

PREVENTING, CONTROLLING, AND SHARING DATA OF ARSENICOSIS IN CHINA

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ABSTRACT

The first case of arsenicosis was reported in China in the 1950s. That incident was associated with the so-called “black foot disease.” In the late 1970s and early 1980s, arsenic specific coetaneous changes were diagnosed in the Xinjiang Autonomous Region and subsequently in the Inner Mongolia Autonomous Region and Shanxi Province. Recently, endemic arsenicosis was also found in Jilin, Ningxia, Qinghai, and Anhui Provinces. The prevalence of arsenicosis in China is becoming more and more serious. In order to prevent and control it, many departments and institutes have begun to work in this field. They have made a great progress including also the sharing of arsenicosis data within a limited area. But the limited nature of this data sharing is a barrier for preventing and controlling arsenicosis. Only once data sharing is realized within the whole nation, can we discover the best way of eliminating arsenicosis. With this goal in mind, we have set up a rudimentary platform of arsenicosis data sharing. This gradually needs to be improved and improved.

Keywords: Arsenicosis, Data sharing, Arsenic poisoning

1 THE BACKGROUND OF ENDEMIC CHRONIC ARSENIC POISONING IN CHINA

Chronic arsenic poisoning in China has resulted in endemic arsenicosis in large, mostly rural, areas. It was first observed in the 1950s and then in the late 1970s and early 1980s in various localities. The follow pictures show arsenic poisoning symptoms.



Figure 1. Symptoms of Arsenic Poisoning

Chronic arsenic poisoning in China can be classified into two types, based on their source: the drinking water type, which comes from consumption of groundwater in medium and deep wells containing high levels of arsenic and the coal burning type, which is caused by the consumption of foods that have been dried by burning coal containing high levels of arsenic in an open stove.

1.1 Drinking water type areas

Chronic arsenic poisoning was reported in the province of Taiwan in the 1950s. However, that incident was associated with the so-called “black foot disease” and seems to have been restricted to Taiwan only. In the late 1970s and early 1980s, arsenic specific coetaneous changes were diagnosed in the Xinjiang Autonomous Region and subsequently in the Inner Mongolia Autonomous Region and Shanxi Province. Recently, endemic arsenicosis was also found in Jilin, Ningxia, Qinghai, and Anhui Provinces. Gradually, more wells having high levels of arsenic were detected in other provinces, followed by an increase of arsenicosis among people in those areas. Currently, more than 3 million people remain at risk, while more than 10,000 arsenicosis cases have been confirmed. The province of Shanxi in Inner Mongol contains many cases.

1.2 Coal burning type areas

The coal burning type of chronic arsenic poisoning occurs mostly in south-western China. In 1953, the first patient was diagnosed in Guizhou Province, but not until the 1980s were more patients identified. Recently, endemic coal-burning arsenicosis has spread to five counties in Shaanxi Province.

In 1992 the Ministry of Health asserted formally that arsenicosis was a new type of endemic disease and listed it in the national prevention and cure plan for key diseases. Figure 2 shows arsenic poisoning distributing areas.

