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Medicine and Public Health in the People's Republic of China

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*Medicine and Public Health
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PUBLIC HEALTH**
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Joseph R. Quinn, Ph. D.
Editor

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tion of steroids. Industrial biochemistry can be expected to become one of the important scientific developments for the national economy. It should be pointed out that in present-day China, the intensified use of antibiotics is not confined to medicine, but also is used in agriculture and stock raising.

Since 1957, the price of penicillin has been markedly reduced with regularity. A wide range of antibiotics manufactured in China is presently available in large quantities for export to other Asiatic countries, Europe and South America.

C. Highlights on Practical Rural Medicinals

Common folk medicinals in China have been found to be simple, economic and, within limits, effective. In answer to a government call to support agricultural expansion, these medicinals are most extensively used in agricultural areas. The more common remedies are listed below with their reported uses and content:⁸⁸

1. **Allium Tuberosum Roxb:** The *chiu-tsai* is a perennial bulbous plant of the *Liliaceae* family. It has long, flat leaves and a hot taste. Both the root and the seed are used medicinally. It contains essential oils, sulfates, carbohydrates, as well as Vitamin C. It is nutritious, "stomach strengthening," and has antihemorrhagic effects. Its uses include (a) chronic alimentary illnesses, including stomach pain, nausea, vomiting, etc; (b) sweating and excessive urination, debility in women, leukorrhea, cold in the lower extremities, etc.; (c) vomiting of blood, excessive bleeding in females; (d) chronic dysentery with blood in the stool; and (e) hemorrhoids and metroptosis.

2. **Hen's egg:** The shell is composed of calcium carbonate, calcium phosphate, as well as bits of animal colloidal matters and is an inexpensive source of calcium for use in pediatric rickets, adult tuberculosis or for females during pregnancy. The egg yoke "oil" contains lecithin and vitamins A and D. It is a nutritious tonic and may be used as a substitute for cod-liver oil for tuberculosis patients. It is more effective than cod-liver oil and less obnoxious. From his research on the effects of lecithin in skin diseases, Professor Ma Wen-chao found that this product increases epithelial cell activity and resistance.

3. **Loaches:** These eel-like fish are native to warm water bogs and ditches. The body is black and has no scales. The mucous secretion, used to treat acute inflammation of the skin, has also been used extensively in cases of erysipelas, cankers, facial sores, otitis media, burns, arthritic and other pains, etc. It is painted on the affected area.

4. **Luffa Gourd:** This is a type of vegetable grown all over the country and is known as T'ien Szu'kua, T'ien-lo, or Shui-kus (in Kwang-

tung). It is a vine of the *Cucurbitaceae* family. Fresh luffa contains saponin, niter, and a great deal of mucus, xylose adipose, proteins, and Vitamins B and C. The pulp contains pentosan and cellulose. Luffa can be used as a diuretic, "blood cleaner" and detoxicant. It has an antitussive effect and is an expectorant. In present day experience it is given for colds, acute bronchitis, sore throats, chest pains, etc. Luffa lotion can also be used as a high grade cosmetic. There are already commercial products sold in foreign countries that can be used on the face. Young people use it to beautify their faces. It is said to clear the skin and eradicate blemishes more effectively than other cosmetics.

5. **Sour Plum** (*Prunus mume*): This is the unripened plum fruit also known as "green plum". The *Wu-mei* or the *Pai-mei* are but the processed product of this plum. The plum belongs to the *Roseaceae* family. It is cultivated all over China. The green fruit (raw) is used for medicinal purposes. The fruit contains succinic, citric, malic, tartaric acids, edible alcohols, native lугistic acid, as well as certain ceryl alcohol-like substances. The sour plum is used as a cooling and anti-febrile agent. It is an astringent, stops diarrhea, relieves pain, suppresses cough, vomiting and nausea. It is a germicide due to its acidic nature. Taken orally, it inhibits bacterial growth in the alimentary tract. It is also used for ascaris worms. (From more than ten years' clinical experience, the writer can attest to the anti-nausea and anti-emetic as well as the anti-diarrhea effect of the aqueous extract of this plum.) In modern experience it has been found effective in epidemic dysentery or fever of unknown origin in children. When used in acute gastritis and diarrhea, it is reported to be more effective than sulfa drugs. When used for typhoid and paratyphoid cases, it effects early eradication of fever and shortening the course of treatment. It was claimed to be an effective preventive for the cholera epidemic during the summer of 1940 in suburbs of Soochow.

6. **Wax gourd** (*Benicasa hispida*): It is also known as the "pillow" or "east" melon. It is available in all parts of China and is of the *Cucurbitaceae* family (obtainable in Chinese communities, New York, Los Angeles and San Francisco). The melon is large, cylindrical, resembling a pillow. When tender it is green and has fuzz covering the skin. When ripe, the surface will present a waxy and white powdery appearance. The flesh is light flavored and the center is hollow. The seed contains urease, adenyl-histidine, trigonelline, etc. It is used for relieving inflammation, detoxication and healing of carbuncles and "internal pustulation." The peel of the gourd has a diuretic effect and is used in the treatment of nephretic edema.

7. **Corn silk:** Corn is a plant found in all rural areas. Its composition includes ergosterol, glucose, saponin, picrates, Vitamins C and K, and wood tar derivatives. According to Soviet research, oral administration of the silk preparation causes increases in biliary secretion and bilirubin concentration, accompanied by increased blood coagulinogenase, hastening blood coagulation. It is also a diuretic. It is used in cases of chronic hepatitis, bile duct illnesses, bile stagnation, biliary inflammation, stone formation, jaundice, chronic nephritic edema, urinary tract stone formation, diabetes, hemorrhagic purpura, nose bleeds and hematuria. It may also be effective in hemorrhages due to lack of coagulinase (agglutinase).

8. **Lotus:** This plant is present in all parts of China, growing in shallow ponds and boggy areas. The leaves, stalks and the flowers are named separately (in Chinese). The pistils are called *lien-shu*, the seeds are commonly called *lien-tzu*. The root contains starch, asparagin, raffinose; the leaves, stalk and pods, lotusate in small quantities. The flesh of the seed contains proteins, fats, carbohydrates, carotene, nucleoflavin, and ascorbic acid and all parts of the plant contain tannic products and have agglutinative effects. Small amounts of lotusin show cardiac stimulating and diuretic effects. The seeds are rich nutrients. Both the seeds and the young seedlings within serve as tranquilizers and diuretics. The root juice inhibits nausea and relieves drunkenness. The leaves, pods and stalks stop vomiting and bleeding. The seedlings "strengthen the gonads" and stop emissions. Thus it is prescribed for vomiting, nose bleeds, uterine bleeding, leukorrhea, chronic dysentery, diarrhea, nocturnal emissions, edema of pregnant women, and chronic nephritis. For chronic nephritis, it is more effective if used together with the leaves of *Artemisia vulgaris* and root of *Amperata arundinacia*. It is also used for hemorrhoids and anal fistulation.

9. **Mulberry Tree** (*Morus Alba*): This tree is cultivated all over China. The fruit is the mulberry and the leaves are used for silkworm feed. The white bark and the roots contain cetylic acid, certain sterols, as well as various glucosides. It also contains acid latex and volatile oils. The white bark has diuretic and antitussive activity. The shoot and leaves act as a blood pressure depressant. It is used for acute nephritis, heat stroke, edema of bronchial asthma, hypertension, rheumatic pains, etc.

