

## SEVERE ACUTE RESPIRATORY SYNDROME (SARS)

### REPORTING INFORMATION

- **Class A:** *Report immediately via telephone* the case or suspected case and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report immediately via telephone to the local public health department in which the reporting health care provider or laboratory is located.
- Reporting Form(s) and/or Mechanism:
  - *Immediately via telephone.*
  - For local health departments, cases should also be entered into the Ohio Disease Reporting System (ODRS) within 24 hours of the initial telephone report to the Ohio Department of Health (ODH).
  - The Centers for Disease Control and Prevention (CDC) [SARS Domestic Case Reporting Form](#) is available for use to assist in local disease investigation. Information collected from the form should be entered into ODRS and not sent to ODH, unless otherwise requested.
- Key fields for ODRS reporting include: import status (whether the infection was travel-associated or Ohio-acquired), date of illness onset, and all the fields in the Epidemiology module.

### AGENT

SARS-associated coronavirus (SARS-CoV) a species of Coronaviridae.

### CASE DEFINITION

#### Case Description:

##### *Early illness*

Presence of two or more of the following features: fever (might be subjective), chills, rigors, myalgia, headache, diarrhea, sore throat, or rhinorrhea

##### *Mild-to-moderate respiratory illness*

- Temperature of  $>100.4^{\circ}\text{F}$  ( $>38^{\circ}\text{C}$ )\*, AND
- One or more clinical findings of lower respiratory illness (e.g. cough, shortness of breath, or difficulty breathing)

##### *Severe respiratory illness*

- Meets clinical criteria of mild-to-moderate respiratory illness, AND
- One or more of the following findings:
  - Radiographic evidence of pneumonia, OR
  - Acute respiratory distress syndrome, OR
  - Autopsy findings consistent with pneumonia or acute respiratory distress syndrome without an identifiable cause

#### Laboratory Criteria for Diagnosis

Tests to detect SARS-CoV are being refined and their performance characteristics assessed\*; therefore, criteria for laboratory diagnosis of SARS-CoV are changing. The following are general criteria for laboratory confirmation of SARS-CoV:

- Detection of serum antibody to SARS-CoV by a test validated by the Centers for Disease Control and Prevention (CDC) (e.g. enzyme immunoassay), OR
- Isolation in cell culture of SARS-CoV from a clinical specimen, OR
- Detection of SARS-CoV RNA by a reverse transcription polymerase chain reaction test validated by CDC and with subsequent confirmation in a reference laboratory (e.g. CDC)

Information about the current criteria for laboratory diagnosis of SARS-CoV is available at <http://www.cdc.gov/sars/lab/index.html>.

### **Exposure**

*Possible exposure to SARS-associated coronavirus (SARS-CoV)*

One or more of the following exposures in the 10 days before onset of symptoms:

- Close contact with a person with confirmed SARS-CoV disease, OR
- Close contact with a person with mild-to-moderate or severe respiratory illness for whom a chain of transmission can be linked to a confirmed case of SARS-CoV disease in the 10 days before onset of symptoms.

### **Case Classification**

Probable: Meets the clinical criteria for severe respiratory illness and the epidemiologic criteria for likely exposure to SARS-CoV.

Confirmed: Clinically compatible illness (i.e. early, mild-to-moderate, or severe) that is laboratory confirmed.

### *Exclusion Criteria*

A case may be excluded as a SARS report under investigation (SARS RUI), including as a CDC-defined probable SARS-CoV case, if any of the following apply:

- An alternative diagnosis can explain the illness fully\*, OR
- Antibody to SARS-CoV is undetectable in a serum specimen obtained >28 days after onset of illness\*, OR
- The case was reported on the basis of contact with a person who was excluded subsequently as a case of SARS-CoV disease; then the reported case also is excluded, provided other epidemiologic or laboratory criteria are not present.

