

SARS

In the spring of 2003 the World Health Organization (WHO) issued an emergency global alert. Reports had come in from Asia of a potentially lethal new disease known as severe acute respiratory syndrome – SARS for short. There was a worldwide panic. Airports began screening passengers, and international trade and travel were disrupted. People everywhere held their breath (or put on masks) as this mysterious pneumonia-like disease travelled rapidly to every continent of the world, infecting over 8000 people in 29 countries, with more than 700 deaths. By July 2003 the SARS pandemic – identified as a coronavirus, spread primarily via airborne droplets – was apparently over. Whether it will re-emerge at some time in the future remains to be seen.



Funds from the sale of these special stamps issued in Taiwan in 2003 were used to help fight SARS.

In mid-February 2003 a small notice in the WHO's *Weekly Epidemiological Record* mentioned a mysterious respiratory infection that was cropping up in Guangdong province, southern China. It had caused the deaths of five people. A week later, Dr Carlo Urbani (1956–2003), an Italian-born WHO specialist in infectious diseases based in Hanoi, Vietnam, rang the WHO regional office for the Western Pacific. An alarming and unidentifiable disease was breaking out in the French Hospital in Hanoi, causing severe pneumonia-like symptoms and deaths, especially amongst the hospital staff. One key patient in this story was the Chinese-American businessman Johnny Chen, who had been admitted to the hospital on 26 February. After three weeks of dealing with the crisis round the clock, on 11 March Dr Urbani travelled to a medical conference in Bangkok, Thailand. On arrival he felt unwell and told a waiting friend not to touch him but to call an ambulance. He was put into an isolated intensive care unit and died on 29 March.

Between the time of the first notice from China of an unusual 'atypical pneumonia' and Dr Urbani's death, the WHO had become suspicious. Reports of a strange new disease had begun to surface from Hong Kong, Singapore, and Toronto, Canada, as well as China and Hanoi. On 15 March the director-general of the WHO, Gro Harlem Brundtland (b.1939), took the unprecedented step of alerting

the world to the threat of a new disease, and at the same time issued an emergency travel warning.

SUPER-SPREADERS

SARS had probably begun not in February 2003 but in China in November 2002. In the intervening period, the newness and potential global severity of the disease had gone unrecognized. The first case was probably a young man from the town of Foshan, China. He was admitted on 16 November 2002 to Foshan No. 1 People's Hospital with an unusual respiratory illness. How and why he contracted the disease remains a mystery. The young man recovered and was discharged from hospital, but, like many cases that were to follow, he set up a trail of infection that was to spread rapidly through China, including Hong Kong, and then around the rest of the world.



A Chinese expert examines X-rays of SARS patients during a meeting with the World Health Organization (WHO) in Guangzhou, capital city of Guangdong province in southern China, 5 April 2003, in the hunt for clues to the disease which was first reported in the area.

The complex sequence of subsequent events was pieced together by the WHO in the spring of 2003. What emerged is that while in many individual cases the spread of the infection to others was limited, a number of so-called 'super-spreaders' were capable of transmitting SARS at an alarming rate and to a disproportionately large number of people, who then carried the virus around the world.

