TB Facts

For Health Care Workers 2006

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GLOSSARY OF ABBREVIATIONS

AFB	acid-fast bacilli
ATS	American Thoracic Society
AIDS	acquired immune deficiency syndrome
BCG	bacille Calmette-Guérin
CDC	Centers for Disease Control and Prevention
DHP	delayed-type hypersensitivity
DOT	directly observed therapy
EMB	ethambutol
HIV	human immunodeficiency virus
INH	isoniazid
LTBI	latent TB infection
MDR TB	multidrug-resistant tuberculosis
MDR LTBI	multidrug-resistant latent TB infection
NHANES	National Health and Nutrition Examination Survey
PPD	purified protein derivative
PZA	pyrazinamide
QFT-G	QuantiFERON®-TB Gold test
RIF	rifampin
RPT	rifapentene
RTMCC	Regional Training and Medical Consultation Center
TB	tuberculosis
TNF-α	tumor necrosis factor-alpha
TST	tuberculin skin test

TUBERCULOSIS — YES! IT'S STILL A PROBLEM!

- Worldwide, nine million new tuberculosis (TB) cases occur each year and there are 2 million TB-related deaths.

- In the United States, after several decades of decline, TB cases increased 20 percent between 1985 and 1992. Reasons for the increase included

  - Deterioration of the TB public health care infrastructure

  - The HIV epidemic

  - Immigration of persons from areas with a high prevalence of TB

  - Transmission of TB in high-risk environments, such as correctional facilities, homeless shelters, hospitals, and nursing homes

- During the resurgence of TB, outbreaks of multidrug-resistant TB (MDR TB) occurred in hospitals and prisons, resulting in high death rates and transmission to health care workers.

- The 14,517 TB cases reported in 2004 represent the eleventh consecutive year of decline in the United States. This decline suggests the successful use of new resources in different areas of the country to better detect and treat persons with TB disease and latent TB infection.

- While the decrease in TB cases is encouraging, there are several areas of concern which will require expanded efforts:

  - TB cases continue to increase in some areas of the United States.

  - During 1993 to 2004, the District of Columbia and 47 states reported diagnosing and caring for persons with MDR TB.

  - An estimated 9 to 14 million persons in the United States are infected with *Mycobacterium tuberculosis*.* Without intervention, about 10 percent of these persons will develop TB disease at some point in their lives.

  - Directly observed therapy (DOT) is not available for many persons with TB disease who have difficulty completing a full course of TB treatment.

  - In 2004, the majority (82%) of all reported TB cases in the United States occurred in racial and ethnic minorities.

  - An increasing proportion of TB cases in the United States are among individuals born outside this country in areas with a high prevalence of TB. International collaboration needs to be strengthened to prevent and control TB in these persons.

  - Despite overall declines in TB cases in the United States, inequities persist in racial, ethnic, and foreign-born groups.

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* 1999 - 2000 CDC National Health and Nutrition Examination Survey (NHANES)

POPULATIONS AT RISK FOR TUBERCULOSIS

Groups at Higher Risk for TB Exposure or Infection

Persons who are at higher risk for exposure to or infection with *M. tuberculosis* include

- Close contacts of persons known or suspected to have TB disease
- Foreign-born persons, including children, from areas that have a high TB prevalence
- Residents and employees of high-risk congregate settings
- Some medically underserved, low-income populations as defined locally
- High-risk racial or ethnic minority populations, defined locally as having an increased prevalence of TB
- Infants, children, and adolescents exposed to adults in high-risk categories
- Persons who inject illicit drugs; any other locally identified high-risk substance users
- Health care workers who serve high-risk clients.

Groups at Higher Risk for Developing TB Disease Once Infected

Persons who are at higher risk of developing TB disease once infected with *M. tuberculosis* include persons with

- HIV infection
- Recent infection with *M. tuberculosis* (within the past 2 years), particularly infants and very young children

- Medical conditions known to increase the risk for disease if infection occurs
- Current use of injecting illicit drugs; other groups of high-risk substance users
- History of inadequately treated TB disease

HIV infection is the strongest known risk factor associated with the progression from latent TB infection to TB disease.