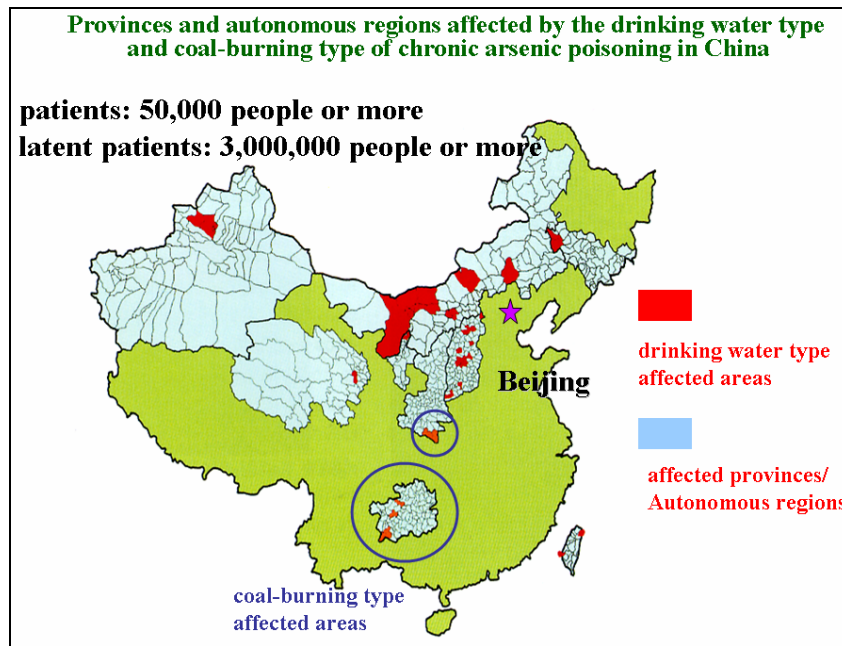


Figure 2. Arsenic Poisoning Distributing Areas

2 DEPARTMENTS AND INSTITUTES INVOLVED IN RESEARCH ON ARSENICOSIS

2.1 The United Nations Children's Fund

The United Nations Children's Fund was established in 1946, with the purpose of helping the poor children of developing countries. In China, the United Nations Children's Fund undertook the project of alleviating arsenic poisoning and its dangers (2001-2005). A survey was made of the arsenic in the water (by the hygiene department and/or disease control centre), which discovered an arsenic concentration $>0.05\text{mg/L}$ in the water used by a population of 110,612. The wells found in Anhui, Heilongjiang; Jilin, Ningxia; Shandong, Inner Mongolia; Shanxi, Qinghai; and Xinjiang, Xinjiang exceeded the standards. This area includes 129 counties and 12 divisions.

The study developed a fast method to determine the amount of arsenic in the water and launched research to prove that arsenic endangers children and woman. Specifically the study showed that the density of arsenic in drinking water has an impact on children's intelligence, that the rate of arsenic poisoning in neonates is very high, and that high arsenic concentration is a danger to pregnant women.

This has resulted in a national project (2004-2010), to plan the prevention and cure of key endemic disease with an investigation at both national and local levels. In 2004 10 million yuan were allocated for this.

2.2 The China Geology Survey

The China Geology Survey is a vice-ministerial level public institution directly under the Ministry of Land and Natural Resources. According to the national territorial resources investigating plan, this survey is responsible for disposing and organizing implementation of the country's basic geological and mineral products for the

public benefit and for strategic purposes. It unifies prospecting for resources, offers basic geological information for national economic and social development, and offers a beneficial service to the society.

The main duties of The China Geology Survey are:

1. Gather the base geological data and upgrade its database.
2. Launch the discovery and appraisal of important mineral resources.
3. Launch the investigation and appraisal of the geological environment and problems associated with it.
4. Accelerate sharing beneficial geological survey results with the public.

Using the upgraded geological database, the survey will set up a digital geological map database for China, including a public inquiry system. The China Geology Survey is launching “China’s geological environment and endemic disease (2006-2100)” investigation. The work includes: China’s endemic disease distribution, the geological environment of districts with endemic diseases, etc.

2.3 Endemic Disease Control Centre (EDCC)

The EDCC led by the China Disease Control Centre is the professional organization for the prevention of endemic disease of China. It is a national technological instruction center for endemic disease medicine. Its predecessor is the China Endemic Disease Prevention and Cure Research Center, which was established in 1987. The responsibilities of the EDCC include:

1. Preventing, curing, and monitoring of national endemic diseases.
2. Processing endemic disease emergencies.
3. Planning the scientific research for prevention and cure of national endemic diseases.
4. Making, examining, and confirming standards and relevant technical indicators for this research.
5. Examining the quality and assessing the effects of these standards.
5. Setting up a national information network including the statistics of endemic diseases.
6. Assisting the Ministry of Public Health in organizing and coordinating the epidemiologic investigation, integrating the survey, researching the techniques, and organizing technological cooperation for national endemic disease control.
7. Doing application research and technological guidance of research work for preventing and curing endemic diseases.
8. Developing and popularizing advanced technology.
9. Detecting the cause of the diseases and appraisal in endemic disease.
10. Establishing a system of quality control.
11. Offering arbitration services of the relevant technology.

