

Tracing SARS virus chain

Disease-control staff's investigations help curb disease spread

Editor's note: A definitive diagnostic test, vaccine and specific treatment are not yet available for severe acute respiratory syndrome (SARS) but epidemiologists in China have been trying to contain the epidemic's spread. From different perspectives, China Daily offers a glimpse at the enormous but multifaceted epidemiological work, which includes tracing people who come into contact with SARS patients.

By YU NAN
China Daily staff

With bloodshot eyes and a husky voice, 35-year-old Pu Yonglan said she really missed her 2-year-old son, whom she has not seen for weeks.

"Actually, it was only during my last media interview that I had enough time to miss him," she joked. "I am too busy even to remember when that was."

As the leader of an epidemiological investigation team with the Centre for Disease Control and Prevention of Beijing's Haidian District, Pu has been busy taking care of everything since confirmed or suspected SARS cases were reported by hospitals in the district in mid-March.

Pu and her more than 80 colleagues in the Haidian centre are responsible for interviewing SARS patients to learn about all the people with whom they have had close contact. They are also responsible for disinfection and set up quarantine areas. By the evening of May 13, they had carried out epidemiological investigations into 552 patients.

Haidian District has a population of 1.2 million and is a nomenclature of infectious-disease hospitals. In the SARS epidemiological chart for the country's capital, it had the most SARS cases, the figures having been gathered from hospitals in the district. By May 14, the number of confirmed cases receiving medical treatment in Haidian hospitals numbered 657 and there were 335 suspected cases.

Over 60 per cent of the patients are not residents of Haidian District. But

the battle against the flu-like epidemic in Haidian has always been tougher since most of Beijing's best universities and dozens of big hospitals are located in the district.

China Daily's interviews with different staff members of the Haidian disease-control centre were interrupted by phone calls and other urgent business so many times that it took five hours to do all the interviews.

"Epidemiological investigation are vital throughout the battle against SARS," said 47-year-old Dong Shulan, a member of the SARS specialist section in the disease-control centre.

"We help cut off the possible channels through which the virus could spread and all the first-hand information that we have collected is important for further analysis and research into the spread of SARS," she added.

Dong said she is happy that their work is now bearing fruit as the number of SARS cases is falling gradually, both within the district and in the city as a whole. "This is the best form of repayment for our work," she said.

On the front line

Pu and 14 of her staff handled their first SARS case on March 15.

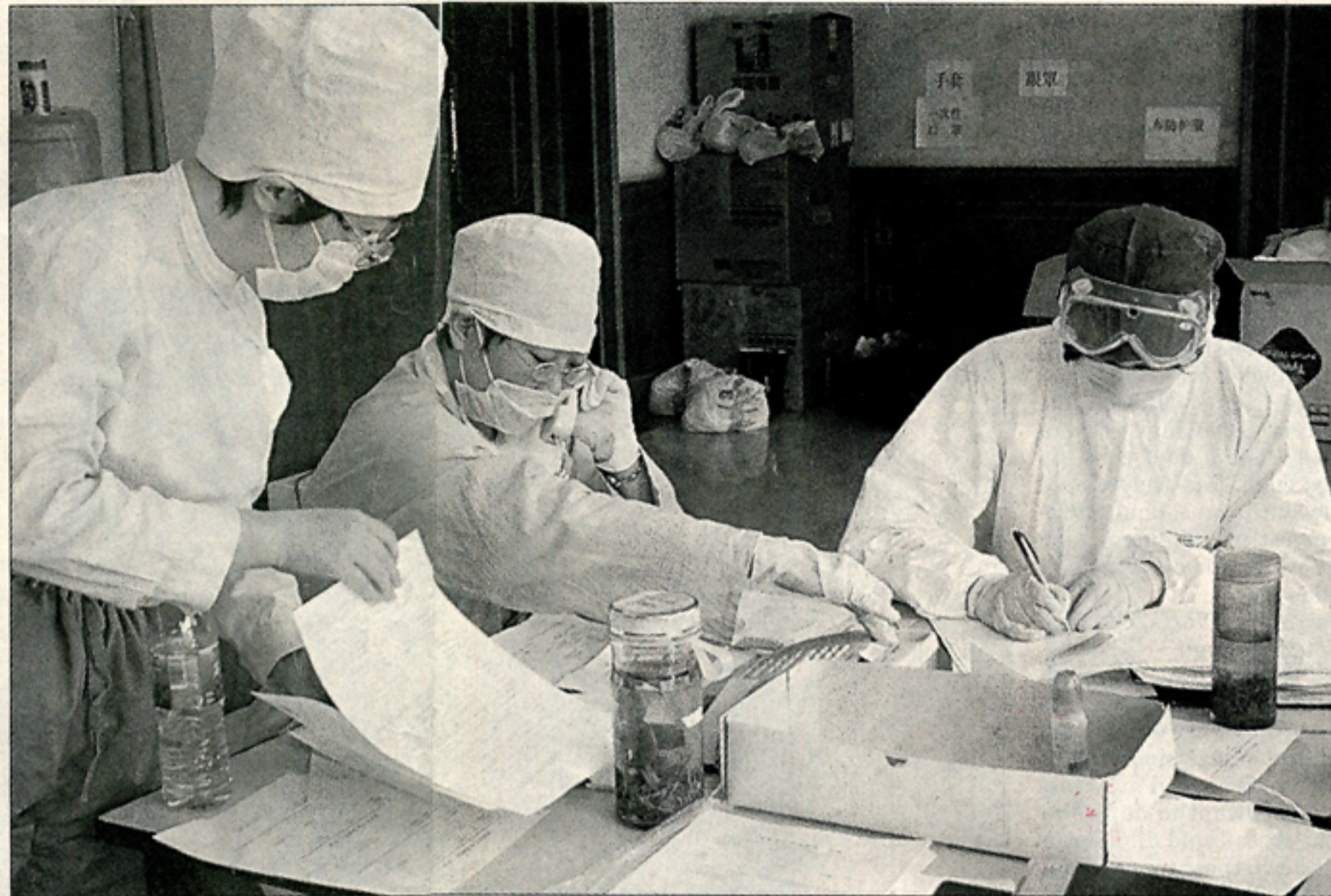
However, the small crew soon found themselves overloaded with the investigation work as the disease spread quickly. They could rest for only two or three hours a day. "My record was when I worked continuously for 48 hours," said Pu, who has worked with the centre for more than 10 years.