MODE OF TRANSMISSION

Mycobacterium tuberculosis is spread by airborne particles, known as droplet nuclei, that can be generated when persons with pulmonary or laryngeal TB sneeze, cough, speak, or sing. Persons who share the same airspace with persons with TB disease are at greatest risk for infection. Infection occurs when a susceptible person inhales droplet nuclei containing tubercle bacilli, and these bacilli become established in the alveoli of the lungs and spread throughout the body.

IDENTIFICATION OF PERSONS WITH LATENT TB INFECTION AND TB DISEASE

Identifying Latent TB Infection (LTBI)

A person exposed to an individual with infectious TB or who has other risk factors for TB as noted above should be given a Mantoux tuberculin skin test (TST) or the QuantiFERON®-TB Gold test (QFT-G).

The Mantoux Tuberculin Skin Test

The Mantoux tuberculin skin test is the intradermal injection of purified protein derivative (PPD) of killed tubercle bacilli, usually on the inner forearm. The site is examined by a

trained health care worker 48 to 72 hours after injection for induration (palpable swelling). The diameter of induration is measured and recorded; erythema or bruising is disregarded.

The criteria endorsed by the American Thoracic Society (ATS) and the Centers for Disease Control and Prevention (CDC) for a positive tuberculin skin-test result (Table 1) are intended to increase the likelihood that persons at high risk for TB will be candidates for treatment of LTBI and that persons having tuberculin reactions not caused by *M. tuberculosis* will not receive unnecessary diagnostic evaluation or treatment.

For each of the risk groups listed in Table 1, reactions below the cutoff point are considered negative. A negative TST result does not absolutely rule out LTBI, especially in persons with TB-like symptoms, HIV infection, or AIDS. Also, it takes up to 8 weeks from the time of exposure for a person to react to tuberculin; thus, the initial TST result of an infected contact may be falsely negative. Therefore, a repeat TST 8–10 weeks postexposure is warranted.

Some persons with both HIV and latent TB infections may have false-negative TST reactions (anergy). Anergy refers to the inability to react to a skin-test antigen even though the person is infected with the organism being tested. Several delayed-type hypersensitivity (DTH) antigens (such as tetanus toxoid, mumps, or Candida) administered by the Mantoux technique have been used in an attempt to determine anergy status. Recent CDC recommendations, however, note several factors that limit the usefulness of anergy skin testing. These include problems with standardization and reproducibility, the low risk for TB associated with a diagnosis of anergy, and the lack of apparent benefit of LTBI treatment for groups of anergic HIV-infected persons. Therefore, the use of anergy testing in conjunction with PPD testing is no longer routinely recommended for TB testing programs in the United States.

Persons with LTBI should be evaluated for HIV risk behaviors and offered counseling and HIV-antibody testing especially if such risk behaviors are present.

Table 1:
Summary of interpretation of tuberculin skin-test (TST) results

An induration of ≥**5 mm** is classified as positive in the following groups:

- Persons who have HIV infection;
- Persons who have had recent close contact with persons who have TB;
- Patients who have had organ transplants, and other immunosuppressed patients (receiving the equivalent of ≥15 mg/day of prednisone for ≥1 month);
- Persons with fibrotic changes on chest radiograph consistent with old TB;
- Persons receiving specialized treatment for rheumatoid arthritis or Crohn's disease.

An induration of ≥**10 mm** is classified as positive in all persons who do not meet any of the above criteria, but belong to one or more of the following groups having high risk for TB:

- Foreign-born persons recently arrived (e.g., within the last 5 years) from areas having a high prevalence or incidence of TB;
- Persons who inject illicit drugs;
- Residents and employees of high-risk congregate settings: prisons and jails, nursing homes and other long-term facilities for the elderly, health-care facilities (including some residential mental health facilities), and homeless shelters;
- Mycobacteriology laboratory personnel;
- Persons who have other medical conditions that have been reported to increase the risk for progressing from LTBI to TB – these medical conditions include diabetes mellitus, silicosis, prolonged corticosteroid therapy and other immunosuppressive therapy, cancer of the head and neck, hematologic and reticuloendothelial diseases, end-stage renal disease, intestinal bypass or gastrectomy, chronic malabsorption syndromes, or weight loss of >10% below ideal body weight;
- Children <4 years of age, or children and adolescents exposed to adults in high-risk categories.

