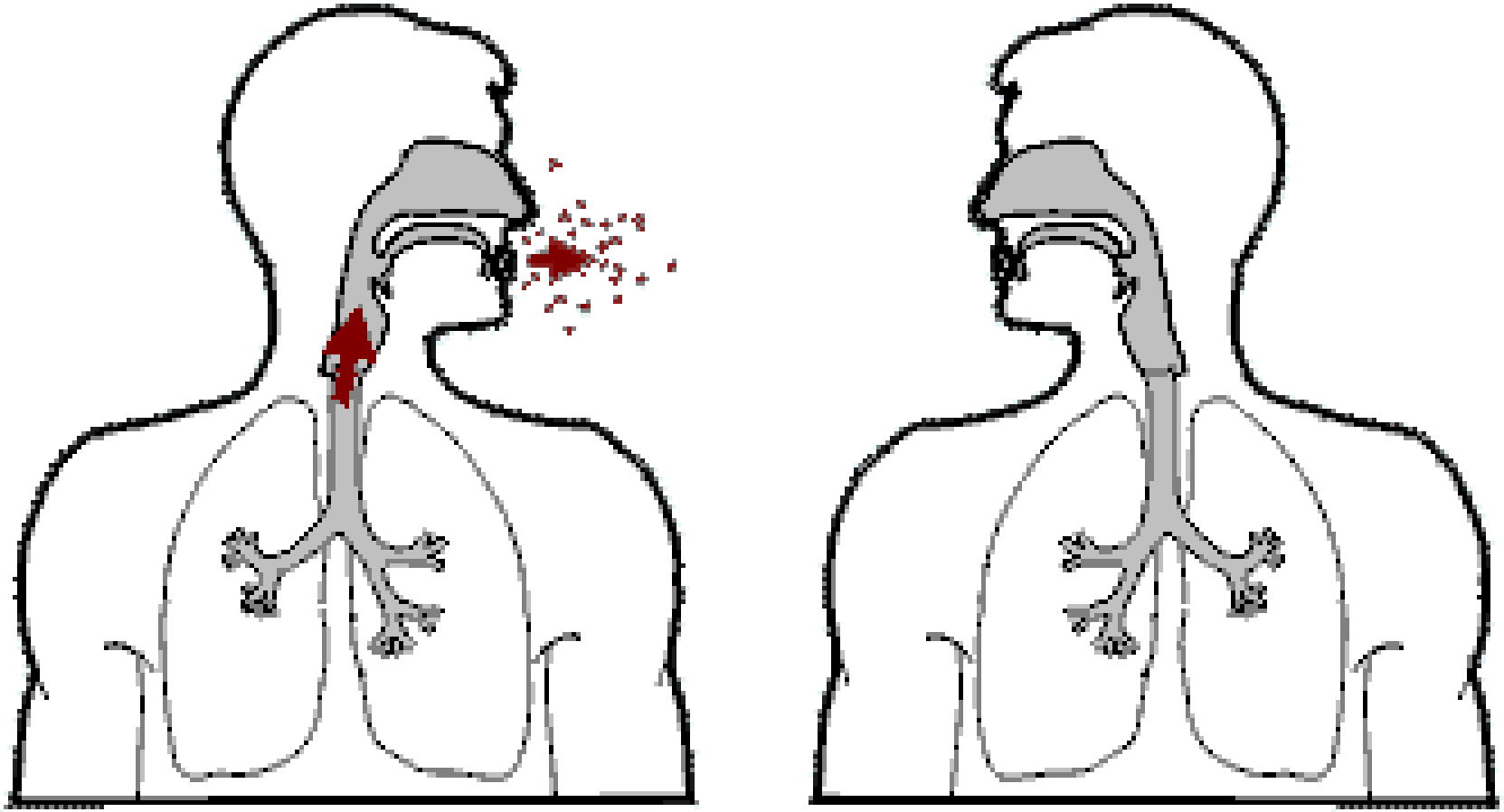
North Carolina
SPICE
Statewide Program for
Infection Control & Epidemiology

TB CONTROL IN HEALTHCARE FACILITIES: A PRACTICAL GUIDE FOR PREVENTION

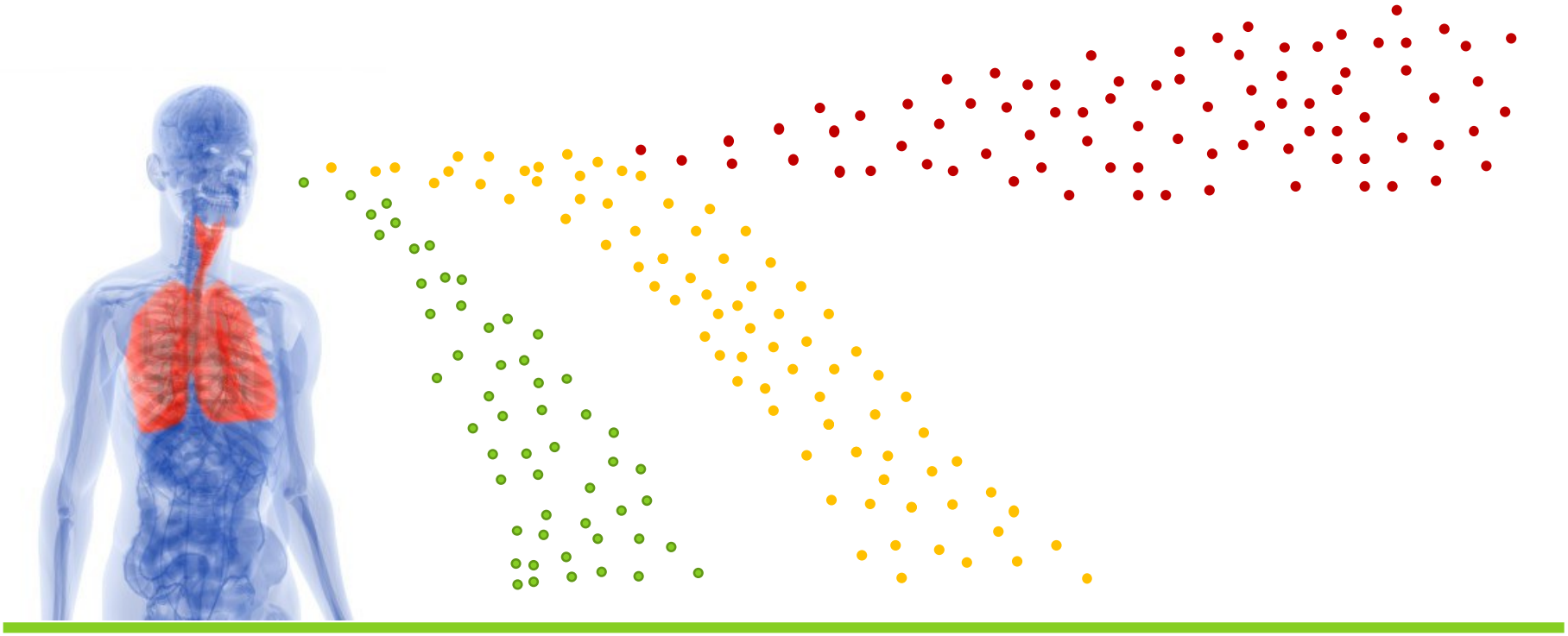
HOW TB IS SPREAD



GENERATION OF TB DROPLET NUCLEI

- One cough produces 500 droplets
- Average TB patient generates 75,000 droplets/day (before therapy)
- Each droplet carries 3-10 bacilli
- Infectious Dose (ID_{50}) <10 bacilli

