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Acta Tropica 82 (2002) 305–311

ACTA TROPICA

www.parasitology-online.com

Regional Network for Research, Surveillance and Control of Asian Schistosomiasis (RNAS)

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Abstract

In order to strengthen the communication, cooperation and coordination among scientists and control authorities concerned with these parasitic diseases at the regional level, the establishment of the Regional Network on Asian Schistosomiasis (RNAS) was initiated 1998 in Wuxi, People's Republic of China. The RNAS was facilitated by an initiating collaborative research grant from WHO/TDR in 1999. The main activities and achievements of the RNAS during its first 2 years of existence are described. It is hoped that more interested parties will become involved in the network activities and other international agencies will consider providing technical and financial support to the network in the future to ensure the sustained development of the RNAS. The website of RNAS is now available in both English and Chinese versions with URL address: http://www.rnas.org. Thus far, the RNAS has held two important meetings with a third planned for 2002. The annual meeting will involve scientists and control authorities from all countries endemic for Asian schistosomiasis, providing a forum for more regional cooperation and coordination. More focus will be directed at training activities in specific fields such as immunodiagnostics, standardization of ultrasound use for monitoring infection-related morbidity, cost factor analysis, application of GIS/RS technology, environmental modification and human behaviour, agricultural efforts including livestock management for control of schistosome transmission, etc.

Keywords: *Schistosoma japonicum*; *S. mekongi*; *S. malayensis*; Regional network; RNAS; Asian

In Asia, three species of schistosomes infecting humans are endemic in six countries: *Schistosoma japonicum* in the People's Republic of China, Philippines and Indonesia, *S. mekongi* in Laos and Cambodia and *S. malayensis* in Malaysia. *S.*

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0001-706X/02/$ - see front matter
PII: S0001-706X(02)00024-4

japonicum has been reportedly eliminated from Japan (WHO, 1993). Unique characteristics of the Asian schistosomes compared to other schistosomes infecting humans include more severe pathology related to infection and the involvement of animals as reservoirs making the transmission dynamics much more complicated. During the past century, much attention has been paid to Asian schistosomiasis resulting in important research findings and the formulation of effective surveillance and control strategies in some endemic areas, however utilization of this information in other areas has been hampered due to the lack of information exchange between countries. In order to strengthen the communication, cooperation and coordination among scientists and control authorities concerned with these parasitic diseases at the regional level, establishment of the Regional Network on Asian Schistosomiasis (RNAS) was initiated during the International Symposium on Schistosomiasis (McGarvey et al., 1999) held in September, 1998 in Wuxi, the People's Republic of China with Dr Feng Zheng, Shanghai Institute of Parasitic Diseases, People's Republic of China and Dr Remigio Olveda, Research Institute of Tropical Medicine, Philippines appointed as network co-chairpersons.

The initial working group of RNAS consisted of eight Chinese experts, four Philippines experts and ten international advisors, however Indonesian, Japanese and other Asian participants have become involved. The main tasks of the RNAS working group are to: (1) coordinate and secure support for research on surveillance and control of schistosomiasis transmission in humans and animals; (2) disseminate information about ongoing research and training activities; (3) develop standardized protocols for infection and disease surveillance; (4) evaluate current control strategies and assign regional research priorities; and (5) share plans for new studies and explore the potential for international collaboration. Establishment of the RNAS was facilitated by an initiating collaborative research grant from WHO/TDR in 1999. A first meeting of the RNAS working group was held in the Philippines in 2000, followed by a second meeting in the People's Republic of China in 2001, at which the working group was expanded to include more participants from Asian countries. The main activities and achievements of the RNAS during its first 2 years of existence are described as follows. It is hoped that more interested parties will become involved in the network activities and other international agencies will consider providing technical and financial support to the network in the future to ensure the sustained development of the RNAS.

1. Facilitating communication of knowledge concerning Asian schistosomiasis

With the support of TDR, the Chinese Ministry of Health and the Philippine Department of Health, the RNAS has been able to facilitate the transfer of knowledge concerning research, surveillance, control and other information related to Asian schistosomiasis to scientists, control authorities and other interested parties throughout the world via the establishment of a RNAS homepage on the internet. The first version of the RNAS homepage became available on the internet in October, 1999 and provided a considerable amount of information for the scientific community as well as the general public. During the first meeting of the RNAS in February, 2000 the importance and popularity of the website was noted and consideration was given to shortening the original lengthy URL address to http://www.rnas.org to promote accessibility. The new web address has been used since August, 2000 when the second version of the homepage was created.

