

Microbiological laboratory tests

Because other diseases can resemble tuberculosis in the X-ray image, findings during X-ray examinations are not by themselves proof of tuberculosis. To complete the diagnosis, attempts must be made in the laboratory to detect the tuberculosis bacteria. Various methods are used for this purpose.

If pulmonary tuberculosis is suspected, the sputum is examined. If there are many bacteria there, they can be seen directly in the laboratory under the microscope after staining. In addition, modern methods (PCR/NAT) can be used to detect genetic material of the bacteria within a short time. Furthermore, the sample is tested in an incubator in a culture to see whether bacteria can be cultivated.

Sometimes there are so few bacteria in the respiratory secretions that they cannot be detected under the microscope and with modern methods. However, bacteria can grow and thus be detected in a culture after several weeks. If tuberculosis bacteria are detected in the sputum or other respiratory secretions, infectious tuberculosis will be diagnosed. However, tuberculosis that is only detected from a culture is less infectious than tuberculosis that is detected under the microscope. Additional tests are also used, e.g. tissue tests, to detect tuberculosis outside the lungs.

Endoscopy of the lungs (= bronchoscopy)

If tuberculosis bacteria cannot be successfully detected from the sputum, although pulmonary tuberculosis requiring treatment is suspected, a lung endoscopy may be necessary. This allows secretions to be obtained from deeper sections of the lung, which are then examined further. If tuberculosis bacteria are found in the respiratory tract secretions (obtained in this way) infectious tuberculosis has been detected.

LATENT TUBERCULOSIS INFECTIONS (LTBI)

A latent tuberculosis infection is a bacterial tuberculosis infection without the person having developed tuberculosis. This condition is indicated by a positive THT or IGRA with an inconspicuous X-ray image. A latent tuberculosis infection is not infectious. In order to prevent a later illness after a tuberculosis infection (positive THT or IGRA), there is the option of preventative medication (preventative therapy). Whether preventative treatment is necessary and useful depends on individual factors. The decision should always be made together with your doctor. The risk of developing tuberculosis is particularly high among children and those with a weakened immune system after close contact with a person with infectious tuberculosis. Therefore, prophylactic therapy may be recommended even if the skin or blood test is negative.

RESISTANT TUBERCULOSIS

Resistance means that one or more types of tuberculosis medication have become ineffective and can no longer be used to treat tuberculosis in the patients affected. If there is resistance to the two most important types of medication in tuberculosis therapy, rifampicin and isoniazid, this is called multidrug resistance (MDR). Multidrug-resistant tuberculosis must be treated for much longer than the usual 6 months and with a larger number of medications. The chances of recovery are also lower. The development of resistance must therefore be avoided at all costs.

TREATMENT

Uncomplicated tuberculosis cases can be treated with medication. The aim of the therapy is to cure the disease; to do so, all tuberculosis bacteria must be killed. The treatment generally takes 6 months. During the first 2 months, a combination of 4 different medications is administered. 2 of the medications have to be taken for an additional 4 months. Even if the infected person feels better shortly after the start of therapy or no longer exhales bacteria, it is essential to take the medication daily and until the end of the therapy. Therapy that is too short or irregular can lead to a relapse or the medication becoming ineffective (resistances), which is often more difficult to treat.

YOU WILL FIND MORE DETAILED INFORMATION AT:

<https://www.dzk-tuberkulose.de/patienten/>

or in the information document

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LEAFLET TUBERCULOSIS



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WHAT IS TUBERCULOSIS?

Tuberculosis is an infectious disease caused by tuberculosis bacteria (bacteria from the *Mycobacterium tuberculosis* complex). The disease most frequently affects the lungs. However, other organ, even several organs, can be affected.

TRANSMISSION

Bacterial tuberculosis infections occur mainly via the respiratory tract from person to person. People suffering from infectious tuberculosis release small particles containing bacteria (aerosols) into the ambient air when speaking, singing, sneezing, or coughing. These can be inhaled by other people. In general, tuberculosis is not an easily transmitted disease. The risk of infection depends on the duration and intensity of the contact and the amount of bacteria exhaled.



Not every contact with tuberculosis leads to infection, and not every infection leads to disease.

