the organism to experimental animals, and results of inoculation

to mouse foot pads. Lepro **45** (1976) 145-152. (In Japanese)

The frequency of isolation of cultivated acid-fast organisms from nasal washings of leprosy patients was 90.0% by the method that has been reported. The present communication describes the virulence of these organisms in experimental animals.

Viable cultivable organisms of *Mycobacterium sp.* I strain isolated from nasal washings of a patient with lepromatous leprosy were suspended in a sterile saline solution. Then the suspension was inoculated subcutaneously, intraperitoneally and into foot pads of rabbits, guinea pigs and mice. The organisms did not produce progressive lesions in any of the experimental animals, either macro- or microscopically. However, in the case of inoculation into mouse foot pads, acid-fast organisms similar to leprosy bacilli were observed in the inoculated sites and these organisms seemed to multiply in number. Attempts to cultivate organisms harvested from infected foot pads of mice on egg yolk media were made but there was no growth.—(*Adapted from* author's English abstract)

Kirchheimer, Waldemar F. and Sanchez, Rita M. Carville Hospital researchers find no sign of mycobacteriosis in 141 feral armadillos studied. Public Health Rep. **91** (1976) 481.

Examinations of 141 feral armadillos from several different areas of the United States at the Public Health Service Hospital at Carville, Louisiana, have given no indication of the existence of any mycobacteriosis, including the infection caused by the leprosy bacillus *Mycobacterium leprae.* These results are in contrast to a report in the December 1975 issue of the JOURNAL OF THE RETICULOENDOTHELIAL SOCIETY that workers from the Gulf South Research Institute, New Iberia, LA., had observed feral armadillos in some parts of Louisiana that had become infected naturally with acid-fast bacteria which resembled, or actually were *M. leprae.*

Autopsies were performed at Carville on 25 armadillos that had not been experimentally infected with *M. leprae.* Eleven of these animals had been caught in 1974 in Louisiana, east of the Atchafalaya River. Ten had been obtained in 1975 from Ray Singleton & Co., Inc., an animal supplier in Riverview, Fla.; and four from Stanley Critters, an animal supplier in Brownwood, Tex. No signs of mycobacterial infections were found in any smears or sections made from the lymph nodes, spleens, livers, or other tissues (including the nerves), of any of these armadillos.

Autopsies were performed on 13 other armadillos several weeks after they had been experimentally infected with *M. leprae.* Eleven of this second group of animals were from Louisiana, east of the Atchafalaya River, and two were from Florida. Ten of the 13 had been infected intracutaneously in the lower abdomen with 1.0 to 7.5×10^7 of *M. leprae.* Acid-fast bacilli were found only in the cutaneous inoculation sites, not in the adjacent or remote tissues. The other three armadillos had been infected intravenously with several hundred million *M. leprae.* Occasional acid-fast granules and a rare acid-fast bacillus were found in the lymph nodes, spleens, and livers of two of these three, but no evidence of mycobacteriosis.

Next, 57 armadillos (53 caught in surroundings of Carville in 1975 and 4 from Fla.) were examined by ear-clip and buffy coat preparations for acid-fast bacilli before being experimentally infected with *M. leprae.* The results were negative for all 57 animals. Ear-clip and buffy coat examinations were performed on an additional 43 armadillos (20 from the Carville area and 23 from Fla.) one to six months after they had been intravenously infected with several hundred million *M. leprae.* In a few of these armadillos, an occasional acid-fast granule was found in sections from the ear skin but never in smears made from ear-skin tissue homogenates. In a few instances, also, an acid-fast particle was present in the buffy coat preparation.

In summary, the 141 feral armadillos examined either by autopsy or by ear-clip and buffy coat preparations, did not indicate the existence of any mycobacteriosis. The existence in feral armadillos of a mycobacteriosis, particularly of leprosy, should be validated by trapping, processing, and bacterial identification by researchers.—(*Excerpted and adapted from* article)

Meyers, Wayne M. Leprosy and armadillos. South. Med. J. **69** (1976) 1103. (Letter to Editor)

The SOUTHERN MEDICAL JOURNAL is widely circulated in areas of the United States where leprosy is mildly endemic and where there are wild armadillos. Your readers may be interested in the following comments on leprosy in wild armadillos.

