

## Infection Control in Health-Care Settings

### Introduction

All health-care settings need an infection-control program designed to ensure prompt

- detection,
- airborne precautions, and
- treatment

of persons who have suspected or confirmed tuberculosis (TB) disease (or prompt referral of persons who have suspected TB disease for settings where persons with TB disease are not expected to be encountered). In order to be effective, the primary emphasis of the TB infection-control program should be on achieving these three goals.

In all health-care settings, particularly those in which persons who are at high risk for exposure to *Mycobacterium tuberculosis* work or receive care, policies and procedures for TB control should be developed, reviewed periodically, and evaluated for effectiveness to determine the actions necessary to minimize the risk for transmission of *M. tuberculosis*.

### Overview of TB Infection-Control Measures

The TB infection-control program should be based on a three-level hierarchy of control measures. The first and most important level of the hierarchy, administrative measures, affects the largest number of persons and is intended primarily to reduce the risk of uninfected persons exposed to persons who have TB disease. These measures include the following activities:

- Assigning responsibility for TB infection control in the setting;
- Conducting a TB risk assessment of the setting;
- Developing and instituting a written TB infection-control plan to ensure prompt detection, airborne precautions, and treatment of persons who have suspected or confirmed TB disease;
- Ensuring the timely availability of recommended laboratory processing, testing, and reporting of results to the ordering physician;

- Implementing effective work practices for the management of patients with suspected or confirmed TB disease;
- Ensuring proper cleaning and sterilization or disinfection of potentially contaminated equipment (e.g., bronchoscopes, endoscopes);
- Training and educating health-care workers (HCWs) regarding TB, with specific focus on prevention, transmission, and symptoms;
- Screening and evaluating HCWs who are at risk for TB disease or who might be exposed to *M. tuberculosis*;
- Applying epidemiologic-based prevention principles, including the use of setting-related infection-control data;
- Using appropriate signage advising respiratory hygiene and cough etiquette; and
- Coordinating efforts with the local or state health department.

The second level of the hierarchy is the use of environmental controls to prevent the spread and reduce the concentration of infectious droplet nuclei in ambient air. Primary environmental controls control the source of infection by using local exhaust ventilation (hoods, tents, or booths) and dilute and remove contaminated air by using general ventilation. Secondary environmental controls control the airflow to prevent contamination of air in areas adjacent to the source (airborne infection isolation [AII] rooms) and clean the air by using high efficiency particulate air (HEPA) filtration, or ultraviolet germicidal irradiation.

The first two control levels of the hierarchy minimize the number of areas in the health-care setting where exposure to *M. tuberculosis* may occur.

They reduce, but do not eliminate, the risk in those few areas where exposure to *M. tuberculosis* can still occur (e.g., AII rooms housing TB patients and treatment rooms in which cough-inducing or aerosol-generating procedures are performed on TB patients). Therefore, the third level of the hierarchy is the use of respiratory protective equipment in situations that pose a high risk of exposure to *M. tuberculosis*.

Use of respiratory protection equipment can further reduce risk for exposure of HCWs to infectious droplet nuclei that have been expelled into the air from a patient with infectious TB disease. The following measures can be taken to reduce the risk for exposure:

- Implementing a respiratory protection program
- Training HCWs on respiratory protection
- Training patients on respiratory hygiene and cough etiquette procedures.

### Determining the Infectiousness of TB Patients

In general, patients who have suspected or confirmed TB disease should be considered infectious if (a) they are coughing, undergoing cough-inducing procedures, or have positive sputum smear results for acid-fast bacilli (AFB); and (b) they are not receiving adequate antituberculosis therapy, have just started therapy, or have a poor clinical or bacteriologic response to therapy.

For patients placed under airborne precautions because of suspected infectious TB disease of the lungs, airway, or larynx, airborne precautions can be discontinued when infectious TB disease is considered unlikely and either

- Another diagnosis is made that explains the clinical syndrome, or
- The patient produces three consecutive negative sputum smears collected in 8- to 24-hour intervals (one should be an early morning specimen).

