TUBERCULOSIS

Also known as: TB, Consumption

Responsibilities:
Hospital: Report by facsimile, mail or phone
Infection Preventionist: Notify Iowa TB Control Program
Lab: Report presumptive/positive cultures of TB
Physician: Report all suspected or active cases by mail or phone
Local Public Health Agency (LPHA): Follow-up required

Iowa Department of Public Health TB Control Program: (515) 281-8636 or (515) 281-7504
Secure Fax: (515) 281-4570

1) THE DISEASE AND ITS EPIDEMIOLOGY

A. Agent

TB is a communicable disease caused by *Mycobacterium tuberculosis*, sometimes referred to as the tubercle bacillus. It is spread primarily by tiny airborne particles (droplet nuclei) expelled from a person who has infectious TB. If another person inhales air containing these droplet nuclei, transmission may occur. Some bacilli reach the alveoli, where they are ingested by macrophages. Infection begins with the multiplication of tubercle bacilli within these alveolar macrophages. Some of the bacilli spread through the bloodstream when the macrophages die; however, the immune system response usually contains the bacilli and prevents the development of disease. Persons who are infected but who do not have TB disease are asymptomatic and not infectious; such persons usually have a positive reaction to the tuberculin skin test (PPD). Only 10% of infected persons will develop TB disease at some time in their lives, but the risk is considerably higher for persons who are immunosuppressed, especially those with HIV infection. Although the majority of TB disease in adults is pulmonary, TB can occur in almost any anatomical site or as disseminated disease.

B. Clinical Description

Symptoms: The general symptoms of TB disease include feeling sick or weak, weight loss, fever, and night sweats. The symptoms of pulmonary TB include coughing, chest pain, and coughing up blood. Other symptoms depend on the part of the body that is affected.

Onset: Persons at the highest risk of becoming infected with tuberculosis are close contacts — persons who have had prolonged, frequent, or intense contact with a person with infectious TB. Close contacts may be family members, roommates, friends, co-workers, or others. Data collected by CDC since 1987 show that infection rates have been relatively stable, ranging from 30% for the contacts of infectious TB patients.

Complications: Person's with TB can develop life-threatening complications. Worldwide, approximately two million people die each year from TB. If treated properly and early enough, people with TB can be cured.

Infants/children -- LTBI: Because of their age, infants and young children with LTBI are known to have been infected recently, and thus are at a 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. Children <5 years of age who are close contacts should receive treatment for LTBI even if the tuberculin skin test result and chest radiograph do not suggest TB, because infected infants may be anergic as late as 6 months of age. A second tuberculin test

should be done 8 – 10 weeks after the last exposure to infectious TB. Treatment of LTBI can be discontinued if **all** of the following conditions are met:

- The infant is at least 6 months of age;
- The second tuberculin skin test is negative;
- The second test was performed at least 8 weeks after the child was last exposed to infectious TB.

Infants/children –TB disease: Because of the high risk of disseminated tuberculosis in infants and children younger than 5 years of age, treatment should be started as soon as the diagnosis of tuberculosis is suspected.

C. Reservoirs

Common reservoirs: Humans

Less Common reservoirs: Livestock, wildlife, mainly for *m. bovis*.

D. Modes of Transmission

Spread: TB germs are placed in the air when a person with pulmonary TB disease of the lungs or throat coughs, sneezes, speaks or sings. When a person inhales air that contains TB germs, he or she may become infected. Pulmonary Tuberculosis (TB) is spread from person to person through the air. It usually affects the lungs, but it can also affect other parts of the body, such as the brain, kidneys, or spine. People with TB infection (and not disease) do not feel sick and do not have any symptoms. However, they may develop TB disease at some time in the future.

People with TB disease are most likely to spread it to people they spend time with every day, such as family members or co-workers. If someone thinks they have been around someone who has TB disease, they should go to their medical provider or the local health department for tests. It is important to remember that people who have TB infection but not TB disease cannot spread the germs to others.

E. Incubation period

For people with latent TB infection (LTBI) and no risk factors, the risk of LTBI developing into disease is about 10% over a lifetime. For people with TB infection and diabetes, the risk is 3 times higher, or about 30% over a lifetime. For people with TB infection and HIV infection, the risk is about 7% to 10% PER YEAR, a very high risk over a lifetime.

