Recollections

The Role of the WHO Collaborating Centre for Tropical Diseases in China

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In the Memorandum of Understanding on Health Technology Cooperation issued in Beijing in 1978, the Ministry of Health (MOH) of China and the World Health Organization (WHO) agreed to create a series of WHO Collaborating Centres (WHOCC). The Institute of Parasitic Diseases at the Chinese Academy of Medical Sciences (the predecessor of the National Institute of Parasitic Diseases [NIPD] at China CDC) was officially designated as a "WHO Collaborating Centre for Malaria, Schistosomiasis, and Filariasis" in 1980 based in Shanghai (*1*). Since then, the WHOCC for Malaria, Schistosomiasis, and Filariasis has played an important role in promoting the development of medical science in China.

From 1980 to 2015, the WHOCC for Malaria, Schistosomiasis, and Filariasis has conducted fruitful cooperative activities facilitating the building of a first-rate organization for research and control of malaria, schistosomiasis, and filariasis (*2*). It has hosted international conferences and training courses, introduced advanced technologies, and validated tools for control approaches. New diagnostics, drugs, and vaccine candidates have been developed and evaluated, which has effectively promoted the control of parasitic diseases in China. Briefings and disease-specific reports have been produced to guide the process of controlling and eliminating the three diseases within its sphere of responsibility. To achieve this, the WHOCC for Malaria, Schistosomiasis, and Filariasis established and coordinated international networks and projects, such as the development of strategies for schistosomiasis elimination and liver fluke control. It has also provided leadership for a Southeast Asian multi-country network called the Regional Network on Asian Schistosomiasis and Other Helminthic Zoonoses (RNAS$^+$) (*3*).

In line with the development of China's economy and social development, the NIPD has taken on a supporting role for the Belt and Road Initiative as it extends into the field of global health. To reflect these wider responsibilities, the WHOCC for Malaria, Schistosomiasis, and Filariasis was re-designated as the "WHO Collaborating Centre for Tropical Diseases" in May 2015. The aim of this article is to review its achievements since 1980, to summarize the role played by the centre during its development, and to outline its role in global health governance.

Development

International exchange and cooperation have been important components of the NIPD's promotion of developmental achievements in improved tropical diseases research and control. Meanwhile, the NIPD has expanded its activities related to global health through the WHOCC. With the open-door policy instituted in the country in the late 1970s, international exchange developed rapidly, and the WHOCC took the lead in moving through four stages from the WHOCC for Malaria, Schistosomiasis, and Filariasis to the WHOCC for Tropical Diseases based on funding resources.

The Initial Stage (1976–1979) The WHOCC for Malaria, Schistosomiasis, and Filariasis, inaugurated at the Institute of Parasitic Diseases in February 1980, came about after the Director, Dr. Mao Shou-Pai, visited the WHO headquarters in Geneva, Switzerland and had discussions with Dr. Halfdan Mahler, Director-General of WHO in 1976. In the two years following meeting, the NIPD was reviewed and evaluated by many visits by WHO representatives including Dr. T. A. Lambo, Deputy Director-General of WHO, and Dr. A. O. Lucas, Director of the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR). These visits were followed up by training exchanges and courses, the first of which was a workshop on application of the enzyme-linked immunosorbent assay (ELISA) for the diagnosis of tropical diseases.

The WHO-Funding Stage (1980–1997) The WHOCC for Malaria, Schistosomiasis, and Filariasis was one of the earliest established such centres in China. From 1980 to 1997, 25 research projects were funded by WHO at a total of USD 344,099. In addition, USD 140,000 was awarded by the TDR's

Institution Strengthening Fund to improve research capacity. Other TDR funding included support for returning scientists after training (re-entry grants) and specific research projects from the Director's Initiative Fund. This provided evidence of research capacity and laid the foundation for future multilateral financial support (*4*). With the initiated funds from WHO, more international funding resources came into the WHOCC for Malaria, Schistosomiasis, and Filariasis at NIPD as well (Figure 1).

The Co-Funding Stage (1998–2010) At this stage, the research capacity was further strengthened through co-funding involving the WHO and the Chinese MOH. Research on diagnosis, drug, and vaccine development received support from the WHO, while control strategies for parasitic diseases, such as "study on the distribution of *Anopheles anthropophagus*" and "schistosomiasis control strategies in the mountainous region", were supported by the MOH, with the number of projects and funds from the Chinese government showing an increasing pattern over time. Funds from international organizations, such as the USA's National Institute of Health (NIH) and the World Bank, were also obtained showing the start of growth in international cooperation. This led to more comprehensive research being carried out by both local and international institutions.

The Self-Funding Stage (2011–2018) With the rapid development of China's economy, more research and training activities were being carried out in both the WHOCC for Malaria, Schistosomiasis, and Filariasis and the WHOCC for Tropical Diseases using domestic funds after 2011. In this stage, the amount of funding that projects received from local governments grew more than those involving WHO support, which declined after reaching their intended goal of promoting the new collaborating centre (Figure 1). However, with lymphatic filariasis, malaria, and schistosomiasis almost eliminated in China, the WHO augmented its sponsoring of training activities at the NIPD, which provided opportunities for international scientists from low- and middle-income countries (LMIC) to learn from the national control programs in China. This led to more scientists from the NIPD to start implementing research projects in other countries, such as Cambodia, Laos, Thailand, Papua New Guinea, Tanzania, etc.