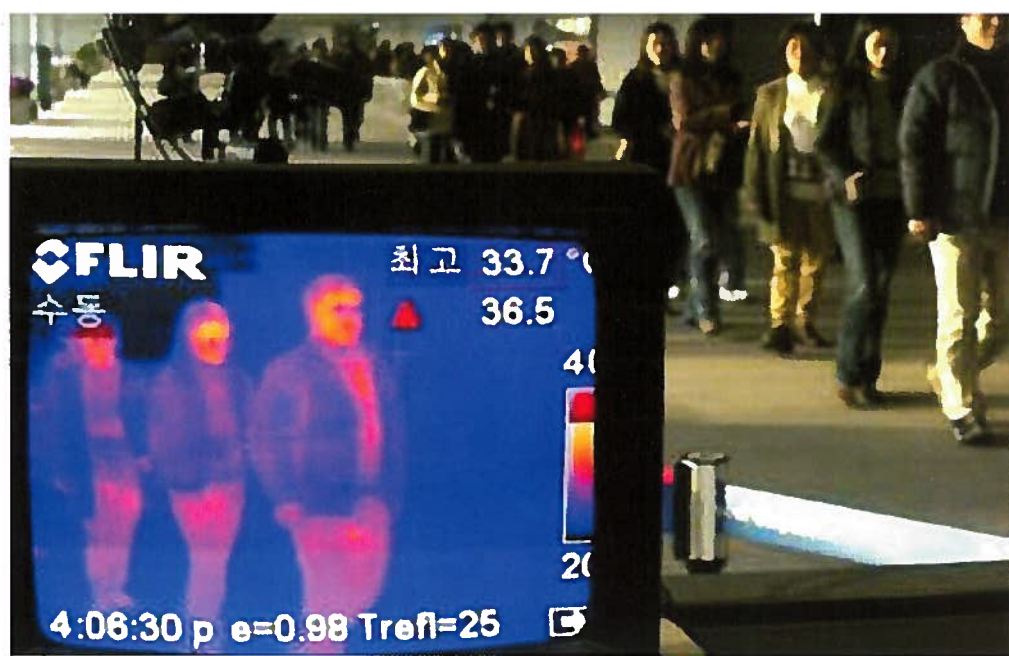
In China the first super-spreader was Zhou Zuofeng, a seafood trader who contracted the disease in late January 2003 in the city of Guangzhou in Guangdong province. He not only infected staff and patients in three local hospitals (health workers in the end accounted for 20 per cent of all SARS cases), but also transmitted the disease to Liu Jianlun, an elderly professor of nephrology. The professor and his wife travelled to Hong Kong on 21 February and stayed at the Hotel Metropole, on the ninth floor. Ten days later the professor was dead.

timeline

- 2002: 16 November** First case of 'atypical pneumonia' in Guangdong province, China (only linked to SARS retrospectively).
- 2003: 22 January** First case in Hong Kong: a woman becomes ill following a visit to mainland China, and dies on 3 February.
- 30 January** The first 'super-spreader', Zhou Zuofeng, is admitted to hospital in Guangzhou, southern China.
- 14 February** The WHO's *Weekly Epidemiological Record* mentions 305 cases of an acute respiratory syndrome and five deaths in southern China.
- 21 February** Professor Liu Jianlun from Guangdong province, stays in the Hotel Metropole in Hong Kong, unwittingly infecting several other people.
- 23–6 February** Guests from the Hotel Metropole carry SARS to different parts of the world, including Singapore, Toronto, Canada, and Hanoi, Vietnam.
- 28 February** Dr Carlo Urbani in Hanoi alerts the WHO to a strange respiratory infection, seen in a patient from Shanghai called Johnny Chen, who had stopped at the Hotel Metropole en-route to Hanoi. The disease spreads to hospital staff.
- 5 March** A woman who stayed at the Hotel Metropole in February dies of what later turns out to be SARS in Toronto, Canada. Her son also contracts SARS and dies, setting up a chain of cases across Ontario.
- 11 March** WHO specialist Carlo Urbani travels to Thailand and is admitted to hospital.
- 12 March** Hong Kong health officials report an outbreak of 'acute respiratory syndrome' to the WHO.
- 15 March** The WHO alerts the world to the threat of a possible new infectious disease of unknown origin. The disease is named SARS (severe acute respiratory syndrome).
- By this time cases have also appeared in Indonesia and the Philippines.
- 17 March** The WHO sets up a worldwide collaborative effort to find the cause of SARS and to develop reliable diagnostic tests.

(continued ...)

A special camera at Incheon International Airport, South Korea, measures the body temperature of travellers arriving from China as a way of detecting possible infection with SARS during late 2003. Control measures were clearly instrumental in containing the disease and breaking the chains of transmission, although luck or the quirkiness of the SARS virus also probably played a role in its rapid disappearance.



By the end of February a number of visitors to the ninth floor of the hotel had become infected. Some had been admitted to hospital in Hong Kong but some, unaware that they were ill, visited family in the Amoy Gardens housing estate of Hong Kong, while others flew to Vietnam, Singapore or Toronto.

