

EPIDEMIC  
ALERT &  
RESPONSE

WHO guidelines for the global surveillance  
of severe acute respiratory syndrome  
(SARS)

*Updated recommendations  
October 2004*

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## Executive summary

This document sets out revised guidelines for the global surveillance and reporting of SARS as an ongoing strategy for rapidly detecting cases and preventing further national or international spread. Addressed to national health authorities, the guidelines respond to the need for a sustainable long-term approach to SARS surveillance that maintains an adequate level of sensitivity yet does not overburden health system capacity. With this objective in mind, the document adopts a phased approach to surveillance and preparedness, with different levels of activity recommended for each of four phases. These phases move from the absence of evidence that the SARS coronavirus (SARS-CoV) is circulating in human populations, to the detection of human chains of transmission, to evidence of international spread, to the post-epidemic period.

The revised guidelines, which replace a previous document issued in August 2003<sup>1</sup>, draw on experiences during four recent incidents in which cases of SARS occurred following breaches in laboratory biosafety, or human exposure to an animal reservoir or other environmental source. Apart from demonstrating the importance of continued vigilance, these incidents revealed the need for more precise guidance on laboratory testing and on the requirements for official reporting to WHO. Throughout the document, specific recommendations take into account the high demands of a disease with non-specific symptoms and a diagnosis that requires multiple test results and rigorous procedures for quality assurance. Particular emphasis is given to the prevention of secondary transmission from sporadic cases and common source outbreaks as a strategy for reducing the risk of another international outbreak.

## Document structure

The document has five main sections. The **first section** gives the background to the 2002-2003 SARS epidemic, discusses the potential sources of the SARS coronavirus since the global interruption of human transmission in July 2003, and presents the case for continued vigilance for the reappearance of SARS as a threat to human health.

**Section 2** describes the clinical and laboratory criteria recommended by WHO for the diagnosis of SARS for the purposes of global surveillance i.e. the clinical and laboratory case definitions used by WHO to assess, verify or discard reported cases of SARS-like illness. Extensive experience during the 2002-2003 epidemic is used to provide advice on clinical symptoms, the differential diagnosis, recommended laboratory tests, and the interpretation of results.

**Section 3** presents and explains a revised definition of the WHO SARS Alert which applies globally in the inter-epidemic period and for countries/areas free of SARS after its re-emergence elsewhere. The Alert, which operates as an early warning and preparedness mechanism, is based on what has been learnt about the potential sources of human exposure to SARS-CoV and the early epidemiological indicators that this may have occurred. Based on recent experiences, the Alert has been expanded to include additional epidemiological risk factors that should raise the level of suspicion and prompt investigation. The section also includes advice on assessing the risk within a given country or area that SARS might emerge or be introduced, and the indications for testing during the inter-epidemic period. Situations in which WHO recommends testing are set out in a table. Further information includes advice on the public health management of a SARS Alert, and a series of 11 enhanced surveillance activities that could help detect cases in groups at particular risk.

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<sup>1</sup> World Health Organization. *Alert, verification and public health management of SARS in the post-outbreak period, 14 August 2003*. <http://www.who.int/csr/sars/postoutbreak/en/>

**Section 4** presents revised guidance for the global surveillance of SARS during an outbreak. In view of the inherent difficulties with diagnostic tests, the section describes "preliminary positive", "confirmed", "probable" and "unverifiable" cases of SARS on the basis of the clinical, laboratory and epidemiological evidence for SARS coronavirus-associated infections in a population. Procedures for verifying an outbreak of SARS are followed by diagnostic and reporting algorithms for use during the inter-epidemic and epidemic periods.

**Section 5**, on international reporting of SARS, outlines information about cases that should be officially reported to WHO, and suggests additional information that can assist in the rapid investigation of rumours and the accurate dissemination of information to other governments, the media, and the public.

## What's new

The *WHO Guidelines for the Global Surveillance of SARS. Updated Recommendations October 2004* replaces all previous WHO guidance on SARS surveillance and response.<sup>1,2</sup> The present document introduces a number of important changes to the global risk assessment and case definitions for SARS to ensure that the response to a case of acute febrile respiratory disease is commensurate to the risk posed to the patient, their contacts, health care workers, and local and international communities. The document should be used together with the *WHO SARS Risk Assessment and Preparedness Framework*. The aims, objectives and underlying assumptions of the *WHO SARS RAPF* have been summarized in Annex 1.

## Definitions

Key epidemiological concepts have been defined in the introduction.

## Changes to the risk assessment for SARS

In recognition that human exposure to SARS-CoV since July 2003 has occurred in laboratories working with the virus or from wildlife sources of SARS-like coronaviruses, WHO has replaced the previous risk categories for the emergence of SARS<sup>1</sup> to better reflect the current situation, noting that some countries/areas may fall into two categories. The new risk categories are:

- Emergence from wildlife or other animal reservoirs
- Emergence or introduction from laboratories or via international travel
- Low risk of SARS-CoV emergence or introduction.

These risk categories are intended to assist national health authorities in determining the most cost-effective surveillance strategy for SARS in their country.

## Clinical criteria for surveillance purposes and indications for testing for SARS-CoV

Clear distinction has been made between the comprehensive clinical assessment made by clinicians in the differential diagnosis of acute febrile respiratory disease and the clinical evidence required to define a **clinical case of SARS for surveillance purposes**. This section provides a detailed description of:

- The indications for testing for SARS-CoV in the inter-epidemic period

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<sup>1</sup> World Health Organization. *Alert, verification and public health management of SARS in the post-outbreak period*, 14 August 2003. <http://www.who.int/csr/sars/postoutbreak/en/>

<sup>2</sup> World Health Organization. *Case Definitions for Surveillance of Severe Acute Respiratory Syndrome (SARS)*, revised 1 May 2003. <http://www.who.int/csr/sars/casedefinition/en/>

- The laboratory investigations, their interpretation and test quality assurance required for the diagnosis of SARS.

