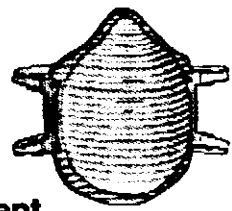
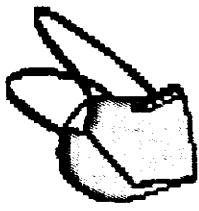


**Protect Yourself
Against Tuberculosis**

— A Respiratory Protection Guide

for Health Care Workers



A NIOSH Educational Document



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health



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or

visit the NIOSH Home Page on the World Wide Web at
<http://www.cdc.gov/niosh/homepage.html>

December 1995

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FOREWORD

The use of respirators in health care is a relatively new but important step in the efforts to prevent the transmission of TB. The National Institute for Occupational Safety and Health (NIOSH) created “Protect Yourself Against Tuberculosis—A Respiratory Protection Guide for Health Care Workers” to answer questions about respirator use in the health care industry. This booklet is designed to serve as a quick reference for health care workers employed in a variety of settings and with varied educational backgrounds. It should be regarded as a complement to, not a substitute for, the required respiratory protection program.

NIOSH is part of the Centers for Disease Control and Prevention (CDC) within the Department of Health and Human Services and is the federal agency responsible for conducting research and making recommendations for the prevention of work-related injuries and illnesses. NIOSH is also responsible for certifying respirators used in the workplace.

In June of 1995 NIOSH updated its respirator certification requirements. As a result new respirators used for the prevention of TB provide better protection to health care workers and are considerably less expensive. Call 1-800-35-NIOSH for more information on the new respirator standard or to request a complimentary copy of “The NIOSH Guide to the Selection and Use of Particulate Respirators Certified Under 42 CFR 84.”



Linda Rosenstock, M.D., M.P.H.
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Occupational Safety and Health
Centers for Disease Control and Prevention

ACKNOWLEDGEMENT

NIOSH wishes to thank the health care workers and their agencies that provided significant and valuable input into this document.

DISCLAIMER

Mention of any company name or product does not constitute endorsement by the National Institute for Occupational Safety and Health.

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CASE STUDIES

Multi-drug-resistant strains of TB have been reported in 40 states and caused outbreaks in at least 21 hospitals. In these outbreaks, 18 to 35 percent of exposed workers had documented conversion tuberculin testing.¹

- **An RN working at a major medical center contracted multi-drug resistant TB while caring for neurology, renal and overflow TB patients from another unit. The nurse was unable to work for two of the three years of her treatment. Her treatment included surgery to remove half of a lung.**
- **Five personnel present during a 3-hour autopsy converted from negative to positive skin tests. Two of these persons had a positive sputum culture eight weeks later.²**

¹Menzies D, Fanning A, Yuan L, and Fitzgerald M. Tuberculosis Among Health Care Workers: *New England Journal of Medicine*. 1995 Jan 12.

²Templeton GL, Illing LA, Young L, Cave D, Stead WW, and Bates JH. The Risk for Transmission of Mycobacterium Tuberculosis at the Bedside and During Autopsy: *Annals of Internal Medicine*, 122(12):922-5. 1995 Jun 15.

I. INTRODUCTION

This guide is for health care workers required to wear respirators for protection against tuberculosis (TB). It may also be used by employers to fulfill some of the federally required training aspects of a respirator program.

It is not intended for the education of respirator program administrators, who need training and additional information on setting up and running an adequate respirator program.

Purpose

This guide will help you protect yourself against TB through the proper use of respirators.

Q: What is tuberculosis, and how might I get it?

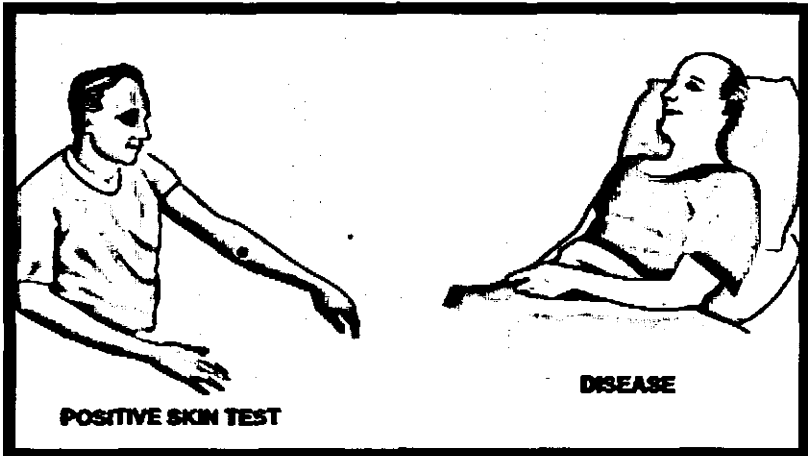
A: Tuberculosis is a potentially severe contagious disease that primarily affects the lungs, but can also damage many parts of the body. It is usually transmitted by droplets in the air we breathe. Tuberculosis bacteria may be spread by patients with active disease whenever they cough, speak, or sneeze.