Hansen's discovery of the leprosy bacillus *(Mycobacterium leprae)* in 1873 made possible new and rational approaches to the medical and social problems of a pestilence that for millennia had been enshrouded in mystery and misunderstanding. This single event determined the course of much of the meaningful research in leprosy for more than a century.

In December 1975 observations were reported on seven armadillos that had become infected in nature with a bacillus that seems to be identical to the leprosy bacillus that infects man. The disease in these animals was like that which developed in armadillos following inoculation with *M. leprae* obtained from tissues of patients with leprosy. Both the experimental and the naturally occurring diseases have many features in common with leprosy in man, particularly the invasion of peripheral nerves by the bacillus.

The armadillos with indigenous leprosy all came from coastal areas of Louisiana, but the geographic limits of the disease have not yet been fixed. The disease could exist wherever there are wild armadillos.

This discovery has great potential to provide information on questions which have long puzzled researchers in leprosy. To name a few: Is the leprosy bacillus a saprophyte in the soil? Can the disease be transmitted through contaminated soil? How does the armadillo pass the disease to fellow armadillos—if indeed it does?

A preliminary retrospective epidemiologic study suggests that contact with armadillos in Louisiana is not a factor in the transmission of leprosy to man.—Author's Letter

Navalkar, R. G., Patel, P. J., Dalvi, R. R. and Kanchana, M. U. Electrophoretic patterns of serum proteins and immunoglobulin levels in mycobacterial infections: studies in mice infected with *Mycobacterium leprae* and *Mycobacterium lepraemurium*. J. Natl. Med. Assoc. **68** (1976) 500-505.

Studies on the serum protein and immunoglobulin levels in mice infected with *Mycobacterium leprae* and *Mycobacterium lepraemurium* appear to indicate changes in both that were related to the progression of infection in these animals. The levels of both the serum proteins and immunoglobulins observed in the *M. leprae* infected mice appeared to parallel those that are seen in patients suffering from tuberculoid type of leprosy whereas those observed in *M. lepraemurium* infected mice appeared to parallel the changes seen in the advanced stages of leprosy infection. The reason for the differences observed are directly related to the type of infection that the mouse model exhibits when infected either with *M. leprae* or *M. lepraemurium*, the former being a rather restricted infection almost analogous to the tuberculoid type of disease in man, whereas the latter is a generalized disseminated type of infection similar to the lepromatous type seen in man.

It is proposed that the mouse model, therefore, can be employed as a means of evaluating the mechanisms of host-parasite interactions that may occur in human leprosy.—Authors' Summary

Ogawa, Tatsuji. Attempts at growth of *M. leprae* in mice. Lepro **45** (1976) 223-229. (In Japanese)

A bacterial suspension prepared from lepromas was injected into mice once or several times at weekly intervals by subcutaneous or intravenous routes, or by both routes. Animals were killed at various intervals, 2 to 16 months after injection. At necropsy, lesions were sought by gross inspection. Portions of various organs were removed and ground in a mortar to make homogenates. Smears made from the homogenates were stained by the Ziehl-Neelsen method and examined microscopically. The homogenate was treated with 1% NaOH solution and then inoculated onto the egg yolk medium (for *M. lepraemurium;* also for *M. leprae* [?]) and Ogawa 1% egg medium (for cultivable mycobacteria). The tubes were incubated at 37°C for over three months.

Ten experiments, four with single inoculation and the other six with multiple inoculation, were carried out. One experiment exhibited a probable contamination and its results will be described in a separate paper. In nine experiments the gross findings were all negative. Cultivation trials showed a few

smooth and buff colonies, supposedly atypical mycobacteria, from only two specimens but no colonies of mycobacteria suspected as being *M. leprae* have been isolated.