An induration of ≥**15 mm** is classified as positive in persons who do not meet any of the above criteria.

QuantiFERON®-TB Gold Test (QFT-G)

The QuantiFERON®-TB Gold test (QFT-G) is a blood test that measures a person's immune reactivity to *M. tuberculosis*. Blood specimens are mixed with antigens and incubated for 16–24 hours. In a person with LTBI, the blood cells recognize the tuberculin antigen and release interferon-gamma (IFN-γ); results are based on the proportion of IFN-γ released. The first generation QFT (QuantiFERON®-TB test) was approved by the U.S. Food and Drug Administration (FDA) in 2001. The second generation test (QuantiFERON®-TB Gold test) was approved by the FDA in 2005.

QFT-G advantages:

- Requires a single patient visit
- Does not cause booster phenomenon
- Less subject to reader bias than TST

QFT-G disadvantages:

- Blood sample must be processed in 12 hours

QFT-G is recommended for

- Initial and serial testing for those at increased risk for LTBI

CDC discourages use of diagnostic tests for LTBI among populations at low risk for infection with *M. tuberculosis*. However, initial testing is occasionally performed among certain population groups for surveillance purposes or where cases of infectious TB disease might result in extensive transmission to highly susceptible populations, including the following:

- Initial and serial testing of persons who are at low risk for LTBI, but whose future activity places them at increased risk of exposure;
- Testing of those who are not considered to have an increased possibility of infection, such as persons meeting entrance requirements for certain schools and workplaces.

There are limited data regarding the use of QFT-G for

- Screening of pregnant women, children under the age of 17, or persons with clinical conditions that increase the risk of progression to disease

QFT-G is not currently recommended for

- Confirmation of TST results
- Diagnosis of *M. avium*-complex disease

Please refer to the CDC website for the most current information on the use of QFT-G: www.cdc.gov/tb.

The Bacille Calmette-Guérin (BCG) Vaccine

The Bacille Calmette-Guérin (BCG) vaccine is a live vaccine derived from a strain of *Mycobacterium bovis* that was attenuated by Calmette and Guérin at the Pasteur Institute in Lille, France. An early version of BCG was first administered to humans in 1921. Since that time, many different strains have been derived and are used today throughout the world. BCG vaccination is not generally recommended in the United States because of the low risk of infection with *M. tuberculosis*, the variable effectiveness of the BCG vaccine against adult pulmonary TB, and the vaccine's interference with the ability to interpret tuberculin reactivity.

Many foreign countries still use BCG as an appropriate part of their TB control programs for infants. In persons vaccinated with BCG, sensitivity to tuberculin is highly variable, depending upon the strain of BCG used, the group vaccinated, and age at vaccination.

Neither the TST nor QFT-G is contraindicated for persons who have been vaccinated with BCG. The presence or size of a postvaccination TST reaction does not predict whether BCG will provide any protection against TB disease. The size of a TST reaction in a BCG-vaccinated person is not a factor in determining whether the reaction is caused by *M. tuberculosis* infection or by the prior BCG vaccination.

The TST results are used to support or exclude the diagnosis of LTBI. TST results in persons vaccinated with BCG should be interpreted using the same criteria for those not BCG vaccinated. Such persons should be evaluated for isoniazid to treat LTBI after disease has been ruled out.

Identifying TB Disease

If the skin-test result or QFT-G is positive, or if symptoms suggestive of TB are present (e.g., productive and prolonged cough, fever, chills, loss of appetite, weight loss, fatigue, or night sweats), a chest radiograph should be obtained to determine if active pulmonary TB is present. The chest radiograph may also be used to detect the presence of fibrotic lesions suggestive of old, healed TB or silicosis.