Q: *What is the difference between tuberculosis infection and tuberculosis disease?*

A: If you inhale tuberculosis bacteria you may become infected with the bacteria, but not get sick. This infection can be detected by a positive tuberculosis skin test. The infection may remain dormant for an indefinite length of time, often not causing disease.

However, infection may lead to active disease. Active disease can be contagious; symptoms may include cough, fever, chills, and weight loss.

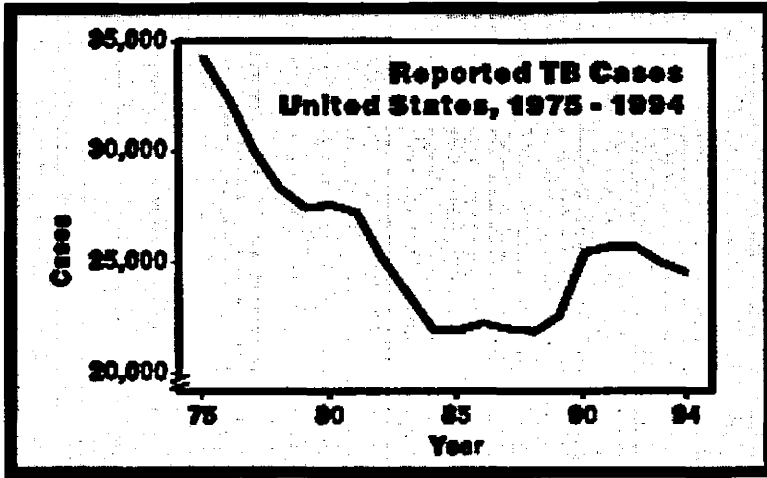


Q: *If I do get infected isn't there a cure?*

A: It is recommended that some individuals with TB infection be treated with medicine(s) to prevent active TB disease. Although the treatments usually are very effective and safe, there may be side effects in some patients. The goal is to prevent both TB infection and active disease.

Q: Why has tuberculosis become so important?

A: For most of this century TB decreased rapidly in the United States, but from 1985 to 1992 the number of cases of TB increased. Outbreaks of tuberculosis have occurred in hospitals, and some health care workers acquired the disease, a few of whom have died. Some TB bacteria have become resistant to the usual antibiotics (so-called "Multidrug-Resistant" or MDR-TB). Better preventive actions should reduce the spread of TB in hospitals and other health care settings.



Q: What kinds of prevention measures are there?

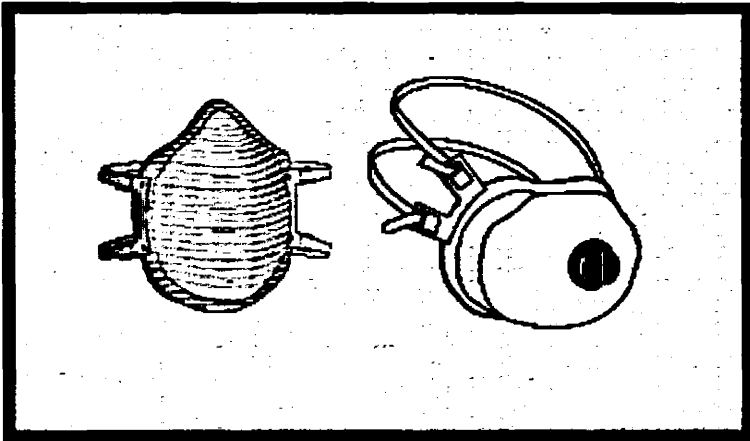
A: The first step in preventing the spread of TB is to quickly identify, isolate and properly treat contagious patients. Nearly all TB patients under proper treatment will become "non-contagious," that is, he or she will not be able to transmit the disease to others. Other steps to reduce the spread of the disease include ventilation to remove the bacteria from the air you breathe, and ultraviolet lights that kill the bacteria. For further information, see:

CDC Publication MMWR Oct. 28, 1994/Vol. 43/No. RR-13. *Guidelines for Preventing the Transmission of Mycobacterium Tuberculosis in Health Care Facilities.*

When you are in close contact with a contagious TB patient, none of these steps will completely protect you, and respirators are needed.

