

SARS:

Lessons learned thus far

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The speed with which public health agencies such as the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) have addressed the outbreak of severe acute respiratory distress syndrome, known as SARS, has been impressive. Working with academic epidemiologists and researchers, they appear to have identified a new virus as the likely causative agent, characterized some of the basic epidemiology and clinical course of the infection, and developed confirmatory lab tests.

Understanding the SARS story is important both for its medical implications and the public health principles it illustrates. This article summarizes key points about SARS, mainly using reference material from the CDC.¹

■ DIAGNOSIS

Infection with the SARS virus produces a range of clinical responses:

- **Asymptomatic or mild respiratory illness**
- **Moderate illness:** temperature <100.4°F (<38°C) and 1 or more clinical findings such as cough, shortness of breath, or hypoxia

- **Severe illness:** the above findings plus radiologic evidence or autopsy findings of pneumonia, respiratory distress syndrome, with or without an identifiable cause.

Suspect SARS when patients presenting with any of the above symptoms meet one of these epidemiologic criteria.

- having *traveled* to areas under CDC travel alerts or advisories
- having had *close contact* within 10 days of developing symptoms with a person known or suspected to have SARS.

When evaluating such patients, use careful hand hygiene and precautions against airborne transmission (N-95 respirator or standard face mask if this is not available) and direct contact (gloves, gowns).

Probable cases (clinical criteria of severe respiratory illness of unknown cause since February 1, 2003, epidemiological criteria, with or without lab criteria) and *suspected* cases (same criteria, but with moderate respiratory illness only) should be reported to local or state health departments.

Diagnostic testing

Diagnostic testing should include chest x-ray, pulse oximetry, blood cultures, sputum gram stain and culture, and testing for viral pathogens (influenza and respiratory syncytial virus).

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Legionella and pneumococcal urine antigen testing can be considered. Acute and convalescent (21 days) serum should be saved for lab testing.

In May, the CDC announced the development of an enzyme-linked immunosorbent assay (ELISA) blood test to identify antibody to the presumed SARS virus. The test is now available to local and state health departments for acute and convalescent testing of patients' serum. A more sensitive polymerase chain reaction test is under development.

Treat with supportive measures

No specific treatment exists for SARS. Treat patients as you would any community-acquired pneumonia of unknown origin and provide supportive therapy as necessary. Hospitalization should be based on the usual indications.

■ TRADITIONAL INFECTION CONTROL METHODS CAN WORK

Most importantly, public health departments have demonstrated that traditional infection control measures such as surveillance and isolation/quarantine may be successful in limiting the spread of the infection. Physicians should be aware of these important concepts.

The incubation period for SARS is believed to be up to 10 days. During this time, people are not contagious. Transmission is believed to occur mainly during close face-to-face contact such as happens in households or patient-care settings. Aerosol or airborne transmission is also a possibility, although believed to be much less likely.

Surveillance is the system and process of monitoring for specific conditions. Infectious disease surveillance requires the cooperation of local, state, and federal health departments, private and public laboratories, and clinicians working in private and public settings. A definition of the condition being monitored and a method of identifying and reporting cases are necessary. To maximize surveillance, it helps to have a reporting requirement such as we have for diseases like tuberculosis or measles.

History of SARS

On February 11, 2003, the World Health Organization (WHO) was first informed by Chinese health authorities of 305 cases of acute respiratory syndrome in Guangdong province in southern China. As it turned out, these cases had started in November 2002, and the disease was characterized by transmission to health-care workers and household contacts.

People who visited China in this period and were exposed to SARS became unwitting carriers. Disease outbreaks occurred subsequently in Vietnam, Hong Kong, Singapore, Toronto, and Taiwan. In April, as international pressure increased, Chinese authorities began acknowledging the wider extent of the SARS outbreak, including hundreds of cases in Beijing and smaller numbers in other parts of the country.

As of June 16, 2003, the WHO had reported 8460 cases of SARS worldwide with a death rate of 9%.² At that time, the CDC had reported 72 probable and 329 suspected cases in the US, almost all travel-related.¹

Theoretical source: civet cats

In April, scientific teams from several countries identified a new coronavirus as the likely cause of SARS. This family of viruses had previously been identified as a cause of mild upper respiratory illnesses. In mid-April, CDC and others announced they had sequenced the genome of the specific coronavirus thought to cause SARS. In late May, researchers from Hong Kong and China announced they had discovered a virtually identical virus in a species of tree-dwelling cat, the civet, that is eaten as wild game in southern China, where SARS is believed to have started. One theory is that the virus may have lived in animals and passed to humans through a mutation or other mechanism.³

An ELISA blood test is now available to identify antibodies to the presumed SARS virus

Both **isolation** of suspected cases and **quarantine** of contacts have been used to control SARS. In the US, quarantine is usually implemented voluntarily, but, for certain conditions such as SARS, people can be quarantined involuntarily. In the case of a communicable disease such as SARS for which there is no known treatment and which can spread readily under certain circumstances, the strategies of isolation and quarantine are even more important.

A need for better defenses

As of early June, countries most affected were mainland China, Hong Kong, and Taiwan. These countries were subject to a CDC travel advisory, which means people should travel there only if they had essential business. In addition, the CDC issued a travel alert for Singapore, and re-issued one for Toronto after the city failed to contain the initial outbreak. Alerts advise travelers that if they have visited a specific SARS-affected area, they should seek medical attention if they get sick within 10 days.

Strategies against SARS. While SARS appears to have been brought under control in certain areas (Hanoi and maybe Singapore), this has not happened in others. To date, the US has been spared a serious outbreak. Use of strategies such as travel alerts and advisories, screening airline passengers from affected countries, and heightened vigilance in following up suspected cases and exposures have all helped.

Another emerging infection: monkeypox

As SARS was being contained, an infectious disease new to the US erupted: monkeypox. On June 16, when the number of cases stood at 82 persons

in 5 states, the federal government banned the sale and distribution of prairie dogs and all rodents from Africa, in an effort to control the spread. Monkeypox is believed to have spread from an African rat imported by a pet store and housed with prairie dogs for sale to the public.

Most infected persons had direct contact with diseased prairie dogs that had been purchased as pets. In some instances, however, direct contact with infected animals could not be documented; therefore, health officials cannot rule out the possibility of human-to-human transmission of the monkeypox virus.

Monkeypox was first identified in monkeys in 1959, but certain African rodents were later identified as its real host. Outbreaks in people occurred in the Congo in the 1990s.

The Centers for Disease Control and Prevention issued an interim case definition for human cases of monkeypox and a recommendation that certain individuals be offered smallpox vaccination for protection (available at <http://www.cdc.gov/ncidod/monkeypox/casedefinition.htm>).

Our best defense

Continued emergence of infectious diseases and the dramatic spread of SARS internationally through airline travel and close contact in hospitals should prompt us to strengthen our public health systems. A well functioning surveillance system coupled with the infrastructure to apply traditional techniques such as case finding, tracking, isolation, quarantine—and bans, as in the case of monkeypox—may be our best defense against communicable disease epidemics.

REFERENCES

1. Centers for Disease Control and Prevention. Severe acute respiratory syndrome (SARS). Available at: www.cdc.gov/od/oc/media/sars.htm. Accessed on June 17, 2003.
2. World Health Organization. Cumulative number of reported probably cases or SARS. Available at: www.who.int/csr/sars/country/2003_06_16/en. Accessed on June 17, 2003.
3. Bradsher K, Crampton T. Hong Kong travel advisory lifted; cat virus tied to SARS. *New York Times*, May 23, 2003.