### *SARS Report Under Investigation*

- *Reports in persons from areas where SARS is not known to be active*
- SARS RUI-1: Cases compatible with SARS in groups likely to be first affected by SARS-CoV if SARS-CoV is introduced from a person without clear epidemiologic links to known cases of SARS-CoV disease or places with known ongoing transmission of SARS-CoV
- *Reports in persons from areas where SARS activity is occurring*
- SARS RUI-2: Cases meeting the clinical criteria for mild-to-moderate illness and the epidemiologic criteria for possible exposure (spring 2003 CDC definition for suspect cases\*)
- SARS RUI-3: Cases meeting the clinical criteria for severe illness and the epidemiologic criteria for possible exposure (spring 2003 CDC definition for probable cases\*)
- SARS RUI-4: Cases meeting the clinical criteria for early or mild-to-moderate illness and the epidemiologic criteria for likely exposure to SARS-CoV

**\* For notes that go with this case definition, see:**

<http://wwwn.cdc.gov/NNDSS/script/casedef.aspx?CondYrID=845&DatePub=7/1/2003 12:00:00 AM>

## **SIGNS AND SYMPTOMS**

In general, SARS begins with a high fever (temperature >100.4°F [>38.0°C]). Other symptoms may include headache, an overall feeling of discomfort and body aches. Some people experience mild respiratory symptoms with the onset of symptoms, while others develop a dry cough after 2-7 days. Respiratory symptoms are usually progressive; almost all SARS patients have radiographic evidence of pneumonia by the sixth day of illness and in most cases lymphopenia. Some patients have reported diarrhea during the febrile prodrome.

## **DIAGNOSIS**

Initial diagnostic testing for suspected SARS patients should include chest radiograph, pulse oximetry, blood cultures, sputum Gram stain and culture, and testing for viral respiratory pathogens, notably influenza A and B and respiratory syncytial virus (RSV). A specimen for *Legionella* and pneumococcal urinary antigen testing should also be considered. Clinicians should save any available clinical specimens (e.g. sputum, serum) for additional testing until a specific diagnosis is made. Acute and convalescent (>28 days after onset of symptoms) serum samples should be collected from each patient who meets the SARS case definition.

In the absence of person-to-person transmission of SARS-CoV anywhere in the world healthcare providers should ask all people **hospitalized with chest x-ray-confirmed pneumonia** 3 key screening questions:

1. "Do you have a history of recent travel (within 10 days) to a SARS-affected area or close contact with ill persons with a history of travel to such areas?"
2. "Are you employed as a health care worker with direct patient contact or work in a laboratory where exposure to SARS-CoV is possible?"
3. "Do you have close contacts that have been told they have pneumonia and the cause of pneumonia has not yet been determined or is unknown?"

If the answer to any of the 3 screening questions is "yes," healthcare providers will need to:

1. Institute droplet and airborne precautions with goggles.
2. Notify the local health department.
3. Consider SARS testing if no alternative diagnosis is found within 72 hours.

## **EPIDEMIOLOGY**

### **Source**

The Himalayan masked palm civet was the main source of the SARS virus in the 2002-3 outbreak. Similar coronaviruses were isolated from other wildlife species, including bats. A lab accident or undetected transmission in humans may be other potential sources of the virus.

### **Occurrence**

Currently, there are no known cases of person-to-person transmission of SARS-CoV worldwide. However, during November 2002-July 2003, a total of 8,098 probable SARS cases were reported to the World Health Organization (WHO) from 29 countries, including 29 cases from the United States; 774 SARS-related deaths were reported, none of which occurred in the United States. Eight United States cases had serologic evidence of SARS-CoV infection. A total of 156 reported SARS cases in the United States from the 2003 epidemic remain under investigation, with 137 (88%) cases classified according to previous surveillance criteria as suspect SARS and 19 (12%) classified as probable SARS. Because convalescent serum specimens have not been obtained from the 19 probable and

137 suspect cases that remain under investigation, whether these persons had SARS-CoV disease is unknown. In 2003, 16 suspect and 1 probable SARS cases were reported in Ohio. Serologic evidence of infection was not detected in any of these cases.