Q: *What is a respirator?*

A: A respirator is a protective facepiece, hood or helmet that is designed to protect the wearer against a variety of harmful airborne agents. Only certain types of respirators will protect you from TB, as explained later.



Q: *Do I have to wear a respirator?*

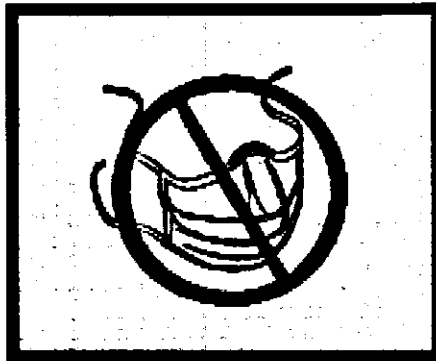
A: Wearing a respirator reduces your chances of becoming infected with TB. Your hospital or organization's infection control committee determines under what circumstances respirators *must* be worn and *which employees are required* to wear them.

In addition, the Occupational Safety and Health Administration (OSHA) currently requires the use of respirators and is enforcing their use under the general duty clause while developing specific standards for preventing TB in health care workers.

Q: *I have always worn a surgical mask to protect against tuberculosis. **IS** wearing a surgical mask still acceptable?*

A: No. Recent research has shown that many surgical masks do not do a good job of removing all TB bacteria. Some surgical masks fit so poorly that they provide very little protection from any airborne hazard.

Only NIOSH-certified respirators should be worn for TB protection. *A surgical mask is not a respirator.*



Q: ***What** else do I need to know?*

A: You should carefully read the next two sections for information about different types of respirators and the importance of respirator use programs.

II. RESPIRATOR INFORMATION

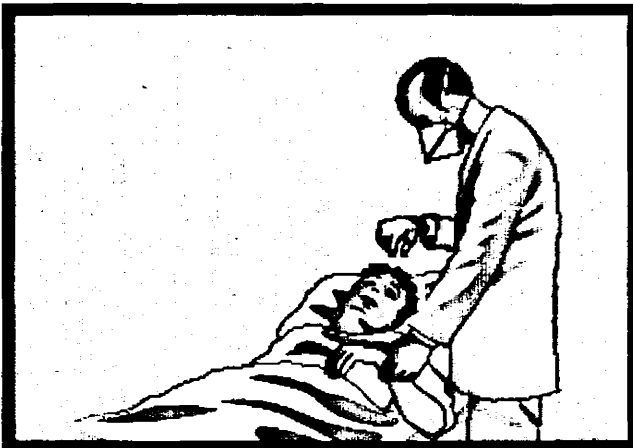
In general, there are two types of respirators: (1) *air-purifying respirators* that filter out or capture harmful agents from the surrounding air, and (2) *air-supplying respirators* that provide a separate source of clean air for breathing.

Q: Can I use any respirator?

A: No, only certain certified respirators will protect you against TB, also OSHA *requires* the use of certified respirators when respiratory protection is needed.


Q: Who certifies respirators?

A: The National Institute for Occupational Safety and Health (NIOSH).




Q: How can I recognize a certified respirator?

A: Certified respirators have a *certification number* (TC-84A-XXX) or (TC-21C-XXX) and a *NIOSH* or *NIOSH/MSHA approval label* on the filter, container, instruction sheet and sometimes on the respirator (See the following samples).



SAMPLE

**ABC COMPANY
ANYWHERE USA
1-800-123-4567**



THESE RESPIRATORS ARE APPROVED ONLY IN THE FOLLOWING CONFIGURATIONS:			
TC-	PROTECTION ¹	RESPIRATOR	CAUTIONS AND LIMITATIONS ²
84A-00X	N95	HALO 2000	ABCJMNO

1. PROTECTION

N95-Particulate Filter (95% filter efficiency level) effective against particulate aerosols free of oil; time use restrictions may apply.

2. CAUTIONS AND LIMITATIONS

- A- Not for use in atmospheres containing less than 19.5 percent oxygen.
- B- Not for use in atmospheres immediately dangerous to life or health.
- C- Do not exceed maximum use concentrations established by regulatory standards.
- J- Failure to properly use and maintain this product could result in injury or death.
- M- All approved respirators shall be selected, fitted, used, and maintained in accordance with MSHA, OSHA, and other applicable regulations.
- N- Never substitute, modify, add, or omit parts. Use exact replacement parts in the configuration as specified by the manufacturer.
- O- Refer to users instructions, and/or maintenance manuals for information on use and maintenance of these respirators.

