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## EDITORIALS

*Editorial opinions expressed are those of the writers.*

### A General Condition of the Work on the Prevention and Treatment of Leprosy in China

Leprosy is a very old disease in China with a history which can be traced back to more than 2000 years ago. It was first recorded in the "Nei Jing," one of the earliest Chinese medical classics of the Warring States (403–221 B.C.), in which the symptoms and features of leprosy were described under the name of "Da Feng." Records of symptoms and remedies for leprosy were also found in the medical books and literature of succeeding dynasties and in traditional hearsay. Moreover, prescriptions for the treatment of leprosy were found inscribed on bamboo slips recently excavated from a Han tomb (55–68 A.D.).

Leprosy was prevalent in China during the past few centuries. It was endemic in most provinces, especially along the coast and in the Yangtze valley. In addition to the Han people, it was also found among minority nationalities. In 1950, the total number of leprosy patients in the whole country was estimated at about 600,000. At present, it has dropped to approximately 200,000.

Various causes contributed to the long term existence and spread of leprosy in China. In the past, the working people frequently lived in poverty under poor health conditions with overcrowding and poor nu-

trition. Fear of and discrimination against leprosy compelled patients to run away. Backwardness in medical sciences and the lack of effective prophylaxis and treatment also contributed to the spread of the disease. In 1886, foreign missionaries and philanthropic societies started leprosy hospitals in provinces such as Guangdong, Guangxi, Shandong, Hubei, Hunan, Jiangsi, Zhe-jiang, Sichuan, Yunnan, Guizhou, Gansu, and Shanghai. According to a report of the Ministry of Health of the former Nanking Government to the Fifth International Leprosy Congress in 1948, the total number of leprosy hospitals at that time was 40, of which 39 were established by foreign missionaries with a total of 2391 beds.

After the founding of the People's Republic of China in 1949, public health work improved. With the application of well planned and organized programs against leprosy started by various health organizations, good results have been achieved during the last 30 years.

#### I. PRINCIPLES AND MEASURES

Prevention and treatment of infectious diseases were given special attention by the Party and by the Chinese People's Govern-

ment. In a national conference against epidemics which was held as early as 1951, a special discussion was held on the prevention and treatment of leprosy. The "National Program for Agricultural Development," which was issued by the Central Government in 1956 called for leprosy control. In 1957, another national conference on leprosy control was called by the Ministry of Health in which a nationwide program against leprosy was laid down. Provincial programs were made by various provinces accordingly. Leprosy control was made a definite part of health work.

Active prevention, vigorous treatment, and control of sources of infection are considered the principles of our leprosy work. Comprehensive prophylactic and therapeutic measures, consisting of publicity and education of the public, discovery and treatment of cases, isolation of infectious cases, and protection of contacts were taken as the main steps toward the realization of our hope to control and eradicate leprosy as soon as possible in China.

Beginning in the 1950s, antileprosy organizations such as leprosy hospitals, villages, and stations were built one after another in localities where leprosy was prevalent. There are about 1000 antileprosy organizations and institutions in the whole country. Even in the border regions such as Xizang (Tibet) and Sinjiang, leprosy hospitals were also established. Since 1951, seven major advanced training courses in leprosy were presented by medical institutions to provide more professional workers for leprosy hospitals. Short course training classes were often given by the commune health stations to popularize scientific knowledge about leprosy among health workers and barefoot doctors. At present, there are nearly 10,000 antileprosy personnel in the country. Leprosy networks were organized at the county level where leprosy patients were numerous. The network is actually a combination of professional and paramedical workers in the leprosy hospital, the commune health station, and the barefoot doctor at the production brigade level. The hospital is the center of this tripod organization.

**1) Propaganda and education.** For thousands of years leprosy was believed to be a "heavenly condemnation," an "inherited

disease," and hence an "incurable disease." Such misconceptions had seriously hampered antileprosy work. With the aid of pamphlets, posters, blackboard bulletins, and lantern slide shows, popularization of scientific knowledge about leprosy with respect to its causes, mode of infection, early symptoms, prevention, treatment, etc., were carried out. Emphasis was placed on the fact that leprosy is curable and that early treatment permits early cure. In due course, misapprehensions about leprosy were gradually relieved, and better results were obtained in early discovery and the fulfillment of prophylactic and therapeutic measures.