10. **Earthworms** (also known as ch'u-chan): The traditional medical name is *ti-lung*. It is a vermes of the *annulata species*. It contains an antifebrile substance known as "antifebrile salt" (perichaeta), which has been found to be a derivative of tyrosine. From dried earthworms, it is possible to extract an effective nitrogen-containing component.

which has the effect of dilating the bronchioles and affect the lung function of the rabbit (Chinese translation by Chao Ch'eng-ku, Chang Ch'ang-shao, 1937). Its hypotensive effect is characterized in animal experimentation by mild, slow and sustained reduction of blood pressure. A detailed discussion on its hypotensive mechanism and composition of material is reported in the *Journal of the Lanchow Medical College, No. 4, 1959*, by Chang P'ei-yen, et al. Uses include influenza and other acute fevers, high fevers in children, headaches, hypertension, cerebral strokes and palsy.

11. **Toads** (also known as *lai-ha-mo*): The following have been extracted from the toad by Ch'en K'o-kuei: adrenalin, cholesterol, phelonic acid, cinobufenine (also known as the amine of toad toxin), cinobufotoxin, cinobufogonin. (*Journal of Biology of Chemistry, Vol. 87, No. 3, 1930, p. 741-53*). Cinobufogonin and cinobufotoxin are stimulants and have myocardiac and vago-stimulating effects. Toad secretion is a stimulant, an anti-inflammatory and antitoxic drug. It is used for treating carbuncles and sores.

12. **Turtles**: They are native to lakes, rivers, ponds and bogs, especially in Chekiang Province. The shell contains gelatins, fats and salts. These are used for nourishment and tonics, weeping carbuncles, fistulation, tuberculosis of the spine, knee joint, etc., and hasten calcification of pulmonary tuberculosis.

13. **Grasshoppers and Locusts**: They are pests that attack rice plant leaves and are classified as *Pachytylus, Orthoptera* of the *Arthropodas*. They contain water, 22.6%; protein, 64.25%; fats, 2.33%; ashes, 3.3%; plus Vitamins A, B, etc. They are considered highly nourishing, tasty and can be used for subsidiary foodstuff and a condiment. Medicinally, they have the effect of calming the nerves and stopping coughs and they are used in whooping cough and tetanus. Grasshoppers are said to be specific for cases of pertussis and asthma.

Accelerated Growth of Natural Resources

In order to meet the increasing need for traditional Chinese plant remedies, their cultivation has been greatly accelerated in recent years. Intensive campaigns have been launched to encourage farmers to grow medicinal plants (Fig. 1). Response was enthusiastic, and, although planting and cultivation were accomplished solely by hand, results showed great increase in acreage cultivated and harvests sold over subsequent years (Fig. 2). Important measures have been adopted by all departments concerned to implement the directive of the State Council for the development of traditional medicine. Schools and training courses have been set up to teach the production of traditional



FIGURE 1. The *Aster tartaricus* cultivated by the Cadres' School of the Peking First Commerce Bureau. Chinese medicinal herbs are grown over large areas in the communes and brigades in the suburban counties of Peking (China Pictorial, Nov. 1971)

drugs (Fig. 3). There have been projects all over the country to accelerate cultivation and to introduce new medicinal herbs. Also, a number of medicinal plants reportedly have been successfully transplanted. For example, the famous *ginseng*, which was thought to be adaptable for cultivation only in the northeastern provinces, has been successfully planted in other areas, such as Shansi, Hopei, and Yunnan.³⁴ *Carthamus tinctorius*, *Chrysanthemum incanum* L. and *Dioscorea japonica* have been introduced to Kiangsu, Shanghai, Shantung, and Kuangtung. As they are produced locally, the needs for these plants in these provinces are met. There have also been large amounts of surplus to supply other regions where these plants are not grown.

As to traditional remedies of animal origin, there have also been programs of breeding medicinal animals with good results. For example, deer raising has developed rapidly in China the last few years (Fig. 4). A nation-wide survey program has also been carried out to locate all the sources of natural medicinal products in China.³²

CONCLUSION

To the Western scientist, Chinese medicine, with its long traditions of herbal medications, superstitions, and philosophy, has appeared somewhat strange, irrational and enigmatic, and, at best, empirical. Recently, as a result of an initial blend of Western and traditional Chinese medical practice, some startling achievements such as



FIGURE 2. The clinic staff of a production brigade in Changshu County, Kiangsu Province, process the medicinal herbs they have gathered (*Medical Workers Serving The People Wholeheartedly*, Foreign Languages Press, Peking 1971)

acupuncture anesthesia have been revealed. Two facts have been demonstrated: (1) That Western and Chinese traditional medical practices are not irreconcilable, and (2) that further potential usefulness of traditional Chinese medicine to medical science would require the use of Western scientific methods to analyze systematically and thoroughly and to identify and clarify causative factors and relationships.

The challenge is clear. Initial headway gained by Western-trained scientists handicapped by limited equipment, experienced personnel and technological backup has demonstrated the great potential attainable if full marshalling of adequate scientific resources were possible. The Chinese materia medica is a vast storehouse of complex, loosely structured, pharmacological information subject to scientific screening and verification. In the past, Western medicine has gained immeasurably from chance discovery and application of ancient Oriental medicinals. Ephedrin (*Ma Huang* from China) and *Rauwolfia serpentina* (from India) are two classic examples of the application of Western science and technology to traditional herbal remedies. It is conceivable other herbal medicaments with equal potential to Western scientific



FIGURE 3. A health worker shows commune members the different medicinal plants and explains what they can do in treating and preventing diseases. (*China Reconstructs*, Nov. 1971)



FIGURE 4. The *Sika* deer is a wild animal of great economic value. The knobs and collagen of its antlers are effective in promoting various functions of the human body, treating weakness of the heart muscle and hastening the healing of wounds. The antlers, after processing, are used for ulcers and swellings. The foetus, tendons, tail and viscera of the deer can be made into medicine. Deer raising has developed rapidly in China in the past few years. Herds of deer grazing on a P.L.A. farm. (*China Pictorial*, Nov. 1971)

and medical areas of interest exist. Such areas of interest may well include the treatment of cancer, viral disease, leukemia, and perhaps neuromuscular ailments such as muscular dystrophy and poliomyelitis. A key program launched by Western scientific and medical professions to conduct an investigation into Chinese medical practices and medicines would be fraught with frustration and difficulties, but the payoff may well be worth the effort.

INFECTIOUS AND PARASITIC DISEASES

Kun-Yen Huang, M.D., Ph.D.

INTRODUCTION

In the past the Chinese frequently referred to themselves as the "weaklings of eastern Asia." While it may have also referred to the conditions of nonmedical domains of China in the past hundred years, the term may be appropriate for a country plagued for centuries by a wide variety of communicable diseases. The number of these diseases is so large that it is impossible to discuss all of them in this chapter. Hence ten of the diseases which in the author's judgment are of major importance on the Chinese mainland today were chosen. This selection inevitably had to be based on the author's own *judgment*, because medical publications have been nearly nil since the Cultural Revolution of 1966. The information contained herein was obtained mostly from medical articles which appeared before the Revolution, and partly from news and notes scattered among nonmedical publications, which are sufficient only to provide the most sketchy of the current picture.

The scope of the health problem as it existed in the early 1950's was unknown to the Chinese themselves. It was only gradually revealed after years of concentrated effort in nationwide surveys of existing diseases, their geographical distributions and the number of patients. At the same time, numerous institutions were established throughout the country, many of which were strategically located and specifically commissioned to study a particular infectious disease in relation to its mode of transmission, the life cycles of its causative agents, and the biology of its vectors, and to develop practicable control measures. Whether or not progress in these lines of work was in fact satisfactory, the government did set a target date for the "eradication of five most menacing parasitic diseases," i.e. schistosomiasis, malaria, filariasis,

kala-azar, and ancylostomiasis, as part of its National Programme for Agricultural development in 1956.