On the other hand, microscopic examination revealed the presence of acid-fast bacilli in the tissues of various organs. In two experiments, there were remarkable microscopic findings. Acid-fast bacilli were found at the injection site and in superficial lymph nodes, but not in the tissue of the viscera. In the intravenous experiment, acid-fast bacilli were detected in the spleen, liver and lungs, but were smaller in number in comparison with those of the skin injection site. No bacilli were found in the superficial lymph nodes. In both of the experiments the acid-fast bacilli had a tendency to steadily decrease in number. Where numbers of bacilli were present globi were often seen, but these were usually small and loose in arrangement. It was uncertain whether the bacilli had multiplied within the tissue or not.

As the materials used differed from experiment to experiment, it was impossible to directly compare the values of percentages for smear-positive specimens. As a whole, however, it seemed justifiable to conclude that the microscopic findings were more superior in the multiple inoculation than in the single inoculation. This fact is in accordance with observations reported by other workers.—(*Adapted from* author's English abstract)

Peppler, Richard D. and Stone, Sergio C. Plasma progesterone level in the female armadillo during delayed implantation and gestation: preliminary report. Lab. Anim. Sci. **26** (1976) 501-504.

Ovulation in the armadillo was followed by an increase in the plasma level of progesterone to 10 ng/ml. The plasma concentration of progesterone decreased to approximately 5 ng/ml during the 3.5 months of delayed implantation and then increased to approximately 20 ng/ml for the 4.5 month period of gestation.—Authors' Summary

Ruby, John R. and Allen, E. Raworth. Ultrastructure of the salivary bladder of the nine-banded armadillo. Cell Tissue Res. **169** (1976) 383-394.

The nine-banded armadillo possesses a salivary bladder which is a dilated portion of the main duct of the submandibular gland at its origin. The wall of the bladder is composed of an epithelium, a submucosa and a thick coat of skeletal muscle. The ultrastructure of the epithelium reveals that it is complex and consists of three cell types: 1) principal cells, 2) light cells, and 3) basal cells. The general organization of the epithelium suggests that it is a transporting type of epithelium in the amphibian and reptilian urinary bladders and the mammalian gall bladder. The submucosa is composed primarily of densely-packed collagen fibers. The skeletal muscle is very vascular and richly innervated.—Authors' Summary

Epidemiology and Prevention

Abreu, A., Werthein, L. J., Ruiz De Zarate, S. and Ayrado, A. Programa de control de lepra en Cuba: estado actual. [Control program for leprosy in Cuba: current state.] Rev. Cuba Hig. Epidemiol. **14** (1976) 117-122. (In Spanish)

The program in force from 1962-1971 involved updating the census, ambulatory treatment, and annual examination of persons living with patients. A new program established in 1972 has exploited the improved dermatologic and leprotic resources of the country and is characterized by decentralization of diagnostic and therapeutic measures. Persons living with patients undergo chemoprophylaxis. Prevention of physical handicaps and rehabilitation of those afflicted are fundamental aims. In 1974, 307 new cases were detected. There were 4,672 known leprosy cases, of which 4,517 were controlled. Of the 12,530 persons in contact with leprosy, 88.2% were under surveillance.—Ann Grant (*Adapted from* Trop. Dis. Bull.)

Feldman, Roger A. and Sturdivant, Marylyn. Leprosy in the United States, 1950-1969: an epidemiologic review. South. Med. J. **69** (1976) 970-979.

The information about leprosy in the separate states of the U.S. from 1950 through

1969 allows us to draw certain conclusions about the epidemiology and control of leprosy in the United States.

Few indigenous foci of leprosy have developed in the United States, and several, such as those in Louisiana and Key West are disappearing. Foci in native Hawaiians, in Puerto Ricans in Puerto Rico, and in some areas of Texas are persisting with no evidence of increasing rates. There is no evidence that a focus of leprosy developed as a result of the early forced immigration of Blacks to the United States; however, in Louisiana, within the focus that developed, Blacks had rates similar to those of Whites. The small number of indigenous foci within the United States may relate to reduced transmission from cases to contacts because of less crowded housing and other improved social conditions, and current use of effective chemotherapy is probably a significant factor in further reducing the frequency of transmission of leprosy.