The website is now available in both English and Chinese versions. An introduction to the RNAS and related network information are available by accessing icons for background, recommendations, working groups, etc., on the homepage. Related news and announcements are also presented and changed frequently each month. For example, the three versions (the first, second and final) of the announcement for the International Symposium of Schistosomiasis held in Shanghai in 2001 were presented as they became available, attracting thousands of 'visits' to the website. Information concerning schistosomiasis and its prevention are available via the health

education topic in order to advise the general population about the disease. It is also possible to find an introduction to the Chinese Endemic Diseases Society on the RNAS website, as well as link to various institutions and universities in the People's Republic of China and the Philippines having programs concerned with schistosomiasis.

The RNAS website is linked to more than 50 other websites related to schistosomiasis, including the TDR website and MEDLINE for searching medically-related journals. The Chinese reference database on *S. japonicum* is available from the RNAS website in both Chinese and English. Currently, only recent references are available, however it is anticipated that references as far back as the 1950s will become accessible. It is also possible to link to the English version of several relevant Chinese journals, such as the Chinese Journal of Schistosomiasis Control, Journal of Tropical Medicine and the Chinese Journal of Parasitology and Parasitic Diseases.

Information concerning research and training activities, surveillance schemes and control strategies is also available from the site. Ideas and/or plans for research on Asian schistosomiasis for which financial support is needed are presented. For example, a research proposal on the application of geographic information systems and remote sensing for the schistosomiasis monitoring system in the middle and lower researches of the Yangtze River is described on the site. Training activities, such as research programs for PhD and Masters degrees, national, regional and international training courses, as well as professional meetings concerning schistosomiasis, are also presented. In addition, the current surveillance and control strategies for *S. japonica* in the People's Republic of China and the Philippines is described. These strategies are revised according to new information presented at the annual RNAS working meeting. Information concerning products helpful for surveillance and control, such as diagnostic kits, molluscides, antiparasitic drugs, etc., is available via the products icon on the website homepage.

A sub-network on the use of geographic information systems (GIS) and remote sensing (RS) for schistosomiasis surveillance, prevention and control has been made accessible from the RNAS website in order to exchange information and experience on GIS/RS research activities, in accordance with the agreement from the GIS training course focused on schistosomiasis held in Wuxi, People's Republic of China, 9–17 November, 1998. This sub-network is considered to be a model network under the framework of the global network of snail-born diseases geographic information systems (GnosisGIS) led by Professor John Malone, Louisiana State University, USA.

2. Providing direct scientific and operational exchange and collaboration at the regional level

Although the availability of the RNAS website allows for exchange of important information through the internet, it does not allow for direct interaction of persons involved in research and control of schistosomiasis. The annual meetings of the RNAS bring together scientists and control authorities from different sectors and disciplines from the endemic countries as well as international advisers to discuss the current status of schistosomiasis in the different countries, new tools available which may assist with control efforts, relevant research and training opportunities, mobilization of resources, etc. These meetings provide a forum for a more regional approach to the problem and promote intersectoral, interregional and international collaboration for research, surveillance and control of Asian schistosomiasis. Thus far, the RNAS has held two important meetings with a third planned for 2002.

The first meeting of the RNAS was held on February 18–19, 2000 in the Philippines at the Filemon C. Rodriguez Training Center in Tagaytay City, Luzon. Sponsors of the historic event were the Schistosomiasis Control Service and the Research Institute for Tropical Medicine of the Philippine Department of Health, WHO/TDR and the Danish Centre for Experimental Parasitology.

Twenty-eight participants from the People's Republic of China, the Philippines, Japan, Australia, Denmark and Switzerland, representing governmental health agencies of the People's Republic of

China and the Philippines, the Chinese Academies of Preventative Medicine and Agricultural Sciences, international research institutes of human and animal parasitology and the World Health Organization Research Agency for Tropical Diseases (WHO/TDR), attended the 2-day conference which marked the official establishment of the RNAS. During the meeting, a total of 15 papers concerning progress on research and control of *S. japonica* were presented. Three round table discussions were conducted to review the progress of the network in its first year, formulate a 2-year plan for the network and evaluate the present procedures used for diagnosing *S. japonica*. The presentations, roundtable discussions and group meetings allowed for the following activities: (1) reporting on the current status of schistosomiasis in the People's Republic of China and the Philippines; (2) discussing issues related to chemotherapy, environmental control and snail control, including strategies for research, surveillance and control of morbidity, chemotherapy as a means of control versus the other methods, the reliability of current diagnostic techniques and identification of strategies for their improvement and the roles and control of animals in schistosomiasis transmission; (3) discussing barriers and a possible time frame for eradication of *S. japonica*; (4) reviewing the status of *S. japonicum* vaccine development; and (5) discussing strategies and plans of action for collaboration on research, surveillance and control, including possible funding sources and training opportunities.