It is debatable whether these goals have ever been reached, yet evidence is abundant that many infectious diseases, parasitic or nonparasitic, have been brought under control. Cholera and smallpox have been literally wiped out. Sabin vaccine was produced domestically and used in a large scale vaccination program in 1960, resulting in a drastic reduction in the incidence of poliomyelitis and the disappearance of the peak of seasonal incidence in the following years.^{1, 2} The control of measles seemed quite satisfactory with the production and clinical use of a live vaccine in 1963-64.^{3, 4} Venereal diseases are probably the first infectious diseases brought under control as the byproduct of the change in the socioeconomic structure. Among the parasitic diseases, kala-azar is without doubt the most successfully combatted, although evidence indicates that the incidence rose after an initial drop in the late 1950's.⁵ It should be stressed that even the diseases which are still prevalent in China, such as the ten chosen for discussion in this chapter, are decreasing in incidence. These ten diseases are tuberculosis, leprosy (Hansen's disease), trachoma, viral encephalitis, schistosomiasis, malaria, filariasis, clonorchiasis, paragonimiasis and ancylostomiasis.

It is the intention of the author to provide a general picture of each infectious disease as it exists in China. Specific emphasis is placed on the distribution and prevalence of the disease, major achievements in research, both basic and clinical, and specific control measures. Information readily obtainable from other sources, such as symptomatology, unless deemed of particular interest, is not within the realm of this discussion. It should be noted that two previous publications are available for additional information.^{6, 7}

Tuberculosis

Before 1949, the status of tuberculosis in China was quite obscure. Studies in a few major cities showed the prevalence rate to be 3-9% of the population. Based on this figure, the minimum number of patients at this time can be estimated at 15,000,000.⁸ The mortality rate per 100,000 for tuberculosis was 230 in 1949. A decade of antituberculosis campaigning brought about a decline in the prevalence rate to 1% in the cities, and the mortality rate to 46/100,000 in Peking in 1958,⁸ still a considerably high rate compared to 6/100,000 in the U.S. in the same year. Further reduction in the mortality rate was seen through 1963. This disease, despite this remarkable drop in incidence, was still the number one killer in China in 1958.⁹

It is more prevalent in urban than in rural areas. Samples of tuberculin test surveys in 300,000 children 15 years of age or under carried out

from 1950 to 1956 in the Shanghai area show a steady increase in infection rate from infancy (Table 1). Similar rates of infection were reported from different localities throughout the country.¹⁰ It is also clear from this table that the prevalence of infection, as manifested by tuberculin test, did not decrease during the period from 1950 to 1956.

*Table 1. Prevalence of tuberculin positive reactions in children in the Shanghai area, 1950-1959**

	Percentage of positive reactions in different age groups					
	Urban (yr)					Rural (yr)
	1	1-4	5-9	10-14	15	15
1950	5.9	18.9	53.2	76.4	82.9	71.5
1952	5.3	25.0	57.3	80.4	87.0	70.3
1956	5.3	20.8	47.1	60.9	91.8	62.1

*Adapted from Wei et al.²⁰

In addition to pulmonary tuberculosis, tuberculous meningitis is quite common among children. Representative results from a series of studies in 1964 show that tuberculosis accounted for 5.8% of the total number of pediatric patients hospitalized. About one third of these cases were meningitis.¹¹ In fact it was urged that cases of aseptic meningitis be managed as tuberculous in nature until proved otherwise. The diagnosis of tuberculous meningitis was said to be facilitated by using the fluorescent Na diffusion rate test.¹² Tuberculous pleurisy and peritonitis on the other hand were common medical conditions encountered in adults. The former accounted for 3.2%–7.5% of hospitalized adult patients, and over half of them fell in the 16–25 year age group. The latter was responsible for 0.55% of all adult patients or 1.3% of those hospitalized in medicine, and was twice as common in the female than in the male.¹³ Other conditions frequently encountered are bone, renal and miliary tuberculosis. Silicotuberculosis is probably of particular importance. Silicosis is one of the most important occupational diseases in China. One study showed that 27% of the workers in a brick factory had silicosis; 30–40% of these cases were complicated by tuberculosis.¹⁴ The rate of complication with tuberculosis steadily increases as silicosis advances in severity, and it is believed that silicon oxide exerts an inhibitory effect on the body defenses, resulting in the activation of old foci of tuberculosis.

China was up-to-date in treatment of tuberculosis during the 1950's. The chemotherapeutics in use included streptomycin, isoniazid derivatives, p-aminosalicylate, viomycin, cycloserine and thiosemicarbazone.⁸ Among various types of tuberculosis, silicotuberculosis responded to

chemotherapy most poorly.¹³ Artificial pneumothorax and pneumo-peritoneum were extensively used as auxiliary methods of treatment. Surgical treatment included various kinds of collapse therapy and lobectomy or pneumonectomy, which was started in 1951.¹⁵ Traditional medicinal herbs and acupuncture were widely applied, with the latter said to be especially effective for symptoms of neurofunctional origin, such as anorexia and night sweating.¹⁶

A nationwide program of BCG inoculation was initiated in the mid-fifties. The immediate goal of the program was to vaccinate 1) all newborns and 2) all healthy children under fifteen who were tuberculin negative. By 1964, it was claimed that more than 90% of newborn infants had been vaccinated. The logistic support, especially that of manpower, required by this enormous program was partly met in some localities by the short-course training of teachers of nurseries or elementary schools in tuberculin testing and BCG inoculation. In 1960 there were six biological products laboratories producing PPD and BCG. In addition to the conventional BCG, lyophilized vaccine was experimentally produced in 1956, the stability of which was said to be highly satisfactory.⁸ The drop in the incidence of tuberculosis in BCG-inoculated as compared to uninoculated children has been well documented.^{8, 11, 17}

Facilities for tuberculosis treatment, although increased significantly during the preceding years, were in the author's view still inadequate in 1960. There were 236 tuberculosis clinics, hospitals or sanatoria with a total of 36,000 beds. In addition, about 10% of the beds in general hospitals were reserved for tuberculosis patients. Of particular interest is a new type of nursery termed "Recuperation Nursery" which appeared in Tsintao, Shantung, in 1960, providing isolation, therapy and education for 1- to 6-year old urban children with active pulmonary tuberculosis. The number of doctors directly involved in anti-tuberculosis campaigns were said to have increased from 100 before 1949 to 2,700 in 1959.⁸

Education of the public in the mode of transmission and methods of control of the disease has been actively carried out. Routine roentgenological examination, however, does not seem to be available for the majority of the people.

Leprosy (Hansen's disease)

Leprosy (Hansen's disease) is distributed mostly in the tropics and subtropics. The disease has been recorded since ancient Chinese history, along with the cruelties to which leprosy patients have been subjected. It is estimated that about half of the 12,000,000 to 20,000,000 world total of cases are in India and China. Roger and

Muir estimated in 1946 that the total number of patients in China was 1,000,000.¹⁸ Accurate information is unavailable. Even the Chinese official figure given in 1951, 1,200,000 minimum, was accompanied by an acknowledgment that many cases could have been unregistered.¹⁹ According to Yü,¹⁹ the inaccuracy of this figure is reflected in the classification of the patients. Representative data show that 47.7% of the cases belong to the tuberculoid type, with the remaining 52.3% lepromatous. These figures differ significantly from those generally accepted by international leprosy investigators, i.e., 70% tuberculoid, 20% lepromatous and 10% unclassified, suggesting failures in detecting tuberculoid leprosy cases.