Since 2004, there have not been any known cases of SARS reported anywhere in the world. The content in the CDC website (and the IDCM) was developed for the 2003 SARS epidemic. But, some guidelines are still being used. Any new SARS updates will be posted on the IDCM website.

### **Mode of Transmission**

The main way that SARS seems to spread is by close person-to-person contact. The virus that causes SARS is thought to be transmitted most readily by respiratory droplets (i.e. droplet transmission) produced when an infected person coughs or sneezes. Droplet spread can happen when droplets from the cough or sneeze of an infected person are propelled a short distance (generally up to 3 feet) through the air and deposited on the mucous membranes of the mouth, nose, or eyes of persons who are nearby. The virus also can spread when a person touches a surface or object contaminated with infectious droplets and then touches his or her mouth, nose or eye(s). In addition, it is possible that the SARS virus might spread more broadly through the air (i.e. airborne transmission) or by other ways that are not now known.

### **Period of Communicability**

Available information suggests that people with SARS are most likely to be infectious only when they have symptoms, such as fever or cough. However, as a precaution against spreading the disease, CDC recommends that people with SARS limit their interactions outside the home (e.g. not going to work, not going to school) until 10 days after their symptoms have gone away. Patients are most infectious during the second week of illness.

### **Incubation Period**

2-10 days, most commonly 4-6 days.

## **PUBLIC HEALTH MANAGEMENT**

### **Case**

#### Investigation

Obtain information about the patient's occupation, history of travel outside the United States, contact with suspected or confirmed SARS case or close contact with an ill individual who traveled to a SARS-affected area within 10 days of illness onset.

#### Treatment

No specific treatment recommendations can be made at this time. Empiric therapy should include coverage for organisms associated with any community-acquired pneumonia of unclear etiology, including agents with activity against both bacterial and viral respiratory pathogens. Treatment choices may be influenced by severity of the illness. Infectious disease consultation is recommended.

### Isolation

Ohio Administrative Code 3701-3-13 (V) states "SARS (Severe Acute Respiratory Distress Syndrome): a person with confirmed or suspected SARS shall be placed in airborne isolation until no longer considered infectious."

Clinicians evaluating suspected cases should use standard precautions (e.g. hand hygiene) together with airborne precautions (e.g. N-95 respirator) and contact precautions (e.g. gowns, gloves). Until the mode of transmission has been defined more precisely, eye protection also should be worn for all patient contact. A person with confirmed or suspect SARS shall be placed in airborne isolation until no longer considered infectious.

### **Contacts**

#### Investigation

ODH does not recommend the quarantine of asymptomatic individuals who have had exposure to SARS. ODH recommends isolation of all persons known or suspected as having SARS and persons exhibiting symptoms of respiratory illness clinically consistent with SARS who have also been identified as having close contact to a known or suspect SARS case.

Persons who may have been exposed to SARS should be vigilant for fever (i.e. measure temperature twice daily) and respiratory symptoms over the 10 days following exposure. During this time, in the absence of both fever and respiratory symptoms, persons who may have been exposed to SARS patients need not limit their activities outside the home and should not be excluded from work, school, out-of-home child care, church or other public areas.

Exposed persons should notify their healthcare provider immediately if fever or respiratory symptoms develop. Exposed persons should also notify their healthcare provider when they will be arriving at the healthcare facility for evaluation so arrangements can be made to prevent any possible transmission of SARS to individuals in the healthcare setting.