About 70 more doctors from local hospitals and institutions joined the Haidian centre's staff on April 23. "But none of us will get the chance to take a break before the spread of SARS is under control," she said.

"There were a few days when I had just come back to the office after handling one case, another one was already waiting me to go out again," she recalled.

It takes about five or six hours for each case if everything goes smoothly, she said.

During those five or six hours, the two investigators first rush to the hospital involved to interview the SARS patient and fill in an epidemiological study chart. Then they go to the patient's home to quarantine the family members and disinfect the whole apartment, the elevators and the corridors of the building. After that, they



Tracing the virus: Staff from the epidemiological investigation team with the Centre for Disease Control and Prevention of Beijing's Haidian District, work at a SARS hospital.

rush to the patient's workplace for further investigations and disinfection work. Finally, they help the patient's family and colleagues take proper measures to quarantine every one who has come into close contact with the SARS patient.

The Haidian centre's staff strictly follow the detailed guidelines set by the Ministry of Health for investigations, disinfection work and quarantines, said Pu.

Time limits have been set out. Epidemiologists must get to the hospital within one hour of a case being reported. They must arrive at the patient's home within two hours. All work for a particular case must be finished within 24 hours, Pu said.

However, the staff sometimes find it impossible to keep to the time.

For instance, at 8 am on May 8, Haidian Hospital reported that a construction worker had been diagnosed with SARS. The worker, surnamed Zhou, arrived in Beijing for the first

time on May 6, having taken the train from Guangzhou, the capital of South China's Guangdong Province. Zhou did not know enough about Beijing to tell the exact location of the construction site where he had worked.

Pu sent four squads to interview Zhou, trying to get more useful information out of him. But all he could recall was three phone numbers that he often called. One of the numbers had expired, the other was always busy and they couldn't get an answer from the third phone number.

Construction sites, schools and hospitals are three key places for obser-

and disinfection are especially important for construction sites, which are relatively messy and where migrant workers often live in small, densely packed quarters.

When they were at their wits' end, Pu asked for help from Zhou Liangluo, the head of Haidian District. The local police then managed

to reach the people whose phone numbers Zhou had. They were members of Zhou's family in Southwest China's Yunnan Province. These family members told the Haidian police the specific location of the building site at 2 am on May 9.

By 6 am that same morning, the construction site in the northeast of the district had been disinfected. All 23 workers identified as having come into close contacts with Zhou, from among about 100 workers in total, were quarantined.

No one else has developed SARS symptoms yet, said Pu.

