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**

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.

**References**


**Additional Resources**

**Websites:**
CDC Division of Tuberculosis Elimination: www.cdc.gov/tb

CDC National Institute for Occupational Safety and Health: www.cdc.gov/niosh/topics/tb

Occupational Safety and Health Administration: www.osha-slc.gov/SLTC/tuberculosis/index.html

State TB control offices: www.cdc.gov/tb/links/tboffices.htm

American Industrial Hygiene Association: www.aiha.org

American Conference of Governmental Industrial Hygienists: www.aegih.org

**Fact Sheet:**
Infection Control in Health-Care Settings: www.cdc.gov/tb/publications/factsheets/prevention/ichcs.htm
Additional Frequently Asked Questions (FAQ) for Clarification of Recommendations in
the “Guidelines for Preventing the Transmission of *Mycobacterium tuberculosis*
in Health-Care Settings, 2005”

1) What is an infection-control team?

The infection-control team consists of persons who develop and implement infection-
control policies for a health-care setting (including, but not limited to, individuals with
expertise in infection control, epidemiology, clinical issues [medical doctor, registered
nurse], microbiology, engineering, and administrative matters).

2) An inpatient setting (a hospital) with more than 200 beds and less than six TB
   patients for the preceding year would be classified as low risk according to the
criteria in the guidelines; however, the infection-control team for our setting prefers
to continue screening nurses annually. Is that acceptable?

Yes, the infection-control team may determine that a higher risk classification is
warranted for a specific setting or for a specific group of health-care workers (HCWs).
Low-risk settings are free to select recommendations for medium-risk settings, if desired.

3) Is the model tuberculin skin test (TST) training program used by the National
   Health and Nutrition Examination Survey (NHANES) described on page 50 of the
guidelines required for all settings?

No, CDC guidelines are recommendations, they are not requirements. “The suggested
TST training recommendations are not mandatory” (from page 45 of the guidelines).
“The number of training hours, sessions, and TST readings should be determined by the setting’s TB risk assessment” (p. 48). Settings with a low prevalence of TB may not be able to meet NHANES TST training recommendations.

4) **What is the positive cut-point baseline TST result for HCWs?**

When making decisions for the diagnosis and treatment of latent tuberculosis infection (LTBI), setting-based risk factors (e.g., the prevalence of TB disease) and personal risk factors (e.g., having an immunocompromising condition or known contact with a TB case) should be assessed when choosing the cut point for a positive TST result.

“For HCWs who are at low risk (e.g., those from low incidence settings), a baseline result of ≥15 mm of induration (instead of ≥10 mm) might possibly be the cut point. When 15 mm is used as the cut point, TST results of 10–14 mm can be considered clinically negative. These HCWs should not have repeat TST, and the referring physician might not recommend treatment for latent tuberculosis infection (LTBI).” (p. 47)

For HCWs who are at medium risk, a baseline TST result of ≥10 mm is considered positive. For HCWs who are known contacts to a person with infectious TB disease (i.e., HCWs who are tested during contact investigations), and for HCWs who are infected with HIV, a TST result of ≥5 mm is considered positive.
5) How should HCWs in low-risk settings who have positive test results for *M. tuberculosis* infection (positive TST or blood assay for *M. tuberculosis* [BAMT] result) be managed?

The treating physician, with assistance from the infection-control team, should decide how to manage these HCWs. After a chest radiograph (CXR) is performed to rule out TB disease, the infection-control team may recommend providing an annual symptom screen to HCWs in low-risk settings who have positive test results for *M. tuberculosis* infection and who may or may not have received treatment for LTBI.

6) The guidelines state (p. 10): “HCWs with a baseline positive or newly positive test result for *M. tuberculosis* infection (i.e., TST or BAMT) or documentation of treatment for LTBI or TB disease should receive one CXR result to exclude TB disease (or an interpretable copy within a reasonable time frame, such as 6 months).” What does “or an interpretable copy within a reasonable time frame, such as 6 months” mean?

Six months is meant as an example. Individual institutions may set their own parameters. A CXR may be necessary sooner than 6 months, depending on the situation. The treating physician should decide if and when CXRs should be performed.

7) If a HCW with a newly positive TST or BAMT result has documentation of a recent (1 month ago) negative CXR result would they need an additional CXR?

If the HCW has symptoms of TB, a CXR would be recommended. If the HCW is immunocompromised, a CXR might be considered. If not, another CXR is not needed.
unless recommended by a physician. Again, the treating physician should decide if and when CXRs should be performed.

8) If a HCW has documentation of a prior positive TST or BAMT result and documentation of a negative CXR result following that, would they need an additional CXR?

If the HCW has symptoms of TB, a CXR would be recommended. If the HCW is immunocompromised, a CXR might be considered. If not, another CXR is not needed unless recommended by a physician.

9) How should the duration of the infectious period for TB patients be estimated?