Leprosy in Americans exposed overseas during military service is an infrequent problem, but one that has attracted much interest. The largest number of persons with such illness had military service in the South Pacific, and a few had served in Korea. During the study period, there were no cases reported in persons who served in Vietnam. However, since the period from exposure to diagnosis is often a decade for persons who develop lepromatous leprosy, it is possible that exposure during the Vietnam War may be followed by a small number of cases of leprosy.

From 1965 to 1969, 65% of the reported cases in the United States were lepromatous or dimorphous; a large proportion probably resulted from earlier infection outside the country. However, in Louisiana, where almost all cases are indigenous, 57% were lepromatous and dimorphous, and in Texas-born persons with non-Spanish surnames, 62% were lepromatous and dimorphous. This high percentage of lepromatous and dimorphous cases in indigenous foci is difficult to ignore. Although it may relate to poor reporting of tuberculoid and indeterminate cases, it is more likely a characteristic of leprosy in areas where control measures have effectively limited transmission.

Where the attack rates of leprosy have been measured for persons of foreign birth, it is not surprising that they approximate those of the countries of birth. However, subsequent transmission of leprosy within families and the areas of residence seems significantly less frequent in United States residents. The rapid disappearance of leprosy in Norwegian immigrants in the northern United States may well be repeated in American families of Mexican, Filipino, Cuban, or Samoan origin.

In states with large numbers of cases, household contacts of leprosy patients are examined at regular intervals, so the group at greatest risk is under constant and effective surveillance.

No data were presented in this review concerning the magnitude of deformity associated with the cases diagnosed from 1950 to 1969. At the present time, the early diagnosis of leprosy makes significant deformity an unusual event.

This review of leprosy in the United States over a 20-year period has shown that the magnitude of the problem of leprosy has stayed relatively constant, although the epidemiologic features have varied significantly. The basis of control of this disease in the United States includes early diagnosis, effective use of chemotherapy, and careful follow-up of household contacts. With such programs we may expect indigenous foci of leprosy to be controlled effectively.—(*From* authors' discussion)

Golden, G. S., McCormick, J. B. and Fraser, D. W. Leprosy in the United States, 1971-1973. J. Infect. Dis. **135** (1977) 120-125.

Information regarding the incidence of reported leprosy in the United States for 1964 through 1973 is presented in Figure 1 [of the article]. Despite the peak incidence in 1968, which was the result of an unusual effort at case finding that revealed many previously diagnosed but unreported cases (the compilation of data for the first leprosy surveillance report), a definite upward trend may be observed in leprosy cases reported and in rates of infection over the ten year period.

Since 1969, the increasing incidence has closely paralleled a rise in the number of imported cases. The number of indigenous cases has remained roughly constant over the same five year period. Part of the increase in imported cases is related to increased immigration from leprosy-endemic

areas, notably Mexico and the Philippines. Data from 1971 through 1973 show that a steadily increasing number of patients were born in Mexico and the Philippines; figures from the U.S. Immigration and Naturalization Service indicate that there has been a mean increase of nearly 150% in annual legal immigration from these two countries between the years 1965 and 1974. Moreover, increases in the number of nonimmigrants and illegal aliens may be responsible for some of the additional cases in foreign-born persons. This increase in the number of imported cases may also be attributed, in part, to a change in the immigration policy of the United States in 1970; this change permitted the legal entry of persons with noninfectious leprosy who are under treatment or have been treated.—(*Excerpted from* article)

Liu, J. N., Lehrer, J. L., Baker, L. H. and Holmes, F. F. Leprosy in Kansas. J. Kans. Med. Soc. 7 (1976) 507-511.