New NIOSH Approval Label

SAMPLE

PERMISSIBLE

**PERMISSIBLE PARTICULATE FILTER RESPIRATOR FOR DUSTS, FUMES, AND MISTS,
INCLUDING RADIONUCLIDES**

**MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL
SAFETY AND HEALTH**



APPROVAL NO. TC-21C-300X



**ISSUED TO
ABC Company
Anywhere, USA**

LIMITATIONS

Approved for respiratory protection against dusts, fumes, and mists having a time-weighted average less than 0.3 milligrams per cubic meter (excluding radionuclides).

Not for use in atmospheres containing toxic gases or vapors.

Not for use in atmospheres immediately dangerous to life or health. Not for use in atmospheres containing less than 19.5 percent oxygen.

CAUTION

In making assembly or repair, parts identified with those furnished by the manufacturer under the approval cannot be substituted. Follow the manufacturer's instructions for changing filters.

The wearer of this respirator shall use and maintain in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

**MSHA NIOSH Approval TC-21C-300X
Issued to ABC Co., February 21, 2000**

The approved assembly consists of the following part numbers:

**000-000
000-000
etc.**

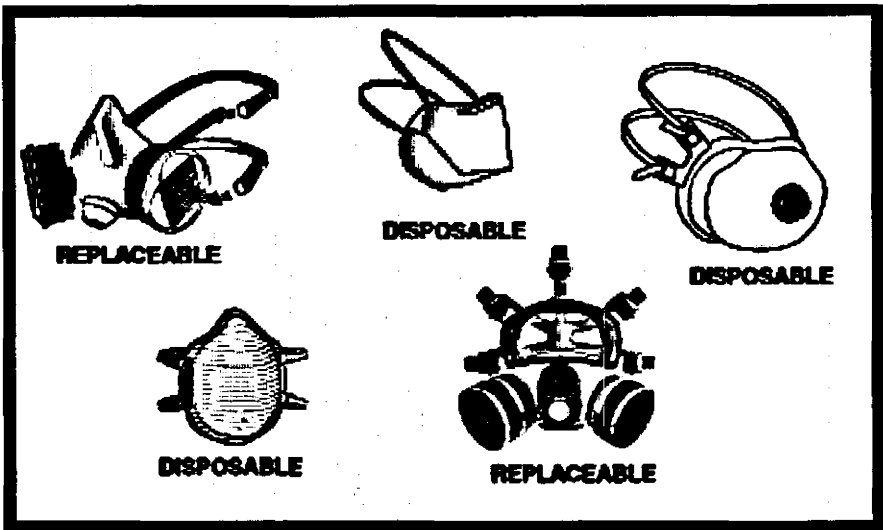
NIOSH/MSHA (HEPA) Approval Label

Types of Respirators for Protection Against TB

Air-Purifying Respirators

◆ Particulate Respirators

These respirators remove small particles from the air you breathe. There are several types of particulate respirators (HEPA, N, P or R series) that are available for use against TB. Some are made without exhalation valves, making them particularly useful in certain health-care settings.



Replaceable filter and disposable respirators.

USE particulate respirators when entering TB isolation rooms or other areas of the health-care facility that your employer has determined require respiratory protection. A face shield may provide additional protection against body fluids.

DO NOT USE particulate respirators with an exhalation valve when working in a sterile field, such as an operating room. The exhalation valve allows droplets and particles exhaled by the health care worker to escape and potentially contaminate the surgical field.

Advantages

- These respirators are light weight and do not restrict mobility.
- These respirators are low cost (compared to other respirators).

Drawbacks

- This respirator is a negative-pressure device using the suction produced by inhalation to draw air through the filter. The inhalation process, under the best of circumstances, will allow some contaminated air to leak into the facepiece.
- Communication can be difficult.
- Models with a full facepiece may fog up during use.