The distribution of the disease in China is also related to climate, rain and humidity, consistent with that observed in other parts of the world (Fig. 1). Not a single province or district is free of the disease. Among the 26 provinces and autonomous districts, Kwangtung, Kwangsi Chuang, Shantung, and Fukien have the highest incidence. The total number of patients in Kwangtung alone was estimated at 600,000.¹⁹ One out of a thousand people in Kwangsi Chuang, a region with a population of nearly 20,000,000, was a leprosy patient in the 1950's.¹⁹ In Shantung province, the prevalence rate was 4–12 per 10,000 persons, depending on the region, and the total number was at least 33,200. There were probably around 2,000 patients in each of the two

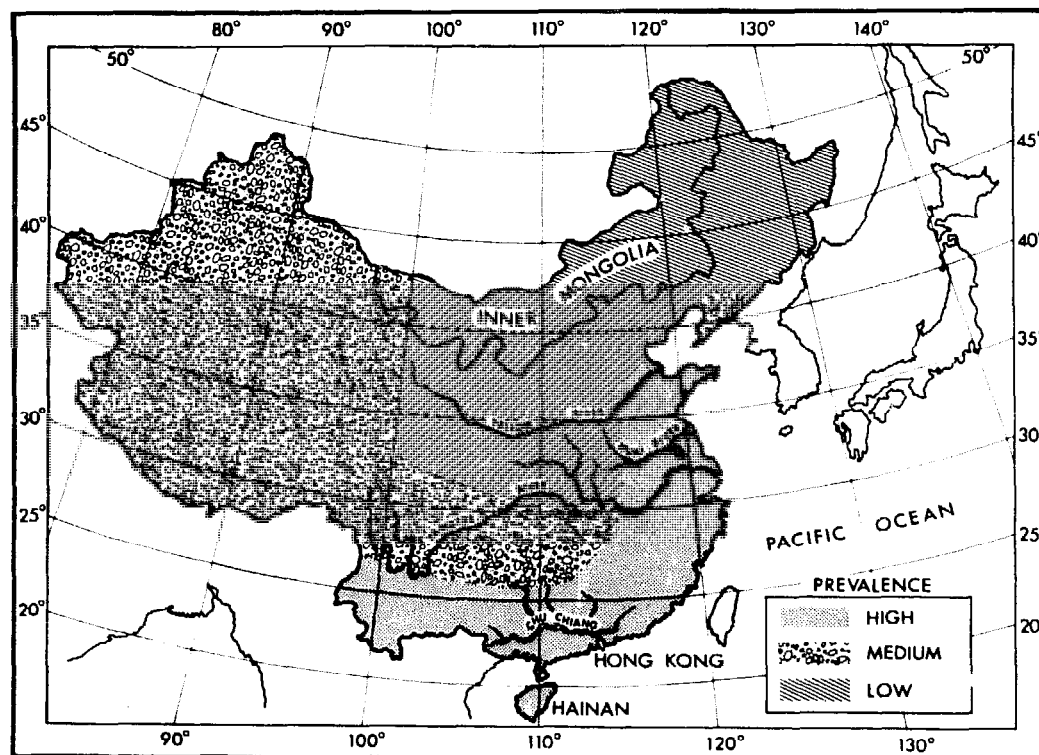


FIGURE 1. Distribution of leprosy in China. Adapted from Yü.¹⁹

large regions in the northwest, Sinkiang Uighur and Tsinghai, and only three cases were reported in Inner Mongolia, the area of lowest incidence.¹⁸ It is more common in males than in females with a ratio of 3.6:1, and the peak incidence is seen in the 20-39 year age group.²⁰ The onset of the disease is usually in young adulthood and the primary lesion is most common in the lower extremities.²⁰

One of the achievements claimed in the field of diagnosis of Hansen's disease is the papain-digestion-fotation method. The method essentially is the release and concentration of mycobacteria from involved tissues for better microscopic detection. It was said to have increased the positive rate by a factor of at least six as compared to the conventional method of detection.²¹ However it is not clear which staining procedure was followed in the actual detection of the microorganisms. A technique has also been described which used the viscera of leprosy patients who died in advanced stages as the source of lepromin.²² This method was claimed to be much simpler and more productive than the conventional method which uses lepromatous lesions of skin as the source.

Two major steps were taken toward the control of leprosy. One was the intensive campaign of the early 1950's to register patients in order to provide a clear picture of the extent of the disease. In areas of high endemicity general surveys were carried out, while in those of moderate endemicity, only sampling surveys were performed. A large number of personnel were given courses on the method of history taking and techniques of various examinations for this purpose. The other step taken was the education of the public on leprosy in order to bring patients to seek medical assistance on their own initiative. The dramatic effect of this campaign was described by Yü.¹⁹ Before 1949, leprosy patients who came to seek treatment at a hospital in Shantung rarely came within a year of onset of the disease, and in fact in most the disease was too far advanced to give a satisfactory response to therapy. After a decade of public education, 20% of the patients seeking help came within a year of onset and some even came to request examinations merely because they had contact with leprosy patients.

Despite these efforts, only modest progress was made by the end of the 1950's. Only 151 clinics and control centers were established throughout the country.²³ Leprosaria, either expanded or newly established, totaled 56. In addition, 703 so-called "leprosy villages," apparently a commune type lepra colony with dual functions of therapy and production, were set up. In this connection, it is interesting to note a study which led to a conclusion that a certain amount of physical labor could be beneficial to the course of leprosy.²⁴ By 1959, only about 60,000 patients had been admitted to these facilities and of these 6,000 had been discharged after satisfactory improvement.²³ Patients with tuberculoid leprosy are

generally handled at the out-patient clinic and those with lepromatous leprosy are isolated. Diaminodiphenylsulphone is the drug of choice. However, traditional medicinal herbs and acupuncture are widely used as supplementary therapeutic methods. The former are said to be more effective in restoring nerve functions than western medicine and the latter is said to be highly effective for neuralgia.²³

It must be emphasized that the nationwide BCG vaccination program launched in the early 1950's had dual objectives of controlling tuberculosis and leprosy. No follow-up report is available, however, and it is not known whether China has discarded this unpromising program.

Trachoma

Trachoma, although not a killer in its own right, is certainly the most prevalent and disabling infectious disease in China. The estimated nationwide rate of infection was reported as 50% of the population in 1958, and depending on the locality, it could be as high as 90%.²⁵ On the basis of these figures, the total number of patients would be a staggering 300,000,000. The disease was distributed corner to corner throughout the country, including Tibet where 88% of the hospitalized patients with eye disease had either trachoma or its complications. The general pattern of distribution was that it was more prevalent in the north than in the south, in the west than in the east, among the poor than among the wealthy, in the countryside than in the city, in smaller cities than in larger cities. It was thus most prevalent in the northwest and least prevalent on the east coast.²⁶ It has a peak incidence in the 11-30 year age group,²⁷ and is more common in females than in males. Representative studies show that trachoma is responsible for 45% of the impairment of vision and 25-45% of blindness in China.^{25, 27} The transmission of the disease is greatly facilitated by the habit of Chinese in sharing towels and other toilet articles in homes or in public.