Johnny Chen was one of the unlucky 'super-spreader' victims. A Chinese-American businessman from Shanghai, Chen was en route to Hanoi when he stopped over at the Hotel Metropole - on the ninth floor. When he reached Hanoi he was taken ill with pneumonia-like symptoms, and on 25 February was admitted to the French Hospital. Staff and patients at the hospital were subsequently infected. Among them was Dr Carlo Urbani, who first alerted the WHO as to the potential seriousness of this new disease. Johnny Chen was taken back to Hong Kong by his relatives, where he died on 13 March in an isolation facility.

THE RACE TO IDENTIFY THE NEW DISEASE

When the WHO issued its emergency global travel alert on 15 March, no one had any idea what this deadly disease was. It did not even have a name - other than 'atypical pneumonia'. The first reaction was that it might be an influenza virus. The initial symptoms (a high temperature, muscle aches, chills and a cough) were similar to flu, but tests soon disproved this theory. In severe and fatal cases there was overwhelming damage to the lungs, and while some suggested it might be

pneumonic plague, the disease did not respond to antibiotics - ruling out a bacterial infection. It took, however, only a few weeks to identify the cause of this mysterious infection and to discover that it was the first serious 'new' disease to emerge in the 21st century.

The disease was labelled 'severe acute respiratory syndrome' - SARS. On 17 March the WHO set up a worldwide collaborative initiative bringing together some of the leading microbiologists, virologists, clinicians and epidemiologists. The scientists corresponded daily using tele-conferences and a secure website on the internet. They shared their findings and swapped ideas. By early April the lethal pathogen was shown to be an entirely new 'coronavirus' - never before seen in humans or animals. Ironically, SARS is of the same family as one of the world's most widespread and harmless diseases - the common cold. How and why one human coronavirus has been around as a mild irritant for centuries and a new and deadly one suddenly emerges is a troubling question.

CONTROLLING THE SPREAD OF SARS

At the peak of the epidemic in early May 2003, when over 200 new cases were being reported every day, there was still no specific antiviral drug and no vaccine. Controlling the spread of SARS relied on classic epidemiological methods of patient isolation, contact tracing, quarantine, travel restrictions, screening at international borders, and infection-prevention measures in hospitals.

Tracking down those who might be incubating the virus, often in distant parts of the world, involved trying to establish who had been in contact with SARS patients in the previous ten to 20 days, and precisely where and when. In Singapore those suspected or known to have been in contact with a SARS patient were issued with home-quarantine orders, and web cameras were installed in their houses to detect violators. Severe penalties were imposed on anyone breaking the regulations. In Hong Kong, where 320 people fell sick from SARS in one of the blocks on the Amoy Gardens estate, the residents were at first quarantined in the building and then evacuated to isolation camps for ten days. Following the first death (at the time, of unknown cause) in Toronto on 5 March, hospitals across Ontario were quarantined for months, and a number were closed altogether in an effort to contain the disease. The WHO advised against all but essential travel to Toronto.

A SHRINKING WORLD SARS has demonstrated how quickly infectious diseases can be spread around the globe.

In the late 18th century it took a year to travel by ship from Britain to Australia, with the result that many outbreaks of infectious disease had died out by the time the first settlers reached their destination. With the advent of steamships in the mid-19th century, the voyage to Australia was reduced to three months, with passengers often arriving carrying or incubating a number of communicable diseases. By the 1950s, passenger ships took less than six weeks to make the passage.

Air travel has, however, significantly increased the speed with which diseases can spread. In 1925 it took 16 days to travel by air from England to Australia. Today it takes about a day. Most of the world's great cities are now within a few hours of each other. As SARS showed, a virus that is in Hong Kong one day can be carried by an infected traveller to any point in Southeast Asia within three or four hours, to Europe in 12 hours and to North America in 18 hours. Nearly 1.5 billion passengers travel by air every year, creating many opportunities for diseases to spread quickly across the globe.

timeline

2003: 19 March SARS spreads to the USA and Europe, with the UK, Spain, Germany and Slovenia reporting cases.

26 March Ontario, Canada, declares SARS a provincial emergency.

29 March Dr Carlo Urbani dies of SARS.

8 April Hong Kong scientists publish a paper identifying a new coronavirus as the causal agent of SARS. Their work is the result of an international collaboration.

