**Tuberculosis** [1]

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Tuberculosis (TB) is an infection of the lungs and respiratory system, which is the organ system that allows us to breathe. TB is caused by a bacterium called *Mycobacterium tuberculosis*. It spreads from person to person when an infected person coughs, sneezes, laughs, or spits. Tiny droplets of fluid from the lungs are carried in the air and can be breathed in by someone nearby. Although it can affect many parts of the body, TB usually occurs in the lungs.

One third of the world’s people are living with TB, and along with HIV, TB is one of the world's leading causes of death. The World Health Organization (WHO) estimates that 3.2 million women became sick with TB in 2017.

Of the roughly-ten million new cases of tuberculosis in 2017, nearly one million occurred in people
living with HIV. The risk of developing TB is estimated to be 20 to 30 times greater for people living with HIV than for those who are HIV-negative. Two thirds of global TB infections occurred in eight countries in Asia and Africa. Close to three quarters of new TB cases among people living with HIV were in Africa.

In the US, the number of new TB cases reported declined each year from 1993 to 2014; there was a slight increase in the number of cases in 2015 (1.6 percent more than in 2014). According to the Centers for Disease Control and Prevention (CDC), the number of TB cases reported in 2017 was the lowest that it has been since reporting began in 1953.

Worldwide, TB is the leading cause of death in people living with HIV in Africa, and a leading cause of death elsewhere. The WHO estimates that about one third of the 36.9 million people living with HIV worldwide are also living with TB. The CDC recommends that people living with HIV be screened for TB when they are first diagnosed with HIV; in addition, yearly screening is recommended for people living with HIV who have repeated exposure to others with active TB (see "Diagnosing TB," below).

Forms of TB

Having TB does not mean a person is contagious or able to spread TB. This is because not everyone who is infected with TB bacteria shows signs of TB infection or develops "active" disease.

- **Latent/Inactive TB** - Most people with healthy immune systems [2] can fight off TB bacteria, even after they breathe them in and are infected. This is called latent TB, which means it is inactive. People with latent or inactive TB are infected with TB yet have no symptoms. They do not feel sick and cannot spread the disease to other people. In some people, TB stays latent or inactive for their entire lives. But in other people, latent TB turns into active disease if their immune system is damaged or weakened, through things like HIV, cancer [3], or transplant surgery, which requires taking drugs to suppress the immune system.

- **Active TB** - Some people who have TB develop active disease. Active TB usually causes symptoms like coughing, night sweats, and weight loss. People with active TB can spread it to others. Active TB may develop either soon after infection or years later when a person's immune system becomes weaker.

TB and HIV

People with weakened immune systems are more likely to develop active TB disease. This includes people living with HIV, children, elderly people, and people who take drugs that suppress the immune system. Research shows that, among those with inactive TB, people living with HIV are three to 12 times more likely to develop active TB disease than HIV-negative people. Treating latent TB can greatly reduce your chances of developing active TB. Treatment of latent TB protects your health and keeps you from spreading TB to others. You can develop active TB with any CD4 count [4].

Preventing TB

<table>
<thead>
<tr>
<th>Active TB</th>
<th>Latent (inactive) TB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spreads through air when an infected person coughs, sneezes, laughs or spits</td>
<td>Cannot be spread, but can become active</td>
</tr>
<tr>
<td>After a person with active TB has been treated for 2-3 weeks (see &quot;TB Treatment&quot; below), they usually do not spread TB anymore.</td>
<td>Treatment to prevent latent TB from becoming active.</td>
</tr>
</tbody>
</table>
Positive sputum (spit) test (see "Finding and Diagnosing TB" below) or chest X-ray confirm active TB.

Positive TB skin or blood test (see "Finding and Diagnosing TB" below) means you have TB, but not necessarily active TB.

People living with HIV may have a negative TB skin test, but still have been exposed to TB (have latent TB). They should therefore have a blood or sputum test instead of a skin test.

Family members of people with active TB, people living in the same household, health care workers, and people who live in residential facilities like homeless shelters and prisons are most likely to get TB.

People with active TB should be separated from others until they can no longer spread the disease. If you have TB or spend time around people with TB, it is important to wear a disposable face mask. Certain types of air filters can trap the TB bacteria, and ultraviolet light can kill it.

