



TUBERCULOSIS AND THE HEALTHCARE WORKER: CONTROL MEASURES AGAINST EXPOSURE

The risk of tuberculosis (TB) infection for healthcare workers can only be eliminated if good control measures are put into place. Traditional infection control measures are not enough to cope with every aspect of exposure. An industrial approach called "the hierarchy of control" should be incorporated into every healthcare employer's infection control program to ensure better protection. This model seeks to control the hazard at the source.

Hierarchy Rule #1: Wherever feasible, find an engineering control or method to eliminate or reduce the amount of a hazard before it reaches the worker.

Ventilation is the engineering control of choice. The goal is to keep the droplet nuclei of tuberculosis away from healthcare workers and patients. Some recommended ventilation controls are:

Patient Rooms:

- **Ideal:** Patients with active tuberculosis should be isolated in a room with ventilation that provides six total air changes per hour, including at least two outside air changes per hour. The room should have a directed air flow so that air flows from the hallway into the room (negative pressure) to stop the spread of droplet nuclei into other parts of the building. The air should be exhausted directly to the outside of the building.
- **Less than ideal:** Many older facilities do not have isolation rooms with ventilation that provides adequate fresh air and which also exhausts to the outside. An interim ventilation measure is the use of portable HEPA filtration units to filter the room's air and remove droplet nuclei.

Emergency Rooms and General Waiting Rooms:

- **Ideal:** In general areas of a healthcare facility, persons with active cases of tuberculosis are not always quickly and readily identified. In these areas, general ventilation must be improved (e.g., more fresh air brought in) to dilute the concentration of droplet nuclei and thus reduce the chances of exposure. There should be at least 10 air changes per hour in the emergency room and general out-patient waiting rooms.
- **Less than ideal:** When ample fresh air cannot be brought into these areas and/or air is recirculated, HEPA filters should be installed in air ducts to capture the circulating droplet nuclei. Ultraviolet lights in the ducts should also be used.

Treatment Rooms:

- **Ideal:** In treatment rooms where procedures that are likely to induce coughing

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(e.g., aerosolized drug treatment, bronchoscopy, etc.) will be performed, the general ventilation requirements should mirror those for patient isolation rooms. In addition, localized exhaust should be installed over treatment areas to capture TB droplet nuclei during coughing or sputum induction. For instance, treatment booths for pentamidine that are exhausted to the outside are very effective.

Hierarchy Rule #2: When a hazard (TB droplet nuclei) cannot be completely eliminated at the source, the worker should be supplied with protective equipment to prevent exposure.

Respirators are the protective equipment of choice for workers who are not protected by ventilation.

Respirators can confer some protection to workers who may be exposed to TB droplet nuclei. However, a careful respirator program must be put in place to ensure that exposure is being prevented. An OSHA-approved respirator must have:

1. Hazard assessment so that the appropriate respirator is chosen to protect the worker. There is not enough research on TB and other bioaerosols to say with certainty that respirators will filter out TB droplet nuclei in the air. However, most experts believe that a respirator with a HEPA filter will confer protection.

There is confusion about what types of respirators are protective. Many healthcare employers claim that disposable molded respirators filter out droplet nuclei. However, these respirators do not form a seal between the worker's face and the respirator. There can be up to 60 percent "leakage" of outside air into the mask. For a disposable mask, a better choice is a high-efficiency respirator with an exhalation valve. The worker must be fit-tested for this mask to make sure that a good seal is made. An example of a high efficiency respirator is 3M's "Model 9970."

An even better respirator is the HEPA cartridge respirator. But this respirator also requires fit-testing.

The drawback to all respirators is that the more efficient the respirator is in filtering the contaminant out, the more physiological demand it puts on the wearer's body. Respirators can be hot, and breathing through them may put strain on the heart and lungs.

The CDC recommends that healthcare workers who perform high-risk procedures or attend to patients in isolation rooms wear some form of respirator.

2. If healthcare workers must wear respirators, OSHA requires that the employer provide a fit-testing program, a comprehensive training program on proper use and maintenance of the respirators, and a medical surveillance program.

Whenever possible, respirator use should be avoided. Proper ventilation is far more effective in protecting workers.

Hierarchy Rule #3: When engineering controls are not completely effective or possible, administrative controls should also be used to reduce the amount of time a worker must stay in the hazardous area.

The administrative control of choice for healthcare workers is effective isolation of undiagnosed patients with suspicious pulmonary symptoms.

Every healthcare facility should have a policy and procedure for dealing with undiagnosed patients with suspicious symptoms in emergency rooms, outpatient/ambulatory patient clinics and general waiting areas. Elements of the policy should include:

1. Isolating undiagnosed patients with suspicious coughs in separate, well-ventilated rooms (rooms should contain a portable HEPA filtration unit at a minimum).
2. Immediate masking of undiagnosed patients with suspicious symptoms. A surgical mask will capture most of the sputum and droplet nuclei of patients.
3. Masking of patients with active cases of tuberculosis during transportation, to prevent the spread of droplet nuclei.

In conclusion, healthcare workers should be afforded all three control measures--ventilation, protective equipment and administrative controls.

Home health/visiting nurses will be forced to rely on protective equipment and administrative controls. When a health professional enters the home of a person with suspected or confirmed tuberculosis, the worker should instruct the patient to cover coughs and sneezes. If the patient cannot or is not compliant, the worker should mask the patient. The worker should also wear a respirator when entering the home and try to open windows and doors for ventilation. Precautions are especially important if cough-inducing procedures are performed in the home. Respiratory precautions may be discontinued when the patient is improving clinically (usually two to three weeks after medication has begun).

For more information, contact the AFT Healthcare Occupational Safety and Health Program at 202/393-5674.