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Acta Tropica 96 (2005) 296–302
ACTA TROPICA
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The National Institute of Parasitic Diseases, Chinese Center for Disease Control and Prevention: a new administrative structure for schistosomiasis control

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Available online 26 August 2005

Abstract

Since more than 5 decades, the overall responsibility for the national programme on schistosomiasis control in China resides at the government level, i.e. Ministry of Health. Day-to-day activities are carried out by independent provincial parasitic institutes situated in the endemic areas. Along with the general economic development and the steady progress in the medical sciences, successful developments in control and research of the parasitic diseases in the country were achieved. This necessitated a corresponding reorganization of the administrative structures which has taken place at several levels. In January 2002, the Chinese Centre for Disease Control and Prevention was reorganized and the Institute of Parasitic Diseases in Shanghai became part of this new organization under the name of the National Institute of Parasitic Diseases to better reflect its new role. By assigning all administrative tasks regarding research and control of parasitic diseases under the umbrella of one administrative central laboratory, the new task force for epidemiological surveys and direction of parasitic control programmes is well suited to respond to the daunting challenges of the future. The new institution has only existed for a few years but has already become a well-functioning force with a broad contact net of national and international experts on research and control of parasitic diseases.

Keywords: Parasitic diseases; Schistosomiasis; Disease control; Public health; Central laboratory; China CDC

1. Introduction

The Institute of Parasitic Diseases (IPD) can be traced back to its precursor, the East China Branch (ECB) of the National Institute of Health, established in Nanjing in November 1950 (ECB, 1951). The institute got its current name in 1956 and was then part of the Chinese Academy of Medical Sciences (CAMS). The following year, the new IPD was merged with the Hainan Anti-Malaria Station (CAMS) and moved to Shanghai where it focused on the main parasitic diseases at that time, namely malaria and schistosomiasis (IPD, 1957). There were no major administrative changes for the next 25 years but in 1983, IPD

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0001-706X/$ – see front matter © 2005 Elsevier B.V. All rights reserved.
doi:10.1016/j.actatropica.2005.07.024

was affiliated with the Chinese Academy of Preventive Medicine (CAPM) and started to develop in different directions. In 1992, IPD became the base of the Key Laboratory for Parasite and Vector Biology under the Ministry of Health (MOH) and in 1996, the Chinese National Center of Systematic Medical Malacology was established. IPD has developed international links and was designated a WHO Collaborative Centre for Malaria, Schistosomiasis and Filariasis by the World Health Organization (WHO) in 1980 and a Tropical Medical Research Center by the US National Institutes of Health (NIH) in 1996. The responsibilities were thus steadily growing, making IPD a key laboratory for many different diseases and organisms in China and the larger sub-region.

The increasing national and international programmes and projects that had become the responsibility of IPD made the administration cumbersome and shortly after entering the new millennium, it was decided to streamline the various activities into a more smoothly running structure.

2. China CDC: a new centre for disease control and prevention

The reorganization of the infrastructures dealing with disease control in China was carried out according to two main themes, one purely administrative and the other technical. All institutions with responsibility for disease control and prevention in various regions of the country were linked together in a system based on their national, provincial, prefecture and county level. The highest administrative body is occupied by the newly created Chinese Centre for Disease Control and Prevention, China CDC for short. The institutions can exchange information but must report to China CDC according to a strict administrative procedure. In this way, a network of institutions for disease control and prevention was created which can execute disease control in their areas of expertise and according to their geographical location.

China CDC is a non-profit institution at the national level working in 18 different fields of disease control and prevention, public health management and provision of service. It has its headquarters based in Beijing. The 18 professional institutes, centers and offices affiliated with China CDC are responsible for control and research of diseases that are of public health importance. They thus implement disease control and research on important communicable and non-communicable diseases and manage public health issues for food safety, occupational health, health-related product safety, radiation health, environmental health and health care for women and children. These institutions conduct applied scientific research on their own and are also engaged in a number of activities, such as:

- strengthening research on strategies and measures for disease control and prevention;
- organizing and implementing control and prevention plans for different kinds of diseases;
- providing technical guidance, staff training and quality control for disease control and prevention and public health services throughout the country;
- establishing national working groups for disease prevention, emergency relief and construction of public health information systems.