As seen with those patients who presented at KUMC with fairly typical manifestations of lepromatous leprosy, a complete history and physical examination, with particular attention to the patient's past social history, was essential to suspecting the diagnosis. Since diagnosis was established in both patients by skin biopsy, it is important for the examining physician to alert the pathologist, so that special stains may be used to confirm the diagnosis.—Authors' Summary

Merlin, M., Carme, B. and Laigret, J. Impact de la modification profonde des structures d'une société sur l'évolution d'une maladie endémique: la lèpre en Polynésie française. [Effect of changing environmental structures on the course of an endemic disease: leprosy in French Polynesia.] Bull. Soc. Pathol. Exot. **69** (1976) 422-433. (In French)

The authors describe briefly the rapidly changing picture of life in the Pacific Islands. From the idyllic tranquility of 25 years ago, economic development has transformed brusquely the economy, the life-style, and the prevalence of leprosy. The construction of the international airport at Tahiti and the establishment of the Atomic Energy Experimental Center have attracted migrant populations who now earn inflated wages after abandoning their subsistence farming or fishing. In 25 years the population has doubled and the economic transformation has resulted in declining standards of hygiene.

Although leprosy was never a serious public health problem in the islands, with the exception of the Marquesas and Tuamotu, where there were rather higher prevalence rates, the migration of populations that include many undiagnosed and untreated leprosy sufferers who are potentially contagious presents the authorities with a serious situation. An example given is the finding, during routine school surveys, of children suffering from florid lepromatous leprosy. Since about 53,000 people (41% of the population) are now concentrated in Tahiti itself, the existence of the virtually uncontrolled focus in the urban areas augurs ill for the future unless vigorous measures are taken.—S. G. Browne (*From* Trop. Dis. Bull.)

Richmond, J. S. Notes on the history of leprosy in Florida to 1921. J. Florida Med. Assoc. **63** (1976) 631-641.

During the latter 19th century, American officials and physicians became concerned about the presence of leprosy in the Caribbean, where it had long thrived, and in Key West. Because of the open commerce between the southernmost city of the United States and the islands of the Caribbean, the disease was placed under maritime control by the Marine Hospital Service in 1889. A special Commission reported in 1902 that after Louisiana, Florida and California shared second place as the states with the most leprosy victims. Despite the Commission's recommendation for the early establishment of one or two national leprosaria, nothing was accomplished until after World War I. A Board that was appointed to consider appropriate sites attempted in 1919 to locate such a facility on three keys off Florida's Gulf Coast. Governor Sydney J. Catts led Floridians in opposing this action, and the matter was finally dropped on the basis that the state's commercial interests might be injured. The National Leprosarium was established in Louisiana in 1921, and by 1929, 35 patients had been admitted from Florida.—Author's Summary

Scarborough, Harold. Leprosy in northern Nigeria. Br. Med. J. **1** (1977) 379. (Letter to Editor)

Dr. C. L. Crawford (Br. Med. J., 25 Dec. 1976, p 1562) criticizes me and, by implication, the Faculty of Medicine of Ahmadu Bello University, Zaria, for sending medical students to a leprosarium to learn about leprosy.

Whatever is the prevalence and, even more important, the incidence of leprosy in the north of Nigeria today, it remains an important disease. Leprosy has a remarkably wide spectrum of clinical features, and medical students should have seen as many of these as possible, especially if the disease is to be dealt with in general dispensaries, clinics, and hospitals. The place to become familiar with the natural history of leprosy, with its manifold manifestations and with the difficulties of making a clinical diagnosis, is a leprosarium where good records are kept and large numbers of outpatients seen. It is desirable, too, that the student should be able to reach a definitive diagnosis himself by making, staining, and examining slit-skin smears. This also can be learned under supervision in a well-equipped leprosarium.

The management of the established case of leprosy involves a good deal more than regular administration of dapsone, and students can see for themselves the wide range of therapeutic measures available in a good leprosarium (physiotherapy, occupational therapy, surgery, physical, psychological, and social rehabilitation, etc.). If an attachment to a leprosarium enables students also to see a wide variety of skin disorders, to visit villages where over half the inhabitants have onchocerciasis, and to see for themselves the conditions in which this infection is common, as well as to familiarize themselves with the ecology of a part of the vast Federation of Nigeria which they might otherwise never know about, then their visit to the leprosarium at Garkida should be a rewarding and relevant experience.—Author's Letter

Zgrzyblowski, Antoni and Rozen, Ludwik. Problemy dermatologii Republiki Wietnamu w koncowym etapie wojny domowej. [Dermatological problems in Vietnam during the war.] Przegl. Dermatol. **63** (1976) 721-726. (In Polish)

Dermatologic problems in South Vietnam during 1970-1975 are presented. The morbidity of skin, venereal diseases and leprosy, the organization of dermatologic services, therapeutic methods, and the development of a dermatologic staff are presented. The negative effect of the civil war on the development of Vietnamese dermatology is discussed.—(*Adapted from* authors' English summary)

Rehabilitation

Prasad, K. R. Family planning in relation to leprosy, venereology and dermatology. Indian J. Dermatol. Venereol. Leprol. **43** (1977) 225-226.