The RNAS working group decided that the following activities were appropriate for the objectives and working framework of the network and thus deserved RNAS action: (1) strengthening the established RNAS internet website; (2) promoting and facilitating technical exchange; (3) preparing for the international symposium on Asian schistosomiasis in 2001; and (4) making preparations for a second RNAS meeting in 2001 in the People's Republic of China. The objectives and topics of a second RNAS meeting were discussed and certain issues were considered critical by the network working group including: (1) standardization of surveillance techniques and assessment of intervention strategies; (2) introduction of new potential reservoir hosts (e.g. goats) in endemic areas; (3) research on novel drug delivery methods especially for animals; (4) livestock management for prevention; (5) inclusion of *S. mekongi* researchers and control authorities in RNAS meetings and activities; and (6) possible sources of financial support. With particular reference to the future of the RNAS, a special call was made on the need to identify new sources of funding in the light of the dwindling support coming from traditional financial supporters, such as WHO/TDR and the World Bank.

The second meeting of the RNAS was held on July 1–2, 2001 in Wuxi, the People's Republic of China at the Jiangsu Institute of Parasitic Diseases Training Center with the support of the Chinese Ministry of Health and Academy of Preventative Medicine and TDR. A total of 38 participants attended the meeting, including 24 from the People's Republic of China with the rest from the Philippines, Indonesia, Vietnam, Japan, Australia, Denmark, USA and Switzerland, including representatives from TDR and WHO's Western Pacific Regional Office.

During the second RNAS meeting, 15 presentations were given including working reports, lectures and scientific reviews covering various important issues of common interest in the region related to schistosomiasis research and control. Progress of the RNAS since the first RNAS meeting was reviewed and evaluated. The network working group considered that the RNAS has become well-established and made good progress with regard to the original objectives set out by the network working group, especially with regard to the improved RNAS internet website and extensive information exchange. The RNAS working group also considered that the RNAS has provided an important platform for researchers and experts working in schistosomiasis control in the region to think and work together, basing their discussions and actions on the most current information.

For the first time the network, with pleasure, had input from Indonesian colleagues. The current status of *S. japonicum* in Indonesia indicates that, although the number of infected cases does not appear significant and the endemic areas are

limited, active monitoring of the situation should be conducted considering the potential public health threat since interruption of transmission is not evident.

A representative of the Western Pacific Regional Office of WHO presented information on the current status of *S. mekongi* transmission in Laos and Cambodia. Surveys indicate that a total of 10,000 people in the two countries are infected with schistosomiasis and that dogs and pigs have also been found to be infected, though their role, if any, in transmission remains to be elucidated. The RNAS working group noted the importance of involving relevant persons from Laos and Cambodia in future network activities.

In addition to the information concerning *S. japonicum* in Indonesia and *S. mekongi* in Laos and Cambodia many other topics were discussed, the highlights of which are as follows:

- The current status and strategy for schistosomiasis control in the People's Republic of China indicates that schistosomiasis transmission continues in 108 out of an original 413 endemic counties after 50 years of control efforts. Different control strategies have been formulated for the different ecological areas where the parasite remains endemic.
- The People's Republic of China has established standard criteria for assessing the impact of control efforts and elimination of schistosomiasis at the national level. These criteria provide an example of a form of long term evaluation for the success of control programs in different regions and possibly different countries.
- It is attractive in knowing a proposed study on the standardization of ultrasound and relevant approaches in the assessment of *S. japonicum* induced pathological lesions in the Philippines, which is obviously of medical importance in terms of health care to the illness.
- Much attention in the Philippines is being given to the human immune response to schistosomiasis in different groups of people.
- A rapid, simple dipstick dye immunoassay with sensitivity and specificity comparable to ELISA detection was introduced by the Jiangsu Institute of Parasitic Diseases. The dipstick test is more rapid, much simpler and less costly than the ELISA test.
- A new 5-year project involving research groups in the Philippines, USA, Denmark and China, financially supported by the US National Institutes of Health, will address the ecology and transmission of *S. japonicum* in the Philippines (specifically the Eastern Visayas and Sorsogon). The project should provide information on the current status of schistosomiasis including prevalence in the human, livestock, wildlife and snail populations. The role of agricultural practices in schistosomiasis transmission will be investigated.
- Researchers in Denmark and Australia are investigating the development of a timed-release intraruminal bolus formulation of praziquantel as a novel way for controlling bovine schistosomiasis. The idea behind the bolus is to overcome the compliance problem related to repeated treatments with praziquantel by a one-time treatment which releases praziquantel at strategic times which would cover an entire transmission season.
- Monkeys are being used as an experimental model for schistosomiasis vaccine research in the Philippines.
- Japanese colleagues presented results of intensive research on the potential of calpain as a *S. japonicum* vaccine candidate. Results from murine experimental studies indicate that it prevents disease.
- The DNA-plasmid vaccine candidates, Sjc23 and Sj TPI, have shown potential in preliminary experimental pig studies.
- Ideas and plans for a global network concerning schistosomiasis information system and control of snail-born diseases by using GIS and RS provides an opportunity for the RNAS to participate in a global network with easy access.
- A TDR representative presented information on a new TDR Research Strengthening Grant initiative that he thought was appropriate for the RNAS to consider for potential support. The RNAS working group decided to submit a letter of intent for applying to TDR for a grant under the new initiative.