DROPLET FATE



FACTORS DETERMINING TRANSMISSION

FACTOR	DESCRIPTION
Susceptibility	Immune status of the exposed individual
Infectiousness	Directly related to number of bacilli expelled into the air. Individuals who expel many bacilli are more infectious than those that expel few or no bacilli.
Environment	Factors that affect the concentration of bacilli in the air (ventilation, circulation, air pressure, etc)
Exposure	Proximity, frequency and duration of exposure

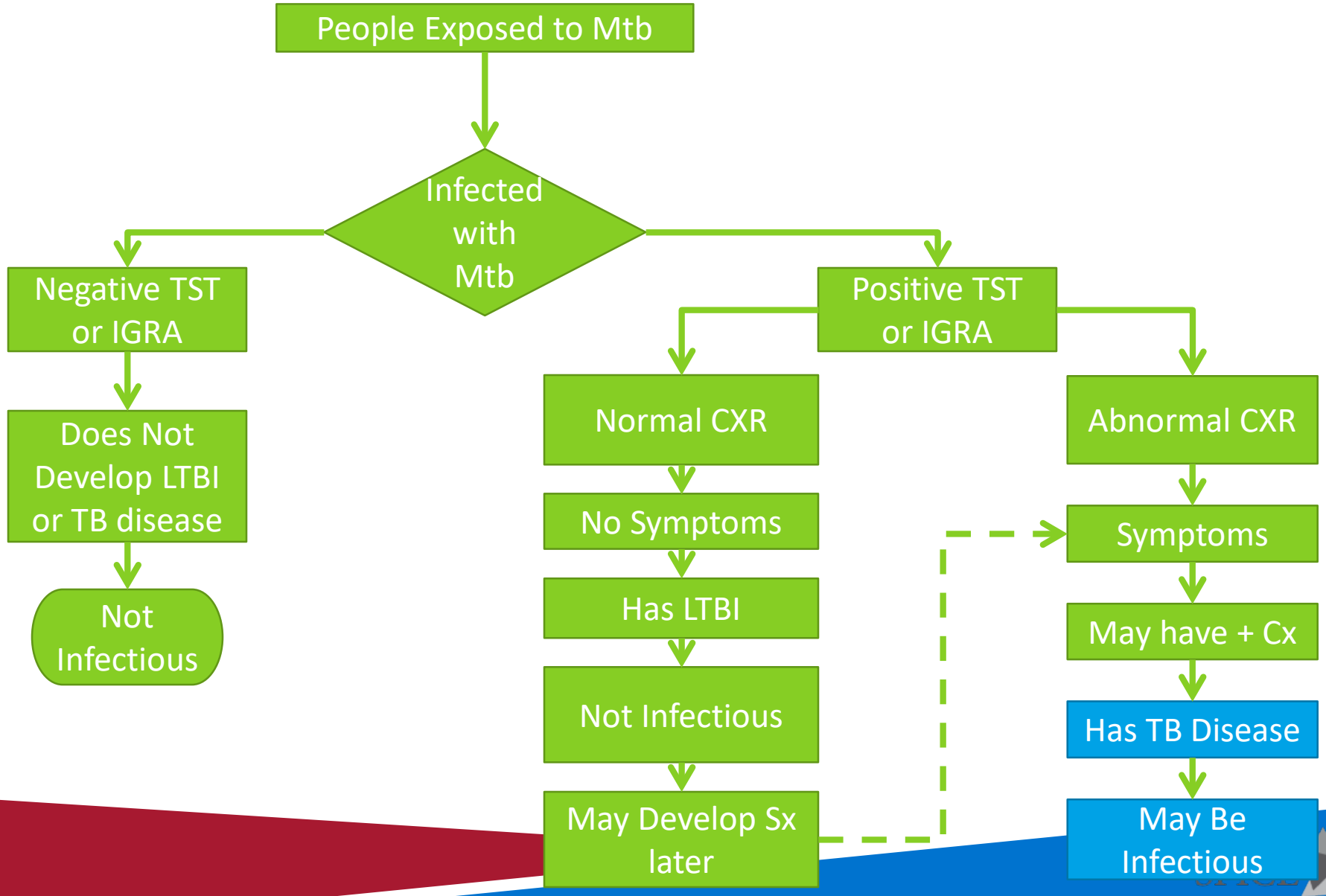
PATIENT CHARACTERISTICS ASSOCIATED WITH INFECTIOUSNESS

Factor	Description
Clinical	• Persistent cough > 3 weeks • Respiratory tract disease, especially laryngeal disease (highly infectious) • Failure to cover cough/sneeze • Inadequate/Inappropriate treatment
Procedure	Undergoing cough-inducing or aerosol-generating procedure (e.g., bronchoscopy, sputum induction)
Radiographic and Laboratory	• Cavitation on CXR • Positive culture Mtb • Postive AFB smear

ENVIRONMENTAL FACTORS - INCREASE TRANSMISSION

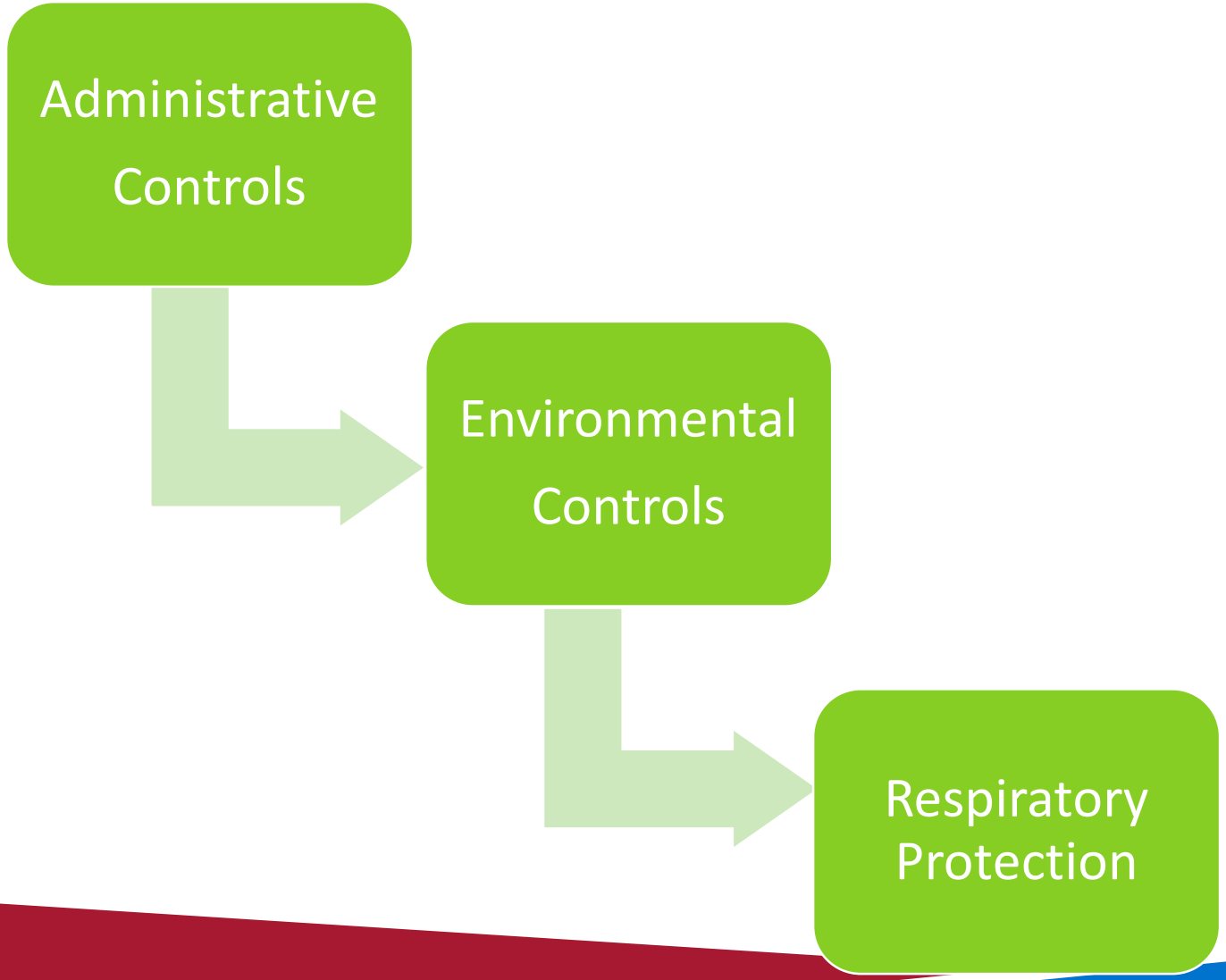
Factor	Description
Concentration of droplet nuclei	The more droplet nuclei in the air, the more probable that Mtb will be transmitted
Space	Exposure in small, enclosed spaces
Air Circulation	Recirculation of air containing droplet nuclei
Air Pressure	Positive air pressure in infected patients room causes droplet nuclei to flow to other areas