However, China has contributed to the understanding of trachoma as much as she has suffered from it. In 1957, T'ang et al. succeeded in cultivating the causative agent.²⁸ They were able to select the proper antibiotics and concentrations to selectively suppress the growth of bacteria contaminating the conjunctival washings from which the agent was to be isolated. This success enabled them to study further the agent's growth characteristics in various cells,²⁹ and its physicochemical properties.³⁰ The impact of this breakthrough is quite obvious. In the ensuing years, different strains of this agent were isolated by investigators all over the world, with T'ang's method, and subsequent studies of this agent led to a practical and efficient program of control.

Attempts were also made to develop a vaccine. Both active and inacti-

vated vaccines were experimentally produced and tried in monkeys in 1964.³¹ Complement-fixing and hemagglutination inhibiting antibodies appeared in response to both vaccines, but a sustained effect was not obtained. The live vaccine was said to be significantly better than the inactivated vaccine, but results of further study are not available.

Intensive public education was initiated in the 1950's. It was a direct attack on the chain of transmission with the slogans "one person one towel" and "running water for washing face" (face washing used to be done by using a basin which was shared by many persons). Besides, numerous mobile units and a network of antitrachoma stations were set up to examine and treat patients. These facilities were staffed by medical professionals, paramedical personnel and medical aides in schools and factories who had been given short courses on anti trachoma campaigning. Two lines of work must have contributed considerably to the shaping of the mass control program. One is the simplification of the clinical classification into two stages from the conventional four stages, i.e., trachoma (Tr.) I, the progressive, and Tr.II, the regressive stage.²⁶ The other is the revelation of the need of continuous drug therapy for a period of time after clinical cure, resulting from combined pathological and clinical investigation.²⁶

Details of the current status of trachoma are not available, but evidence indicates that the disease is still not under proper control.³²

Japanese B Encephalitis

This disease is reported to be transmitted chiefly by *Culex pipiens* var. *pallens*, and *Anopheles hyrcanus* var. *sinensis* and is widespread throughout the country. The occurrence of epidemics is strictly seasonal, being closely related to the mosquito breeding cycle, and the peak incidence is seen in July and August.³³ In addition to their role as vectors, some claim that mosquitos transmit the virus vertically and therefore may be important reservoirs themselves. Various hoofed animals, especially pigs, are also natural reservoirs of the virus. In a series of studies conducted in the Peking area, 100% of the pigs were found to possess neutralizing antibody.³³

There is usually a period in early summer with sporadic cases before an outbreak. Approximately one-third of the cases are under 10 years of age, and one-half between 10 and 20 years of age. Subclinical infections are quite common. A large-scale serological survey shows that 67% of adults between 20 and 30 years of age and 80% of persons over 30 are immune to the disease.³³ In the Peking area, 20 to 30% of the population have detectable complement-fixing antibodies after an epidemic season, indicating recent infections.

The incubation period is 10-14 days. The disease has a gradual onset

characterized by headache, fever, dizziness, vomiting, somnolence, neck stiffness and various neurological signs.³⁴ There are usually more severe cases and deaths during the first half of an epidemic than in the second half, and the most common cause of death is paralysis of the respiratory center.³³ The mortality rate was around 30% before 1949 but dropped considerably in recent years.³⁴ Approximately 11% of the patients are discharged from the hospital with sequelae.

The diagnosis can be made with little difficulty on a clinical basis and with serological tests. Measures of control described below for malaria are applicable also to Japanese B encephalitis.

Schistosomiasis

There is only one species of *Schistosoma*, *S. japonicum*, in China. The number of cases of schistosomiasis was estimated at 10,000,000 in 1959. The disease was endemic in areas south of the Huai River and east of the Langtsang River, involving 3,000 square miles covering 12 provinces,³⁵ and was threatening the health of 100,000,000 people. It was especially rampant along the great Yangtze River with the prevalence rate there reaching 60% in some villages. The only known intermediate host of schistosomes in China is *Oncomelania hupensis*. The spread of this snail corresponds with that of the disease and surveys have shown that wherever there is *O. hupensis* there are also human cases of schistosomiasis. Many domestic and wild animals have also been found naturally infected; the most important of these are cattle.^{36, 37}

In the 1950's, at least forty-two schistosomiasis institutes were set up to extend a broad-spectrum research program. The areas of research interests ranged from the studies of modes of contracting the disease specific to various types of farmland, and factors influencing the hatching of schistosome eggs in human and animal feces, to copulation, oviposition, multiplication and hibernation of snails.³⁷ Results of these studies probably contributed significantly to the mapping of control measures of schistosomiasis.

Most of the patients (62.9%) were in the 31-50 year age group. The incubation period was around 40 days. Acute phase schistosomiasis was characterized by fever and general symptoms of acute toxemia.³⁶ Leukocytosis, especially that of the eosinophilic cells which may account for 88% of the total, was almost a constant finding.³⁶ In fact, absence of eosinophilia was indicative of graveness of the disease and poor prognosis.³⁷ One of the late manifestations of schistosomiasis was liver cirrhosis. Schistosomal hepatic cirrhosis differed pathologically from portal cirrhosis in that there was fibrosis in the periportal areas with normal architecture of the hepatic lobules and without apparent or marked

nodular formation.³⁶ However, clinical manifestations of hepatic failure were uncommon, and liver cirrhosis or deterioration of hepatic functions could be halted by splenectomy and/or antischistosomal chemotherapy.³⁶ Another important late manifestation of schistosome infections was endocrine disturbance, characterized by reduced tolerance to cold, loss of body and pubic hair, decreased libido and dwarfism.^{36, 38, 39} This was due primarily to the suppression of pituitary functions by toxic secretions of adult worms and miracidia within the ova or secondarily to the functional disturbances of the liver and intestine following repeated infections during childhood.³⁷ The dwarfism was reversible upon appropriate antischistosomal treatment.^{37, 38, 39}

During the acute stage, ectopic lesions occurred more frequently in the lung and brain than in any other organ.⁴⁰ Studies also showed higher incidence and an average of a 9.8-year earlier onset of colonic cancer among schistosomiasis patients than in the normal population.⁴¹ The duration of schistosomiasis before cancer varied from five to 20 years.⁴¹

As is true for other major parasitic diseases, two methods were available for the diagnosis of schistosomiasis. Immunological diagnosis was made with the ova antigen prepared from infected rabbit liver. However, the onset of a skin reaction was late after infection and persisted long after a successful treatment, rendering skin tests useless in the diagnosis of acute cases and the assessment of the effects of the treatment. For early diagnosis, both the cercarial membrane reaction and circum-oval precipitating tests were said to be more practical.³⁷ A highly sensitive indirect hemagglutination test was also available but studies concerning its time of onset seem incomplete. Also in use was a complement-fixation (CF) test which gave a somewhat lower (86.3%) positive rate. However, the combination of the CF test and skin test could increase the positive rate to nearly 100%.⁴³ The causative agent could be detected either by stool examination or rectal biopsy. For the former, best results were obtained by combining the sedimentation and hatching techniques. The hatching time required was considerably shortened by increasing the incubation temperature to 40°C.³⁵

Schistosomiasis is extremely hard to treat and complete cure is difficult to attain. Drugs in use were mainly the antimonials. However, China has also been diligent in the search for new parasiticides. Perhaps the most important discovery in antischistosomal chemotherapy is the new drug furapromidine, also known by its code number F30066, which is an orally effective, nonantimonial therapeutic agent.⁴⁴ Chemically, it is N-isopropyl-3-(5-nitro-2-furyl)-acrylamide (Fig. 2).

