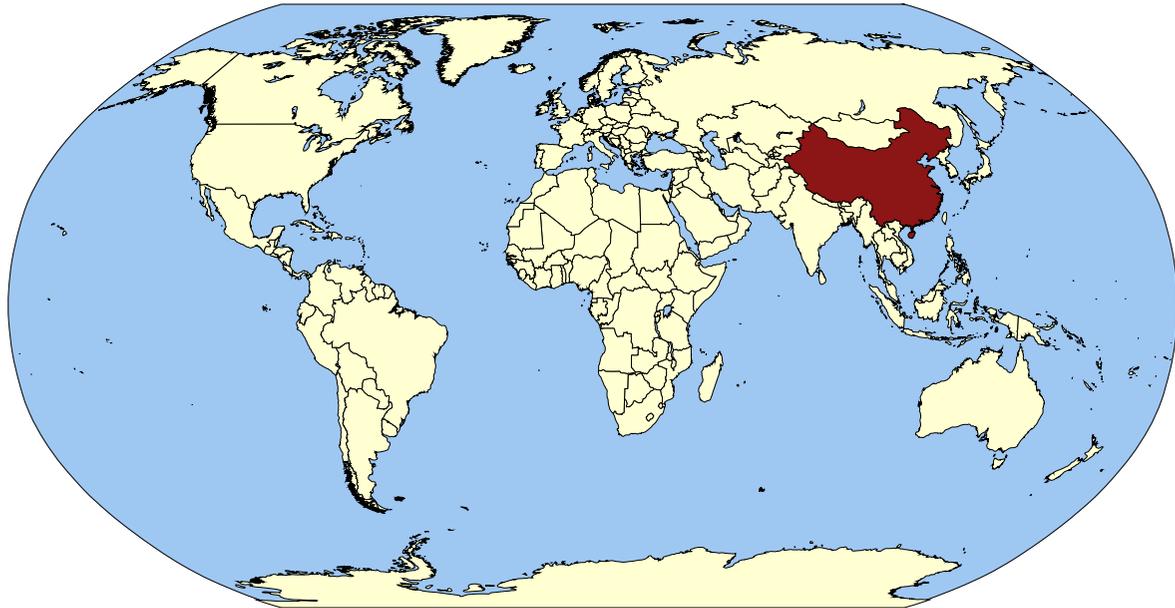


China



The History of Schistosomiasis in China

The People's Republic of China (China) is often discussed as an example of successful, though not yet complete, control of schistosomiasis through national programs primarily directed at interrupting transmission through snail control. Schistosomiasis in China is caused by *Schistosoma japonicum* infections transmitted from the amphibious intermediate host *Oncomelania* snails. *Oncomelania* can colonize and thrive in a wide range of habitats - namely lakes, marshes, irrigation schemes and wet microhabitats in drier areas [1]. Furthermore, *S. japonicum* infects other mammalian species. Egg contamination from water buffalo can be as high as 90% in some areas [1]. The first record of schistosomiasis in China was found in a relatively well-preserved corpse from the Han dynasty dated to c. 206 BCE, in which *S. japonicum* eggs were found in the liver and rectum [2]. Historical descriptions of the disease refer to a 'potbelly' or 'big belly' disease.

Schistosomiasis in China [7]

121,607 people required treatment for schistosomiasis in 2013.

<1% of the population requires preventive chemotherapy for schistosomiasis

Nearly all individuals requiring preventive chemotherapy for schistosomiasis are school-age children.

Overview of China [8]

- » Population in 2015: 1,367,485,388
- » Official Language: Chinese (Mandarin)
- » Capital: Beijing
- » Communist State
- » Percentage of Population with Access to Improved Drinking Water in 2012: 91.9%
- » Percentage of Population with Access to Improved Sanitation in 2012: 65.3%

The Spread of Schistosomiasis in China

Schistosomiasis reached epidemic levels in both the Hunan province after the flooding of the Yuan River c. 1853, and in Mianyang County in Hubei province [3]. The first official diagnosis in modern China occurred in 1905, when American physician Dr. Logan identified *S. japonicum* eggs in the feces of a diarrheal patient in the Hunan Province. Shortly thereafter, the disease was identified in the Anhui province in 1907; Hubei, Jiangxi, Shanghai, and Zhejiang in 1910; Guangdong in 1911; Jiangsu in 1913; Fujian in 1924; Guangxi and Sichuan in 1938; and in Yunnan in 1940. The total came to 12 endemic provinces out of 22 defined provinces in China [3].

Initial Control

The first nation-wide survey for schistosomiasis distribution occurred in the mid-1950's, during China's political "Transition to Socialism" following the establishment of The People's Republic of China in 1949 led by Mao Ze Dong [3]. The effort was carried out by thousands of healthworkers and found that the most severely affected areas were along the Yangtze River and surrounding lakes [3]. A census at the same time revealed China's huge population, which was estimated at 583 million in 1953. Control programs began in the 1950's and focused primarily on intermediate snail host control. Snail control remains a central component of contemporary control programs. Early programs relied on large-scale community participation to apply molluscicides and employ environmental management of *Oncomelania* habitats [1]. There is little quantified data regarding the changes in prevalence country-wide at the time, but it is clear that China's strategy successfully reduced snail habitats and human infection rates [1].