F. Period of Communicability or Infectious Period

In general, patients who have suspected or confirmed active TB should be considered infectious if (a) they are coughing, undergoing cough-inducing procedures, or their sputum smears are positive for acid-fast bacilli; **and** (b) they are not receiving therapy, have just started therapy, or have a poor clinical or bacteriologic response to therapy. The infectious period is closed when the following criteria are satisfied: 1) effective treatment (as demonstrated by *M. tuberculosis* susceptibility results) for $\geq$2 weeks; 2) diminished symptoms; and 3) mycobacteriologic response (e.g., decrease in grade of sputum smear positivity detected on sputum-smear microscopy). The exposure period for individual contacts is determined by how much time they spent with the index patient during the infectious period. Multidrug-resistant TB (MDR TB) can extend infectiousness if the treatment regimen is ineffective. Any index patient with signs of extended infectiousness should be continually reassessed for recent contacts.

More stringent criteria should be applied for setting the end of the infectious period if particularly susceptible contacts are involved. A patient returning to a congregate living setting or to any setting in which susceptible persons might be exposed should have at least three consecutive negative sputum AFB smear results from sputum collected $\geq$8 hours apart (with one specimen collected during the early morning) before being considered noninfectious.

G. Epidemiology

One third of the world's population is infected with the TB bacteria and each year over 9 million people around the world become ill from it. An estimated 10 - 15 million persons in this country are infected with *M. tuberculosis*. TB disease may develop in these persons at some time in the future. For current TB data, please refer to the IDPH TB Control webpage: www.idph.state.ia.us/ImmTB/TB.aspx?prog=Tb&pg=TbHome

H. Bioterrorism Potential

None.

2) DISEASE REPORTING AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting:

Prevention and control efforts should include three priority strategies:

- Identifying and treating all persons who have TB disease
- Finding and evaluating persons who have been in contact with TB patients to determine whether they have TB infection or disease, and treating them appropriately
- Testing high-risk groups for TB infection to identify candidates for treatment of latent infection and to ensure the completion of treatment.

B. Laboratory and Healthcare Provider Reporting Requirements

Iowa Administrative Code 641-1.3(139) stipulates that the laboratory and the healthcare provider must report suspected/confirmed *M. tuberculosis*.

What to report:

- Pulmonary and extrapulmonary sites of disease should be reported to IDPH within one working day. This includes laboratory confirmed or clinically suspected tuberculosis disease.
- Latent tuberculosis infection (LTBI) is not reportable.
- IDPH provides medication free of charge for anyone to treat both LTBI and TB disease.

How to report tuberculosis:

Call or FAX: IDPH TB Control Program
(515) 281-8636 or (515) 281-7504
Fax (515) 281-4570.

IDPH TB Control Program requests that tuberculosis cases be reported by phone to help ensure timely public health follow-up measures.

Specimens should be submitted to:

State Hygienic Laboratory
UI Research Park - Coralville
Iowa City, IA 52242-5002
319-335-4500 or 800-421-IOWA

Postage-paid disease reporting forms are available free of charge from the Iowa TB Control Program at (515) 281-8636 or (515) 281-7504.

Both outpatient and inpatient facilities that offer services for TB patients should have ready access to laboratory and diagnostic services. Access to radiological services includes radiography equipment, trained radiography technicians, and radiograph interpretation by a qualified person. Radiograph findings and reports should be available within 24 hours.

Laboratory services should be readily accessible to provide results of acid-fast bacilli smear examinations within 24 hours of specimen collection. The State Hygienic Lab is designated to process all isolates for TB in the state. Smear results are available within 24 hours from receipt of the specimen. All initial positive smears are telephoned to the submitting facility.

AMPLIFIED MYCOBACTERIUM TUBERCULOSIS Direct (MTD) Test
Description: Direct target-amplified nucleic acid probe test for the in vitro diagnostic detection of Mycobacterium tuberculosis complex rRNA in acid-fast bacilli (AFB) smear positive and negative concentrated sediments from sputum, bronchial specimens, or tracheal aspirates. For testing information, call the State Hygienic Laboratory at 319-335-4500 or the IDPH TB Control Program at 515-281-8636/515-281-7504.

The use of the BACTEC liquid culture system and DNA probes for M. tuberculosis continue to aid in rapidly and accurately isolating and identifying cultures of mycobacteria. All isolates are tested for drug susceptibilities. All M. tuberculosis identifications and susceptibility results are telephoned to the submitter immediately. The TB Control Program also receives these reports.