Control Centre of Haidian District, said: "The sooner the infected places are disinfected and people who have had close contact (with a SARS patient) are quarantined, that chain of infection will be cut off. "We are trying to protect the whole of society and guarantee a relatively safe and healthy environment."

In so doing, the epidemiological workers have put themselves in a high-risk group as they contact both patients and groups of people in potential danger of infection.

Some people regard the disease-control workers as unwelcome and annoying because they bother patients and their families when they are still in pain, Pu said.

"But none of us has any other choice, right? We have to do the job and do it meticulously for the sake of preventing the further spread of the disease," she said.

Need to be meticulous

Pointing at the two pages of the standard questionnaire, Pu said that is what they have to ask just one single SARS patient. The questionnaires cover all the basic information about the patient, clinical signs, current medical treatment and reactions, the latest history of contact with particular places, people and animals.

Pu admitted that some patients were reluctant to answer the questions but most co-operated when Pu and her colleagues told them about the potential damage that SARS would cause.

The team will meet more difficulties when the weather gets hot, said Pu. She added: "Wearing stuffy protective outfits for hours while doing interviews in the wards can make us faint. Even nowadays, we are usually dripping with sweat when we take them off."

The information gathered by the Haidian disease-control centre staff is sent to the main Beijing centre for further analysis and research, said Dong Shulan.

The workers have been so busy with their routine inquiries and disinfection and quarantine work that they have had little time for rest and have been unable to put their heads together to come up with their own

is transmitted except being sprayed at short range," said Dong. "In some SARS cases, we don't even find any history of possible contact with the SARS virus."

"What we still need is more understanding of the importance of our work from all levels of society."

Race against epidemic

By WEN JIAO
China Daily staff

Xiao Su (not his real name) is a Hainan Airlines ground service worker based at Baiyun Airport in Guangzhou, capital of South China's Guangdong Province.

On the evening of May 2, he boarded the airline's flight HU7801 to do the cleaning work, as usual, but wearing protective gloves and a mask. The plane had just arrived after a three-hour flight from Beijing.

The next day, the airline's Guangzhou office asked Xiao Su to go to hospital for a medical check-up because one passenger from the flight was suspected of having been infected with SARS. The passenger already had a fever and was flying to Guangzhou from North China's Inner Mongolia with a stop-over in Beijing. She admitted only the next day that her father died of SARS and her mother was in a critical condition with SARS in Inner Mongolia.

Her revelation immediately set the local Guangzhou Centre for Disease Control in motion.

By May 9, the Guangzhou centre had contacted 44 passengers from the flight, many of whom entered voluntary quarantine at home and promised to go to hospital if they felt unwell, according to Wang Ming, the centre's director. By yesterday, no one had developed any SARS symptoms.

Xiao Su, the flight crew and 26 other airport staff were placed under observation.

For Wang Ming and his colleagues across the country, such work, though hard, is now routine because it has been proved effective when it comes to cutting the chain of SARS infection.

Major local and national news media and websites frequently run notices from different provincial health authorities, warning passengers from certain trains, long-distance buses and airlines that they should report to their local hospital for a medical check-up.

When one patient is confirmed as

being infected with SARS, doctors call epidemiologists over to carefully interview the patient to find out his or her case history and the people with whom he or she might have come in "close contact."

The work to stop SARS spreading is being firmly established at the rural grassroots level. Researchers have already determined that SARS is easily spread among family members or people in close contact.

On April 29, Lou Zongxin and his wife Xu Zufeng arrived in Wuhu railway station in East China's Anhui

Province, after finishing some business they had to do in Beijing. Before they left the station, they had their temperatures taken. That was the second time they had been required to do it on their way home from Beijing.

During the trip between the city of Wuhu and the village of Bafen, a distance of some 50 kilometres, the couple had a third medical check-up before they reached their house. Before boarding the train, they told Lou's parents by phone to empty the family tool shed so that the couple could stay in the shed for two weeks under voluntary quarantine.

Meanwhile, Xu Huacun, the village head, leads the village medical workers every day as they give medical check-ups to Lou and 30 other villagers who came back from SARS-hit areas. "It's for the good of other villagers," said Xu, who heads a village of 776 households and 2,645 residents, with 790 villagers working in big cities outside the province.

Epidemiologists are also checking on possible high-risk groups. For instance, epidemiologists at Peking University have been monitoring those who have chronic illnesses or

had visited their hospitalized parents or other relatives during the period between March and early April, when the SARS infection was especially serious in Beijing's hospitals.

All this work has so far contributed to the steady decline in SARS infections in the hardest-hit areas of North China, including Beijing, and to a much lesser incidence in cities and provinces in East and Central China.