“For programmatic purposes, for patients with positive AFB sputum smear results, the infectious period can be considered to begin 3 months before the collection date of the first positive AFB sputum smear result or the symptom onset date (whichever is earlier). The end of the infectious period is the date the patient is placed under airborne precautions or the date of collection of the first of consistently negative AFB sputum smear results (whichever is earlier). For patients with negative AFB sputum smear results, the infectious period can begin 1 month before the symptom onset date and end when the patient is placed under airborne precautions” (p. 35).

Please also see Table 2 from CDC’s Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis – Recommendations from the National Tuberculosis Controllers Association and CDC, MMWR 2005; 54 (p. 7).
Table 2 is printed at the end of this document.

10) **Is CDC recommending that fit testing should be conducted at least annually in accordance with Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.134?**

The CDC recommendation regarding fit-testing is: “Perform fit-testing during the initial respiratory-protection program training and periodically thereafter in accordance with federal, state, and local regulations [http://www.osha.gov/SLTC/respiratory-protection/index.html](http://www.osha.gov/SLTC/respiratory-protection/index.html)” (p. 39). The recommendation is for initial and periodic fit testing; however, employees must be cognizant of federal, state, and local regulations.

11) **Is a personal respiratory protection program required for low-risk settings?**

“Settings in which patients with suspected or confirmed TB disease are not expected to be encountered do not need … a respiratory protection program for the prevention of transmission of *M. tuberculosis*” (p. 17). A personal respiratory protection program is required for all HCWs who will use respirators.

12) **Students in our nursing school often change work rotations and may work at different hospitals every 3 months. Would you recommend that nursing students be rescreened each time they change hospitals for a new rotation?**

No, routine rescreening every 3 months is not necessary. The infection control team should decide on policies for their specific circumstances. If the nurse is transferring
from low-risk to low-risk settings, “after a baseline result for infection with *M. tuberculosis* is established and documented, serial testing for *M. tuberculosis* infection is not necessary” (p. 12).

If the nurse is transferring from low-risk to a medium-risk setting, “after a baseline result for infection with *M. tuberculosis* is established and documented, annual TB screening (including a symptom screen and TST or BAMT for persons with previously negative test results) should be performed” (p. 12 & 13).

If the nurse is transferring from a medium-risk to a low-risk setting, after a baseline result for infection with *M. tuberculosis* is established and documented, serial testing for *M. tuberculosis* infection is not necessary.

If the nurse is transferring from medium-risk to medium risk setting, after a baseline result for infection with *M. tuberculosis* is established and documented, annual TB screening (including a symptom screen and TST or BAMT for persons with previously negative test results) should be performed.

13) Is directly observed therapy (DOT) recommended for treatment of all persons with TB disease and for all persons with LTBI?

DOT is the ATS-recommended standard of practice for treating TB disease. DOT should be used for all doses during the treatment of TB disease, and it also should be considered for treating LTBI, whenever feasible. CDC’s MMWR publication, Guidelines for the
Investigation of Contacts of Persons with Infectious Tuberculosis – Recommendations from the National Tuberculosis Controllers Association and CDC, 2005; 54 (p. 18–19) states: “Although DOT improves completion rates, it is a resource-intensive intervention that might not be feasible for all infected contacts. The following order of priorities is recommended when selecting contacts for DOT (including window-period prophylaxis):

• contacts aged <5 years,

• contacts who are HIV infected or otherwise substantially immunocompromised,

• contacts with a change in their tuberculin (or BAMT) status from negative to positive, and

• contacts who might not complete treatment because of social or behavior impediments (e.g., alcohol addiction, chronic mental illness, injection-drug use, unstable housing, or unemployment)”

14) **Is the guidance for discontinuing AII intended to apply to direct AFB smears or only to concentrated smears?**

A patient may be released from AII based on direct AFB smears. Concentrated AFB smears are more sensitive and hence, would be more stringent.
In addition, the text on one of the slides in the Infection Control guidelines slide set has changed.

This is the link to the slide set: http://www.cdc.gov/tb/pubs/slidesets/InfectionGuidelines/default.htm.

Previously, the last part of slide #123 said:

3. Known exposure
≥5 mm = positive when baseline result is 0 mm; increase of ≥10 mm = positive when baseline result is negative or previous follow-up TST result ≥ 0 mm

It now says (changes are in **bold**):

3. Known exposure (contact investigation)
≥5 mm = positive when baseline result is 0 mm; increase of ≥10 mm = positive when baseline or previous follow-up TST result is >0mm, but <10mm
TABLE 2. Guidelines for estimating the beginning of the period of infectiousness of persons with tuberculosis (TB), by index case characteristic

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>AFB* sputum</th>
<th>Cavitary</th>
<th>Chest radiograph</th>
<th>Recommended minimum beginning of likely period of infectiousness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td></td>
<td>3 months before symptom onset or first positive finding (e.g., abnormal chest radiograph) consistent with TB disease, whichever is longer</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td>3 months before symptom onset or first positive finding consistent with TB disease, whichever is longer</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>No</td>
<td></td>
<td>4 weeks before date of suspected diagnosis</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td>3 months before first positive finding consistent with TB</td>
</tr>
</tbody>
</table>


*Acid-fast bacilli.