Symptomatic persons exposed to SARS should follow the following infection control precautions:

- If fever or respiratory symptoms develop, the person should limit interactions outside the home and not go to work, school, out-of-home child care, church or other public areas. In addition, the person should use infection control precautions in the home to minimize the risk for transmission, and he/she should continue to measure his/her temperature twice daily.
- If symptoms improve or resolve within 72 hours after first symptom onset, the person may be allowed, after consultation with local public health authorities, to return to work, school, out-of-home child care, church or other public areas and infection control precautions can be discontinued.
- For persons who meet or progress to meet the case definition for suspected SARS (i.e. develop fever and respiratory symptoms), infection control precautions should be continued until 10 days after the resolution of fever, provided respiratory symptoms are absent or improving.
- If the illness does not progress to meet the case definition, but the individual has persistent fever or unresolving respiratory symptoms, infection control precautions should be continued for an additional 72 hours, at the end of which time a clinical evaluation should be performed. If the illness progresses

to meet the case definition, infection control precautions should be continued as described above. If case definition criteria are not met, infection control precautions can be discontinued after consultation with local public health authorities and the evaluating clinician. Factors that might be considered include the nature of the potential exposure to SARS, the nature of contact with others in the residential or work setting and any evidence for an alternative diagnosis.

### **Laboratory Criteria for Diagnosis**

CDC has developed and validated an enzyme immunoassay (EIA) and a reverse transcription-polymerase chain reaction (RT-PCR) test for the detection of SARS-CoV. The EIA has been distributed to most state public health laboratories and the RT-PCR has been distributed to most laboratories in the Laboratory Response Network (LRN). Both the EIA and the RT-PCR tests are sensitive and highly specific for SARS-CoV. The ability to diagnose SARS-CoV infection in a patient is often limited, however, by either the low concentration of virus in most clinical specimens (RT-PCR assays) or the time it takes a person to mount a measurable antibody response to SARS-CoV (serologic assays). The likelihood of detecting infection is increased if multiple specimens (e.g. stool, serum, respiratory tract specimens) are collected at several times during the course of illness.

CDC considers detection of SARS-CoV antibody to be the most reliable indicator of infection. Since previous infection is still rare in most populations, seroconversion is not needed to diagnose infection. Therefore, the presence of SARS-CoV antibody in someone without a previous history of SARS is indicative of recent infection. A negative serologic test can rule-out SARS-CoV infection if the serum specimen is collected >28 days after onset of illness. Some persons do not mount an antibody response (i.e. test positive) until more than 28 days after onset of illness. Patients with a negative antibody test result whose specimens were obtained 28 days before illness onset or before should have another serum specimen collected >28 days after onset of symptoms.

RT-PCR for SARS-CoV RNA is a very sensitive and specific assay when performed appropriately. This test can detect SARS-CoV RNA in serum, stool, upper and lower respiratory specimens, various tissues and occasionally urine specimens. Testing of multiple specimen types at several times during the course of illness should increase the likelihood of detecting infection.

See the CDC website for additional information on lab tests:

<http://www.cdc.gov/sars/lab/index.html>.

### **Exclusion Criteria**

A person may be excluded as a SARS report under investigation (SARS RUI), including as a CDC-defined probable SARS-CoV case, if any of the following applies:

- An alternative diagnosis can explain the illness fully.
- Antibody to SARS-CoV is undetectable in a serum specimen obtained >28 days after onset of illness.
- The case was reported on the basis of contact with a person who was subsequently excluded as a case of SARS-CoV disease. Then the reported case also is excluded, provided other epidemiologic or laboratory criteria are not present.

For further information, see: <http://www.cdc.gov/sars/index.html>

**What is SARS?**

Severe acute respiratory syndrome (SARS) is a viral respiratory illness that was recognized as a global threat in March 2003, after first appearing in Southern China in November 2002. There have been no reported cases anywhere in the world since 2004.

**What are the symptoms and signs of SARS?**

The illness usually begins with a high fever (measured temperature greater than 100.4°F [ $>38.0^{\circ}\text{C}$ ]). The fever is sometimes associated with chills or other symptoms, including headache, general feeling of discomfort and body aches. Some people also experience mild respiratory symptoms at the outset. Diarrhea is seen in approximately 10 percent to 20 percent of patients. After 2 to 7 days, SARS patients may develop a dry, nonproductive cough that might be accompanied by or progress to a condition in which the oxygen levels in the blood are low (hypoxia). In 10 percent to 20 percent of cases, patients require mechanical ventilation. Most patients develop pneumonia.