It is said to be dramatically effective in acute schistosomiasis, although its effect in chronic cases is somewhat disappointing.^{44, 45} Long

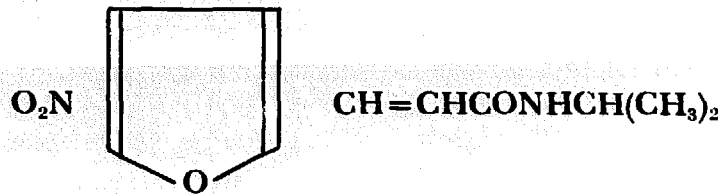


FIGURE 2. Chemical structure of furapromidine.

term use of this drug for 1.5–2.5 months at a daily dose of 50–80 mg/kg body weight given in four divided doses had an 81.4% egg conversion rate and immediate therapeutic results (probably judged by clinical improvement) were put at 83.8%. The drug is not without side effects, which disappear readily upon the termination of the medication.⁴⁵ However, no information is available beyond the stage of clinical trial. A more conventional medical treatment with tartar emetic at a dose of 12 mg/kg body weight with a maximum total dose of 700 mg in 2–3 days was considerably more convenient in mass treatment than previously practiced longer course treatment and was as effective and as safe. In addition to the medical approach, splenectomy is often used in cases with apparent hypersplenism and ascites.^{44, 46} Traditional herb medicine and acupuncture are used for some aspects of symptomatic treatment.^{37, 44}

Control measures can be summarized in three categories: a) Eradication of the source of infection: patients and infected cattle were to be treated by the “three-day tartar emetic” method.⁴⁴ Parasite ova in night soil, an important fertilizer Chinese cannot afford to discard, were to be killed by storage with urine or the addition of chemicals.³⁷ b) Education of the public: the public was informed of the mode of transmission of schistosomiasis and of protection methods, including the use of repellents of cercaria on lower extremities.³⁵ c) Eradication of the intermediate host: molluscacidal chemicals were produced to eliminate snails,³⁷ streams were drained and various water conservancy projects were initiated.

The current status of schistosomiasis is quite disappointing. Abundant evidence indicates that, despite two decades of intensively fought antischistosomal campaigns, the disease has not been brought under control. Each year hundreds of thousands of people are mobilized to eliminate snails in endemic areas. According to recent information, the area of schistosomiasis endemicity has not diminished significantly from that of the early 1950's.⁴⁷

Malaria

There were about 30,000,000 malaria patients in 1959.³⁶ The distribution of malaria is shown in Table 2. All four types of malaria are present, of which falciparum and vivax are the two most prevalent.³⁷ In general, vivax malaria was widely spread throughout the endemic areas while falciparum was mainly concentrated in the south.³⁷ The disease plagued areas south more than those north of 32°N, with an especially tight grip on areas south of 25°N, which include China's most well-known malarial breeding grounds such as Yunnan, Kweichow and Hainan. Several species of anopheline mosquitoes responsible for the transmission of malaria have been identified and their distribution has been well studied (48, Table 2). Of particular importance among these are *Anopheles sinensis* and *A. lesteri* which breed mainly in rice paddy fields and their seasonal role as vector corresponds well with the cycle of rice cultivation. Although malaria is endemic in all parts of China, outbreaks of epidemics do occur as the result of arrivals of nonimmune migrants to an area of endemicity or introduction of a species to an area in which it is not endemic. A typical outbreak of the latter type took place in 1953 in the Northeast when demobilized servicemen returning from Korea imported falciparum malaria, a type not indigenous in the area at the time.³⁷

A nationwide antimalarial campaign, consisting of the treatment of patients and the control of vectors, was launched in 1956,⁴⁸ resulting in a steady drop in the incidence of malaria throughout the country. Today, China boasts domestic production of all antimalarial drugs, including chloroquine, primaquine, chloroguanide and others. The ideal course of individual therapy of vivax malaria was said to be 15 mg of primaquine base for 14 consecutive days combined with a 0.6 gm base of chloroquine on the first day. The rate of relapse of malaria after such a course of treatment was reported to be inversely dependent on the patient's age.⁴⁸ The relapse could be effectively checked by a second course of treatment, up to a total of 225 mg of primaquine. The duration of the interval between the two courses had little effect on the efficacy of the treatment. Shorter versions of these courses developed to suit mass treatment were: a) two courses of 180 mg of primaquine given in 8 days, or b) two courses of 120 mg of primaquine given in 4 days. Both of these two mass therapies were carried out during the non transmission seasons in order to prevent reinfection and to eliminate as many sources of infection as possible in one strike. This mass therapy program was especially hard pushed in areas where spraying operations were considered too costly.

Benzene hexachloride (BHC) is mass produced in China and house

Table 2. General picture of malaria in China*

Area	North of 32°N	25-32°N	South of 25°N	Northwest
Transmission duration	3-6 months	6-8 months	almost perennial 9-12 months	3-6 months
Parasite (<i>plasmodium</i>) species present	mainly <i>vivax</i>	<i>vivax</i> , <i>falciparum</i> and <i>malariae</i> ; ordinarily <i>vivax</i> most prevalent; during high seasons <i>falciparum</i> becomes outstanding	all species present; mixed infections very common	<i>vivax</i> prevalent; <i>falciparum</i> in Sinkiang
Vector (<i>Anopheles</i>) species operating	<i>sinensis</i> ; <i>messeae</i> probably north of 45°N	<i>lesteri</i> , the chief, and <i>sinensis</i> , the secondary vector; <i>minimus</i> and <i>candidiensis</i> in certain hilly districts only	<i>minimus</i> , the chief, and <i>candidiensis</i> secondary vector in hilly districts; <i>sinensis</i> inefficient vector in plains; <i>balabacensis</i> important in jungle areas of Hainan	<i>sinensis</i> in all malaria foci; in Sinkiang <i>sacharovi</i> also present
Geographical distribution	mainly near rivers and lakes	widely spread	widely spread	only present in low-lying damp areas
Prevalence (spleen) rate	less than 10%	10-50% in hilly regions; less than 10% in plains	50-100% in hilly regions; 10-50% in plains	less than 10%

*Adapted from Ho.¹³

fumigation with this agent is done throughout the country during the active season to kill adult mosquitoes. In its powder form, BHC at an appropriate dosage is said also to be effective in eliminating larvae of *A. sinensis* and *A. lesteri* in rice fields.⁴⁸ However, the insecticidal effect of BHC does not last as long as that of dichlorodiphenyl-trichloroethane (DDT).³⁷ China has also had large scale programs of BHC or DDT spraying of households. However, because of fund shortages, the spray program had not been extended to all parts of the country by 1965.

Other sanitary measures were also taken to eliminate breeding places of mosquitoes. These measures included filling and drainage of ditches and other sources of stagnant water. Several suburban areas of Peking, formerly well-known as breeding grounds for mosquitoes, are said to be mosquito-free.³⁷

Filariasis

Filariasis is endemic in areas south of 37°5'N and involves at least 13 provinces. The number of patients was estimated at 40,000,000. In areas of high endemicity, the prevalence rate could be over 30%, such as in Shantung,³⁷ or even over 50% such as in some parts of the deep south. A large number of cases are clinically asymptomatic until late in the course, and the proportion of such cases is especially high among children.⁴⁹

Filariasis is caused by the nematode *Wuchereria*. Two species, *W. bancrofti* and *W. malayi*, have been identified in China. Both bancroftian and malayan filariasis are endemic in all provinces except Kwangtung and Shantung in which only bancroftian filariasis occurs. As a rule, bancroftian filariasis is distributed mainly in the low-lying plains and malayan filariasis in the water-rich hilly districts of South China. The chief mosquito vectors of bancroftian filariasis are *C. pipiens* var. *pal-lens*, distributed north of 30°N, and *C. pipiens* var. *fatigans*, south of 30°N. Malayan filariasis is chiefly transmitted by *A. hyrcanus* var. *sinensis*, which infests mainly the area between 32°N and 25°N and also transmits malaria in the area.⁴⁸ In addition, *Aedes togoi* may serve as a secondary intermediate host for both species of *Wuchereria* in some areas along the sea coast.