Achievements

Academic Exchange From 1980 to 2018, many research professionals were sent to international institutions abroad for training, attending meetings, and collaborative projects. In the last four decades, there were a total of 3,277 visits by international experts, trainees, and consultants to the NIPD, with growing numbers of NIPD staff travelling abroad.

Scientific Collaboration The NIPD coordinated the implementation of international projects on parasitic disease control, such as the World Bank Loan Program

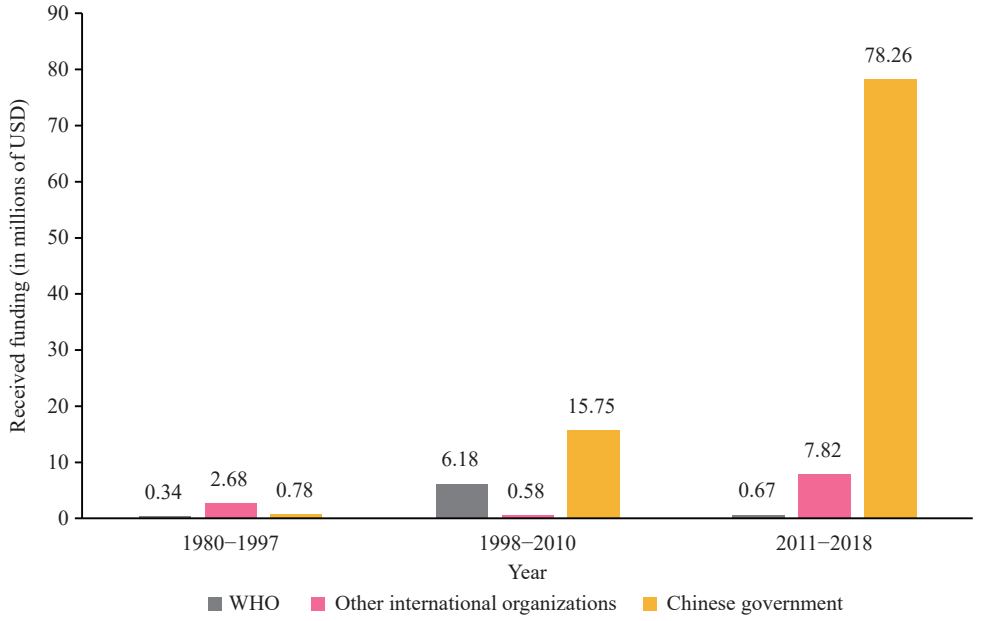

FIGURE 1. Amount of research funds (USD) in the WHOCC for Malaria, Schistosomiasis, and Filariasis and the WHOCC for Tropical Diseases with sources information from 1980 to 2018.

for Schistosomiasis Control in China, the Global Fund to Fight AIDS, Tuberculosis and Malaria Program on Malaria Control in High Transmission Regions in China, and the China-Korea Collaborative Project of Control Strategies for Helminthiasis. In 1996, the Tropical Medicine Research Center, funded by the USA's NIH, was established in the NIPD and in 2002 renewed for another 5 years. From 2008 to 2018, two rounds of funding from the International Development Research Centre (IDRC) of Canada supported "Strategies for schistosomiasis elimination and liver fluke control in South-Eastern Asian countries". From 2014 to 2018, three projects of the Global Health Supported Programmes (GHSPs) funded by the Department of International Development (DFID) of UK, were successfully implemented. Among them, the "China-UK-Tanzania Pilot Project on Malaria Control" covering 200,000 people in 4 communities in Rufiji region of Tanzania significantly reduced the incidence of malaria from 2015 to 2018 (5). Funded by the Australian Government, the "Australia-China-Papua New Guinea Pilot Trilateral Development Cooperation Project on Malaria Control" was implemented from January 2016 to December 2019 in Papua New Guinea.

Cooperative researches have provided the opportunity to develop useful tools for the diagnosis and treatment of parasitic diseases, including support from the TDR for research on using artemether for the prevention of schistosomiasis haematobia and schistosomiasis mansoni. This research was done in cooperation with the Swiss Tropical and Public Health Institute (Swiss TPH) and Cocody University of Côte d'Ivoire.

The experience gained from Chinese domestic control programs has also been transferred to LMICs in cooperation with the WHO. There are three examples: 1) the threshold (at microfilaria rate <1%) at which to stop filariasis control interventions developed by NIPD scientists; 2) control standards for schistosomiasis elimination developed by NIPD scientists; and 3) Chinese experiences for malaria control implemented in Tanzania and Papua New Guinea with several international agencies.

Training and Technology Sharing WHO-sponsored fellows from more than 20 LMICs, including Vietnam, Malaysia, Indonesia, Cambodia, Egypt, the Democratic People's Republic of Korea, and the Philippines, were trained at the NIPD. Since 1999, the NIPD was entrusted by the MOH to host several international symposia on schistosomiasis, malaria, and echinococcosis.