All the present-day epidemiology work, now outlined in a Ministry of Health code for SARS prevention, has drawn on the lessons and experiences

of earlier work done in Guangdong, North China's Shanxi Province and Beijing. Chuo Ruiyi, director of the disease-control centre in Qingxu County in Shanxi, described the work as very hard because the staff could not tell the public the full story and thus win public understanding.

Chuo Ruiyi first heard about feiduan (atypical pneumonia) in early February. At that time, "atypical pneumonia" was raging in South China's Guangdong Province and caused panic buying of vinegar there.

Qingxu County, where the famous Shanxi vinegar is produced, saw quite a number of business people from Guangdong arrive and then leave after ordering locally produced vinegar in bulk. "No one in Qingxu was infected in those days," Chuo said.

The first case that alerted the epidemiologists in Shanxi was a businesswoman surnamed Yu, who ran a jewellery store in a shopping centre in Taiyuan, the provincial capital.

She was a link in the first SARS infection chain between Beijing and Shanxi. The province has become the third hardest-hit area on the

Chinese mainland.

Shanxi has one of the lowest per capita incomes in the country, with a far lower gross domestic product than Beijing and Guangdong. But local medical staff and epidemiologists have been waging a staunch battle.

First chain

Yu went to Guangdong at the end of February to replenish her shop's stock. She caught a cold and had a fever. With little knowledge of the deadly epidemic as a result of infrequent media coverage of SARS, however, Yu did not go to see a doctor in Guangdong. Instead, she returned to Taiyuan with her stock and lived with her family even though her illness was getting worse.

She visited several hospitals in the city for treatment in late February, but her condition did not improve. Medical staff in the province had no knowledge of the killer disease and had not adopted any preventive measures in the region.

Following the custom of local rich families, she hired a taxi and went to Beijing on March 1 to see a doctor at Army Hospital No 301.

It was not until March 7 that Yu was confirmed as a SARS case and was transferred to Army Hospital No 302, which specializes in infectious diseases. By then, eight of her relatives, including her husband and parents, had already developed symptoms similar to hers. They also came to Beijing for treatment.

Yu became the first SARS patient in Beijing and health workers at Army Hospital No 301 were directly infected.

Shanxi epidemiologists started work at once after hearing of Yu's diagnosis. Zhao Baoxin, the Taiyuan Centre for Disease Control, arrived in Beijing on March 9. He and his colleagues went to Yu's ward and talked with her to learn about her case history and the people with whom she had come into contact since her symptoms began to show.

Following the initial rules of epi-



Mask help: Lou Zongxin helps his wife Xu Zufeng put on a face mask when visitors arrive.

demological study, Zhao and his colleagues identified some 30 people who had come into "close contact" with Yu. They quietly established a network to check on these people. It was later confirmed that four of these people had been infected by SARS and they were sent to hospital for treatment.

They found that Yu could be directly linked with about 20 SARS cases in Shanxi Province, including five medical staff at Shanxi Province People's Hospital, where Yu went for treatment.

Second chain

On March 20, a patient who had visited a hospital in Beijing earlier that month for a mouth ulcer went to Shanxi Province People's Hospital. He also had a slight fever.

The patient, surnamed Yue, is head of a township in Qingxu County, about 40 kilometres from Taiyuan. Many of his subordinates went to visit Yue at the hospital.

Yue was suspected on March 23 as having been infected with SARS and this was confirmed later. One of the visitors, Yue's driver and the driver's wife soon fell ill with SARS.

Chuo Ruiyi and his colleagues at the Qingxu Centre for Disease Control got the news from the provincial

disease-control centre and began their round-the-clock work.

They subsequently identified seven people as having come into close contact with Yue and the infected visitor and placed 128 more people under what they called "medical observation."

Ma Xiuzhen, the chief accountant of the Qingxu centre, recalled: "We only talked to those people about a 'spring respiratory disease' because information on the disease was very limited. Those people couldn't understand why they should be hospitalized."

When Chuo and his staff from Qingxu were tracing Yue's contacts, Zhao Baoxin and his colleagues at the Taiyuan CDC were working on another case that turned out to be the third link of infection in Shanxi.

By April 26, the targets of "epidemic investigations" in Qingxu County numbered some 1,300 people, according to Chuo Ruiyi. Chuo and his colleagues had to work every day until 2 o'clock in the morning.

But Chuo admitted that it had become very difficult to unravel the links.

Hu Shuli, Li Qiyuan and Lou Yi from Caijing magazine contributed to this article.