While acute symptoms offer little basis for distinguishing bancroftian for malayan filariasis, late manifestations do show considerable grounds for differentiation. Malayan filariasis is characterized by more common elephantiasis of the extremities, especially of the lower limbs, and relatively rare elephantiasis of the genital organs or chyluria. In bancroftian filariasis, on the other hand, 90% of the cases sooner or later show elephantiasis of genital organs as well as that of extremities, and chylu-

ria is quite common.^{36, 37} It should be noted, however, that mixed infection with both parasites does occur. The pathogenesis of lymphangitis in filariasis is manifold. It may be induced by adult filarial worms per se or their secretions, or secondary bacterial infections, for which *Streptococcus* is believed to play an important role.⁵⁰ Lymphangitis often follows physical exertion and thus is more frequent in spring and summer. It is more severe in malayan than in bancroftian filariasis.³⁷

Studies have also revealed that microfilarial periodicity is under the control of the activity of the vagus nerve, or in other words, is directly under the influence and control of the activity of the cerebral cortex.⁵¹

For immunodiagnosis, the antigen prepared from *Dirofilaria imitis*, the dog heart worm, is used for both skin and CF tests. Positive reactions in these cases were said to be 90% and 87% respectively.³⁷ These tests, which are clearly superior to blood examination in the diagnosis of filariasis, have not been used for mass survey because of logistic problems in the mass production of the antigen.

Hetrazan is the drug of choice. A therapeutic program suitable for mass treatment has been developed.⁵² For the malayan filariasis, 1.0 or 1.5 gm of hetrazan at night is quite effective. For bancroftian filariasis, which requires repeated medication, the suggested program is 0.5 gm twice a day for three days, with a total of 3 gm. The short course treatment, in its safety or efficacy in killing microfilariae and adult filaria worms, is said to be comparable to the longer 7-21 day conventional courses of treatment.

The measures of filariasis control are similar to those of malaria control and, therefore, will not be repeated.

A few words for kala-azar at this point may not be entirely inappropriate, since it was one of the original five parasitic diseases the Chinese strived to control. This disease, caused by *Leishmania donovani*, was distributed mainly in central China, especially the vast plains along the Yellow and Huai Rivers, with an estimated number of half a million cases. The intensive mass therapy campaign in the early 1950's, assisted by the intensive anti-sandfly program, led to a rapid decline in incidence. However, resurgence in the incidence was reported in the early 1960's,⁵ indicating a partial failure in attaining a long-standing severance of the infection chain.

Clonorchiasis

Clonorchiasis, formerly known to be endemic only in some areas of Kwangtung and Kwangsi Chuang along the Chu Chiang (Pearl River), is widespread throughout the country, including Liaoning, Szechuan, Hopei and Shantung.^{37, 53} The prevalence rate

varies from village to village, and could be as high as 40% in some highly endemic areas.

This disease is caused by *Clonorchis sinensis* (liver fluke), the only species known to exist in China. Man is infected by eating raw or partly cooked parasitized fresh water-fish. An interesting feature in the epidemiology of this disease is the relationship of the degree of endemicity and age distribution to the custom of eating fish. T'ang et al. pointed out⁵⁴ that the peak of age incidence of the disease is in the middle-age adult group and that the disease is highly endemic in areas, such as Kwangtung, where people have the custom of eating raw fish. In the endemic areas which were discovered after 1949, where the custom of eating raw fish is not prevalent, the disease is lower in endemicity and its peak incidence is seen in children under 15 years of age. For example, in Fukein, which belongs to the newly discovered endemic areas, 80% of the cases are seen in the 1-15 year age group.⁵⁴ According to statistical data obtained in Hong Kong, which are also believed to be applicable to Kwangtung, 40% of the autopsy cases over 40 years of age have clonorchiasis and the mean age incidence of the disease is 45.⁵⁵

A variety of snails serve as the first intermediate hosts of the parasite including those of genera *Parafossaralus* and *Bithynia*. The secondary intermediate host includes various kinds of freshwater fish, of which grass carp is the most important in Kwangtung. Man is infected when fish containing encysted metacercaria is ingested. Besides man, dogs and cats also are important natural reservoirs of *Clonorchis*.

The disease is confined to the hepatobiliary system. It is characterized by a gradual onset of anorexia, abdominal pain located in the right upper quadrant simulating that of choledochitis or acute cholecystitis, abdominal distension, loss of weight, diarrhea and hepatomegaly. The blood picture usually shows marked eosinophilia.⁵⁶

A study conducted in Kwangtung shows that 39% of hospitalized cases of cholecystitis were due to clonorchiasis.⁵⁶ These cases often require surgical intervention at some stage of the disease. For example, in the same study, it was shown that 4.8% of all the hospitalized surgical patients were cholecystitis cases and in about 50% of them the ailment was due to clonorchiasis. Late stage clonorchiasis often leads to liver cirrhosis. A higher incidence of hepatoma among clonorchiasis patients has also been reported.⁵⁶

Diagnosis of the disease by stool examination is simple in technique but mild cases often escape detection. The stool examination is repeated at least three times in the same individual in mass surveys. An intradermal test with antigen prepared from adult *Clonorchis* was introduced by Chung et al.⁵⁷ and has been widely used. However, highly diluted antigen must be used to avoid cross reaction with *Schistosoma* and *Paragonimus*.⁵⁶

Chemotherapy of clonorchiasis is unsatisfactory, especially in chronic cases. In fact, drugs may only depress the reproductive system of the flukes without killing them. Relapses are commonly seen in treated cases.³⁷ Chloroquine was considered to be the best chemotherapeutic agent available in the early 1960's but the long course and large dose required rendered it impractical in mass treatment.³⁷ Oral hexachlorophene, given at a dose of 20 mg/kg/day for three consecutive days, was reported to be highly effective against the parasite. Parasite ova disappeared from the stool in 41% of the cases in two to three weeks along with expulsion of a large number of adult worms. In this particular study, relapse or reappearance of ova in the stool did not occur during the four-month period of follow-up.⁵⁸ Hexachloroparaxyol was also used but the results seemed less satisfactory than with hexachlorophene. Untoward reactions of these drugs have been well described,^{56, 58} and it is not clear whether these drugs have ever been used in a large scale therapeutic program.