Additional Information

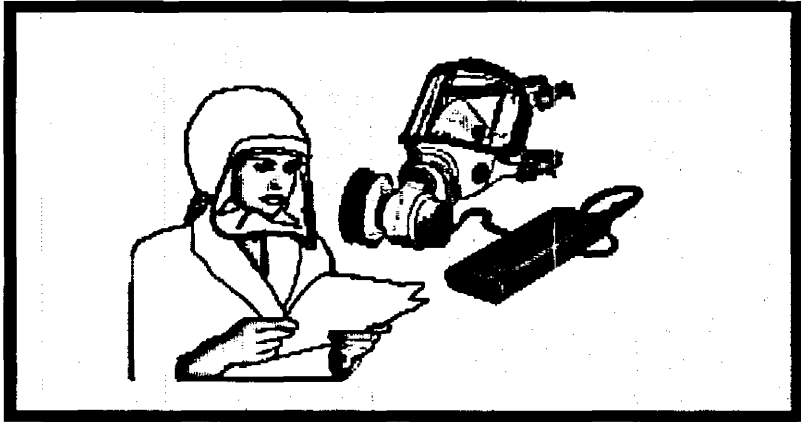
- These respirators may be available in as many as three sizes.
- Fit check this respirator every time you put it on to ensure a proper fit. Follow the manufacturers' recommendations, which can be found in the packaging.
- This respirator can be used for as long as it remains functional. The filter on a disposable respirator should be discarded when it or the disposable respirator is physically damaged, or soiled. Disposable respirators should also be discarded when they fail the fit check.



Fit Check: worker covering inlet and inhaling.

◆ Powered Air-Purifying Respirators (PAPR)

A PAPR uses a blower to pass contaminated air through a HEPA filter, which removes the contaminant and supplies purified air to a facepiece, hood or helmet.



PAPRs should be used when disposable and reusable half-masks do not provide adequate protection. Your employer should perform a risk assessment to identify situations in your health-care facility that might require the use of this advanced level of respiratory protection. A face shield may also be used in conjunction with a half-mask PAPR for protection against body fluids. Whenever high risk procedures such as bronchoscopy or autopsy are conducted, respiratory protection exceeding the CDC standard performance criteria may be needed. Better respirators include half- and full-face negative pressure respirators, PAPRs, or positive-pressure airline half-mask respirators.

Since this type of respirator exhausts air contaminated by the user, it should not be worn during sterile procedures. Hoods, helmets, and facepiece exhalation valves allow droplets and particles to escape, potentially spreading any contagious particles to the surgical field by the health care worker.

Advantages

- This type of respirator usually provides better protection than the other types already mentioned.
- The PAPR is easier to breathe through, more comfortable, and enough air is delivered to the facepiece, hood or helmet that leakage is usually outward.

Drawbacks

- A PAPR can be bulky, noisy, depends on a battery for operation, and is not a true positive pressure device (may allow leakage into hood, helmet, or facepiece).
- Communication can be difficult.

Additional Information

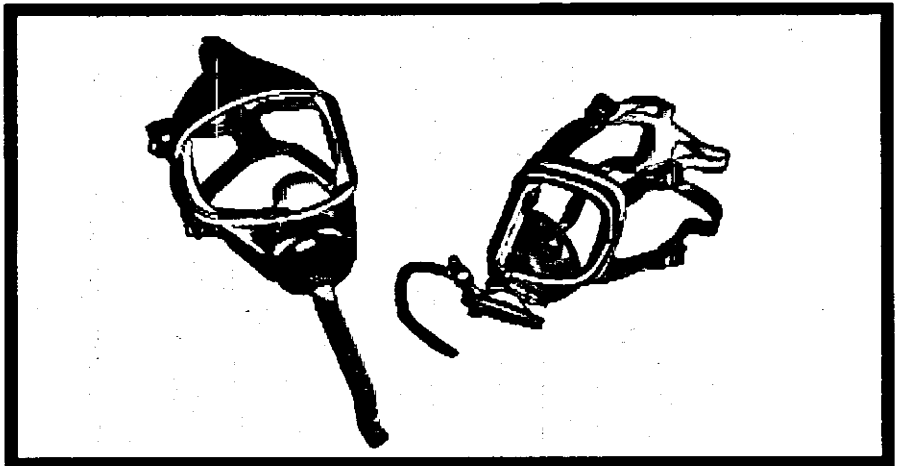
- PAPRs utilizing half-mask and full facepieces are usually available in three sizes. Loose-fitting PAPRs (hoods, helmets, etc.) are available in one size intended to fit everyone.
- Filters should be thrown away when they become physically damaged or soiled.

◆ Positive-Pressure Supplied-Air Respirators

Supplied-air respirators use compressed air from a stationary source delivered through a hose under pressure to a half-mask or full facepiece.

This type of respirator should be used when disposable, reusable respirators, or PAPRs do not provide adequate protection. Your employer should perform a risk assessment to identify situations in your health-care facility that might require the use of this advanced level of respiratory protection. A face shield may also be used in conjunction with a half-mask airline respirator for protection against body fluids.

Since this type of respirator exhausts air contaminated by the user it should not be worn during sterile procedures. The exhalation valve allows droplets and particles to escape through the valve, potentially spreading any contagious particles to the surgical field by the health care worker.



