Tuberculosis (TB)

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Tuberculosis (TB) is a serious infection which most often occurs in the lungs and respiratory system (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 most often occurs in the lungs.

A quarter of the world's people are living with latent TB – they are infected with TB bacteria but are not ill. Along with HIV and COVID-19, TB is one of the world's leading causes of death. The World Health Organization (WHO) estimates that 3.5 million women became sick with TB in 2022. The risk of developing active TB – becoming ill from the bacteria - is estimated to be 18 times greater for people living with HIV than for those who are HIV-negative.

In the US, up to 13 million people are living with latent TB. The US Centers for Disease Control and Prevention (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 repeatedly come into contact with people who have active TB (see "Finding and Diagnosing TB," below).

Forms of TB

Having TB does not mean a person is contagious or able to spread TB. 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 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 but have no symptoms. They do not feel sick and cannot spread the disease to other people. During this time, the immune system is healthy and able to fight off active TB. 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, 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 such as 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. People with inactive TB are much more likely to develop active TB if they are also living with HIV. Treating latent TB can greatly reduce your chances of developing active TB. You can develop active TB at any CD4 count.

Preventing TB

Active TB

Latent (inactive) TB

Spreads through air when an infected person coughs, sneezes, laughs or spits

Cannot be transmitted, but can become active

After a person with active TB has been treated for 2-3 weeks (see "TB Treatment" below), they usually do not transmit TB anymore.

Treatment to prevent latent TB from becoming active.

Positive sputum (spit) test (see "Finding and Diagnosing TB" below) and chest X-ray confirm active TB.

Positive TB skin or blood test (see "Finding and Diagnosing TB" below) means latent TB or having been vaccinated against TB, but not necessarily active TB. Tests may be negative in people with very low CD4 cell counts and should therefore be repeated once the CD4 count reaches 200.

Family members and people living in the same household as someone with active TB, healthcare workers, and people who live or work in residential facilities, such as homeless shelters or prisons, are more likely to acquire TB.

People with active TB should be separated from others until they can no longer transmit the disease. If you have TB or spend time around people with TB, it is important to wear a disposable N95 face mask. Certain types of air filters can trap the TB bacteria, and ultraviolet light can kill them.

TB Symptoms

After TB bacteria are inhaled, they settle in the lungs. People with healthy immune systems can usually fight the bacteria and keep them from multiplying. The immune system may build structures inside the lungs 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 healthcare worker who looks at the spot on the arm and measures any swelling. The test is positive in a person living with HIV 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). In other people, the swelling must be 10 to 15mm for the test to be positive. 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 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, you do not need to return to the clinic; results are usually available within a few days, and you can call to get them.

Diagnosis

For people who have symptoms and therefore may have active TB, healthcare providers generally test saliva ("spit"). This is called a sputum smear and culture and allows the provider to identify the bacteria and test against all anti-TB drugs. Since many TB bacteria are resistant to some anti-TB drugs, such a culture helps the provider find a drug that will work. In some locations, a TB test called the Xpert MTB/RIF test is performed. It uses sputum (mucus or phlegm you cough up from your lungs), and 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 healthcare 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:

Treatment of Latent TB

If you have latent or inactive TB (infected but no symptoms), your healthcare provider will likely suggest that you start treatment to help your body get rid of the TB bacteria. This treatment is meant to prevent your inactive TB from developing into active TB (TB with symptoms).

US guidelines recommend several different treatments because certain HIV drugs interact with rifapentine and rifampin, two common anti-TB medications. Another common TB drug is isoniazid (INH). Treatment options range from a 12-week course of weekly medications to nine months of daily medications. If you are taking INH, your provider will draw blood for lab tests to check for any side effects, such as liver inflammation. The first set of lab tests will be done after you have taken INH for one month. Also, your provider will question you regularly about any side effects that you may be experiencing. Side effects are not common but can include:

- loss of appetite

- nausea and/or abdominal pain
- jaundice (yellowing 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)

In addition, pyroxidine (vitamin B6) is prescribed to prevent the peripheral neuropathy symptoms that INH can cause. It is important not to drink alcohol to prevent liver damage while you are taking INH.

Treatment of Active Disease

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

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

These four drugs are taken daily for two months. There are tests to see how well the drugs are fighting the TB. If the drugs are working 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 to these drugs, or if the TB disease has spread to other parts of the body. Recent research shows that a shorter course of treatment with two other drugs instead of rifampin may be effective. However, more studies, especially among people living with HIV, are needed to confirm this.

Some TB drugs can interact with HIV drugs. Rifampin, for example, can interfere with integrase inhibitors, 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 any of these drugs, your healthcare provider may change your HIV 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 HIV-negative people.

As with HIV, taking your TB drugs exactly as prescribed (good adherence) 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, you must finish the entire course of treatment. This helps prevent TB from coming back and becoming resistant to drugs.

Drug-Resistant TB

Like HIV, TB can change to become resistant 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.

TB and Pregnancy

According to the CDC, untreated TB is a greater threat to pregnant people and their babies than TB treatment. Therefore, it is important for pregnant people to be screened and treated for TB. The TB

skin, blood or sputum tests are safe during pregnancy. 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 people with latent or inactive TB, isoniazid (INH) taken daily or twice weekly at a higher dose for nine months is the usual treatment. In pregnant people 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 people taking INH to take pyridoxine (vitamin B6) daily to help prevent nerve damage in the pregnant person.

Pregnant people should not take streptomycin because it can cause deafness in babies. Pyrazinamide is usually not recommended during pregnancy, because we don't yet know its effects on the developing baby. 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 very important for successful treatment. But unlike HIV, TB can usually be completely cured.

Additional Resources

Select the links below for additional material related to tuberculosis.

- HIV and Tuberculosis (TB) Co-Infection (Be in the Know)
- Tuberculosis (TB) (American Lung Association)
- Questions and Answers About Tuberculosis (US Centers for Disease Control and Pr…
- TB and Pregnancy (US Centers for Disease Control and Prevention)
- TB and HIV (TBa!ert)
- TB and Women (TBa!ert)
- Tuberculosis (What Works for Women & Girls)
- TB and HIV Coinfection (US Centers for Disease Control and Prevention)
- Tuberculosis (UNAIDS)
- HIV and Tuberculosis (TB) (HIVinfo)
- Tuberculosis in Women (World Health Organization, PDF)
- HIV and Tuberculosis (World Health Organization)
- Tuberculosis: The Connection Between TB and HIV (US Centers for Disease Control…
- Tuberculosis and HIV (UNAIDS, PDF)

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