### **The SARS Alert – Vigilance for SARS in the inter-epidemic period**

The SARS Alert remains a tool to raise the possibility of SARS in health-care settings. Individuals under investigation for SARS should be placed in respiratory isolation and transmission-based precautions, including the use of personal protective equipment, implemented while investigations to confirm the diagnosis are ongoing. Individuals at higher risk of SARS through their occupation, close contact with another person under investigation for SARS, or by travel to, or residence in, an area with an outbreak of SARS have been added to the SARS Alert. Clustering of SARS-like illness in health-care workers or others exposed to a health-care facility remain important sentinel events that may indicate the re-emergence of SARS. During the inter-epidemic period, WHO will utilize highly specific laboratory criteria for the diagnosis of SARS and requests that countries investigating a SARS Alert seek independent verification of positive results at one or more WHO International SARS Reference and Verification Network laboratories. A single negative test result is insufficient to confidently exclude SARS when there is compelling clinical and/or epidemiological evidence of SARS due to the risk of false negative test results.

### **The global surveillance of SARS during an outbreak**

Once an outbreak of SARS has been independently verified as above, the laboratory requirements for case confirmation will be less specific than those recommended for the inter-epidemic period.

New surveillance case definitions have been developed for use once one or more individuals with a SARS-like illness test positive at a national SARS reference laboratory ("**preliminary positive**" case) and independently verified by a WHO International SARS Reference and Verification Network laboratory ("**confirmed**" case). Indications for the independent verification of positive SARS tests by a WHO International SARS Reference and Verification Network laboratory during an outbreak are listed.

If secondary transmission occurs the following two categories of patients epidemiologically linked to a laboratory-confirmed chain of transmission will also be considered "**confirmed**" for the purposes of global surveillance:

- "Preliminary positive" cases
- Individuals with clinical evidence for SARS and with a single positive SARS test (serological test or RT-PCR).

Individuals with clinical evidence for SARS who are epidemiologically linked to a confirmed chain of transmission will be regarded as "**probable**" cases.

Finally during an outbreak a living or deceased individual with clinical evidence for SARS but for whom laboratory evidence is lacking will be considered an "**unverifiable**" case of SARS.

Testing and reporting algorithms for SARS in the inter-epidemic period and during an outbreak have been included in this document to assist in the investigation of individuals with clinical evidence for SARS. As with previous guidance, only cases of clinically apparent SARS need be reported to WHO. National health authorities should report the first "preliminary positive" case(s) of SARS in their country to WHO within 24 hours of the receipt of positive test results from their national SARS reference laboratory.

WHO will continue to assist with the independent verification of testing in national laboratories and for primary diagnosis for countries without laboratory capacity for SARS testing if requested.

The period for heightened vigilance for SARS has been extended to **28 days** after the last reported case of SARS globally has been placed in isolation or died and the source(s) and routes(s) of transmission have all been identified and contained. The extended period of vigilance for SARS after an outbreak arises from the lessons learnt during the 2002–2003 epidemic and is recommended to reduce the risk of ongoing transmission arising from missed SARS-CoV infections and from prematurely stepping down respiratory precautions.

## 1. Introduction

### 1.1 Rationale for the continued vigilance for SARS

Severe acute respiratory syndrome (SARS) was first recognized as a global threat in mid-March 2003. The first known cases of SARS occurred in Guangdong province, China, in November 2002 (1,2) and WHO reported that the last human chain of transmission of SARS in that epidemic had been broken on 5 July 2003. The etiological agent, the SARS coronavirus (SARS-CoV) (3,4,5) is believed to be an animal virus that crossed the species barrier to humans recently when ecological changes or changes in human behaviour increased opportunities for human exposure to the virus and virus adaptation, enabling human-to-human transmission (6). By July 2003, the international spread of SARS-CoV resulted in 8098 SARS cases in 26 countries, with 774 deaths (7). The epidemic caused significant social and economic disruption in areas with sustained local transmission of SARS and on the travel industry internationally in addition to the impact on health services directly. While much has been learnt about this syndrome since March 2003, our knowledge about the epidemiology and ecology of SARS-CoV infection and of this disease remains incomplete.

The natural reservoir of SARS-CoV has not been identified but a number of wildlife species – the Himalayan masked palm civet (*Paguma larvata*), the Chinese ferret badger (*Melogale moschata*), and the raccoon dog (*Nyctereutes procyonoides*) – consumed as delicacies in southern China have shown laboratory evidence of infection with a related coronavirus (2,8). Domestic cats living in the Amoy Gardens apartment block in Hong Kong were also found to be infected with SARS-CoV (9). More recently, ferrets (*Mustela furo*) and domestic cats (*Felis domesticus*) were infected with SARS-CoV experimentally and found to efficiently transmit the virus to previously uninfected animals housed with them (10). These findings indicate that the reservoir for this pathogen may involve a range of animal species. The masked palm civet is the wildlife species most often associated with animal-to-human transmission; however, whether the civet is the natural reservoir of SARS-like coronaviruses remains unproven. The modes and routes of inter-species transmission from animals to humans or to other animal species need further investigation.

At the time of writing in October 2004, the world is in an inter-epidemic period for SARS. At this time, the most probable sources of infection with SARS-CoV are exposure in laboratories where the virus is used or stored for diagnostic and research purposes, or from animal reservoirs

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