Advantages

- The supplied-air respirator is much more protective because it provides a positive pressure in the facepiece and almost all leakage is outward.

Drawbacks

- A source of breathing air is needed and the airline hose may limit movement.
- Communication can be difficult.

Additional Information

- These respirators are usually available in three sizes.

III. RESPIRATOR PROGRAMS

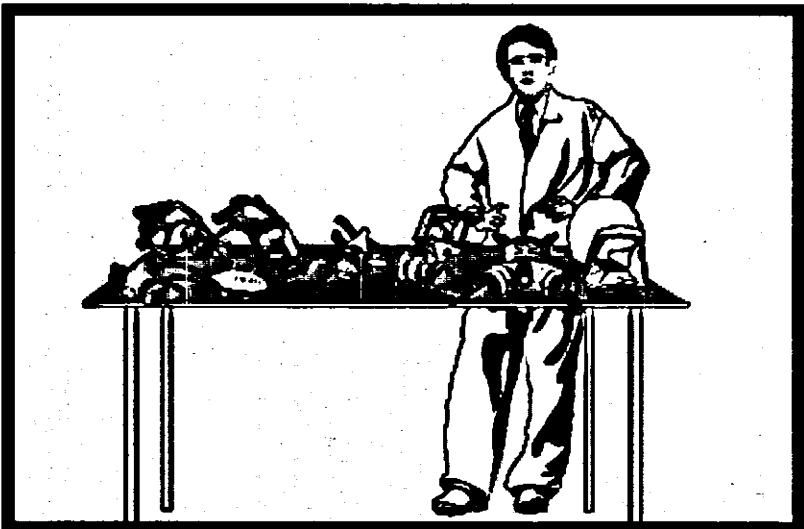
A comprehensive written respiratory protection program is required to assure that workers are provided effective health protection. (See Appendix II.)

Q: *Why is a formal respirator program needed?*

A: A respirator program increases your chances of using a respirator correctly. Just like medicine, a respirator will only help you if you use it correctly. Also, OSHA requires a number of written program elements for all respiratory protection programs.

Q: *Who is in charge of the respirator program?*

A: Your employer must provide someone qualified and knowledgeable in respiratory protection to run all aspects of the program.



Q: *What do I need to know about the respirator program?*

A: The program manager should provide or post a set of written standard operating procedures containing information about all aspects of the respirator program. The procedures describe when, where, and how to correctly use and care for your respirator.

Q: *Should I see a doctor before I use my respirator?*

A: Before you are assigned a task requiring the use of a respirator, and periodically thereafter, your employer must check your health. Not all workers must be examined by a doctor. A questionnaire may be used to determine if conditions or symptoms indicate the need for further evaluation.

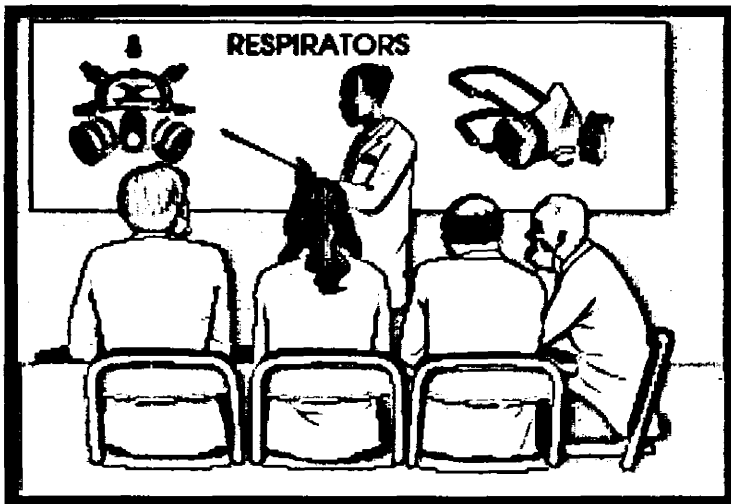


Q: *DO I need training to wear the respirator?*

A: Yes, you and your supervisors must be informed about the necessity for wearing respirators and the potential risks associated with not doing so. This training should include at a minimum:

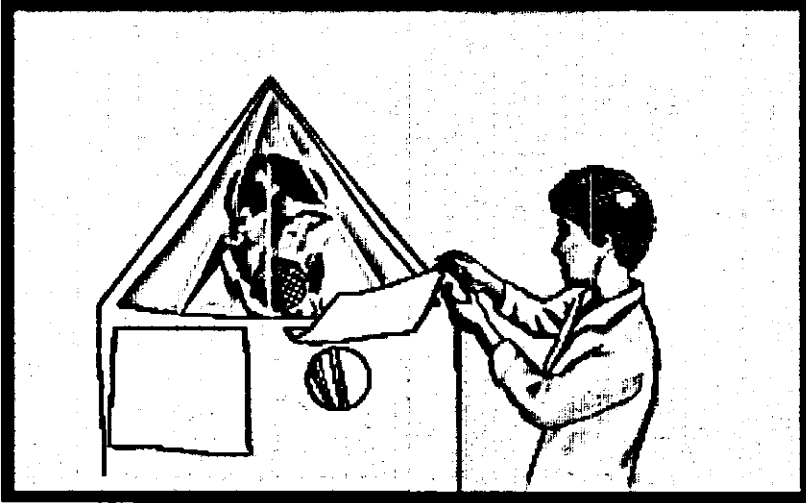
- The nature, extent, and specific hazards of tuberculosis in your respective health-care facility.

- A description of specific risks for TB infection among persons exposed to TB, treatment of the disease, and the possibility of active TB disease.
- A description of engineering controls and work practices and the reasons why they do not eliminate the need for personal respiratory protection.
- An explanation for selecting a particular type of respirator, how the respirator is properly maintained and stored, and the operation, capabilities, and limitations of the respirator provided.
- Instruction in how to inspect, put on, fit check, adjust, and correctly wear the provided respirator.
- An opportunity to handle the provided respirator and learn how put it on, wear it properly, and check the important parts.
- Instruction in how to recognize an inadequately functioning respirator.



Q: *How* do I know if the respirator is the right size for my face?

A: You will undergo fit testing to identify a respirator that adequately fits you.



Qualitative fit test chamber

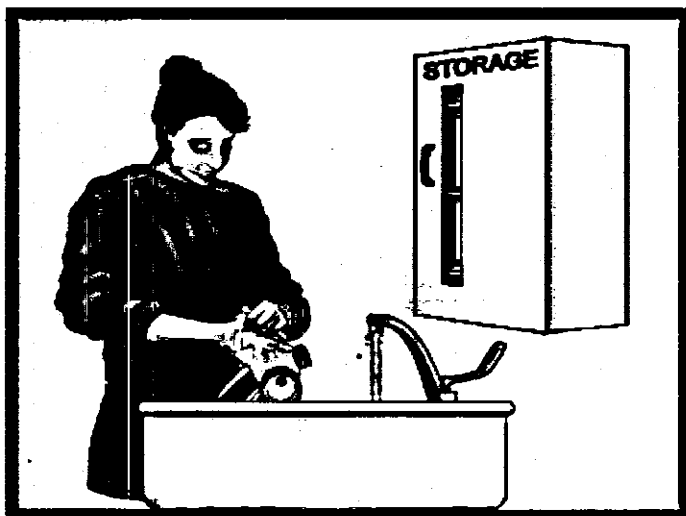
Q: *Can* I check the fit of my respirator?

A: Yes, always check the facepiece fit before each use. Consult the manufacturer's recommendations, which are found in the packaging.

A *fit test* is a method used to select the right size respirator for your face. A *fit check* (see page 10) is a method to check to see if you have correctly put on your respirator and adjusted it to fit properly.

Q: *HOW* do I take care of my respirator?

A: The manufacturer's instructions for inspecting, cleaning, and maintaining the respirator should be followed to ensure that it functions properly. Cleaning, inspection, repair and storage functions may be assigned to each individual user or to a central office.



**Q: *Can* a respirator be used by more than one person?
*How often should it be cleaned?***

A: Disposable respirators should be assigned to only one person and discarded if soiled or physically damaged. Replaceable filter respirators may be shared, but should be thoroughly cleaned and disinfected after each use (see manufacturers' recommendations).

Q: *What* should I do if I have problems with my respirator or questions about the respirator program?

A: Your respirator program administrator should be able to address all your problems and questions about using respirators. If you need additional information, you can contact NIOSH at 1-800-35-NIOSH.



1-800-35-NIOSH
(1-800-356-4674)

Q: *Is* someone checking to see if the respirator program is working?

A: Yes, the respirator program administrator should periodically check the program.



IV. FREQUENTLY ASKED QUESTIONS AND ANSWERS

Q: *How long can I use my respirator before I must discard it?*

A: In the health-care setting the filter material used in respirators may remain functional for weeks to months. Respirators with replaceable filters are reusable, and a respirator classified as disposable may be reused by the same health-care worker as long as it remains functional.