**TB Symptoms**

After TB bacteria are inhaled, they settle in the lungs. People with healthy immune systems can usually fight the bacteria and keep it from multiplying. The immune system may build structures inside the lung that contain the bacteria. These structures can burst, leaving scars in the lungs. If a person's immune system is too weak and the structures burst, the bacteria can get out and enter the bloodstream. Once in the bloodstream, they travel to other parts of the body including the brain, kidneys, bones, liver and reproductive organs, where they can cause infertility. This is called "extrapulmonary TB" because it has spread outside the lungs. Extrapulmonary TB is more likely in people with advanced HIV disease.

People with active TB disease may develop symptoms including:

- Cough lasting more than two to three weeks
- Coughing up sputum (phlegm) or blood
- Unexplained weight loss
- Fever or chills
- Night sweats
- Fatigue (unusual tiredness)
- Loss of appetite
- Chest pain

**Finding and Diagnosing TB**

**Screening**

It is recommended that people living with HIV get screened for TB using a skin or blood test. The skin test is called a TST (tuberculin skin test) or PPD (purified protein derivative; this is the substance used to do the test). A small amount of "tuberculin" (a TB protein) is injected under the skin of the arm, and the test is checked or "read" two to three days later by a health care worker who looks at the spot on the arm and measures any swelling. The test is positive if the area develops a hard swelling under the skin that is bigger than 5mm (5mm is a little smaller than a standard pencil eraser). The swelling shows that the person has developed antibodies (disease-fighting germs) against TB. The body produces these antibodies if the person has been exposed to TB (has latent TB) or if they have been vaccinated against TB. The TB vaccine is rarely used in the US, but it is common in other countries.

There is also a blood test that screens for TB called an interferon-gamma release assay (IGRA) that measures whether your body has been exposed to TB before. With the IGRA test, there is no need to return to a health clinic; results are usually available within 24 hours and can be communicated by phone.
Diagnosis

For people who are suspected of having active TB because they have symptoms, health care providers will often suggest a TB test called the Xpert MTB/RIF test. This test uses sputum (mucus or phlegm you cough up from your lungs) and takes less than three hours to give results. It tests for the genetic material of TB (TB’s DNA) and for resistance to rifampin (a drug used to treat TB; see more below) at the same time.

Your health care provider will look at your symptoms as well as other tests, such as chest X-rays and sputum tests, before diagnosing you with active TB disease.

TB Treatment

There are two types of treatment for TB:

Preventive Treatment

If you have latent or inactive TB (infected but no symptoms), your health care provider will likely suggest that you start treatment to help your body get rid of the TB germ. This treatment is intended to prevent active TB (TB with symptoms) from developing. Treatment typically involves nine months of an antibiotic called isoniazid (INH) plus vitamin B6 supplements.

Although it is recommended that all people living with HIV begin taking HIV drugs as soon as possible, there may still be rare instances in which people living with HIV and TB are not yet taking HIV drugs. These people may be treated with INH and B6 plus rifapentine or rifampin for only three months. The INH, B6, and rifapentine or rifampin treatment combination is not recommended for people on HIV treatment because rifapentine and rifampin can interact[5] negatively with some HIV drugs. Your health care provider will help you decide which treatment option is best for you.

During INH and B6 treatment, your provider will draw blood for lab tests to check for any side effects[6] from the INH medication, such as liver inflammation. The first set of lab tests will be done after you have taken the medication for one month. Also, your provider will question you regularly about any side effects you may be having from the INH. Possible side effects from INH include:

- loss of appetite
- nausea and/or abdominal pain
- jaundice (yellowness of the skin, eyes, and mucous membranes)
- dark urine
- rash
- numbness and tingling of your hands and/or feet (peripheral neuropathy)
- fever and weakness for more than three days
- muscle soreness
- long-lasting fatigue (extreme tiredness)

The pyroxidine or B6 medication is taken to prevent the peripheral neuropathy[7] symptoms that INH can cause. It is important not to drink alcohol while you are taking INH, or your liver may become badly damaged.

Treatment of Active Disease

Treatment of active TB requires combination therapy. The usual regimen is:

- Isoniazid (INH)
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(https://www.thewellproject.org)

- Rifampin (also known as rifampicin, Rifadin, or Rimactane)
- Pyrazinamide
- Ethambutol (Myambutol)

These four drugs are taken daily for two months. Tests can be done to see how well the drugs are fighting the TB. If the drugs are fighting the TB well, then the treatment changes to just two drugs: isoniazid plus rifampin for four more months. Sometimes the treatment will last longer, depending on whether or not the TB is resistant [8] to these drugs, or if the TB disease has spread through the bloodstream to other parts of the body.