PROGRESSION OF TB



INFECTION CONTROL FUNDAMENTALS

HIERARCHY OF INFECTION CONTROL



TB INFECTION CONTROLS - SIMPLIFIED

Administrative – WHO?

- Who is a suspect TB patient?
- Who is at risk from exposure?
- Who has infectious TB?

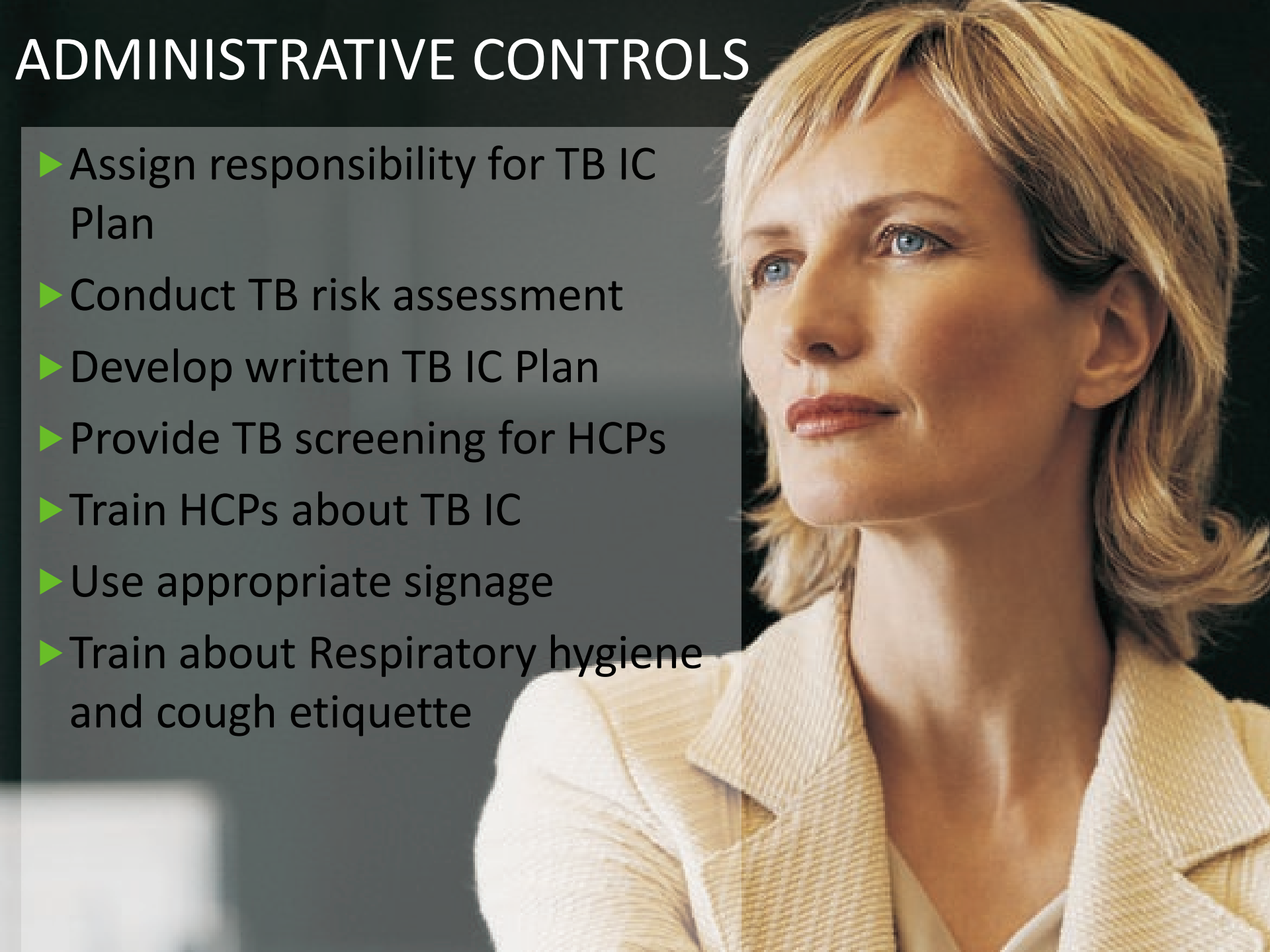
Environmental – WHERE?

- Where is the optimal place to minimize risk?

Personal Respiratory Protection – HOW?

- How can the worker minimize risk of exposure?