Acid-fast bacilli (AFB) smears and cultures should be performed on sputum specimens of all persons who have symptoms of TB or whose chest radiograph suggests TB. A positive AFB smear is an indication for beginning treatment for TB. However, a positive AFB smear may also indicate the presence of nontuberculous mycobacteria. A positive culture for *M. tuberculosis* is the only definitive proof of TB disease.

Health care providers of HIV-infected persons should be aware of atypical patterns of TB disease in these persons. Extrapulmonary TB is more common among HIV-infected persons. Also, pulmonary TB may present in an unusual manner (e.g., in the lymph nodes or in the lower part of the lungs).

All persons with LTBI or TB disease should routinely be offered HIV counseling, testing, and referral because medical management may be altered in the presence of HIV infection.

Maintain a high index of suspicion for TB in persons with undiagnosed pulmonary disease, especially in persons who are HIV seropositive.

PREVENTION OF TUBERCULOSIS

The main purpose of treating LTBI is to prevent it from progressing to clinically active TB disease. Therefore, persons with positive tuberculin skin test results who do not have clinically active disease should be evaluated for treatment of LTBI.

Candidates for Treatment of Latent TB Infection

Persons in the following high-risk groups should be considered for treatment of LTBI if their reaction to the tuberculin skin test is ≥5 mm of induration:

- Persons with HIV infection*
- Close contacts of a TB case*

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*In some circumstances, persons in these categories may be evaluated for the treatment for LTBI in the absence of a positive TST. Treatment for LTBI should be given after TB disease has been ruled out. Some close contacts who have a negative tuberculin skin test reaction (<5 mm of induration) should be evaluated for treatment of LTBI. These contacts include children less than 5 years of age, immunosuppressed people, and others who may develop TB disease quickly after infection.

Close contacts who have a negative reaction to an initial skin test should be retested 8 to 10 weeks after they were last exposed to TB. If receiving treatment for LTBI, treatment may be discontinued if the skin test result is again negative and if the person is no longer exposed to TB.

However, close contacts known to have or suspected of having HIV infection and other immunocompromised persons should be given treatment for LTBI regardless of their skin test reaction.

Because of their age, infants and young children with a positive skin test are known to have been infected recently, and are at high risk of their infection progressing to disease. Infants and young children are also more likely than older children and adults to develop life-threatening forms of TB disease.

Children <5 years of age who are close contacts to someone with infectious TB should receive treatment for LTBI even if the tuberculin skin test result and chest radiograph do not suggest TB. A second tuberculin test should be placed 8–10 weeks after the last exposure to infectious TB. Treatment of LTBI can be discontinued at that time if **all** of the following conditions are met:

- The second tuberculin test is negative.
- The second test was performed at least 10 weeks after the child was last exposed to infectious TB.
- The child is at least 6 months of age.

- Patients who have had organ transplants, and other immunosuppressed patients (receiving the equivalent of ≥15 mg/day of prednisone for ≥1 month)
- Persons with fibrotic changes on chest radiograph consistent with old TB disease
- Persons receiving specialized treatment for rheumatoid arthritis or Crohn's disease

Persons in the following high-risk groups should be considered for treatment of LTBI if their reaction to the tuberculin skin test is ≥10 mm of induration:

- Recent arrivals to the United States (≤5 years) from high-prevalence countries
- Persons who inject illicit drugs
- Residents and employees of high-risk congregate settings
- Mycobacteriology laboratory personnel
- Persons with medical conditions that make them high risk (see Table 1, "Summary of interpretation of tuberculin skin-test results")
- Children <4 years of age, or children and adolescents exposed to adults in high-risk categories

In general, persons with no known risk factors for TB should not be tested for LTBI. However, testing is occasionally performed among certain population groups for surveillance purposes or where a case of TB could result in extensive transmission. If testing is performed in these populations, they may be considered for treatment of LTBI if their reaction to the tuberculin test is ≥15 mm of induration. This group should be given a lower priority for prevention efforts than the groups listed previously.