INFECTION AND DISEASE

When tuberculosis bacteria are inhaled, they can cause an inflammatory reaction in the lungs. The human body tries to control the invading pathogens with the help of the immune system. An infection can be detected by special tests approximately 2 to 3 months after contact. Whether a disease develops after a tuberculosis contact also depends on the functionality of your immune system. In most cases, the body's immune system successfully engulfs the bacteria, thus preventing them from spreading in the body and the disease from breaking out. **About 90% of people who have contracted tuberculosis remain healthy for life.**

If the immune system does not succeed in limiting the infection, tuberculosis will develop.

Only about 10% of people who have been infected with tuberculosis bacteria actually develop tuberculosis. It can take weeks or even decades for the infection to turn into a disease outbreak. People whose immune system is weak have an increased risk of developing tuberculosis. Particularly at risk are small children (because their immune systems are not yet "mature") and also people whose immune systems have been weakened by medication or chronic diseases.

WHAT HAPPENS IF I BECOME ILL?

The tuberculosis bacteria that are inhaled form a centre of infection in the lungs from which the bacteria can multiply and spread further. As the inflammation progresses, this centre could connect to the respiratory tract. Bacteria can then be released into the ambient air when coughing or speaking. Only in this case can it be referred to as **infectious tuberculosis** (colloquially known as open tuberculosis). The tuberculosis bacteria can also reach other organs of the body via the blood and lymphatic system and form centres of inflammation there. Organs such as lymph nodes, pleura, kidneys, bones, meninges or abdominal organs can be affected.

Generally, these forms of tuberculosis pose no infection risk for others.

SYMPTOMS

The disease causes uncharacteristic symptoms such as **prolonged coughing with or without sputum production, weight loss, loss of appetite, fatigue, slight fever, night sweats or, rarely, haemoptysis (coughing up blood)**. Not all tuberculosis patients feel ill, especially at the beginning of the disease, when symptoms may be only slightly pronounced or absent. If you have a cough that lasts a long time, you need to undergo a medical examination. Especially if you have been in contact with a person suffering from tuberculosis, even if the contact has been long ago, it is important to consider tuberculosis as the cause of your symptoms.

Tuberculosis can infect organs other than the lungs; this is called extrapulmonary tuberculosis. Its symptoms often depend on the organ affected. Therefore, always mention symptoms that do not affect the lungs.

INVESTIGATION OF CONTACTS

Every tuberculosis requiring treatment must be reported to your public health department in accordance with the Infectious Diseases Protection Act. The public health department then identifies all people who have had contact with the sick person. These contacts must be examined for tuberculosis (contact investigation).

DIAGNOSTICS

There are different examination options to determine whether you are infected with tuberculosis bacteria or already have tuberculosis.

DIAGNOSIS OF AN INFECTION (LTBI)

Two test procedures are available to detect infection.

IGRA test (Interferon Gamma Release Assay)

Currently, two different IGRA tests are available. These are used to detect infection in adults and can also be used as a confirmatory test in children. To carry out the IGRA tests, a blood sample is examined using a special procedure. The test is positive if the immune cells from the blood sample react to components of the tuberculosis bacteria. The IGRA tests are not influenced by tuberculosis vaccinations.

Tuberculin skin test (THT)

The tuberculin skin test consists of a test substance (tuberculin) being injected into the skin of the forearm. If a hardening of a certain size occurs after 2 to 7 days at the site of injection, this indicates a reaction of the immune system to the tuberculosis bacteria, and the test is considered positive. In Germany, the test is now only recommended for children and must be applied and carried out by experienced personnel. THT can become incorrectly positive following a previous tuberculosis vaccination (BCG vaccination).

Both test procedures only detect that the immune system has been in contact with tuberculosis bacteria, i.e. an infection. If the test result is positive, tuberculosis must be ruled out by further examinations.

DIAGNOSIS OF A DISEASE

In order to detect or rule out tuberculosis in the case of a positive THT or IGRA result, the lungs are examined, as they are the most frequently affected and pulmonary tuberculosis can be infectious. In the event of symptoms indicating tuberculosis, further tests may be necessary even without a positive THT or IGRA result. The diagnosis is confirmed when tuberculosis bacteria are detected in a body specimen.

But even if no tuberculosis bacteria can be detected, there may be tuberculosis present requiring treatment.

Chest x-ray

The lungs are affected in about three quarters of all tuberculosis cases in Germany. An X-ray can then show suspicious changes that indicate tuberculosis. Sometimes an additional computer tomography of the chest organs (CT thorax) may also be necessary.