**2) Discovery of patients.** Early discovery and early treatment are considered very important in control work in leprosy. The methods we used in detecting leprosy patients may be summarized as follows:

- a) Mass Screening Survey by professional medical personnel. This consisted of a full physical examination of whole populations by professional personnel in a district within a certain period of time.
- b) Mass Screening by trained barefoot doctors or health workers. Preliminary physical examinations of the whole population were made by trained barefoot doctors or health workers to discover persons with symptoms suggestive of leprosy while the final diagnosis was made by professional workers following reexamination.
- c) Clue-Survey Method. The symptoms and features of leprosy were described in a number of clues which a person suspected of leprosy could have. The persons then would report or be reported by others as suffering from leprosy. They became aware of the importance of reporting the disease through thorough propaganda and education. The final diagnosis was always made by a doctor.

The above three methods might be used alternately or in combination. The mass screening method was used in regions where scientific investigations for research were needed to obtain experience which might be applied in other places. In epidem-

ic regions leprosy patients were often discovered by hospitals through routine physical examination. Other health organizations and even mobile medical units were also helpful in discovering patients. Past experience has shown that, in the long run, more leprosy patients were usually found in daily clinical routine work than by a rapid mass survey made at one time.

**3) Mass treatment.** Free and early effective treatment was offered to all patients discovered. Other than patients in leprosy villages, ambulatory cases were taken care of either by the antileprosy network or the basic health organizations. Sometimes medical care and drugs were brought to the patient's home. Medical records were kept for all patients under treatment. Dapsone was used as the main drug for treatment with a daily dose of 50–100 mg for adults. Other drugs such as Sulphetrone®, TbI, thiambutosine, rifampin, and clofazimine were also used. Thalidomide was used for the treatment of erythema nodosum leprosum. At present, investigations on the effect of combined Chinese and modern medicine, Chinese herbs, and acupuncture in the treatment of leprosy and leprosy reactions are being made by many leprosy hospitals and villages. Reconstructive surgery of deformities and the prevention and treatment of plantar ulcers are being done. Free medical care is given to all leprosy patients in China.

**4) Isolation of sources of infection.** Isolation of the bacteria-positive cases (open cases) was begun in the 1950s. Leprosy villages of different sizes up to several hundred beds were usually built in the rural areas since leprosy was more prevalent among the peasants in China. All bacteria-positive or severe cases with deformities, plantar ulcers, and leprosy reactions were admitted to the villages. In the cities leprosy hospitals were usually set up to take care of patients. These hospitals were also responsible for training professional workers and organizing antileprosy work in the surrounding areas. Moreover, the hospitals also carried out scientific research.

**5) Protection of contacts.** Contacts, particularly members of the patient's family, are more likely to be infected with leprosy than the general population. As reported by Haian county of Jiangsu, 21.31% of the

county's patients were infected by members of their families. Another report from Chaoan county of Guangdong revealed that the prevalence among family members of lepromatous cases was 6.65%. This prevalence was 24 times higher than among ordinary families. Therefore, periodic check-ups and prophylaxis should be given to immediate contacts. In some districts a policy of general checkup once or twice yearly of family members by professional workers was adopted. BCG vaccination, preventive treatment, and injections of DADDS have been undertaken as additional measures against infections on an experimental basis.

**6) Scientific exchange.** The Ministry of Health and the Chinese Medical Association organized a number of national conferences on field work, experience exchange, and scientific and academic discussions to improve control and prevention work in leprosy by summing up past experience. Some technical standards and regulations relating to scientific research on leprosy were made and issued as working documents. "Plans for the Treatment of Leprosy," "Criteria of Clinical Cure of Leprosy," "Criteria for Identification of the Effect of Treatment," "The Classification of Leprosy," and "The Recording Method of the Lepromin Test" were issued. Regional conferences on the prevention and treatment of leprosy were often called by the provinces and municipalities. Books on leprosy such as *Leprology*, the *Handbook on Leprosy*, and the *Atlas of Leprosy* as well as other reference books were published. Articles on leprosy control were circulated.

**7) Research.** Research work on leprosy was a blank to be filled in old China. More recently, special attention to investigative work in leprosy has become one of the important medical research topics in China. The Institute of Dermatology of the Chinese Academy of Medical Sciences has been appointed to lead leprosy research work in the country. So far, much investigative and research work has been done in epidemiology, therapeutics, pathology, microbiology, immunology, and reconstructive surgery. Experiments on the growth of *M. leprae* in the mouse foot pad are done in some laboratories. More recently, the Chinese herb *Lei Gong Teng* (*Tripterygium*

*wilfordii* Hook F) has been proven to be effective in leprosy reactions. With the rapid growth of international contacts we have established relations with WHO and some leprosy organizations in other countries to exchange scientific experience.