2.4 The China Institute of Water Resources and Hydropower Science Research

The China Institute of Water Resources and Hydropower Science Research was set up in 1958. It has become the centre of water conservancy and the technological development of water and electricity research in China. Its research tasks include: domestic water conservancy, power projects, national scientific and technical brainstorming projects, and the key scientific research tasks of the Ministry of Water Resources in the State

Power Corporation. It is responsible for the design of new water works districts with endemic disease, etc.

3 DATA RESOURCES SHARING AND PROBLEMS

At present in China, some arsenicosis data have been collected and put into a database. The database includes the districts and provinces with arsenicosis, the population distribution of toxicosis, the external symptoms of arsenicosis, and the geographical and geological environments in arsenicosis districts. We set up a relationship among different departments connected with arsenicosis by sharing data resources. Sharing data resources can take advantage of the functions and techniques of different departments to develop and perfect the data resources. Sharing data resources increases the communication and relationships among different departments, so that the different departments can provide each other with required data in a timely fashion. It avoids duplicate work and improves efficiency, thus saving manpower and material resources.

The Environmental Hydrogeology Bureau of Jilin Province and the Number One Endemic Institute of Jilin Province give an example of data sharing. They have fulfilled the reconnaissance of arsenicosis in the west plain of Jilin Province successfully and also have established part of an arsenicosis database. The database is helpful to the local government in improving the quality of life for the population. The following is an example to data sharing of arsenicosis: the Hygienic Guard Department of Jilin Province (Number One Endemic Institute of Jilin Province) found more than 300 cases of arsenicosis in Tongyu, Yaonan, Daan, Shuangliao, Nongan, and Qianan Counties in 2002. Because of limitations in the specialized knowledge of hydrogeology and environmental geology, the researchers cannot ascertain completely the cause of the arsenicosis. The geology department (Environmental Hydrogeology Bureau of Jilin Province) can ascertain the distribution of arsenic in stratum and groundwater, but they do not understand the mechanism in which arsenic influences people's bodies. They also cannot completely distinguish arsenicosis from other illnesses. What geologists are able to do now is to diagnose arsenicosis by observing external symptoms only. Through data sharing, geology departments and hygienic guard departments can quickly exchange their data and resources about arsenicosis. The mode of data sharing saves manpower and material resources, and it also avoids repetition of work.

Although sharing data concerning arsenicosis has been realized in some districts, these districts are in the minority. This kind of data sharing is confined to a few departments. There are many difficulties to overcome before real sharing of arsenicosis data can occur on a nationwide scale. For example, at present many departments are working on their own. They have not communicated with other departments or done so only slightly. This reality is a serious barrier to the prevention and cure of arsenicosis. It not only has delayed development of the prevention and cure of arsenicosis but also has lost significant monetary and material resources for the country. In conclusion, arsenicosis is an all-encompassing problem, which needs the participation of the whole society in its solution. All departments related to the study of arsenicosis must work together and expediently exchange their data and experience. We are trying our best to build an effective, open data platform for the whole nation in the future, in particular in the field of arsenicosis.

4 MULTILATERAL COOPERATION AND OUTLOOK

4.1 Multilateral Cooperation

We have been helped by associate professor Ms. Zheng Yan of the Lamont-Doherty Earth Observatory of

Columbia University and Queens College, City University of New York, the Chinese Geological Survey (CGS), and the United Nations Children's Fund, China office (UNICEF). There have been many exchanges on the topic of arsenic poisoning in 2005, which have led to mutual recognition of the problem.

On January 6, 2006, the Chinese Geology Survey (CGS) held the Potable Water Endemic Disease and Geological Environment Relations Symposium in Beijing. Attending the conference were UNICEF project officer Oluwafem B. C. Odediren, associate professor Ms. Zheng Yan from Lamont-Doherty, researcher Wang Shenglin from the Xinjiang Centers for Disease Control and Prevention, and experts from the Institute of Hydrogeology and Engineering Geology Techniques, CGS and the Institute of Chinese Geology Environmental Monitoring, CGS.