**What is the cause of SARS?**

SARS is caused by a previously unrecognized coronavirus, called SARS-associated coronavirus (SARS-CoV). It is possible that other infectious agents might have a role in some cases of SARS.

**How is SARS spread?**

The primary way that SARS appears to spread is by close person-to-person contact. SARS-CoV is thought to be transmitted most readily by respiratory droplets (droplet spread) produced when an infected person coughs or sneezes. Droplet spread can happen when droplets from the cough or sneeze of an infected person are propelled a short distance (generally up to 3 feet) through the air and deposited on the mucous membranes of the mouth, nose, or eyes of persons who are nearby. The virus also can spread when a person touches a surface or object contaminated with infectious droplets and then touches his or her mouth, nose, or eye(s). In addition, it is possible that SARS-CoV might be spread more broadly through the air (airborne spread) or by other ways that are not now known.

**What does "close contact" mean?**

Close contact is defined as having cared for or lived with a person known to have SARS or having a high likelihood of direct contact with respiratory secretions and/or body fluids of a patient known to have SARS. Examples include kissing or embracing, sharing eating or drinking utensils, close conversation (within 3 feet), physical examination, and any other direct physical contact between people. Close contact does not include activities such as walking by a person or briefly sitting across a waiting room or office.

**If I were exposed to SARS-CoV, how long would it take for me to become sick?**

The time between exposure to SARS-CoV and the onset of symptoms is called the incubation period. The incubation period for SARS is typically 2 to 10 days and most commonly is 4-6 days. In a very small proportion of cases, incubation periods of up to 14 days have been reported.

**How long is a person with SARS contagious?**

Available information suggests that persons with SARS are most likely to be contagious only when they have symptoms, such as fever or cough. Patients are most contagious during the second week of illness. However, as a precaution against spreading the disease, CDC recommends that persons with SARS limit their interactions outside the home (for example, by not going to work or to school) until 10 days after their fever has gone away and their respiratory (breathing) symptoms have gotten better.

**Is a person with SARS contagious before symptoms appear?**

To date, no cases of SARS have been reported among persons who were exposed to a SARS patient before the onset of the patient's symptoms.

**What medical treatment is recommended for patients with SARS?**

CDC recommends that patients with SARS receive the same treatment that would be used for a patient with any serious community-acquired atypical pneumonia. SARS-CoV is being tested against various antiviral drugs to see if an effective treatment can be found.

**If there is another outbreak of SARS, how can I protect myself?**

If transmission of SARS-CoV recurs, there are some common-sense precautions that you can take that apply to many infectious diseases. The most important is frequent hand washing with soap and water or use of an alcohol-based hand rub. You should also avoid touching your eyes, nose, and mouth with unclean hands and encourage people around you to cover their nose and mouth with a tissue when coughing or sneezing.

**GLOBAL SARS OUTBREAK, 2003****How many people contracted SARS worldwide during the 2003 outbreak?****How many people died of SARS worldwide?**

During November 2002 through July 2003, a total of 8,098 people worldwide became sick with severe acute respiratory syndrome that was accompanied by either pneumonia or respiratory distress syndrome (probable cases), according to the World Health Organization (WHO). Of these, 774 died. By late July 2003, no new cases were being reported, and WHO declared the global outbreak to be over.

**How many people contracted SARS in the United States during the 2003 outbreak? How many people died of SARS in the United States?**

In the United States, only eight persons were laboratory-confirmed as SARS cases. There were no SARS-related deaths in the United States. All of the eight persons with laboratory-confirmed SARS had traveled to areas where SARS-CoV transmission was occurring.

See the CDC website for more information: <http://www.cdc.gov/sars/index.html>.