Scaling Up Control

China made huge strides in reducing transmission via snail control by 1989. Schistosomiasis had been interrupted in 4 of the 12 endemic provinces. However, in the 8 remaining endemic provinces, 1.6 million people and 200,000 cattle and buffalo were estimated to be infected [4]. In 1992, China received funding for schistosomiasis control through the World Bank Loan Project, and the strategy shifted to reflect World Health Organization guidelines to focus on morbidity control with praziquantel and health education [4,1]. This represented the biggest schistosomiasis control program in the world, and the primary tool used was largescale chemotherapy complemented with health education, snail control, and environmental modification. By 1998, the number of people infected in China was reduced by 50%, from 1.7 million in 1992 to 874,500 in 1998 [4]. Over the course of the 10 year program, over 63 million people were screened and 3.9 million animals were screened or given mass chemotherapy [4]. Mass treatment was used for humans in areas with over 3% prevalence. Below this threshold, environmental management was the primary method enforced to control transmission. In areas of high endemicity above 15% prevalence, all were given annual doses of praziquantel; in medium endemicity (3 to 15% prevalence), a test-and-treat scheme was used wherein all individuals were screened and treated if necessary every other year. This same method was applied in areas of low endemicity but only amongst 7-14 year olds [4]. In high endemic areas all cattle and buffalo were treated without screening; medium endemic areas, 1/3 were treated annually, and in low endemic areas, only animals imported from other endemic provinces were treated.

In 1992, China launched the largest schistosomiasis control program in the world.

Ecological Control and Education

In all endemic areas, 40-50% of snail habitats were surveyed and treated with niclosamide each year. Environmental modification (lining canals with concrete, altering sluice gates to prevent snail migration) was primarily carried out in low endemic regions to interrupt transmission [4]. On the 3.9 billion m² endemic areas treated in this way, 1.1 billion m² was addressed via environmental modification and 2.8 billion m² with mollusciciding [4]. Tools for health education included comic books and radio and television programs, and it was estimated that over 70% of people in schistosomiasis endemic areas changed their behavior in response to campaigns [4]. By the end of the program, goals were met wherein the number of infected people decreased by 50% and the number of infected animals decreased by 75% [4].

Recent Resurgence

However, when the World Bank project terminated in 2001, control efforts were reduced and schistosomiasis reemerged in focal locations where snail habitats hadn't been controlled and thus represented a sustained disease reservoir [1]. In a study surveying 20 known snail sites from 2000-2005, intermediate host snail populations were spreading into new areas in 17 of those sites, increasing the risk of *S. japonicum* transmission [3]. More concerning, resurgence has been identified in 38 counties across 7 provinces, and newly infected cases were identified in urban areas [3]. Following the resurgence, control strategies were reorganized and a new strategy was proposed by the Chinese government in 2004, focusing on integrated control with the goal of reducing prevalence to below 1% in all remaining endemic areas by 2015 [5].



Challenges Ahead [9]

Water resource development projects have been identified as potential challenges to curbing schistosomiasis risk in historically affected areas. Most notably, fear that schistosomiasis would spread in communities near the Three Gorges Dam (above) on the Yangtze River, built between 2003-2009, instigated aggressive treatment campaigns in the area. As a result, prevalence decreased over the time period, but long-term effects of the dam and changes to *O. hupensis* habitats may not yet be realized [6].

References

1. Rollinson, D. *et al.* Time to set the agenda for schistosomiasis elimination. *Acta Trop.* **128**, 423-440 (2013).
2. Jordan, P. From Katayama to the Dakhla Oasis: The beginning of epidemiology and control of bilharzia. *Acta Trop.* **77**, 9-40 (2000).
3. Zhou, X.-N. *et al.* The public health significance and control of schistosomiasis in China--then and now. *Acta Trop.* **96**, 97-105 (2005).
4. Xianyi, C. *et al.* Policy and Practice Schistosomiasis control in China : the impact of a 10-year World Bank Loan Project (1992 - 2001). **004978**, 43-48 (2005).
5. Zeng, X. *et al.* A Strategy to Control Transmission of. 121-128 (2009).
6. Bergquist, R. & Tanner, M. *Controlling schistosomiasis in Southeast Asia: a tale of two countries.* *Adv. Parasitol.* **72**, 109-44 (Elsevier Ltd., 2010)
7. WHO. PCT Databank for Schistosomiasis. at <http://www.who.int/neglected_diseases/preventive_chemotherapy/sch/en/>
8. Central Intelligence Agency. (2014). China. In The World Factbook. at <<https://www.cia.gov/library/publications/the-world-factbook/geos/ch.html>>
9. "200407-sandouping-sanxiadaba-4.med". Licensed under CC BY-SA 3.0 via Wikimedia Commons. at <<https://commons.wikimedia.org/wiki/File:200407-sandouping-sanxiadaba-4.med.jpg#/media/File:200407-sandouping-sanxiadaba-4.med.jpg>>