International cooperation has promoted the development of parasitology, disease control, and research in China and encouraged the development of human resources at the NIPD. During the latest 4 decades, a total of 55 international symposia or conferences were held with 3,055 people attending. In addition, 1,571 persons were trained at different workshops. New AI-based technology and new methods for rapid diagnosis, GIS technology, and prompt forecasting tools for parasitic epidemics have been introduced and have improved the performance of routine work of disease control and prevention.

Network Coordination So far, six networks have been established including RNAS+; the Regional Network on Malaria Surveillance in Greater Mekong Sub-Region Countries (RNMS); the Institutional-Based Network of China-Africa Cooperation on Schistosomiasis Elimination (INCAS); the Asia-Pacific Network on Drug and Diagnostics Innovation (AP-NDI); the B&R Network for the Elimination and Control of Echinococcosis and Cysticercosis (BR-NEC); and the Institutional-based Network of China-Africa Cooperation on Malaria Elimination (INCAM).

The locations of the networks (Figure 2) not only provide opportunities to update knowledge and information and to share experience, but also lead to better research capacity building, collaborative projects, and strengthening of ongoing control and elimination of diseases at the international, national, and regional levels.

Future

Cooperative Networks More member counties are expected to be involved in the mentioned networks and more training activities on pragmatic and research capacity building will be performed using the network platforms.

Control Programs With more challenges in the final steps of tropical disease elimination programmes in LMICs, the WHOCC needs to work together with local colleagues on integrated control or elimination programmes by localizing Chinese approaches in its cooperation across sectors, countries, and institutions to improve efforts using new mechanisms and techniques based on the surveillance-response system initiated at the NIPD.

Research Projects In order to further improve the efficiency of diagnosis, treatment, monitoring, and evaluation, more joint research projects will be

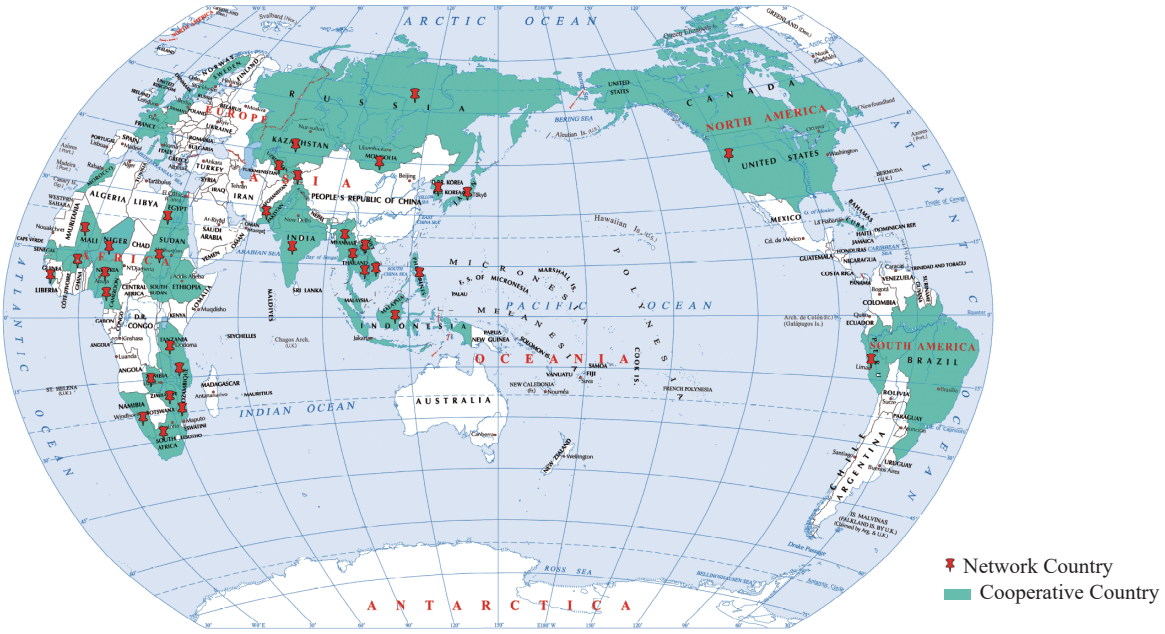

FIGURE 2. Countries with mutually participating networks led by the WHOCC for Malaria, Schistosomiasis, and Filariasis and the WHOCC for Tropical Diseases.

performed in the LMICs. In doing so, the WHOCC will need to perform joint research projects through various funding agencies and scientific resources in cooperation with scientists from both the developed and the developing world.

The WHOCC should reach out as described but also focus on its own capacity building. This has been achieved by not only promoting the development of the institute and its talented team, but also by accumulating adequate experience in international cooperation and exchange through effective bilateral and multilateral cooperation. Through the new opportunities made possible by the Belt and Road Initiative, the WHOCC will promote and develop additional cooperation by playing a greater role in global health activities according to targets of the Healthy China 2030 and Sustainable Development Goals.

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