3. The new IPD structure

IPD is located in Shanghai where it currently has a total staff of 180 persons. Among them, there are 121 professionals, 42 of whom are senior scientists. Academic reviews and consultations are the responsibility of the academic board, which is chaired by the director of the institute and a scientific committee consisting of 16 experts of high academic level, renowned for honesty and good morals. As IPD developed, new departments were added in an organic way to fill perceived and real needs. In order to create a more transparent and better functioning structure, the institute was reorganized around a set of disease-oriented departments with four foci, namely (i) schistosomiasis, (ii) malaria, (iii) filariasis, kala-azar and hydatidosis and (iv) soil-transmitted and food-borne parasitic diseases, as shown in Fig. 1.

Along these specialty departments, five cross-sectorial departments, laboratories and centres at the same administrative level were established, namely (i) Department of Drug Development, (ii) Key Laboratory of Parasite and Vector Biology, (iii) Department of Novel Technology, (iv) Centre for Detection and Consultation of Health Education and (v)

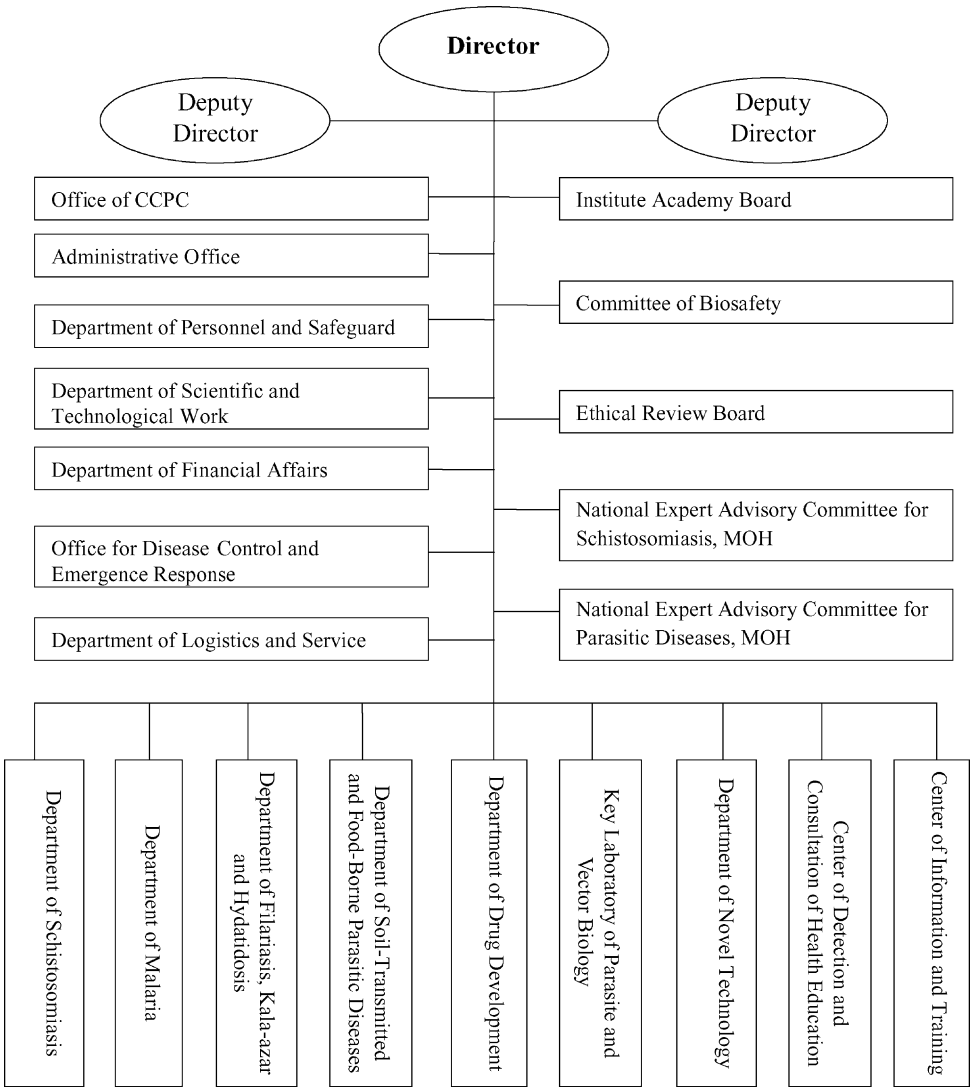

Fig. 1. Organizational structure of the National Institute of Parasitic Diseases (IPD), China CDC.

Centre for Information and Training, also depicted in Fig. 1.

Apart from these technical divisions, there are also seven administrative offices and departments which together carry out the managerial tasks required. These are: (i) Office of CCPC; (ii) Administrative Office; (iii) Office for Disease Control and Emergency Response; (iv) Department of Personnel and Safeguard; (v) Department of Scientific and Technological Work; (vi) Department of Financial Affairs; (vii) Department of Logistics and Service.

4. IPD's mission

IPD constitutes one of the 18 institutions affiliated with China CDC. It is responsible for control and prevention of all parasitic diseases in the country, including schistosomiasis. At present, the mission of IPD is as follows:

- carry out epidemiological surveillance, i.e. study the occurrence, distribution and evolvement of parasitic diseases offering rational bases and professional

support for the drafting of rules and regulations, criteria, norms and programmes related to parasitic diseases;
- draft schemes and carry out prevention and control of parasitic diseases, evaluating quality of work and effect of measures taken;
- conduct professional guidance, quality surveillance and control, including examination for the national prevention and control of parasitic diseases;