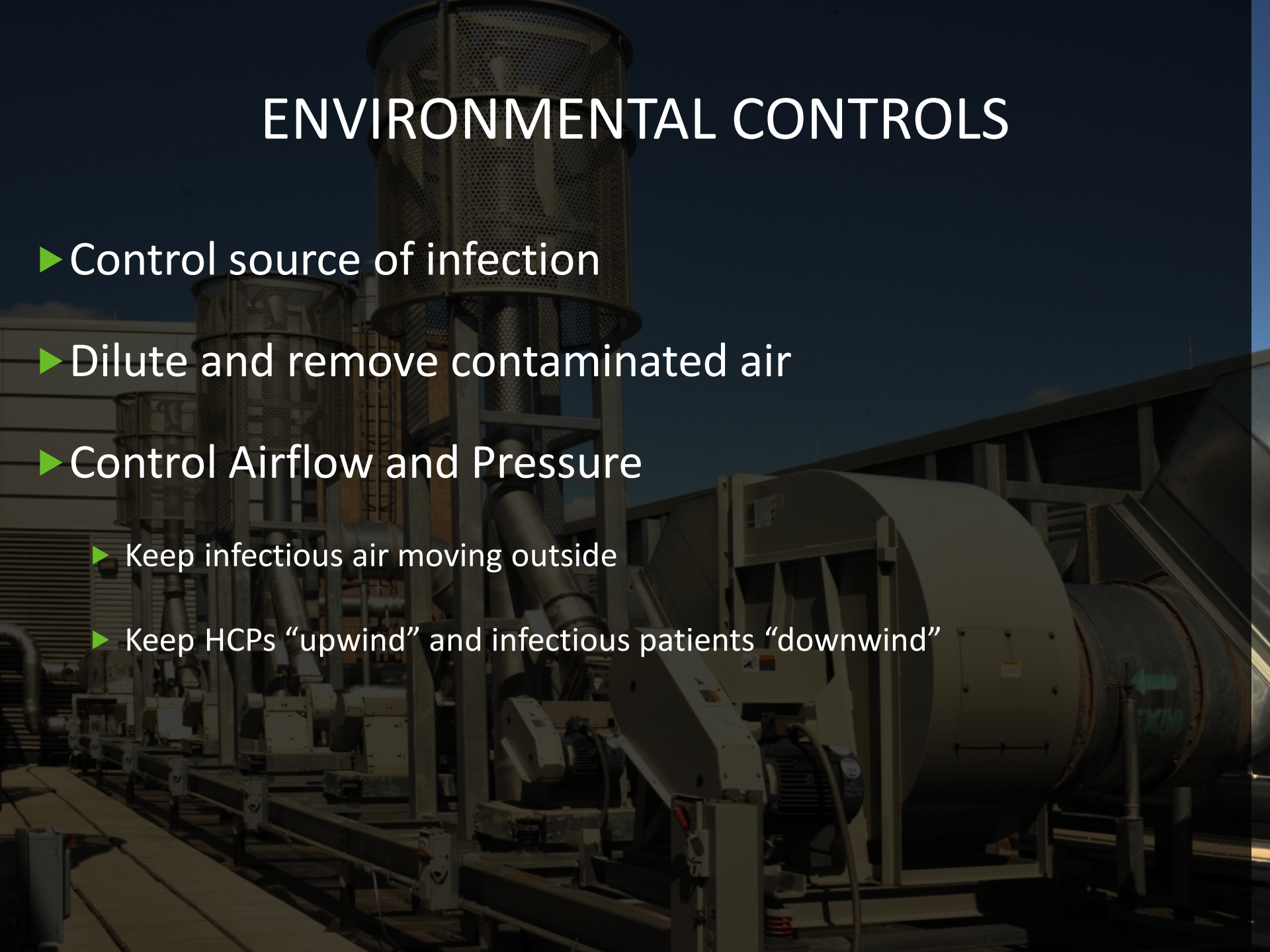
ADMINISTRATIVE CONTROLS



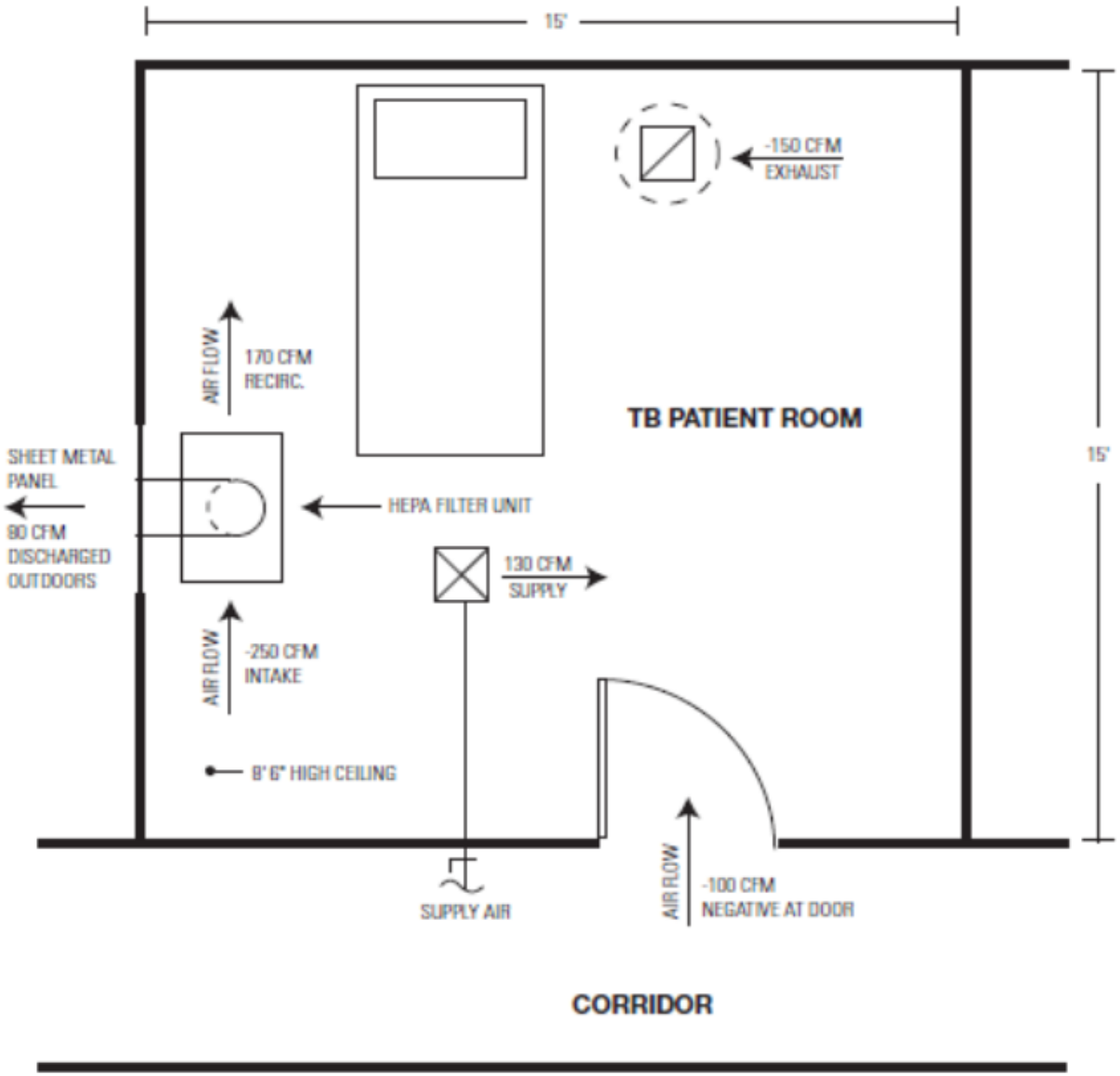
- Assign responsibility for TB IC Plan
- Conduct TB risk assessment
- Develop written TB IC Plan
- Provide TB screening for HCPs
- Train HCPs about TB IC
- Use appropriate signage
- Train about Respiratory hygiene and cough etiquette

ENVIRONMENTAL CONTROLS

- Control source of infection
- Dilute and remove contaminated air
- Control Airflow and Pressure
  - Keep infectious air moving outside
  - Keep HCPs “upwind” and infectious patients “downwind”



AIRBORNE INFECTIOUS ISOLATION ROOM (AIIR)