Some TB drugs can interact with HIV drugs [9]. Rifampin, for example, can interfere with protease inhibitors and non-nucleoside reverse transcriptase inhibitors. This can make it difficult to treat both diseases at the same time. If you are taking a protease inhibitor, your health care provider may make changes to your TB drugs. Your provider may also adjust your drug doses when you are being treated for both TB and HIV. Some people living with HIV may need longer TB treatment than people without HIV.

As with HIV, taking your TB drugs exactly as prescribed (good adherence [10]) is very important. Even though symptoms usually improve after three to four weeks and you feel better before you have finished taking all your drugs, the full course of treatment must be completed. This helps prevent TB from coming back and becoming resistant to drugs.

Drug-Resistant TB

Like HIV, TB can change to become resistant [8] to drugs, especially if a drug is used alone or all the medication is not taken exactly as prescribed. This can cause the drug to stop working. Therefore, it is important for your provider to test your TB for drug resistance. Drug-resistant tuberculosis (DR TB) must be treated with a combination of drugs. Some TB strains are now resistant to several different drugs. These strains are called multiple-drug resistant tuberculosis (MDR TB) and extensively-drug resistant tuberculosis (XDR TB). XDR TB is resistant to almost all medications used to treat TB. As a result, many more people with XDR TB die or their TB treatment does not work. It is estimated that almost half a million new cases of MDR TB occurred in 2014.

TB and Pregnancy

According to the CDC, untreated TB is a greater threat to pregnant women and their babies than TB treatment. Therefore, it is important for pregnant women to be screened and treated for TB. The TB skin test, the TB blood test, and the TB sputum test are safe during pregnancy [11]. As with anyone who is not pregnant, additional tests are needed to determine if someone who tests positive for TB has active TB disease.

For pregnant women with latent or inactive TB, INH taken daily or twice weekly at a higher dose for nine months is the usual treatment. In pregnant women with active TB disease, the usual treatment is INH, rifampin, and ethambutol daily for two months followed by INH plus rifampin for seven months (for a total of nine months of treatment). It is important for pregnant women taking INH to take pyridoxine (vitamin B6) daily to help prevent nerve damage in the mother.

Pregnant women [11] should not take streptomycin because it can cause deafness in babies. Pyrazinamide is most often not recommended during pregnancy, as its effects on the developing baby are not yet known. Other TB drugs that should be avoided during pregnancy include: kanamycin, amikacin, capreomycin, and fluoroquinolones (an entire group or type of antibiotics).

The Bottom Line

TB is a serious disease that is a leading cause of death in people living with HIV worldwide. Many people can keep TB under control and have latent, or inactive, disease. But people with weakened
immune systems, including some people living with HIV, are much more likely to develop active TB disease that needs treatment. In many ways, TB and HIV treatment are similar. Both diseases must be treated with a combination of drugs, since using only one drug can lead to resistance. With both TB and HIV, good adherence is a very important factor in successful treatment. But unlike HIV, TB can usually be completely cured after less than a year of treatment.

**Tags:**

- Tuberculosis and HIV
- Tuberculosis
- TB
- TB and HIV
- tuberculin
- diagnosing TB
- TB Symptoms
- coughing
- chest pain
- Latent TB
- Active TB

**Additional Resources**

Select the links below for additional material related to tuberculosis.

- TB and HIV – Co-infection, Statistics, Diagnosis & Treatment (TBFacts.org)
- Tuberculosis in Women (World Health Organization) (PDF)
- TB/HIV Working Group
- Tuberculosis: An Unchecked Killer of Women (ACTION)
- Tuberculosis (American Lung Association)
- Questions and Answers About TB (US Centers for Disease Control and Prevention)
- Basic TB Facts (US Centers for Disease Control and Prevention)
- Tuberculosis and HIV Co-Infection (Avert)
- TB and Pregnancy (US Centers for Disease Control and Prevention)
- TB/HIV Care (organization in South Africa)
- TB and HIV (TBaler)
- TB and Women (TBaler)
- Tuberculosis (What Works for Women & Girls)
- Mycobacterium Tuberculosis Disease with HIV Coinfection (AIDSinfo)
- Global Tuberculosis Report (World Health Organization; 2017) (PDF)