The futility of compulsory sterilization of leprosy patients as a method of controlling leprosy is pointed out. However, leprosy patients do need family planning advice and methods as does the general population. In addition, infectious leprosy patients need to postpone marriage or pregnancy until they become noninfectious. The possible ways in which family planning may influence sexually transmitted diseases and skin disorders are briefly indicated.—(*Adapted from* author's summary)

Other Mycobacterial Diseases and Related Entities

Meyers, Wayne M. and Connor, Daniel H. Onchocerciasis and streptocerciasis in patients with leprosy. Altered Mazzotti reactions. Trans. R. Soc. Trop. Med. Hyg. **69** (1975) 524-525. (Letter to Editor)

In 1948 Mazzotti described the early onset of severe itching, cutaneous edema, and frequently systemic symptoms in Mexicans with onchocerciasis, following the administration of diethylcarbamazine (DEC). In Up-

per Volta, Monjusiau *et al* (1964) observed that DEC provoked Mazzotti reactions in 114 of 120 (95%) patients with onchocerciasis. The high frequency of Mazzotti reactions in onchocerciasis has led to its use by some as a presumptive diagnostic procedure. Meyers *et al* (1972) in Zaire noted responses similar to Mazzotti reactions in 29 of 35 patients (71%) with streptocerciasis treated with DEC.

During the period 1967-1973 we studied 49 Zaireans with both leprosy and dermal microfilariasis. We treated 32 of these patients (31 adults, 1 child; 20 male, 12 female) with DEC under careful inpatient supervision. Of this group, the species of microfilariae were identified by skin snips and biopsy in 20 patients (onchocerciasis, 14 patients; streptocerciasis, 8 patients), and by skin biopsy alone in 12 patients. In the latter group of patients we did not distinguish the microfilariae of *Onchocerca volvulus* from those of *Dipetalonema streptocerca*. Two patients had both onchocerciasis and streptocerciasis; hence the total of 34 filarial infections in the 32 patients. The leprosy patients were classified according to the criteria of Ridley and Jopling (1966), and their distribution was as follows: lepromatous (LL) and borderline lepromatous (BL), 15 patients; borderline (BB), 6 patients; borderline tuberculoid (BT) and tuberculoid (TT), 11 patients.

Microfilarial density in 20 patients was determined on 2 dermal snips (2 mm in diameter) taken from the scapular area. The snips were teased apart in physiological saline and several microscopic observations made over a 30 minute period. Total microfilarial counts in the two snips ranged from 1 to 15.

The dose of DEC on the first day was 25 mg in 7 patients, 50 mg in 2 patients, and 100 mg in 23 patients. The lower doses were given to patients who were more seriously ill. On days 2 to 21, each patient received DEC 50 mg three times daily. None of the patients was receiving steroids or antihistamines just prior to or during DEC therapy. All but two patients were on long-term diaminodiphenylsulfone (DDS) therapy for leprosy. Doses of DDS ranged from 25 mg twice weekly to 50 mg three times weekly.

Mazzotti reactions occurred in 9 patients and not in the remaining 23 patients: a reaction rate of 28%. Reactions in the 9 patients were all mild, and none required specific treatment nor suspension of DEC therapy. The distribution of reaction rates among the various classes of leprosy patients was as follows: LL + BL, 12%; BB, 50%; and BT + TT, 33%.

Onchocercomata were excised from nine patients 24 to 72 hours after the initial dose of DEC and examined histopathologically. There was a significant eosinophilic response about the adult filariae and in the fibrous tissue of the nodule. A few degenerating microfilariae were observed in the skin.