Negative Pressure

Clean air flows from corridor into AII room

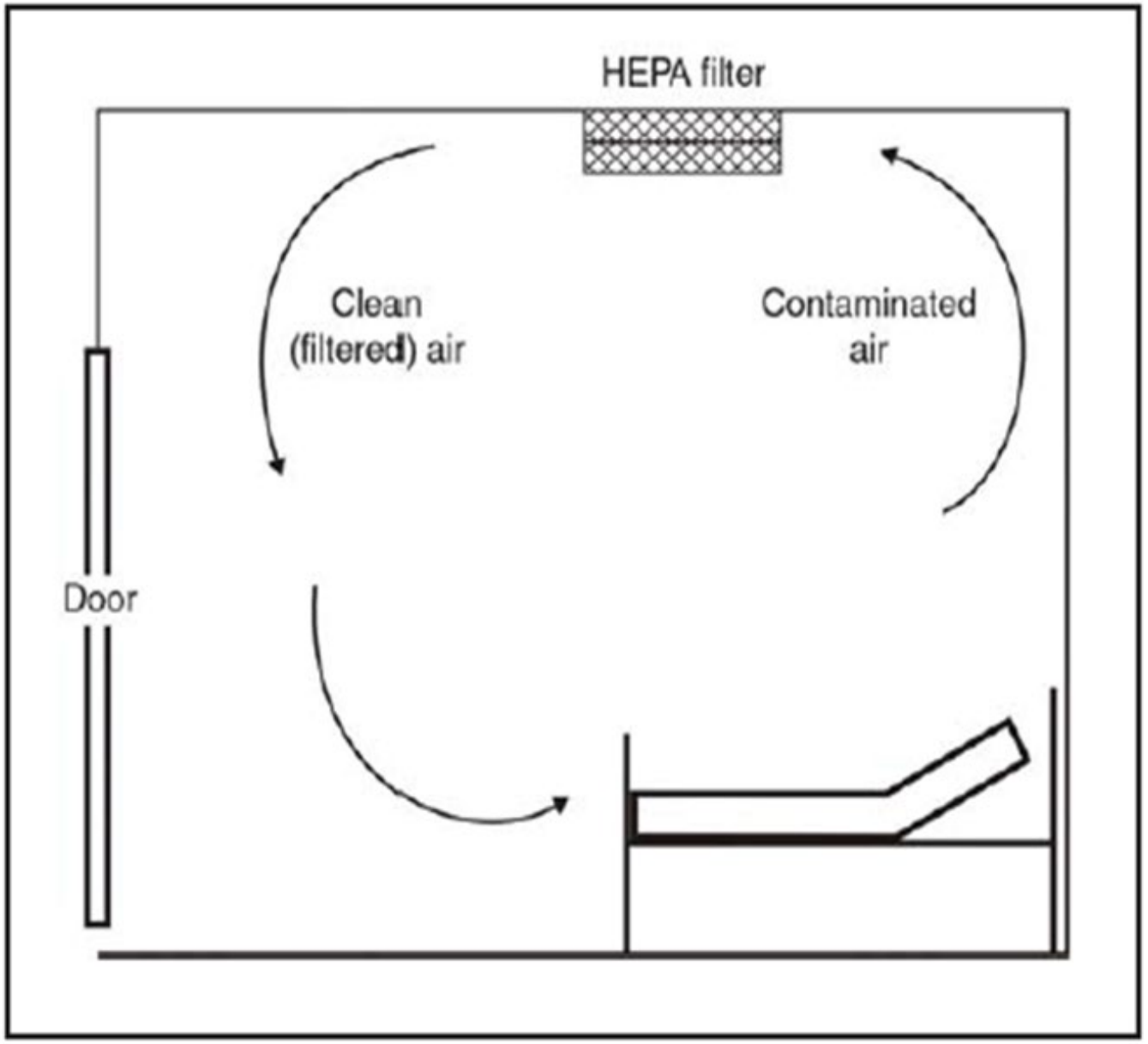
Air cannot escape AII room

Air is exhausted outdoors

Technical Requirements:

- 6-12 Air Changes/hr
- Must be constantly monitored for negative pressure
- Exhaust grills located above bed

HEPA Filters



Remove droplet nuclei from air

Must be used with releasing air from:

- Local exhaust ventilation booth to surrounding areas
- AII rooms to general ventilation system

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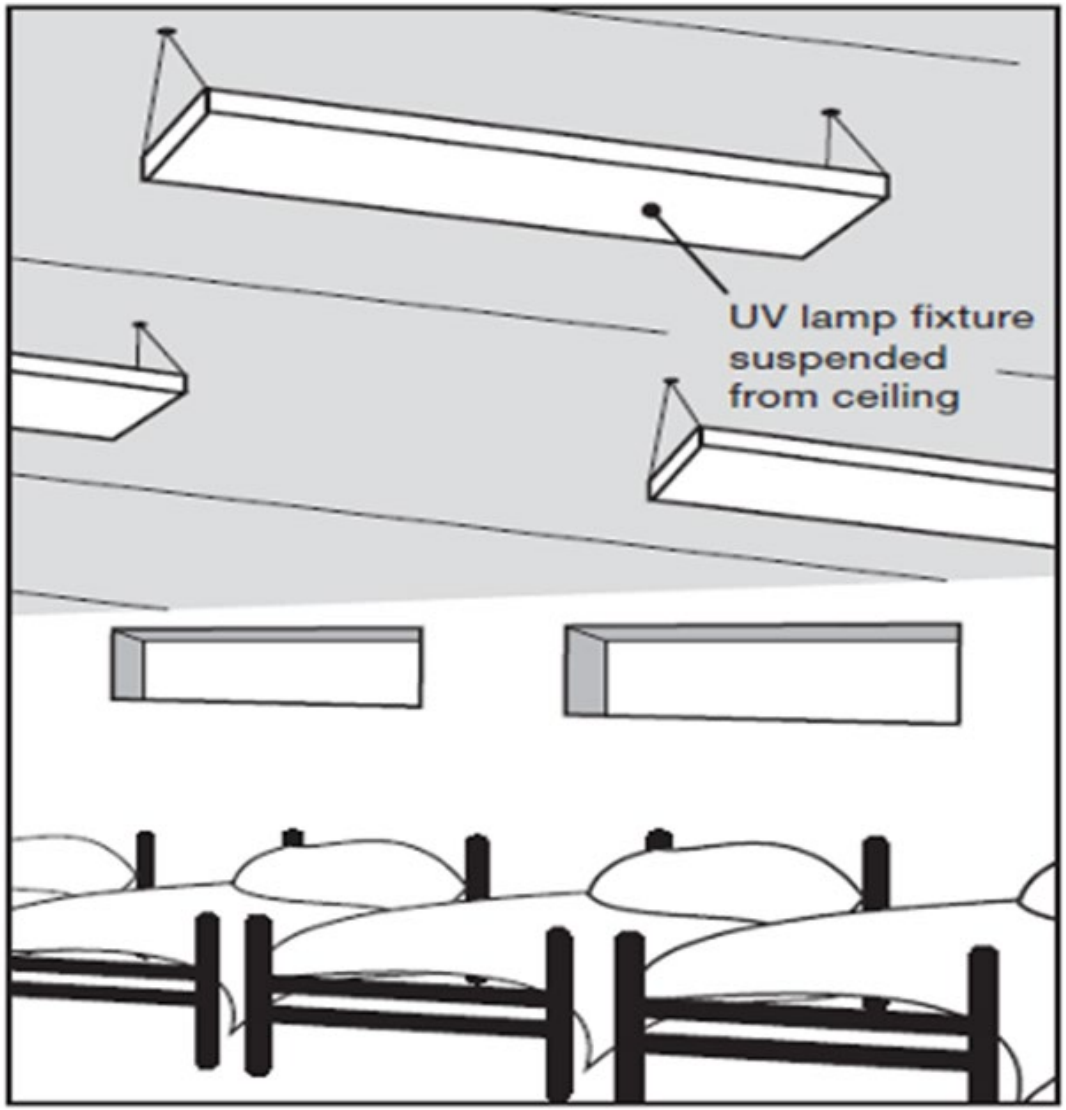
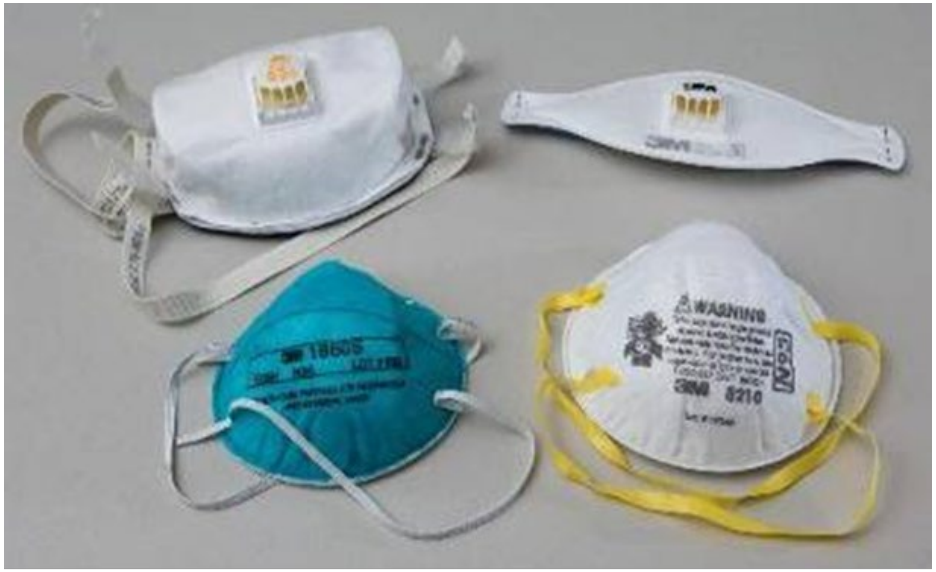
UVGI