Regimens for the Treatment of Latent TB Infection

For persons suspected of having LTBI, treatment of LTBI should not begin until TB disease has been excluded. Persons suspected of having TB disease should receive the recommended multidrug regimen for treatment of disease until the diagnosis is confirmed or ruled out.

Although regimens are broadly applicable, there are modifications that should be considered under special circumstances (i.e., HIV infection, suspected drug resistance, pregnancy, or treatment of children). Listed in Table 2 are the regimens; please refer to *Targeted Tuberculin Testing and Treatment of Latent TB Infection* for detailed information for the treatment of LTBI.

Table 2: Drug Regimens for the Treatment of LTBI

Drugs	Duration (months)	Dosing Frequency	Minimum Doses
Isoniazid	9	Daily	270
		Twice Weekly	76
Isoniazid	6	Daily	180
		Twice Weekly	52
Rifampin	4	Daily	120
Rifampin/ Pyrazinamide	Generally should not be offered for treatment of LTBI		

Owing to the reports of severe liver injury and deaths, CDC and ATS now recommend that the combination of rifampin (RIF) and pyrazinamide (PZA) should generally not be offered for the treatment of LTBI. If the potential benefits substantially outweigh the demonstrated risk of severe liver injury and death associated with this regimen and the patient has no contraindications, a TB/LTBI expert should be consulted prior to the use of this regimen. (Clinicians should continue the appropriate use of RIF and PZA in multidrug regimens for the treatment of TB disease.)

Monitoring

Isoniazid (INH) or Rifampin Alone

Routine laboratory monitoring during treatment of LTBI is indicated only for those whose baseline tests suggest a liver disorder and for other persons with a risk of hepatic disease. Laboratory testing should be performed to evaluate possible adverse reactions that occur during the treatment regimen.

Rifampin/Pyrazinamide or Rifabutin/Pyrazinamide

A TB/LTBI expert should be consulted prior to the use of this regimen.

CDC is collecting reports of severe adverse events (i.e., leading to hospital admission or death) in persons receiving **any** treatment regimen for LTBI. Report possible cases to the Division of Tuberculosis Elimination by calling (404) 639-8401 or by e-mail to Lmanangan@cdc.gov.

To ensure that persons in high-risk groups adhere to therapy, INH can be given twice weekly at a dosage of 15 mg/kg, up to a maximum of 900 mg, using directly observed therapy (DOT) of LTBI. DOT refers to the observation by a health care provider of patients as they ingest anti-TB medications.

The method of DOT of LTBI should be based on a thorough assessment of each patient's needs, living and employment conditions, and preferences. The patient and provider should agree on a method that ensures the best possible DOT of LTBI routine and that maintains the patient's confidentiality.

Situations in which patients not receiving DOT for LTBI miss appointments or demonstrate other nonadherent behavior should be brought to the attention of the appropriate public health officials. These patients should be considered for DOT of LTBI.

Persons given treatment for LTBI should be monitored monthly for drug side effects, especially signs and symptoms of hepatitis.

TREATMENT OF TUBERCULOSIS

Regimens for the Treatment of Tuberculosis

TB is usually curable if effective treatment is instituted without delay. TB treatment regimens must contain multiple drugs to which the organisms are susceptible. Treatment with a single drug can lead to the development of a bacterial population resistant to that drug. Likewise, the addition of a single drug to a failing antituberculosis regimen can lead to resistance to that drug.

There are four basic regimens* recommended for treating adults with culture-positive TB caused by organisms that are known or presumed to be susceptible to INH, RIF, PZA, and ethambutol (EMB). Each treatment regimen consists of an initial 2-month treatment phase followed by a continuation phase. The continuation phase is generally 4 months for the majority of patients. All TB drugs should be given together rather than in divided doses.

