

## Definition

Aspergillosis is a group of illnesses caused by mold. The mold that triggers the illnesses, aspergillus, includes more than 150 types of mold that occur widely in the indoor and outdoor environment. Although most of the molds are harmless, a few can cause serious illnesses in people with a weakened immune system, underlying lung disease or asthma. These illnesses, collectively called aspergillosis, range from allergic responses to severe and sometimes fatal infections.

Aspergillosis begins when susceptible people inhale mold spores into their lungs. In some people, the spores trigger an allergic reaction. Other people develop mild to serious lung infections. The most serious form of aspergillosis — invasive aspergillosis — occurs when the infection spreads to blood vessels and beyond, into the lungs to other organs.

Depending on the type of aspergillosis, treatment may involve watchful waiting, antifungal medications or, in rare cases, surgery.

## Symptoms

The signs and symptoms of aspergillosis vary with the type of illness you develop, including an allergic reaction, growth or infection.

### Allergic reaction

Some people with asthma or cystic fibrosis have an allergic reaction to aspergillus mold. Signs and symptoms of this condition, known as allergic bronchopulmonary aspergillosis, include:

- Fever
- A general feeling of being unwell (malaise)
- A cough that may bring up blood or plugs of mucus
- Wheezing
- Worsening asthma

### Growth

People whose lungs have been damaged by conditions such as emphysema and tuberculosis or advanced sarcoidosis may have air spaces (cavities) in their lungs. A growth of tangled fungus fibers (fungus ball) may develop in these spaces, causing a type of aspergillosis called aspergilloma. This condition may not initially produce symptoms, but over time it can cause:

- A cough that often brings up blood
- Chest pain
- Wheezing
- Shortness of breath
- Unintentional weight loss

### Infection

The most severe form of aspergillosis, invasive pulmonary aspergillosis, occurs when the infection spreads rapidly through your bloodstream to your brain, heart, kidneys or skin. Signs and symptoms depend on which organs are affected, but in general, invasive aspergillosis can cause:

- Fever and chills
- Headache
- Bloody cough
- Shortness of breath
- Chest or joint pain
- Massive bleeding from your lungs

### **Other types of aspergillosis**

Aspergillus can invade your sinuses and ear canals as well as your lungs. In your sinuses, it can cause a stuffy nose, drainage, inflammation, fever, facial pain and headache. Ear canal infections can cause itching, drainage and pain.

### **When to see a doctor**

If you have asthma or cystic fibrosis, see your doctor whenever you notice a change in your symptoms. Although aspergillosis may not be the cause, it's important to have any problems evaluated. If you have a weakened immune system and develop shortness of breath, a cough that brings up blood or an unexplained fever, get immediate medical care. In the case of invasive aspergillosis, prompt treatment is so crucial that treatment is often started before the infection is diagnosed.

## **Causes**

Aspergillus mold is virtually unavoidable. Outdoors, it's found in decaying leaves and compost and on plants, trees and grain crops. Inside, the spores — the reproductive parts of mold — thrive in air conditioning and heating ducts, insulation, carpeting, ornamental plants, tap water, dust and food — especially ground pepper and other spices.

Everyday exposure to aspergillus is rarely a problem for people with healthy immune systems. When mold spores are inhaled, immune system cells simply surround and destroy them. But people who have a weakened immune system from illness or immunosuppressant medications have fewer infection-fighting cells. This allows aspergillus to take hold, invading the lungs, and in the most serious cases, other parts of the body.

Aspergillosis is not contagious.

## **Risk factors**

Your risk of developing aspergillosis depends on your overall health and the extent of your exposure to mold, but in general, these factors make you more vulnerable to infection:

- **Weakened immune system.** This is the greatest risk factor for invasive aspergillosis. People taking immune-suppressing drugs after undergoing transplant surgery, especially bone marrow or stem cell transplants, are the most severely affected. In fact, aspergillosis is the leading infectious cause of death among people who have received a heart transplant. People with later-stage AIDS also may be at increased risk.
- **Low white blood cell level.** White blood cells called neutrophils play a key role in fighting fungal infections. Having a very low level of these cells (neutropenia) due to chemotherapy, an organ transplant or leukemia makes you much more susceptible to invasive aspergillosis. So does having chronic granulomatous disease — an inherited disorder that affects immune system cells.