## II. RESULTS OBTAINED IN PREVENTION AND TREATMENT

After active prevention and treatment in many districts of China, the incidence and prevalence of leprosy has decreased. The total number of leprosy patients now in China has dropped to one-third of that of 30 years ago, i.e., about 200,000. The epidemic areas have been steadily localized, and the number of children and adolescents has decreased among primary cases. So far the accumulated number of "cured" patients has reached approximately 300,000. At present, there is also a relative decrease in the number of active and strongly positive cases.

Guangdong has long been considered as one of the provinces with widespread leprosy in China. From 1949 to the end of 1979, the cumulative number of leprosy patients found in the whole province was 91,942. The number of patients needing treatment in 1979 totaled only 10,868, which amounts to 11.8% of the cumulative numbers. Meanwhile, the prevalence rate of leprosy of the whole province has dropped from 1.2/1000 in 1958 to 0.19/1000 in 1979.

Shandong was also considered as one of the main provinces with leprosy in China, having a history of leprosy for 2000 years. During the last 30 years large scale antileprosy work has been carried out, and the cumulative number of leprosy patients at the end of 1979 was estimated to be 50,827 while the number of patients who are still suffering from leprosy at the end of the same year totaled only 3421, which amounts to 6.73% of the cumulative numbers. The prevalence rate of leprosy has dropped from 0.7/1000 in 1959 to less than 0.05/1000 in 1979.

In Guangxi Autonomous Region the cumulative number of leprosy patients was found to be 27,560 at the end of 1979, and the number of patients still under treatment in the same year totaled 5973, which amounts to 21.6% of the cumulative num-

bers. The prevalence rate of leprosy in the whole region has dropped from 0.51/1000 in 1960 to 0.17/1000 in 1979.

Again, in Jiangsu province the cumulative number of leprosy patients at the end of 1979 was found to be 52,803 while the number of patients still receiving treatment at the end of the same year totaled 9015, which amounts to 17.7% of the cumulative numbers. The prevalence rate of leprosy has dropped from 0.81/1000 in 1970 to 0.16/1000 in 1979.

In other provinces and municipalities the area of leprosy involvement is getting smaller. The general condition may be summarized as follows:

$$\left( \begin{array}{c} \text{Number} \\ \text{of cured} \\ + \text{deceased} \end{array} \right) > \left( \begin{array}{c} \text{Number of} \\ \text{new cases} \\ + \text{relapses} \end{array} \right)$$

Besides, quite a number of patients with deformities and ulcers have obtained better treatment results. However, since antileprosy work has not been evenly carried out in China, no tendency toward a decrease in the disease has been noted in some districts.

## III. CONCLUSIONS

1) During the last 30 years the aim of all work under the People's Government has been service to the people. This has been especially true for the work of the national health service. The principles laid down for public health work were: a) to serve workers-peasants-soldiers, b) to give priority to prevention, c) to unite doctors of traditional Chinese and Western medicine, and d) to combine health work with mass campaigns. Leprosy control work has become part of the national health work. Active prevention and effective treatment have improved the condition of leprosy patients in China. Large scale antileprosy campaigns were held with the participation of almost a million health workers, including the barefoot doctors. From among hundreds of millions of the population, leprosy patients were searched for and treated free of charge. So far (1979) about 300,000 patients have been cured clinically. The endemic areas have decreased steadily. Misconceptions about leprosy among the people were gradually

reduced. At present, the main antileprosy drugs such as dapsone, rifampin, and clofazimine are manufactured domestically.

2) The comprehensive measures adopted in antileprosy work with full emphasis on prevention have shown satisfactory results. These consisted of combining prevention and treatment with various measures needed in the control of infections. Early discovery of the sources of infection and timely control or eradication of infectiousness along with protection of healthy people are considered very important. Therefore, the early discovery of patients combined with early treatment gives rapid control of infection. Since we have adopted the spot survey method combined with routine clinical checkups, it has been possible for us to discover leprosy patients much earlier. For instance, among the patients discovered in Nanhai county of Guangdong in 1971, 74% of the patients' onset of disease was within 2 years while in J.L. Maxwell's analysis of 1379 cases of leprosy from several leprosy hospitals in various districts of China in 1937, only 27.6% of the patients were within 2 years of onset. However, the key to early discovery of patients lies in publicity and education of the people. In New China, the prevention and treatment of diseases is usually combined with mass campaigns. This is also true in leprosy control work. We found that early discovery, full treatment, isolation of "open cases," and protection of contacts was possible in China following thorough publicity and education.