The continuation phase should be extended to 7 months for a total of 9 months (an additional 3 months) for patients

- Who have cavitary pulmonary TB on a chest radiograph at diagnosis and positive sputum cultures at completion of the initial phase; or
- Whose initial phase of treatment did not include PZA; or
- Who are being treated with once-weekly INH and rifapentine (RPT) (only in HIV-negative patients

*Although these regimens are broadly applicable, there are modifications that should be made under specified circumstances. Please refer to *Treatment of Tuberculosis, MMWR* 2003; 52(No. RR-11) for detailed information on TB treatment regimens.

without cavitation for pulmonary disease) and whose sputum culture is positive at completion of the initial phase.

Treatment completion is determined primarily by the number of doses ingested within a specified time frame. The duration of therapy depends on the drugs used, the drug susceptibility test results, and the patient's response to therapy. All 6-month regimens must contain INH, RIF, and initially, PZA; all regimens of 9 months or less must contain INH and RIF.

Management of HIV-related TB disease is complex, and the clinical and public health consequences associated with the failure of treatment are serious. The care for HIV-related TB should be provided by or in consultation with experts in the management of both TB and HIV disease. Every effort should be made to use a rifamycin-based regimen for the entire course of therapy.

Recommendations for the treatment of TB in HIV-infected adults are the same as for HIV-negative patients, with two exceptions:

- Once-weekly administration of INH/rifapentene in the continuation phase should **not** be used in any HIV-positive patient

- Twice-weekly administration of INH/RIF or rifabutin in the continuation phase should **not** be used for patients with CD4+ lymphocyte counts less than 100/µl

Adherence

A major cause of treatment failure and drug-resistant TB is nonadherence to treatment. Treatment failure and drug-resistant TB threaten the health of TB patients. These factors also pose serious public health risks because they can lead to prolonged infectiousness and the transmission of TB within the community.

One way to ensure that patients adhere to therapy is to use directly observed therapy (DOT). DOT means that a health care worker or another designated person watches the patient swallow each dose of TB medication. DOT should be considered for all patients because clinicians are often inaccurate in predicting which patients will adhere to medication on their own.

In many areas, patients are routinely given DOT. DOT has been shown to be cost-effective when intermittent regimens are used. Nearly all the treatment regimens for drug-susceptible TB can be given intermittently if they are directly observed; using intermittent regimens reduces the total number of doses a patient must take, as well as the total number of encounters with the health care provider or outreach worker. Furthermore, DOT can significantly reduce the frequency of acquired drug resistance and relapse.

Other measures commonly used to promote adherence:

- Developing an individualized treatment plan for each patient
- Working with outreach staff from the same cultural and linguistic background as the patient
- Educating the patient about TB medication dosages and possible adverse reactions
- Using incentives and enablers to remove barriers to adherence (e.g., transportation tokens and food vouchers)
- Facilitating access to health and social services

REPORTING

Every state has legal TB reporting requirements. All new TB cases and suspect cases should be reported promptly to the health department by the clinician. Cases may also be reported by infection control nurses or by pharmacies when TB drugs are dispensed. In addition, all positive TB smears

and cultures should be reported promptly by laboratories. Early reporting is important for the control of TB, and it gives clinicians access to the resources of the health department for assistance in case management (e.g., DOT) and contact investigation.

MULTIDRUG-RESISTANT TUBERCULOSIS (MDR TB)

An extremely serious aspect of the TB problem in the United States is MDR TB (i.e., TB caused by organisms resistant to at least isoniazid and rifampin, the two most important anti-TB drugs). **MDR TB can usually be prevented by initially treating TB patients with four drugs and by administering TB medications on a directly observed basis.** Persons at high risk for MDR TB include persons who have been recently exposed to MDR TB, especially if they are immunocompromised; TB patients who failed to take medications as prescribed; TB patients who were prescribed an ineffective treatment regimen; and persons previously treated for TB.

MDR TB presents difficult treatment problems. Treatment must be individualized and based on the patient's medication history and drug susceptibility study results. **Clinicians who are not expert with the management of patients with MDR TB disease or with patients infected with multidrug-resistant organisms should seek expert consultation. Contact your state health department TB program or your Regional Training and Medical Consultation Center (RTMCC). Contact information for the RTMCCs is located at the back of this booklet.**

The risk for progression to TB disease should be considered before recommending treatment for LTBI. Alternative regimens should consist of drugs to which the infecting organism has demonstrated susceptibility. A potential regimen includes daily fluoroquinolone, an antibiotic, for 6-12 months.