The RNAS working plan for year 3 was discussed and further critical issues were identified (in addition to those identified at the first RNAS meeting) which the RNAS should consider including: (1) further improvement of the RNAS internet homepage by inclusion of contact e-mail addresses and provision of a periodic newsletter; (2) scientists and control authorities from Laos and Cambodia should be included in the RNAS and Malaysian experts should be invited to the next RNAS meeting; (3) close involvement of the agriculture sector in the RNAS is needed to ensure intersectoral collaboration and an integrated approach to the situation; and (4) testing of *S. japonicum* vaccine candidates requires standardized procedures in order to make the necessary evaluations. The third RNAS meeting is to be held in 2002 in one of the endemic countries in the region.

3. Sharing technologies for surveillance, prevention and control

The new technologies for Asian schistosomiasis surveillance and control will be exchanged initially between scientists and control authorities in the People's Republic of China and the Philippines and extended to Indonesia, Laos, Cambodia and other endemic countries. The technologies to be shared will be focused on the following four areas.

3.1. Diagnostic procedures

The diagnosis of Asian schistosomiasis in human and animal reservoir hosts is very important for collecting baseline information and monitoring the effect of prevention and control strategies. Standardized diagnostic procedures are essential for comparing surveillance data at the national and regional level. Furthermore, new diagnostic procedures, such as the detection of circulating antigens in blood and urine, will help scientists to improve field research on schistosomiasis epidemiology.

3.2. Cost-effective strategies for Asian schistosomiasis control in humans and animals

Control strategies for Asian schistosomiasis and their success at local level vary depending on many factors. Cost-effective strategies found to be highly successful in an endemic area could be applied in other endemic areas with slight modifications taking into consideration these local factors. Intersectoral cooperation, especially between the health and agriculture sectors, is necessary to ensure an integrated approach to the control of Asian schistosomiasis and this is to be promoted.

3.3. Testing vaccine candidates

A variety of vaccine candidates are being developed and evaluated for their potential to prevent *S. japonicum* infection or morbidity related to infection. These vaccine candidates will need to tested against both Chinese and Philippine strains of *S. japonicum* using standardized evaluation techniques in order to properly compare them.

3.4. Geographic information systems and remote sensing application in schistosomiasis control

With the application of GIS and RS in the field, new GIS and RS techniques need to be discussed and evaluated through the network. The epidemiological data mapping will be helpful for making recommendations to local authorities for policy making as well as evaluating the control program endemic countries. Technical assistance is easily available for improving the application of GIS/RS in schistosomiasis control.

4. The future of RNAS

The RNAS has made great achievements in its short existence with regard to increasing communication, cooperation and coordination of activities related to research and control of Asian schistosomiasis at the regional level. During the next year, the third version of the RNAS website will go on-line promoting more information exchange and possibilities for collaboration. The

website will be improved by adding a list of scientists and institutions involved in research and control of Asian schistosomiasis, a database of schistosomiasis references published in different languages, expanded linkage to other related sites, etc. The annual meeting will involve scientists and control authorities from all countries endemic for Asian schistosomiasis providing a forum for more regional cooperation and coordination. More focus will be directed at training activities in specific fields, such as immunodiagnostics, standardization of ultrasound use for monitoring infection-related morbidity, cost factor analysis, application of GIS/RS technology, environmental modification and human behaviour, agricultural efforts including livestock management for control of schistosome transmission, etc. These collaborative research and control efforts show promise for greatly improving the chances of successful intervention in the future. However, long-term technical and financial support must be secured in order to sustain these efforts to ensure success.

Acknowledgements

The Regional Network for Asian Schistosomiasis (RNAS) is supported by the UNDP/World Bank/WHO Special Programme on Research and Training in Tropical Diseases (TDR).

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