- establish and improve surveillance systems for parasitic diseases, offering professional consultation on identification of pathogens and vectors and with regard to emergency situations involving parasitic diseases;
- study strategies and measures for control and prevention of parasitic diseases facilitating the spread of research achievements pertaining to these diseases such as, for example, new techniques and novel disease control approaches;
- cooperate with relevant international organizations in the areas of parasitic diseases and exchange relevant information;
- carry out health education and health promotion with an emphasis on parasitic diseases;
- offer information to the broader society on prevention, health consultation and professional diagnosis, and the treatment of parasitic diseases;
- train professional staff and complete other tasks assigned by supervisors at higher levels.

5. Achievements

IPD has a large body of expertise and experience on parasitic disease control and prevention, with 26 experts serving the China Expert Bank of Emergency Reaction for Disease. The National Expert Advisory Committee for Schistosomiasis and the National Expert Advisory Committee for Parasitic Diseases of the MOH are both IPD-based, in which 12 experts from IPD act as chairpersons or key members. Several scientists of IPD take the chairs of some of the scientific associations, e.g. Society of Medical Parasitology, China Preventive Medical Association and Shanghai Society of Parasitology. IPD plays a key role in formulation and implementation of control programmes and providing technical support in the management of emerging outbreaks of parasitic diseases and disaster-related epidemics. Some experts participated in the demonstration and formulation of several programmes, including:

- National Technical Programme of Integrated Control of Schistosomiasis;
- National Malaria Control Programme;
- National Parasitic Diseases Control Programme;
- National Surveillance Scheme on Schistosomiasis and Malaria;
- Preparatory Programme of Acute Schistosomiasis Control;
- Criteria of Malaria Control and Basic Elimination of Malaria;
- Programme of Anti-Malaria Drug Use in China;
- Malaria Control and Surveillance Project;
- Programme of Surveillance Report of Schistosomiasis Epidemic Situation;
- Criteria of Elimination of Schistosomiasis;
- Criteria of Elimination of Filariasis;
- Verification of Filariasis Elimination.

Experts from IPD were also involved in the development and successful application of diagnostic standards and enhancement of treatment options for schistosomiasis, malaria, filariasis and hydatidosis and the criteria of control and elimination of schistosomiasis in China.