For the past 5 years in Bangladesh, Ms. Zheng Yan and her study team have researched groundwater arsenic poisoning and the geological environment. She has also worked on the American New England state arsenic sickness research plan and has made a tentative plan for the Bay of Bengal and the Chinese southwest endemic disease geology environment. Experts from the Institute of Hydrogeology & Engineering Geology Techniques introduced to our country prevention methods for endemic diseases, water quality improvement, geological environment relations research, and ground water surveying.

Conference representatives carried on wide-ranging exchanges and discussion concerning prevention of endemic disease and the water quality improvement question. They agreed on the necessity for further strengthening cooperative exchange, discussions of prevention of endemic diseases and the water quality improvement question.

On March 25, 2006, subsidized by the United Nations Children's Fund China office, sponsored by the United Nations Children's Fund China office, the Medical Department Disease Controls Bureau, the Chinese Geology Survey (CGS), the Center for Disease Control (CDC), the Chinese Water Conservation Water and Electricity Academy of Science, with sponsor assistance from the Institute of Hydrogeology & Engineering Geology Techniques (CGS), the "Establishes Chinese Arsenic Network and Enhances the Correlation Scientific Research Ability Construction" seminar convened in Beijing. This seminar established the Chinese Arsenic Network to enhance international cooperation and scientific research capability of the department. The goal of the conference was, through exchange and the deliberation, to increase collaboration in prevention of arsenic poisoning and find a solution for the potable water security problem.

The conference subjects included:

A. Endemic disease and arsenic poison question summary

Introduction to disease prevention and water quality improvement methods, with successful experiences as well as the direction for the next step in the prevention work.

B. Topics

- a. Arsenic poison investigation and condition classification;
- b. Arsenic poison pathogenesis mechanisms and preventive measures;
- c. Disease prevention and the water quality improvement effect appraisal technology;
- d. Human behavior as a function in slowing endemic disease conditions;
- e. Relationship between the geological environment and endemic disease relations;
- f. Pathogenesis ion concentrates and the migration rule in the ground water;

- g. Ground water investigation and development use technology methods.

At the meeting, 20 experts carried on academic exchanges and discussion in view of their present situations in the endemic disease research area. Medical department experts introduced the present situation of Chinese arsenic poisoning, the influence arsenic exposure has on children's intelligence levels and physical growth, arsenic exposure in water and the influence of burning coal on arsenic poisoning on the health in Guizhou, etc. The Chinese Geology Survey and Jilin University's experts related progress in researching the Chinese geology environment and its relationship to endemic disease, past methods of preventing disease by water quality improvement, endemic disease prevention and control measures, and ground water surveying work to be carried out in the next five years. The Water Conservancy Department's experts introduced the present situation and challenges of China's water resources and the present situation of the Chinese countryside's potable water present. Finally experts from Columbia University in the United States introduced research achievements made on arsenic poison and its influence on health in Bangladesh.

4.2 Data Exchange and Forecast

- A. The establishment of a Chinese arsenic net will be helpful to Chinese arsenic research as well as for international exchange and cooperation. Departmental heads and contact persons have been determined for hygiene, geology, and water conservancy departments, and platforms have been built to advance multilateral cooperation.
- B. Hygiene, geology, and water conservancy department experts are fully cooperating to enhance the importance of arsenic research levels overall. They have indicated that this seminar has made a good start for the future tripartite cooperation and that future work will invite outside experts to unite in the research
- C. Each year the group will convene under the subsidy of the UNICEF China office. The health, geology, and water conservation tripartite participation in the conference will strengthen various departments and the cooperation of international organizations will enhance the scientific research ability and will impel the domestic and foreign arsenic research.
- D. The project official from the UNICEF China office indicated that, as always, his organization will subsidize Chinese local arsenic work.
- E. The group also endorsed construction of an open-data type data to share data effectively and to provide effective solutions to arsenic poisoning in China.