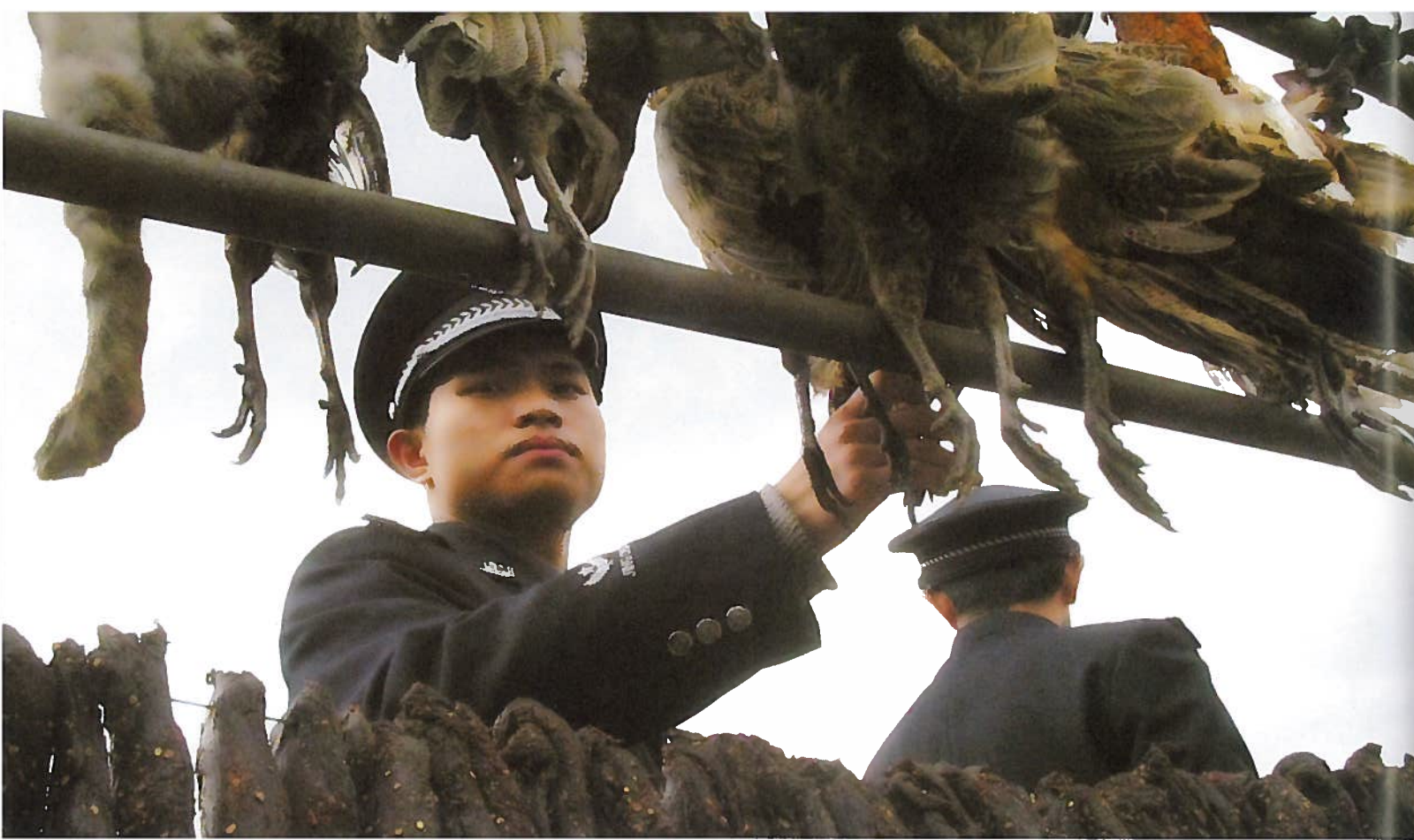
May-June Peak of the epidemic, with some 200 new cases reported every day.

17-18 June The WHO sponsors a global conference on SARS in Kuala Lumpur, Malaysia, with over 900 participants from 44 countries.

23-4 June China and Hong Kong are given the all clear by the WHO.

2 July Toronto, Canada, is declared SARS-free after 20 consecutive days without new cases. It had prematurely been declared SARS-free in April.