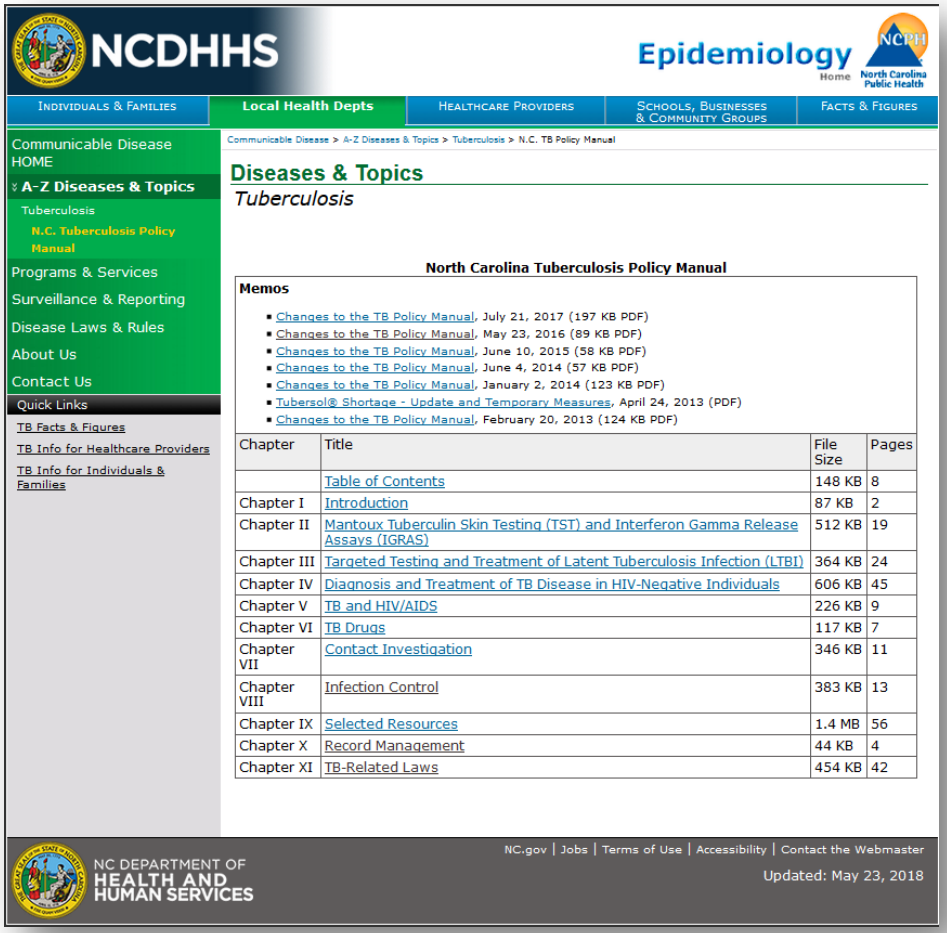
- Air cleaning technology that consist of UV lamps, which kill TB bacilli
- Should be used with other measures
- UV light can be harmful to skin and eyes

RESPIRATORY PROTECTION (RP)

- Implement a RP program
  - Written plan
  - Medical Clearance
  - Baseline and annual fit testing required
- Train HCPs in RP
  - Mask selection
  - User seal check
  - When refit is needed



TB RISK ASSESSMENT



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TB Info for Individuals & Families

Communicable Disease > A-Z Diseases & Topics > Tuberculosis > N.C. TB Policy Manual

Diseases & Topics

Tuberculosis

North Carolina Tuberculosis Policy Manual

Memos

- Changes to the TB Policy Manual, July 21, 2017 (197 KB PDF)
- Changes to the TB Policy Manual, May 23, 2016 (89 KB PDF)
- Changes to the TB Policy Manual, June 10, 2015 (58 KB PDF)
- Changes to the TB Policy Manual, June 4, 2014 (57 KB PDF)
- Changes to the TB Policy Manual, January 2, 2014 (123 KB PDF)
- Tubersol® Shortage - Update and Temporary Measures, April 24, 2013 (PDF)
- Changes to the TB Policy Manual, February 20, 2013 (124 KB PDF)

Chapter	Title	File Size	Pages
	Table of Contents	148 KB	8
Chapter I	Introduction	87 KB	2
Chapter II	Mantoux Tuberculin Skin Testing (TST) and Interferon Gamma Release Assays (IGRAS)	512 KB	19
Chapter III	Targeted Testing and Treatment of Latent Tuberculosis Infection (LTBI)	364 KB	24
Chapter IV	Diagnosis and Treatment of TB Disease in HIV-Negative Individuals	606 KB	45
Chapter V	TB and HIV/AIDS	226 KB	9
Chapter VI	TB Drugs	117 KB	7
Chapter VII	Contact Investigation	346 KB	11
Chapter VIII	Infection Control	383 KB	13
Chapter IX	Selected Resources	1.4 MB	56
Chapter X	Record Management	44 KB	4
Chapter XI	TB-Related Laws	454 KB	42

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Updated: May 23, 2018

TB
RISK ASSESSMENT

http://epi.publichealth.nc.gov/cd/lhds/manuals/tb/toc.html

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TB RISK ASSESSMENT

- Reviewing number of cases
  - National → State → County → Facility
- Determining your risk classification
  - Low
    - No TB cases; <200 beds & < 3 active TB cases; >200 beds & <6 active TB cases
  - Medium
    - <200 beds & > 3 active TB cases; >200 beds & > 6 active TB cases
  - Potential Ongoing Transmission
    - Evidence of ongoing transmission in facility

TB RISK ASSESSMENT

SETTINGS EXPECTING TO ENCOUNTER TB PATIENTS

- Review Community TB profile
- Review number of TB patients encountered
- Determine which HCPs to include in both TB screening and RP program
- Assess the number of AIIR needed
- Determine types of environmental controls needed

TB RISK ASSESSMENT
SETTINGS EXPECTING TO ENCOUNTER TB PATIENTS

- Identify and address areas with increased transmission risk
- Ensure prompt recognition and evaluation of Mtb transmission
- Conduct periodic reassessments
  - Gap Analysis – Identifies gaps between policy and practice
- Correct lapses in IC