Before each use, the outside of the filter material should be inspected. If the filter material is physically damaged or soiled, the filter should be changed (in the case of respirators with replaceable filters) or the respirator discarded (in the case of disposable respirators). Your employer should develop standard operating procedures for storing, reusing, and disposing of respirators that have been designated as disposable and for disposing of replaceable filter elements.

Q: *How do I store my respirator?*

A: Respirators should be labeled for each worker and stored so that physical damage to the respirator is avoided. A good method is to place them in individual storage bins. Respirators may also be stored on pegs outside the TB isolation room door. Keep in mind that respirator facepieces will become distorted and the straps will lose their elasticity if hung on a peg for a long period of time. Check for these problems before each use.

Storing the respirator in a plastic sealable bag after use is not considered a good practice. The respirator may be damp after use and sealing prevents drying and encourages microbial growth. If plastic bags are used, respirators should be allowed to dry before storage. A bad practice is storing respirators in "fanny packs." Respirators can be crushed during work activities, such as lifting patients.

Q: How do I disinfect my respirator?

A: Disposable respirators cannot be disinfected, therefore, they can only be assigned for use to a single individual. Instead, each respirator should be examined between each use. A respirator should be discarded if it is crushed or visibly soiled (such as after performing a procedure where spattering has taken place).

Reusable respirators should be disinfected according to guidelines provided by the manufacturer. The infection control committee at your facility may have more stringent requirements in certain situations and these requirements should be followed.

Q: I find my respirator is hot and uncomfortable to wear. What can I do?

A: Respirators used for protection from TB should not cause undue discomfort. If you experience excessive problems, ask your respirator program administrator about alternative respirators. In some situations where prolonged respirator use is anticipated, the use of powered air-purifying respirators may be considered.

Q: I find it difficult to talk with the patient or my coworkers when wearing my respirator. What can I do?

A: Some respirators may interfere with speech more than others. Ask your program administrator if there are alternatives.

Q: *I have a very small face and had trouble being fit tested for a respirator. **What** can I do?*

A: Some manufacturers have up to three different sizes. Respirators may also vary in size from manufacturer to manufacturer. You may be able to get a better fit by trying a respirator made by another manufacturer. In some cases, the use of powered air-purifying respirators may be appropriate. Your employer must help you find a suitable respirator.

Q: *I have a beard or moustache. **Is** my respirator still effective?*

A: Facial hair that lies along the sealing area of the respirator, such as beards, sideburns, moustaches, or even a few days growth of stubble interferes with the fit of the respirator to your face and allows TB bacteria into your breathing air, and greatly reduces protection. Respirators that do not rely on a tight face seal, such as loose-fitting PAPRs, may offer better protection.

Q: *I get a rash when I wear my disposable HEPA respirator with a latex seal. **How** can I prevent this?*

A: You might have an allergy or sensitivity to the latex or its additives used in the manufacture of some respirators. Changing to a respirator using a silicone-based compound for the face seal, or a respirator that doesn't have a face seal (like a hooded PAPR) may solve the problem. Your employer should help you find a respirator that does not cause this problem.

Q: *What* kind of respirator should I wear during operative procedures on patients with known or suspected tuberculosis?

A: Respirators with exhalation valves and positive-pressure respirators do not protect the sterile field; therefore, a respirator that does not have a valve should be used, or alternative procedures should be developed.

Q: *My respirator became dislodged while I was caring for a disoriented patient who is potentially contagious for tuberculosis. What* should I do?

A: Reposition your respirator as soon as possible. If you think you were exposed to contagious TB, you should report this exposure to your employee health personnel, who will decide what follow-up is required.

Appendix I

Other Sources of Information

1. **The OSHA Respiratory Protection Standard (29 CFR 1910.134).**
2. **Guidelines for Preventing the Transmission of *Mycobacterium tuberculosis* in Health-Care Facilities, 1994, MMWR, CDC, October 28, 1994/Vol. 43/No. RR-13.**
3. **NIOSH Guide to the Selection and Use of Particulate Respirators Certified Under 42 CFR 84. Cincinnati, OH: DHHS, CDC, NIOSH; DHHS (NIOSH) Publication No. 96-101, 1996.**

Appendix II

Required Respirator Program Elements

Written standard operating procedures include:

1. Permissible practices for respirator use.
2. Respiratory program administration.
3. Respirator selection.
4. Inspection of respirators.
5. Cleaning and maintenance of respirators.
6. Storage of respirators.
7. Training in respiratory protection.
8. Fit testing of respirators.
9. Respirator program evaluation.
10. Medical Surveillance of respirator users.



NIOSH

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Through research and prevention

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