Patients for whom the suspicion of infectious TB disease remains after the collection of three negative sputum smear results should not be released from airborne precautions until they

- Receive standard multidrug antituberculosis treatment (minimum of 2 weeks) and
- Demonstrate clinical improvement.

For these patients, additional diagnostic approaches (e.g., sputum induction) and, after sufficient time on treatment, bronchoscopy may need to be considered.

Patients who have drug-susceptible TB of the lung, airway, or larynx, should remain under airborne precautions until they

- Produce three consecutive negative sputum smears collected in 8- to 24-hour intervals (one should be an early morning specimen), and
- Receive standard multidrug antituberculosis treatment (minimum of 2 weeks), and
- Demonstrate clinical improvement.

### Note

The Centers for Disease Control and Prevention (CDC) is not a regulatory agency; CDC recommendations on infection control provide evidence-based guidance. For regulations in your area, refer to state and local regulations and contact your local Occupational Safety and Health Administration (OSHA) office. A directory of OSHA offices may be found at [www.osha-slc.gov/html/RAmap.html](http://www.osha-slc.gov/html/RAmap.html).

### References

CDC. Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care settings, 2005. *MMWR* 2005; 54(No. RR-17). [www.cdc.gov/mmwr/pdf/rr/rr5417.pdf](http://www.cdc.gov/mmwr/pdf/rr/rr5417.pdf)

### Additional Information

#### Websites:

CDC Division of Tuberculosis Elimination:  
[www.cdc.gov/tb](http://www.cdc.gov/tb)

State TB control offices:  
[www.cdc.gov/tb/links/tboffices.htm](http://www.cdc.gov/tb/links/tboffices.htm)

National Institute for Occupational Safety and Health:  
[www.cdc.gov/niosh/topics/tb](http://www.cdc.gov/niosh/topics/tb)

Occupational Safety and Health Administration:  
[www.osha.gov/SLTC/tuberculosis/](http://www.osha.gov/SLTC/tuberculosis/)

#### Fact Sheet:

Respiratory Protection in Health-Care Settings:  
[www.cdc.gov/tb/publications/factsheets/prevention/rphcs.htm](http://www.cdc.gov/tb/publications/factsheets/prevention/rphcs.htm)

## Respiratory Protection in Health-Care Settings

### Introduction

All health-care settings need an infection-control program designed to ensure prompt

- detection,
- airborne precautions, and
- treatment

of persons who have suspected or confirmed tuberculosis (TB) disease. There are three levels of TB infection control in health-care settings. The first level of the infection-control hierarchy, administrative controls, should minimize the number of areas where exposure to *Mycobacterium tuberculosis* may occur.

The second level, environmental controls, should reduce the concentration of airborne *M. tuberculosis*. These administrative and environmental controls should also reduce, although they do not eliminate, the risk in the few areas where exposures can still occur (e.g., airborne infection isolation [AII] rooms and rooms where cough-inducing or aerosol-generating procedures are performed).

Because persons entering these areas may be exposed to airborne *M. tuberculosis*, the third level of the hierarchy is the use of respiratory protective equipment in situations that pose a high risk for exposure.

### Considerations for Selection of Respirators

The overall effectiveness of respiratory protection is affected by 1) the level of respiratory protection selected (e.g., the assigned protection factor), 2) the fit characteristics of the respirator model, 3) the care in using the respirator, and 4) the adequacy of the training and fit-testing program.

Particulate filter respirators certified by the Centers for Disease Control and Prevention's (CDC)

National Institute for Occupational Safety and Health (NIOSH) that can be used for protection against airborne *M. tuberculosis* include

- Nonpowered respirators with N95, N99, N100, R95, R99, R100, P95, P99, and P100 filters (including disposable respirators); and
- Powered air-purifying respirators (PAPRs) with high-efficiency filters.