Some of the steps taken for the control of clonorchiasis, including elimination of snails and disposition of night soil, are part of the general campaign to eliminate four pests (snail, mosquito, rat and sparrow) and five major parasitic diseases. The Chinese authorities now insist on the composting of human manure before it is used in fish ponds. Hazards in eating uncooked fish and the need of improvements in environmental sanitation were stressed in public education. These multifaceted efforts have probably to some extent broken the cycle of and reduced the incidence of clonorchiasis. This conclusion, given by Gibson and Sun, was based on their observation of the sharp drop in the presence of metacercarial cysts of *Clonorchis* in recent fish exports from Kwangtung to Hong Kong.⁵⁵

Paragonimiasis

Paragonimiasis, caused by the lung fluke *Paragonimus*, is wide spread in at least fifteen provinces. The areas in which it has been reported extends from Liaoning in the Northeast to far south in Yunnan, with central China as the most highly endemic area, where the prevalence rate was 67%⁵⁹ in some villages. In the Northeast where paragonimiasis was discovered in 1955, 47% of the population in the Sung-hua Chiang area are infected. More than half of the cases are in the 11-15 year age group.⁵⁹

Chinese scientists claim that two species of *Paragonimus*, *P. westermani* and *P. skrjabini* are existent, and the diseases caused by these two parasites are said to be distinguishable on clinical grounds. In general, *P. skrjabini* is limited to Szechuan, Kiangsi, Yunnan and some parts of Kwangtung, while *P. westermani* is distributed in the remainder of the endemic areas.^{59, 60, 61} Besides man, both domestic and wild animals are

important natural reservoirs. The first intermediate hosts are operculated snails of various genera, and the second intermediate hosts include a wide variety of fresh-water crabs, such as cray-fish.³⁷

The incubation period is three to six days and the onset usually insidious.⁵⁹ The most common symptoms of the disease caused by *P. westermani* are productive cough, hemoptysis and chest pain. However, the patient's sense of well-being is usually not significantly impaired. These symptoms may be preceded by a certain period of abdominal pain and distension, diarrhea or pus and blood in the stool. Marked eosinophilia is a constant finding. In *P. skrjabini* infection, pulmonary symptoms are less severe and hemoptysis less frequent but eosinophilia and pulmonary effusion are more marked than in *P. westermani* infection. Migratory subcutaneous swellings caused by travelling worms are more common in *P. skrjabini* than in *P. westermani* infection.⁶⁰

According to one study, *Paragonimus* involved the brain in 11% of the cases.⁶⁰ The clinical manifestations of the brain involvement are headache, epileptic seizures and other symptoms simulating meningitis or brain tumor. The route of travel of adoleseercaria of *Paragonimus* from the lung to the brain has been studied in detail.⁶²

Pathologically, *P. skrjabini* cysts, unlike those of *P. westermani*, are completely devoid of parasite ova. In fact ova of *P. skrjabini* are difficult to find in sputum, pleural effusion, cerebrospinal fluid and subcutaneous swellings.⁶⁰ However, cysts of *P. skrjabini* are more numerous than those of *P. westermani* in the pathway of *Paragonimus* adoleseercaria from abdominal to the pleural cavity, i.e., the abdominal surface of the diaphragm and the anterior border and the subdiaphragmatic surface of the liver.

The diagnosis of pulmonary paragonimiasis is not a simple matter in a country with highly prevalent pulmonary tuberculosis. As a result paragonimiasis patients are often mistaken for and treated as tuberculosis patients. Although careful roentgenological examinations in skillful hands may differentiate paragonimiasis from tuberculosis,⁶³ the diagnosis of paragonimiasis relies primarily on the demonstration of parasite ova in the sputum or an intradermal or CF test with antigen prepared from adult worms obtained in artificially infected animals. Both of these immunological tests are said to be highly specific with positive rates reaching nearly 100%. The skin test, therefore, was used in the mass survey of paragonimiasis.⁶⁴ The same antigen is also used in the detection of antibody in the cerebrospinal fluid of patients with central nervous system involvement. The positive rate was reported to be 83.3%. Besides, abnormal electroencephalographic findings of brain paragonimiasis may help in establishing the diagnosis.

The drug of choice for paragonimiasis, bithional [2,2'-thiobis 4,6-dichlorophenol], is produced in China.^{44, 60} A so-called 20-day-course

treatment, with 1 gm of this drug given orally in three divided doses a day every other day totalling 30 gm, is a standard program. The relapse rates after this treatment were said to be 2.8% in pulmonary and 4.4% in cerebral paragonimiasis. For patients with cerebral paragonimiasis involvement, a combination of bithional and emetine is desirable.⁶⁰

The control measures for paragonimiasis are similar to those for clonorchiasis and therefore will not be repeated.

Ancylostomiasis

Ancylostomiasis, or hookworm disease, is a highly endemic parasitic disease involving at least 15 provinces. Areas of highest endemicity are those along the Chu Chiang, the Yangtze River and the coast. The incidence is highest among young adults. Even among children, the prevalence rate may reach 50% in areas of high endemicity. It is generally more prevalent in the south than in the north. The only regions spared of the disease are the northwestern parts and Inner Mongolia.³⁷

Two hookworms, *Ancylostoma duodenale* and *Necator americanus*, have been identified. Patients in most areas are infected with both parasites. In the south, however, the disease is predominantly due to *N. americanus*. The total number of patients was estimated at 100,000,000 in 1959.³⁷

Clinical investigations have revealed that besides creeping eruptions, pulmonary symptoms consisting chiefly of dry cough but with occasional blood-streaked sputum containing larvae are quite common in the early stage of the disease. Chronic cases are characterized by anemia, malnutrition and loss of weight.

Results of investigations show that hookworm ova develop and hatch into larvae only in soil with suitable temperature.³⁷ Thus, unlike past belief, rice fields play an insignificant role in the transmission of hookworm disease. The disease is acquired mainly through the cultivation of dry land crops, especially those which need frequent fertilization, such as sweet potatoes, corn, tobacco, vegetables, and mulberry and fruit trees. Therefore, the infection season is closely linked to the cultivation cycle of various crops.³⁷

In addition to methods of detection of parasite ova in the stool similar to those applied to schistosomiasis, an intradermal test for ancylostomiasis apparently proved to be highly suitable for mass survey.^{37, 66} The test, which employs antigen prepared from adult hookworm, is said to be highly specific and is positive in 99.5% of hookworm cases.

Bephenium hydroxylresorcinol was mass-produced in 1960⁴⁴ and widely used as the therapeutic agent. A new drug, the bephenium salt of gallic acid, developed in 1963, was said to be quite satisfactory in the preliminary trial,⁴⁴ but the result of large scale field trials are not

available. The search for better therapeutics for ancylostomiasis was quite active in the early 1960's.⁴⁴

Readers are referred to the section on schistosomiasis for the control measures for ancylostomiasis.

Conclusion

Parasitic diseases, as is clear from this discussion, constitute the major threat to the health of Chinese people. According to the data compiled in 1959, the total entries of parasitic diseases was an incredible 280,000,000.³⁶ This means that one out of every two to three persons dwelling in China at the time might have had a parasitic disease, although this was not necessarily so because mixed infection with more than one parasitic agent was a common occurrence. On the other hand, the credibility of Chinese statistical data has always been questioned on the ground that scientific procedures of data collection are not rigidly followed. Such a deficiency often leads to an underestimation rather than an overestimation and thus the actual number of parasitic disease entries may have been well over 280,000,000. Therefore, it seems logical that Chinese authorities have directed more concerted efforts to the so-called five most menacing parasitic diseases than to tuberculosis, ranked number one as the cause of death, or to trachoma, ranked number one in prevalence.

Despite failures in some aspects of health work and relatively slow progress in the control of infectious diseases, the prospect for greater success in the near future could be quite good. The greatest guarantee for this success is seen in the ability of Chinese medical professionals to keep themselves up to date in the medical sciences and the striking success in the improvement of environmental sanitation, which have caught even the most experienced eyes of recent visitors to China.⁶⁷ It is, in fact, remarkable that such a high degree of success could have been achieved amid the chaos of the postwar period involving a quarter of the world's population. There is no doubt that China has the will and perhaps the capacity to bring these devastating communicable diseases under control, and rescind the title of "the weakling of eastern Asia."