TB RISK CLASSIFICATIONS

Low Risk

- Persons with TB disease not expected to be encountered; exposure unlikely

Medium Risk

- HCP will or might be exposed to persons with TB disease

Potential for Ongoing Transmission

- Temporary classification for any setting with evidence of person to person transmission of TB

Appendix C. Risk classifications for health-care settings that serve communities with high incidence of tuberculosis (TB) and recommended frequency of screening for *Mycobacterium tuberculosis* infection among health-care workers (HCWs)*

Setting	Risk classification†		
	Low risk	Medium risk	Potential ongoing transmission§
Inpatient <200 beds	<3 TB patients/year	≥3 TB patients/year	Evidence of ongoing *M. tuberculosis* transmission, regardless of setting
Inpatient ≥200 beds	<6 TB patients/year	≥6 TB patients/year	
Outpatient; and nontraditional facility-based	<3 TB patients/year	≥3 TB patients/year	
TB treatment facilities	Settings in which • persons who will be treated have been demonstrated to have latent TB infection (LTBI) and not TB disease • a system is in place to promptly detect and triage persons who have signs or symptoms of TB disease to a setting in which persons with TB disease are treated • no cough-inducing or aerosol-generating procedures are performed	Settings in which • persons with TB disease are encountered • criteria for low risk is not otherwise met	
Laboratories	Laboratories in which clinical specimens that might contain *M. tuberculosis* are not manipulated	Laboratories in which clinical specimens that might contain *M. tuberculosis* are manipulated	
Recommendations for Screening Frequency			
Baseline two-step TST or one BAMT¶	Yes, for all HCWs upon hire	Yes, for all HCWs upon hire	Yes, for all HCWs upon hire
Serial TST or BAMT screening of HCWs	No**	Every 12 months††	As needed in the investigation of potential ongoing transmission§§
TST or BAMT for HCWs upon unprotected exposure to *M. tuberculosis*	Perform a contact investigation (i.e., administer one TST as soon as possible at the time of exposure, and, if the TST result is negative, place another TST 8–10 weeks after the end of exposure to *M. tuberculosis*)¶¶		

* Health-care workers (HCWs) refers to all paid and unpaid persons working in health-care settings who have the potential for exposure to *M. tuberculosis* through air space shared with persons with TB disease.

NORTH CAROLINA SPECIFIC RULES

2. Tuberculin Skin Testing (TST) may be required by agency rules or OSHA; if OSHA guidelines apply or annual testing is being done by policy, a two-step test or IGRA should be done at the time of hire

- **hospital employees**
  By: OSHA
  Frequency: upon employment & by risk assessment
- **operating room employees**
  By: OSHA
  Frequency: upon employment & by risk assessment
- **autopsy room employees**
  By: OSHA
  Frequency: upon employment & by risk assessment
- **mycobacteriology laboratory employees**
  By: OSHA
  Frequency: upon employment & by risk assessment
- **employees of ambulatory facilities that perform high hazard procedures on suspected or active tuberculosis patients**
  By: OSHA
  Frequency: upon employment & by risk assessment
- **emergency medical personnel with direct patient contact**
  By: OSHA
  Frequency: upon employment & by risk assessment

NORTH CAROLINA SPECIFIC RULES

- A 2-step TST or IGRA is provided free of charge to new employees who cannot provide a documented negative TST or IGRA within the preceding twelve months

- Those who provide a documented negative TST within the preceding twelve months receive a single TST and this result is considered the second part of the two-step test.

https://epi.publichealth.nc.gov/cd/lhds/manuals/tb/toc.html

MANAGING TB PATIENTS

PROMPT TRIAGE

- Primary risk is patient with undiagnosed/unrecognized TB
- Initiate AII precautions and manage/transfer patients with suspected/confirmed TB
  - Ask about and evaluate for TB
  - Check for signs and symptoms
  - Mask symptomatic patients
  - Separate immunocompromised patients

CRITERIA FOR INITIATING AII PRECAUTIONS

- Know or suspected pulmonary, laryngeal or miliary (disseminated) TB disease
- Patients with known or suspected open/draining TB abscesses or have wound drains in place (JP)
- Gastric Aspirate (pediatrics only) culture positive for TB
- Rule out TB in differential diagnosis and AFB smears ordered
- Previously diagnosed smear-positive TB readmissions

https://epi.publichealth.nc.gov/cd/lhds/manuals/tb/toc.html

CRITERIA FOR DISCONTINUING AII PRECAUTIONS

- Sputum specimen results meet CDC criteria for discontinuation of respiratory isolation;
- Patient has 2 consecutive negative AFB smears collected at least 8 hours apart;
- It has been at least seven days since the last positive sputum smear and
- Patient has been compliant on TB medications to which the organism is susceptible and there is evidence of clinical response to treatment

https://epi.publichealth.nc.gov/cd/lhds/manuals/tb/toc.html ***Chapter XI***

CDC CRITERIA FOR DISCONTINUING AII PRECAUTIONS

- Patients can be considered noninfectious when they meet **ALL** of the following three criteria
  - The patient has three consecutive, negative AFB sputum smear collected in 8-24 hour intervals and at least one specimen should be an early morning specimen
  - They are compliant with an adequate treatment regimen for two weeks or longer; and
  - Their symptoms have improved clinically

CDC recommendation on infection control provide evidence-based guidance. For regulations in your area refer to state and local regulations

https://www.cdc.gov/tb/publications/factsheets/prevention/ichcs.htm

AII PRECAUTIONS POLICIES AND PRACTICES

- All AIIR are single patient rooms with private bathrooms
- Entry of visitors and staff should be controlled
  - Keep door shut as much as possible; anteroom
- HCP should wear at least N-95 disposable respirators or PAPR
- Visitors should be offered N-95 and instructed on use
- Visitors symptomatic of TB have written evidence of no active disease

AII PRECAUTIONS POLICIES AND PRACTICES

- Diagnose and Treat in the AII room
- Educate patients and visitors on AII precautions and ensure compliance
- Schedule patients with TB disease for procedures when there is a minimum number of patients and HCP present
- Provide surgical mask for TB patients during transport, in waiting areas, and when others are present


All rooms should be checked daily when in use.
Results should be documented in the patient record

DISCHARGE CONSIDERATIONS

- Patient can be discharged without 3 negative sputum smears if
  - Follow-up plan and appointment has been made with local TB program
  - Patient is on standard treatment and directly observed therapy (DOT) is arranged
  - Does not reside in a congregate setting
  - No person in home <4 years old or immunocompromised
  - All in household previously exposed
  - Patient willing to stay home until sputum results negative
- Do not release if high-risk persons will be exposed

CONTACT INVESTIGATIONS

EVALUATING PROBLEMS

- Conduct contact investigations for problems such as
  - Conversion in TST or BAMT result in HCP
  - TB disease diagnosis in HCP
  - Suspected person-to-person transmission
  - IC lapses exposing HCPs
  - Possible outbreaks identified using automated lab systems

DEFINING EXPOSURE

Occupational Exposure occurs when

- The source has TB disease (pulmonary, laryngeal, milary); TB disease of skin or wound
- HCP has contact in confined space (same room) or face-to-face contact in open area
- HCP was not wearing PPE
- HCP had exposure to microbiologic sample of viable TB without PPE (laboratory exposure)