The most essential attribute of a respirator is the ability to fit the varying facial sizes and characteristics of health-care workers (HCWs). Assistance with selection of respirators can be done by referring to peer-reviewed research and through consultation with respirator fit-testing experts, CDC, occupational health and infection-control professional organizations, respirator manufacturers, and from participation in advanced respirator training courses.

### Implementing a Respiratory Protection Program

If respirators are used in a health-care setting, the Occupational Safety and Health Administration (OSHA) requires the development, implementation, administration, and periodic reevaluation of a respiratory protection program. The most critical elements of a respiratory protection program include 1) assignment of responsibility, 2) training, and 3) fit testing. All HCWs who use respirators for protection against *M. tuberculosis* infection should be included in the respiratory protection program.

The health-care setting should develop a policy on the use of respirators by visitors. Visitors to AII rooms and other areas with patients who have suspected or confirmed infectious TB disease may be offered respirators (e.g., N95 disposable respirators) and should be instructed by an HCW on the use of the respirator before entering an AII room.

To be effective and reliable, respiratory protection programs must include at least the following elements:

- Assignment of responsibility to one person with sufficient knowledge who is given the authority and responsibility to manage all aspects of the program.
- Standard operating procedures that include information and guidance for the proper selection, use, and care of respirators.
- Screening by a physician or other licensed health-care professional of all HCWs who might need to use a respirator for pertinent medical conditions at the time they are hired, and then re-screening periodically.
- Annual training of HCWs with specific focus on prevention, transmission, and symptoms.
- Selection of filtering facepiece respirators approved by CDC/NIOSH.
- Fit testing performed during the initial respiratory protection program training and periodically thereafter, in accordance with federal, state, and local regulations.
- Inspection and maintenance of respirators according to manufacturer instructions.
- Evaluation of the respirator program periodically to ensure its continued effectiveness.

Information on the development and management of a respiratory protection program is available in technical training courses that cover the basics of respiratory protection. Such courses are offered by OSHA, the American Industrial Hygiene Association, the American Conference of Governmental Industrial Hygienists, universities, manufacturers, and private contractors.

## Note

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## References

CDC. Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care settings, 2005. *MMWR* 2005; 54(No. RR-17). [www.cdc.gov/mmwr/pdf/rr/rr5417.pdf](http://www.cdc.gov/mmwr/pdf/rr/rr5417.pdf)

Occupational Safety and Health Administration. Occupational safety and health standards, subpart I—personal protective equipment. Respiratory protection. Title 29, Code of Federal Regulations 2003. Section 1910.134. [www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=STANDARDS&p\\_id=12716](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=12716)

## Additional Resources

### Websites:

CDC Division of Tuberculosis Elimination: [www.cdc.gov/tb](http://www.cdc.gov/tb)

CDC National Institute for Occupational Safety and Health: [www.cdc.gov/niosh/topics/tb](http://www.cdc.gov/niosh/topics/tb)

Occupational Safety and Health Administration: [www.osha-slc.gov/SLTC/tuberculosis/index.html](http://www.osha-slc.gov/SLTC/tuberculosis/index.html)

State TB control offices: [www.cdc.gov/tb/links/tboffices.htm](http://www.cdc.gov/tb/links/tboffices.htm)

American Industrial Hygiene Association: [www.aiha.org](http://www.aiha.org)

American Conference of Governmental Industrial Hygienists: [www.acgih.org](http://www.acgih.org)

### Fact Sheet:

Infection Control in Health-Care Settings: [www.cdc.gov/tb/publications/factsheets/prevention/ichcs.htm](http://www.cdc.gov/tb/publications/factsheets/prevention/ichcs.htm)

# **TB Infection Control**

I understand and agree to comply with all safety standards set forth by my employer, HealthSource Global Staffing.

I certify by my signature below, that I have been provided with the HealthSource Global Staffing TB Infection Control advisory.

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