Since the designation of IPD as a WHO Collaborating Center for Malaria, Schistosomiasis and Filariasis in 1980, further collaboration between IPD and other domestic and foreign institutions has been successfully developed. Up to now, 31.8% of research projects belong to international collaborating projects, more than 294 people-times went abroad for international meetings, cooperative research and training, and a total of 1231 foreign scientists visited IPD. A total of 43 workshops (2258 person-times) and several seminars, co-sponsored by the MOH and WHO, were organized at IPD. Several national training courses have been conducted in order to raise the professional level of staff across the country, since 1951 when the first advanced training course for senior teachers from universities was held at IPD. Since 1978, a total of 63 researchers completed their master, doctoral or post-doctoral theses and six fellows from overseas were trained at IPD.

Altogether, 67 prizes have been awarded to IPD, 32 of which were granted by the MOH or provincial level, 21 were from CAPM or the Municipal Health Bureau and 14 by the State Council of Science and Technol-

ogy. Among the scientific achievements obtained thus far, 35.8% pertain to malaria, 32.8% to schistosomiasis, 13.4% to leishmaniasis, 4.5% to filariasis and the remaining 13.5% to other parasitic diseases of public health relevance. The key scientific advances made over the past decade are summarised below.

In 2000, the project "Studies on the strategy for interrupting transmission of lymphatic filariasis in China and technical measures" has won the first prize of State Award for Scientific and Technological Advances. This achievement was accomplished through a unique collaboration among 17 institutions in the country, under the leadership of the MOH and concerted efforts over the past 40 years. Based on enhanced understanding of parasite biology of lymphatic filariasis, facilitated through detailed studies on the transmission dynamics and threshold analyses, a new control strategy was established, namely elimination of the source of infection as the main feature of control. As a consequence, residual low density microfilaremia cases were of no or only very limited practical importance in filariasis transmission during the post-control stage. Subsequently, a rigorous indicator for filariasis transmission interruption was proposed, and technical measures were developed for subsequent implementation. Adhering to this strategy, the transmission of filariasis has indeed been interrupted successfully in China, and theoretical and practical bases for the global elimination of lymphatic filariasis have been generated (Shi and Sun, 1999; WPRO, 2003).

Another project entitled "Application of artemether in prevention of *Schistosoma japonicum*, *Schistosoma mansoni* and *Schistosoma haematobium* and its basic study" received the second prize of State Award for Scientific and Technological Advances in 2001. Artemether has been widely applied in the focal endemic areas of schistosomiasis japonica, with remarkable results. WHO has issued several reports of these achievements, and hosted an ad hoc meeting on "Prevention of schistosomiasis with artemisinins" in January 2001 in Geneva and suggested that artemether could be used for the prevention of schistosomiasis in areas that are malaria-free. In areas where *S. japonicum* was highly endemic and people were exposed to the infested water, they were given oral artemether at a dose of 6 mg/kg, 7–15 days after exposure, followed by repeated administration of artemether at the same doses at 15 days' intervals for up to 10 doses. Various field trials, covering half or the entire transmission period, were carried out. To date approximately 4500 study subjects participated in the trials that revealed protective efficacies of 60–100%. No acute cases of schistosomiasis japonica were seen in the individuals exposed to infested water and treated with oral artemether (Utzinger et al., 2001; Xiao et al., 2002; Xiao, 2005). Importantly, these findings were extended from *S. japonicum* to *S. mansoni* (Utzinger et al., 2000) and *S. haematobium* (N'Goran et al., 2003).

The project entitled "First nationwide survey of human parasite in China" was awarded the first prize for Advances in Science and Technology in Medicine and Health, MOH in 1994. This first nationwide survey of human parasites in China was carried out during 1988–1992. A random sampling scheme was employed to identify pilot sites, and a set of unified, standardized and quality-controlled methods were utilized for faecal examination. A total of 2848 pilot sites in 726 counties of 30 provinces (autonomous regions, municipalities) were selected, involving 1,477,742 people. More than 90 million items of data pertaining to general and specific demographic, epidemiological, geographic and parasitological issues, as well as applied research, were collected. The data of the survey had been used by the MOH as baseline to design the national control programme on parasitic diseases. Institutions and health personnel dealing with parasite control have been strengthened and developed through the survey (Xu et al., 2000).