CONTACT INVESTIGATION

Objectives

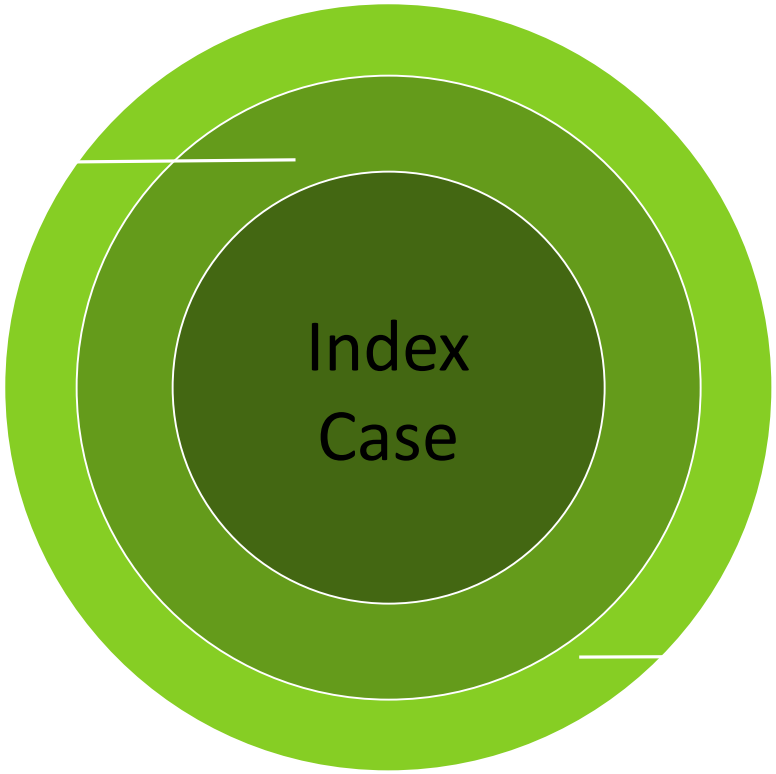
- Determine likelihood that transmission occurred
- Determine extent of transmission
- Identify exposed individuals and, if possible, source of potential transmission

CONTACT INVESTIGATION

- Identify factors that could have contributed to transmission
- Implement interventions
- Evaluate effectiveness of interventions
- Ensuring that exposure to TB is terminated and conditions leading to exposure are eliminated

CONCENTRIC CIRCLE

1st Concentric Circle: Close and high-risk contacts



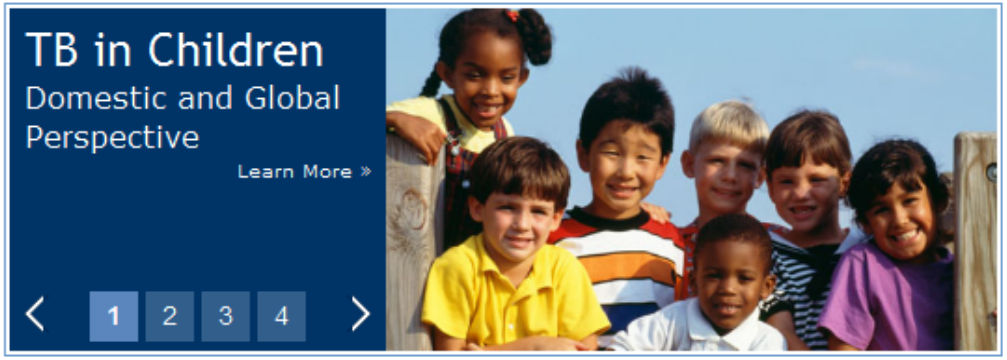
OCCUPATIONAL EXPOSURE EVALUATION

- HCP and other exposed persons screened by symptoms and TST or IGRA as soon as possible after exposure
- Follow-up testing repeated in 8-10 weeks following exposure, if initial result negative
- Provide treatment for LTBI or active TB, as appropriate

RESOURCES

Tuberculosis (TB)

TB is a disease caused by a bacterium called *Mycobacterium tuberculosis*. The bacteria usually attack the lungs, but TB bacteria can attack any part of the body such as the kidney, spine, and brain. If not treated properly, TB disease can be fatal. TB disease was once the leading cause of death in the United States. Learn More »



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Basic TB Facts
Signs and Symptoms, Transmission, Risk Factors, Exposure...

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Testing & Diagnosis
Testing Methods, Tuberculin Skin Testing, Blood Tests...

TB & HIV Coinfection
Basic Information, Treatment Regimens...

Infection Control & Prevention
Infection Control in Health-Care Settings, International Travelers,

Vaccines & Immunizations
BCG Vaccine...

Publications & Products

- Fact Sheets
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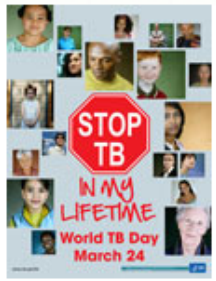
Events



World TB Day

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Diseases & Topics

Tuberculosis

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View Info for Healthcare Providers
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Tuberculosis (TB) is a disease caused by bacteria that can damage the lungs or other parts of the body like the spine, lymph nodes or kidneys. If not treated properly, TB disease can be fatal.

TB is spread through the air from one person to another when a person with active TB disease of the lungs or throat coughs, sneezes, speaks or sings. People nearby may breathe in these bacteria and become infected. Family members, roommates and close friends of the sick person are more likely to become infected than the general public. This is because they spend long periods of time together in enclosed spaces like a home or car. TB is not spread by shaking hands, kissing, sex, sharing plates, glasses, utensils, clothing, bedding or furniture.

Most people who become infected with TB do not get sick. Their bodies are able to fight the germs. This condition is known as latent TB infection (LTBI). People with LTBI cannot infect other people. However, without proper antibiotic treatment, the infection can progress to active TB disease.

epi.publichealth.nc.gov/cd/lhds/manuals/tb/toc.html

NC Department of Health and Human Services

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Tuberculosis

North Carolina Tuberculosis Policy Manual

Memos

- New Edition of the TB Policy Manual, January, 23, 2012 (83 KB PDF)

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	Table of Contents	92 KB	9
Chapter I	Introduction	21 KB	2
Chapter II	Mantoux Tuberculin Skin Testing (TST) and Interferon Gamma Release Assays (IGRAS)	397 KB	24
Chapter III	Targeted Testing and Treatment of Latent Tuberculosis Infection (LTBI)	153 KB	16
Chapter IV	Diagnosis and Treatment of TB Disease in HIV-Negative Individuals	226 KB	44
Chapter V	TB and HIV/AIDS	88 KB	9
Chapter VI	TB Drugs	437 KB	9
Chapter VII	Contact Investigation	138 KB	10
Chapter VIII	Infection Control	165 KB	13
Chapter IX	Selected Resources	2.6 MB	75
Chapter X	Record Management	724 KB	27
Chapter XI	TB-Related Laws	179 KB	42

PICE

Health topics

Tuberculosis

Tuberculosis, or TB, is an infectious bacterial disease caused by Mycobacterium tuberculosis, which most commonly affects the lungs. It is transmitted from person to person via droplets from the throat and lungs of people with the active respiratory disease.

In healthy people, infection with Mycobacterium tuberculosis often causes no symptoms, since the person's immune system acts to "wall off" the bacteria. The symptoms of active TB of the lung are coughing, sometimes with sputum or blood, chest pains, weakness, weight loss, fever and night sweats. Tuberculosis is treatable with a six-month course of antibiotics.

More about tuberculosis

Highlight: Global tuberculosis report 2012

Global tuberculosis report 2012

General

World TB Day, 24 March 2013

Technical

The Stop TB Strategy

Six-point WHO strategy building on the successes of

MMWR™

Morbidity and Mortality Weekly Report

Recommendations and Reports December 30, 2005 / Vol. 54 / No. RR-17

Guidelines for Preventing the Transmission of *Mycobacterium tuberculosis* in Health-Care Settings, 2005

Questions??