We cannot explain the low frequency and reduced severity of the Mazzotti reaction in these leprosy patients but offer the following possibilities: a) Leprosy patients, especially those with lepromatous leprosy, have a depressed cell-mediated immunity to *M. leprae*. Whether or not this impairment could alter the Mazzotti reaction in a nonspecific manner is unknown, but the rate of Mazzotti reactions in lepromatous patients is much lower than in those with borderline or tuberculoid leprosy. The extensive granulomatous infiltration in the skin of lepromatous patients may also alter the allergic reactivity of the skin. We do not believe that dermal nerve damage by leprosy contributes significantly to the altered Mazzotti reaction.

b) All but two of the patients were under DDS therapy for leprosy. One of these two, a patient with streptocerciasis, developed numerous papules following DEC. Nothing is known of the effect, if any, of DDS on the Mazzotti reaction.

c) The filarial infections were light; however, we do not think this is a likely explanation because Mazzotti reactions were usually intense in local nonleprosy patients with equivalent dermal microfilariasis.

The clinical manifestations of onchoceriasis and leprosy vary considerably in different geographical areas, and hence inter-relationships between these two diseases may differ. The observations of investigators treating leprosy patients in other endemic areas of dermal filariasis may be of interest.—Authors' Letter

Nishioka, K., Kawamura, K., Hirayama, T., Kawashima, T., Shimada, K. and Kogure, M. The complement system in tumor immunity: significance of elevated levels of complement in tumor-bearing hosts. Ann.

NY Acad. Sci. **276** (1976) 303-315.

Elevation of serum complement level and depressed state of tuberculin reaction were observed in lung cancer patients. A clinical follow-up study demonstrated negative conversion of tuberculin reaction while keeping the complement at an elevated level during the observation period. This phenomenon can be explained; the complement system is elevated to compensate for the depressed cell-mediated system to prevent the immunologic surveillance system from invading agents in tumor-bearing hosts.

The immunologic states of the patients with various diseases are classified into six stages according to the tuberculin reactivity, positive or negative, and complement level: elevated, normal, or depressed. A healthy control group is composed of the group of complement normal and tuberculin positive (Stage I). Most of acute inflammation falls into the elevated level of both complement and positive tuberculin reaction (Stage II). Sarcoidosis, leprosy, and Wegener's granulomatosis are divided into the elevated level of complement and depressed tuberculin reaction (Stage III). Systemic lupus erythematosus is in Stage V with the depressed state of both tuberculin reaction and complement level.

A follow-up study of lung cancer patients showed a possible chronological sequence starting from Stage I through III, and finally to V, similar to the progression-of-disease process. The biological and medical significance related to the phenomenon is discussed, based upon immunochemical, phylogenical, and immunogenetical standpoints of complement research.—Authors' Summary

Oiwa, Koji. Effects of murine leprosy bacilli on spontaneous mammary tumor in mice. Bull. Chest Dis. Res. Inst. Kyoto Univ. **9** (1976) 7-13.

When heat-killed *Mycobacterium lepraemurium*, with or without Freund's incomplete adjuvant, was injected intraperitoneally into C3H/He female mice repeatedly, the incidence of spontaneous mammary tumor was retarded or suppressed. The murine lepromin reactions, especially late reactions, became stronger by this treatment. Freund's incomplete adjuvant seems to aid the effect of heat-killed bacilli. Live cells of *Mycobacterium lepraemurium*, with or without the adjuvant, had no tumor suppressing effect and the murine lepromin reactions were weak.—Author's Summary

Premanath, M. and Ramu, G. The association of leprosy and tuberculosis. J. Indian Med. Assoc. **67** (1976) 143-145.

Observations are made on 40 patients suffering from both tuberculosis and leprosy (29 lepromatous and 11 borderline). The serious prognosis of tuberculosis when co-existing with lepromatous leprosy is stressed, and synergism rather than antagonism between the two mycobacteria is thought to be a possibility.—T. F. Davey (*Adapted from* Trop. Dis. Bull.)