The project entitled "Strategies for control and interruption of schistosomiasis in mountainous area" had won the second prize of State Award for Scientific and Technological Advances in 1998. The project developed an effective strategy of schistosomiasis control in mountainous areas, including plateau valleys, based on the investigation of epidemiology, characteristics of environmental and socio-economic factors, so that chemotherapy can be reinforced with health education and snail control in the high transmission areas (Zheng et al., 1997).

The project entitled "Study on candidate antigen GST for vaccine development against *S. japonicum* and application of recombinant schistosome GST antigen" won the second prize for Advances in Science and Technology in Medicine and Health, MOH, in 1995. The initial results obtained with the native GSTs showed that 26 kDa GST from *S. japonicum*

is the main protein in induction of antigenicity and immunogenicity. A comparative study of the antigenicity, immunogenicity, protective efficacy and amino acid sequence analysis of this fraction and Philippines recombinant Sjc26GST carried out subsequently yielded similar results and almost 100% homology in sequence. A relatively low but significant level of protection (23.7%) in terms of reduction of worm burden against challenge infection with the cercariae of a Chinese strain of *S. japonicum* was obtained in mice experiments. The level of anti-GST antibody in immunized mice was also significantly higher than in control mice. Vaccination experiments were also carried out in pigs and water buffaloes, and similar results were obtained. Therefore, development of a veterinary vaccine against schistosomiasis japonica would be clearly a useful adjunct to chemotherapy for reducing the transmission of *S. japoncum* from animals to humans (Liu et al., 1995a,b).

Finally, the project entitled "Studies on new molluscicide, bromoacetamide" passed the appraisal for scientific achievement in 1995. The new molluscicide bromoacetamide was screened by IPD already in 1980, with a higher molluscicidal effect against snail and its eggs (LC_{90} is 1.0 and 0.34 mg/l against *Oncomelania hupensis* snails and its eggs for 24 hours immersion under 25 °C) and low toxicity to fish. Subsequently, bromoacetamide was applied in various environments of 28 counties covering a surface area of 5.06 million m^2 and it was found that bromoacetamide was safe to fish production and exhibited a highly molluscicidal effect to *O. hupensis* at a low dose of 1 g/m^2 by spraying. There was no carcinogenicity detected in the laboratory after teratogenic and mutagenic tests in rats or mice. The short-term residue of bromoacetamide in soil and water showed no harm to the environment (Zhu et al., 1999).

6. Conclusion

Since its inception in the mid 1950s, IPD has achieved a track record in parasitic disease research and control, particularly so in schistosomiasis. This body of achievements forms a sound basis for further development and implementation of control approaches and strategies, technological innovations and development of criteria for evidence-based and cost-effective control of the major parasitic diseases endemic in China. IPD has played a seminal role as a "national team" during the elaboration, implementation and evaluation of national parasitic disease control programmes.

The re-construction of the departments has contributed to free professionals of IPD from many administrative duties permitting them to engage more efficiently in solving key technological problems to foster research and to translate the most important findings into public health action, i.e. the control of the major parasitic diseases in the country.

After entering the new millennium, IPD has faced additional challenges due to the economic globalization. These developments, in turn, require efforts also from the young generation of IPD, with an emphasis on the use of available modern technologies (Hu et al., 2003), and ideas inspired through constant exchanges with the international scientific community (Zhou et al., 2002). These two features hold promise to foster sound research, control and surveillance of parasitic diseases that remain of public health and economic significance in China and the larger sub-region (Zhou et al., 2001). Overall, the control of parasitic diseases remains a formidable challenge across China, but IPD has contributed on multiple aspects in major ways. Further advances are mandatory, spurred by development of science and technology. Now that IPD will celebrate its 55-year anniversary, the staff is encouraged to pursue their work with a rigour and a pioneering spirit for the years to come.

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