C. Local Public Health Agency Follow-up Responsibilities

Case Investigation

Contact Investigation

Prompt and thorough contact investigation is essential for the control of TB. The purpose of the investigation is to find contacts who (1) have TB disease so that they can be given treatment, and further transmission can be stopped, (2) have latent TB infection (LTBI) so they can be given treatment, and (3) are at high risk of developing TB disease and therefore require treatment until LTBI can be excluded.

The local health departments are legally responsible for ensuring that a complete and timely contact investigation is done for the TB cases reported in its area. Therefore, health departments should work closely with other agencies (e.g., managed care organizations, private providers) to ensure the prompt reporting of suspected TB cases. The health department should work closely with other agencies to plan the contact investigation and receive a report of the results. Occasionally, a contact investigation may be conducted by people outside of the health department, but under the supervision of the health department.

Contact investigations should be discussed with the TB Control Program Manager. The results of all contact investigations must be submitted to the Iowa TB Control Program. Forms used to document investigations are available by calling the program at (515) 281-7504 or (515) 281-8636.

3) CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements

Suspected or active cases of infectious TB should be isolated to home and not return to normal activities until they meet the criteria for non-infectiousness (see Period of Communicability or Infectious Period). Persons already living in the household may continue to do so. These persons are free to continue their normal activities. People not previously exposed should refrain from entering the environment until the patient is no longer infectious.

Although TB care and treatment are often provided by other medical care providers, the health department has the ultimate responsibility for ensuring that TB patients do not transmit *M. tuberculosis* to others. Health departments must ensure that medical services are available, accessible, and acceptable for TB patients, suspects, contacts, and others at high risk, without regard to the patients' ability to pay for such services.

B. Protection of Contacts of a Case

The local health department will identify and evaluate all close contacts of suspected or active cases of TB. These contacts will be evaluated to determine if they have latent tuberculosis infection or active disease.

C. Managing Special Situations

Reported Incidence Is Higher than Usual/Outbreak Suspected

Report unusual cases to the Iowa TB Control Program at (515) 281-7504.

Exposure of a Laboratory Worker

Confer with Iowa TB Control Program or Infection Preventionist at the place of exposure.

D. Preventive Measures

Environmental Measures

The second level of the hierarchy is the use of engineering controls to prevent the spread and reduce the concentration of infectious droplet nuclei. These controls include (a) direct source control using exhaust ventilation, (b) controlling the direction of airflow to prevent the contamination of air in areas adjacent to the infectious source, (c) diluting and removing contaminated air via general ventilation, and (d) cleaning the air via air filtration or ultraviolet germicidal irradiation

Preventive Measures/Education

Call the Iowa TB Control Program at (515) 281-8636 or (515) 281-7504.

4) ADDITIONAL INFORMATION

The Council of State and Territorial Epidemiologists (CSTE) surveillance case definitions for Tuberculosis can be found at: www.cdc.gov/osels/ph_surveillance/nndss/phs/infdis.htm#top

CSTE case definitions should not affect the investigation or reporting of a case that fulfills the criteria in this chapter. (CSTE case definitions are used by the state health department and the CDC to maintain uniform standards for national reporting.)

In the United States, the vast majority of TB cases are caused by Mycobacterium tuberculosis, sometimes referred to as the tubercle bacillus. M. tuberculosis and six very closely related mycobacterial species (*M. bovis, M. africanum*, and *M. microti*, *M. canetii, M. caprae, M. pinnipeddi*) can cause tuberculosis disease, and they compose what is known as the M. tuberculosis complex. Mycobacteria other than those comprising the *M. tuberculosis* complex are called nontuberculous mycobacteria. Nontuberculous mycobacteria may cause pulmonary disease resembling TB.

References

Centers For Disease Control and Prevention – Division of Tuberculosis Elimination www.cdc.gov/tb/
Heymann, D.L., ed. *Control of Communicable Diseases Manual, 20th Edition.* Washington, DC, American Public Health Association, 2015.

Additional Resources

Treatment of Tuberculosis: MMWR June 20, 2003 / 52(RR11); 1-77
www.cdc.gov/mmwr/preview/mmwrhtml/rr5211a1.htm
IDPH TB website: www.idph.state.ia.us/ImmTB/TB.aspx?prog=Tb&pg=TbHome