TEST

Sputum fungal smear

A sputum fungal smear uses a microscope to look for fungi in mucus coughed up from the lungs.

WHAT IT MEASURES
Fungal cells or structures visible under a microscope

SAMPLE
Sputum coughed up from the lungs

FASTING NEEDED?
No

HOW LONG IT TAKES
Usually 5 to 15 minutes

RESULTS IN
Same day to several days, varying by laboratory

USED FOR
Helping diagnose a fungal lung infection

MAIN LIMITATION
Negative smears can miss fungi; positives may not prove infection

Overview

A sputum fungal smear is a laboratory test that looks for fungi in sputum. Sputum is thick mucus brought up from the lungs by a deep cough. It is different from saliva made in your mouth.

In the laboratory, a thin layer of the sample is placed on a slide. A stain or chemical preparation may make fungal cells and structures easier to see under a microscope. The report may mention yeast, spores, or hyphae, which are thread-like fungal structures.

The smear provides a relatively quick result. It is often ordered with a fungal culture, in which the laboratory tries to grow fungi from the sample. Culture takes longer but may identify the type of fungus and allow further testing.

A smear alone cannot confirm every fungal lung infection. Results must be considered with your symptoms, medical history, imaging, and other laboratory tests.

Why the test is ordered

The test may be ordered when a fungal lung infection is one possible explanation for ongoing respiratory symptoms or an abnormal chest X-ray or CT scan.

Symptoms that may lead to testing include:

These symptoms have many possible causes. The test does not establish that fungi are responsible unless the overall evidence supports that conclusion.

Testing may be more useful if you have a weakened immune system, a long-term lung condition, or an exposure linked to certain fungi. Exposure can occur through soil, dust, bird or bat droppings, decaying plants, or particular workplaces and geographic areas.

This is not usually a routine screening test for someone without symptoms or relevant risk factors.

- A persistent cough
- Fever or night sweats
- Shortness of breath
- Chest discomfort
- Coughing up blood
- Unexplained weight loss

Who should have the test

You may be offered a sputum fungal smear if your healthcare professional suspects a fungal lung infection and you can produce a sputum sample.

It may also be considered if:

A sputum smear may not be the best first test for every fungus. Depending on the suspected infection, blood tests, urine antigen tests, molecular tests, bronchoscopy, or a tissue sample may provide more useful information.

- Pneumonia is not improving as expected
- Imaging shows a lung cavity, nodule, or unusual area
- You take medicines that suppress the immune system
- You have had an organ or stem cell transplant
- You have advanced immune suppression

- Your work, travel, or home environment suggests a fungal exposure

How to prepare

Fasting is not required. You can usually eat and drink as normal unless you are also having another procedure that has different instructions.

Follow the collection instructions from your clinic or laboratory. An early-morning sample is sometimes preferred because mucus can collect overnight. Drinking water beforehand may make mucus easier to bring up, unless you have been told to limit fluids.

Rinse your mouth with plain water before collecting the sample. Do not add water, saliva, or anything else to the container.

Tell the person arranging the test if you are taking an antifungal medicine. Treatment can reduce the amount of fungus in the sample. Do not stop any prescribed medicine unless the prescriber tells you to.

What happens during the test

You will be given a sterile container. You usually take several deep breaths and then cough deeply from your chest. Bring the sputum into your mouth and spit it directly into the container.

A good sample is usually thick or discoloured rather than clear and watery. The laboratory may reject a sample that is mainly saliva because it does not represent material from the lower airways.

Collection may take place outdoors, in a specially ventilated room, or at home. This is because coughing can release droplets and tiny particles into the air.

If you cannot produce sputum, you may be offered induced sputum. You breathe in a fine mist of salty water through a nebuliser to help loosen mucus and trigger coughing. Some people instead need bronchoscopy, in which a thin camera is passed into the airways to collect fluid. Bronchoscopy is a separate procedure with its own preparation and risks.

Understanding your results

A positive smear means the laboratory saw structures that looked like fungi. The report may describe yeast or fungal filaments, but microscopy often cannot identify the exact species.