5 July The WHO announces that all countries touched by SARS are now free of the disease.



Chinese police with wild animals confiscated at a market. Following the suggestion that the SARS virus entered the human population from civets or from animals eaten in restaurants and butchered in live animal markets in southern China, the Chinese embarked on a culling programme, killing over 10,000 civets as well as other animals suspected of harbouring SARS.

In hospitals strict preventive measures included the use of masks, gloves, eye protection, disposable gowns and of footwear that could easily be decontaminated. Hospital staff were advised to wash their hands before and after contact with an infected patient, and to use disinfectants and disposable equipment. In many airports sophisticated temperature scanners were set up alongside the metal detectors to check for passengers with a fever. The fear of SARS was as great as the fear of terrorism.

In China, once the government had recognized the enormity of the problem – especially following a major outbreak in Beijing that in the end accounted for over a quarter of all SARS cases worldwide – they too responded with amazing speed to try to bring the disease under control. Schools, internet cafés, discos, cinemas and theatres were closed, and marriages suspended. Spitting in public places was prohibited. Nevertheless, the impact on the hospital system was immense – hundreds of doctors, nurses, ambulance drivers and other health workers contracted the disease. On 27 April work started on a new 1000-bed hospital for SARS patients on the outskirts of Beijing – it took 7000 construction workers just eight days to build it, at a cost of US \$170 million.

The new Xiaotangshan Hospital treated 680 patients, of whom only eight died and by the end of June it was no longer needed for the treatment of SARS victims. China was given the all-clear by the WHO on 24 June 2003, and on 5 July 2003 the WHO announced that all 29 countries that had been touched by SARS were free from the disease. The deadly virus had mysteriously ‘vanished’.

THE MYSTERIES OF SARS

One possible clue to the origin of the epidemic was found in a market in southern China. In some animal species, including the masked palm civet, the raccoon dog and the Chinese ferret badger, scientists found a genetically identical virus to the human SARS virus. Antibodies in those handling and selling these animals for human food or medicinal purposes were found to be higher than in the general population. One-third of the early cases of SARS in southern China also involved food handlers, suggesting that the disease may have jumped the species barrier from animals to humans. On the other hand, the animals could have been infected by contact with humans. It is also possible that the animals sold in the markets were originally infected in the wild by some other species (see Sars and Bats, right).

A FOOTNOTE IN MEDICAL HISTORY?

The panic associated with SARS is over – at least for the time being. Some epidemiologists have wondered whether the short-lived epidemic will simply go down as a footnote in medical history. The WHO maintains global surveillance of probable and suspect cases: there have been a few isolated cases since July 2003, mostly associated with accidental laboratory transmission. As the world braces itself for a possible outbreak of bird flu (see pages 172–83), who knows whether or when SARS will re-emerge on a global scale in the future.

Many lessons have been learnt from the SARS experience. As experts at the WHO have noted: ‘SARS dramatically showed the wide-ranging impact that a new disease can have in a closely interconnected and highly mobile world. It also underscored the importance of a co-ordinated global response characterized by close collaboration and open sharing of data and experiences’.

While increasing global contact can prove deadly, worldwide scientific collaboration can prove vital. At present it is not known whether SARS is lying dormant, or whether the chain of infection has actually been broken. Is this really the end of the story? Only time will tell us the answer.

SARS AND BATS Bats have been implicated in the transmission cycle for a number of diseases, most notably rabies. There is also a possibility that bats are a natural reservoir for the SARS virus. Fruit-eating bats chew fruit to extract the sugar and then spit out the rest, which falls to the ground. Insect-eating bats get rid of the hard body parts of the insect. Scientists have suggested that these undigested bits might harbour viruses that can then be picked up by foraging animals on the ground, such as the masked palm civet, and then potentially passed on to humans. The Chinese horseshoe bat has been considered a suspected source of SARS.

‘The analogy of war echoed throughout the SARS crisis. This was an attack by an unseen invader to which nations had to respond as they would to any other attack – by mobilizing the resources to repel the invader. For many countries it became clear that the real threat to security would come not from invading armies, but from unknown microbes.’

THOMAS ABRAHAM, *TWENTY-FIRST CENTURY PLAGUE: THE STORY OF SARS* (2005). [THE SARS EPIDEMIC COINCIDED WITH THE LEAD-UP TO AND THE BEGINNING OF THE IRAQ WAR.]