3) Problems of isolation. The importance of isolation of "open cases" was stressed during the 1950s and 1960s when a large number of leprosy hospitals and villages were built with a total number of 86,000 beds. This was considered very necessary at that time. It played an important part in providing regular treatment, reducing chances of infection, and in planning scientific investigations and in performing reconstructive surgery for deformities. On the other hand, it brought about a number of problems such as a relative waste in manpower and material resources. Since the leprosy hospitals and villages are located in out of the way places, this has caused much inconvenience to the medical staff and family members due to lack of transport and communication facilities. Further-

more, it is very difficult for cured patients to return to jobs or work together with people who discriminate against them. As a result, cured patients are often kept in the hospital or village for an indefinite period of time. With the steady decrease of leprosy patients in China, some leprosy hospitals have been combined with others or closed. Although isolation in leprosy hospitals and villages was historically necessitated, consideration at present is being given to expanding ambulatory treatment and "chemotherapeutic" isolation as a routine method gradually to replace the old hospital-village isolation methods. Work of the outpatient clinics has been strengthened to take care of ambulatory cases.

4) Prolonged struggle maintained. Since leprosy has a long latent period with early symptoms which are usually slight, and drug resistance or relapses sometimes occur during treatment, it has been necessary to provide a long term program for the control of the disease. Well planned treatment and careful observations were made to obtain experience to improve the work. Past experience showed that in places where early discovery and early treatment are properly done, a drop in the spread of the disease was seen in about 10 years, and continued efforts often lead up to basic control of the disease. In contrast, in places where the work has been neglected, the spread of the disease continued and even increased.

#### IV. PROSPECTS AND PERSPECTIVES

Leprosy is a worldwide problem. It is prevalent in the developing countries of Asia, Africa, and Latin America. China is also a developing country. During the last 30 years of struggle against leprosy, we have achieved some satisfactory results. Still the task before us is very great. Although morbidity has dropped in many districts, primary cases still occur. For example, Jiangsu province reported 1145 new cases over a period of 4 years (1976-1979). Although a great number of leprosy patients have been "cured" using dapsone, dapsone-resistant cases have appeared at times. For example, among the inpatients of Taixian Leprosy Hospital in Jiangsu, 12 cases were proven resistant to dapsone clinically and/or by mouse foot pad tests,

accounting for 5.1% of the total BL-LL cases.

The mass survey method was not as satisfactory as expected because greater numbers of leprosy patients were often found among those who evaded the survey. Moreover, it turned out to be very expensive and time consuming to detect only one or two patients among 100,000 people, particularly when the number of new cases was low. Therefore, how to discover and diagnose new cases earlier is a topic for further study. How to identify the "risk group" precisely and start effective protection is another problem to be studied. Improvement of the treatment of deformities and plantar ulcers, discovery of more effective antileprosy drugs, and combining of traditional Chinese and modern medicine are further tasks to complete. Other topics such as the *in vitro* culture of *M. leprae*, a leprosy vaccine, immunology, and the

mechanism of nerve injuries, need further work. Nevertheless, given the successes we have had during the last 30 years, we are optimistic that by the end of this century we will be able to basically eradicate leprosy from China.

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## The Immunopathology of Nerve Damage in Leprosy<sup>1</sup>

Over 10 million people in the world today have a chronic infection, leprosy. How many more uncounted millions have successfully fought off the disease? Unravelling the complicated immunopathology of leprosy could be the key to its management.

The bite of the disease lies in the disability it causes, and this is mainly a result of damage to nerves. After a brief summary of the general immunopathology of leprosy, the possible mechanisms of nerve damage are listed and then examined in the light of experimental evidence.

<sup>1</sup> This review was written in 1979 by Ian Hill-Smith, M.B., B.S., B.Sc., while he was a medical student at University College, London. It was written in response to the annual competition set up by the British Leprosy Relief Association (LEPRA) for essays on various aspects of leprosy and was one of the prize winning essays for 1979. We take pleasure in publishing this excellent review. Dr. Hill-Smith's present address is Stoke Mandeville Hospital, Aylesbury, Buckinghamshire, U.K.—RCH

### GENERAL IMMUNOPATHOLOGY

Leprosy is a spectrum of disease; it ranges from tuberculoid, with granulomata heavily infiltrated with lymphocytes and a cell-mediated immune response, to lepromatous, in which there are numerous lesions containing a high concentration of acid-fast bacilli and causing a humoral response. There are two possible reasons for this spectrum: either the precise nature of the infecting organism is inconstant or the reaction of the host varies.

The experiments of Rees<sup>2</sup> support the latter; inoculation of the mouse foot pad with bacilli isolated from patients with different types of the disease resulted in apparently identical infections. However, as he points out, this is not conclusive evidence. Further support is gained from experiments

<sup>2</sup> Rees, R. J. W. New prospects for the study of leprosy in the laboratory. *Bull. WHO* 40 (1969) 785–800.