A positive result does not always mean that fungi are causing an infection. Some fungi can live

in the mouth or airways without invading lung tissue. Others may enter the sample from the environment. For example, finding Candida in respiratory secretions usually represents airway colonisation rather than Candida pneumonia.

A negative smear means no fungal structures were seen in the portion examined. It does not rule out infection. There may have been too few organisms to see, or the affected part of the lung may not have released organisms into the sputum.

There is no universal numerical reference range for this test. Laboratories may use different preparation methods, stains, and reporting terms. Interpretation also varies with age, sex, pregnancy status, medicines, immune health, and the wider clinical context, although several of these factors do not directly change what the microscope shows.

What affects the results

The main influences relate to the sample and the amount of fungus present.

A result can be misleading because of:

Age, pregnancy, kidney function, recent exercise, and blood transfusion do not usually alter the smear directly. They may still affect which other tests are appropriate or how the complete clinical picture is interpreted.

- Saliva instead of deep sputum: Mouth organisms may appear while material from the lungs is missed
- A small or poorly collected sample: The examined portion may not contain fungi
- Low or uneven fungal burden: Organisms may be sparse or released only at certain times
- Antifungal treatment: Treatment before collection may reduce visible fungi
- Delayed transport or poor storage: Organisms and sample quality can change
- Mouth or airway colonisation: Fungi may be present without causing lung disease
- Environmental contamination: Spores can enter during collection or handling

Accuracy and limitations

Direct microscopy is fast, but it can miss fungal infections. A negative result is more likely when only a small number of organisms are present, the infection is in a limited area, or the sample contains mostly saliva.

The test can also report fungal structures when the answer to "Is this causing disease?" is no.

Colonising fungi, environmental contamination, and material that resembles fungi under the microscope can produce a misleading positive result.

The appearance of a fungus may suggest a broad group, but it rarely proves the exact species. Culture, molecular testing, or fungal antigen testing may be better for identification. Some fungi grow slowly, so culture results may take several weeks.

For suspected invasive disease, sputum may not show whether a fungus has entered lung tissue. Fluid collected during bronchoscopy or a tissue biopsy may be more informative. Blood or urine antigen testing can be especially useful for certain infections, such as histoplasmosis or aspergillosis, depending on the clinical setting.

Risks and complications

Producing sputum naturally has little risk. Deep coughing may briefly cause discomfort, gagging, light-headedness, or increased coughing.

Induced sputum can cause wheezing or tightening of the airways, especially if you have asthma or another lung condition. Staff monitor for this and can stop the procedure if needed. Bronchoscopy has additional risks that should be explained separately before the procedure.

What happens next

Your result will usually be reviewed with your symptoms, examination findings, imaging, and any culture or antigen results. The smear and culture may be reported at different times.

A negative smear may lead to repeat sputum collection or a different test if suspicion remains. A positive smear may be followed by culture, molecular identification, blood or urine testing, or bronchoscopy. Treatment decisions are not usually based on the smear alone.

Routine follow-up is appropriate if your symptoms are stable while you wait for results. Contact your healthcare service promptly if your breathing is worsening, fever persists, or you begin coughing up small amounts of blood.

Seek emergency help for severe difficulty breathing, blue or grey lips, confusion, fainting, severe chest pain, or coughing up a large amount of blood.

Common questions

Can I drink coffee before the test?

Usually, yes. Fasting is not needed. Rinse your mouth with plain water before collecting the sample, and follow any separate instructions for other tests or procedures.

Does the time of day matter?

An early-morning sample is often preferred because sputum may collect overnight. However, a good deep-cough sample collected at another time can still be useful.

Can I exercise beforehand?

Exercise does not directly change what the smear detects. Avoid strenuous activity if it worsens breathlessness or leaves you unable to provide a controlled, deep-cough sample.

What if I cannot cough up any sputum?

Tell the clinic rather than filling the container with saliva. Induced sputum, bronchoscopy, or another type of fungal test may be considered.

Is a positive result definitely a fungal infection?

No. Fungi can colonise the airways or contaminate a sample without causing disease. Your result needs to be compared with symptoms, imaging, and other tests.

Why is the smear ready before the culture?

The smear is examined directly under a microscope. A culture requires time for fungi to grow, and some species grow slowly.

Sources

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