Contacts may be treated for 6 months or observed without treatment. Immunocompromised contacts (e.g., persons who are HIV infected) should be treated for 12 months. All persons with suspected MDR LTBI should be followed for 2 years regardless of the treatment regimen.

INFECTION CONTROL MEASURES

The spread of TB in health care settings can be minimized by implementing CDC recommendations for preventing TB transmission in these settings. The early detection, airborne infection isolation, and treatment of disease in persons with infectious TB are essential to controlling transmission. TB should be suspected in all persons with symptoms consistent with TB (e.g., cough, fever, night sweats, chills, fatigue, weight loss, or loss of appetite), especially those with confirmed or suspected HIV infection and undiagnosed pulmonary disease. Precautions should be taken to prevent airborne transmission of infection until TB is diagnosed and treated or ruled out.

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.

Precautions should be taken during and immediately after procedures that may induce coughing, such as bronchoscopy, sputum collection, the aerosol induction of sputum, and the administration of aerosolized medication, such as pentamidine.

Antituberculosis drug treatment should be promptly initiated for persons with TB disease to render them noninfectious. Persons at high risk for LTBI should be tested and, if infected, evaluated for LTBI treatment. Ongoing TB testing should be provided to health care workers who have regular contact with persons with TB or HIV infection.

Remember! The key to preventing LTBI and death and disability from TB disease is to consider the possibility of TB in high-risk groups, make the diagnosis as quickly as possible, and initiate effective, directly observed drug therapy for persons found to have TB. Think TB!

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RESOURCES

For more information about TB, contact your state or local health department.

Or contact your Regional Training and Medical Consultation Center:

- Francis J. Curry National Tuberculosis Center
  Phone: (415) 502-4600
  Website: www.nationaltbcenter.edu
  Serving AK, AS, CA, CO, FM, GU, HI, ID, MH, MP, MT, NV, OR, PW, UT, WA, and WY.

- Heartland National Tuberculosis Center
  Phone: (800) 839-5864
  Website: www.heartlandntbc.org/heartland.htm
  Serving AZ, IA, IL, KS, MN, MO, NM, NE, ND, OK, SD, TX, and WI.

- Northeastern Regional Training and Medical Consultation Consortium
  Phone: (800) 482-3627
  Website: www.umdnj.edu/globaltb/home.htm
  Serving CT, DC, DE, IN, MA, MD, ME, MI, NH, NJ, NY, OH, PA, RI, VT, and WV.

- Southeastern National Tuberculosis Center
  Phone: (352) 265-7682
  Website: http://sntc.medicine.ufl.edu/
  Serving AL, AR, FL, GA, KY, LA, MS, NC, PR, SC, TN, VA, and VI.

To order this document or other educational materials about TB, visit

CDC Division of Tuberculosis Elimination Website at www.cdc.gov/tb

TB Education and Training Resources Website

This site may be used to search for TB education and training materials, submit TB materials for inclusion in the database, find out how to order TB materials, locate funding opportunities, get information about TB organizations, find out about upcoming events, sign up for TB-related listservs and digests, and locate TB-related Web links. This website is intended for use by TB and other health care professionals, patients, and the general public. The TB Education and Training Resources Website can be accessed at www.findtbresources.org.

Other TB-related resources

TB-Update

This weekly e-mail update is a compilation of TB-related articles published for the benefit and information of people interested in TB. To subscribe, please visit www.cdcnpin.org/scripts/subscribe.asp#journal.

TB Education and Training Network

TB ETN was formed to bring TB professionals together to network, share resources, and build education and training skills. Currently, membership includes representatives from TB programs, correctional facilities, hospitals, nursing homes, federal agencies, universities, American Lung Associations, Regional

Training and Medical Consultation Centers, and other U.S. and international organizations interested in TB education and training issues. Additional information about TB ETN can be accessed at www.cdc.gov/nchstp/tb/TBETN.