- **Lung cavities.** An aspergilloma develops when mold spores germinate in a healed air space (cavity) in your lungs. Cavities are areas that have been damaged by serious lung diseases such as tuberculosis or sarcoidosis — an illness that causes inflammation in your lungs and other organs. The larger the cavity, the greater your chance of developing an aspergilloma. Most often, aspergillomas don't spread beyond the cavity, but when they do, they can cause a cough that brings up blood, and the bleeding may be severe.
- **Asthma or cystic fibrosis.** Up to 10 percent of people with asthma and cystic fibrosis have an allergic response to aspergillus mold. This is more likely to occur in people whose lung problems are long-standing or hard to control.
- **Long-term corticosteroid therapy.** Because corticosteroids suppress your immune system, they increase the risk of aspergillosis. Infections that result from corticosteroid use tend to be severe and develop rapidly.
- **A hospital stay.** Aspergillus mold is found on many hospital surfaces — bedrails, plants, surgical instruments, air conditioning, ducts, insulation — and in the tap water. Though healthy people aren't likely to be affected, people with a weakened immune system or serious illness are highly susceptible to infection. Most major hospital outbreaks have been traced to nearby building destruction and renovation projects, and to contaminated air filters and carpeting.
- **Genetics.** Genetic factors may make certain people more prone to aspergillosis infection.

## Complications

Depending on the type of infection, aspergillosis can cause a variety of serious complications:

- **Bone destruction and spread of infection.** An aspergillus infection in your sinuses can destroy facial bones. It can also spread beyond your sinuses, and may be life-threatening if you have a weakened immune system.
- **Bleeding.** Both aspergillomas and invasive aspergillosis can cause massive, and sometimes fatal, bleeding in your lungs.
- **Systemic infection.** The most serious complication of aspergillosis is the spread of the infection to other parts of your body, especially your brain, heart and kidneys. Invasive aspergillosis spreads rapidly and is often fatal in spite of early treatment.

## Preparing for your appointment

People who develop aspergillosis usually have an underlying condition, such as asthma or cystic fibrosis, or have a weakened immune system due to an illness or to immune-suppressing medications. If you have symptoms of aspergillosis and are already being treated for a medical condition, call the doctor who normally provides your care for that condition. In some cases, when you call to set up an appointment, your doctor may recommend urgent medical care.

If you have a weakened immune system and develop an unexplained fever, shortness of breath or a cough that brings up blood, seek immediate medical care.

Here's some information to help you get ready for your appointment, and what to expect from your doctor.

### What you can do

- **Be aware of any pre- or post-appointment restrictions.** At the time you make the appointment, be sure to ask if there's anything you need to do in advance.

- **Write down your key medical information.** If you are going to see a new doctor, bring a summary of other conditions for which you're being treated as well as recent medical appointments or hospitalizations. Also write down all medications you're taking.
- **Take a family member or friend along.** Aspergillosis can be a medical emergency. Take someone who can soak up all the information your doctor provides and who can stay with you if you need immediate treatment.
- **Write down questions to ask your doctor.**

Prepare a list of questions so that you can make the most of your time with your doctor. For aspergillosis, some basic questions to ask your doctor include:

- What is likely causing my symptoms or condition?
- Other than the most likely cause, what are possible causes for my symptoms or condition?
- What kinds of tests do I need?
- Do I need to be hospitalized?
- What treatment do you recommend?
- If the first treatment isn't effective, what will you try next?
- Am I at risk of side effects from the medications you're recommending? What are they?
- How will you monitor my response to treatment?
- Am I at risk of long-term complications from this condition?
- Do we need to change the treatments I'm taking for other health conditions?

In addition to the questions that you've prepared to ask your doctor, don't hesitate to ask questions during your appointment at any time that you don't understand something.

### **What to expect from your doctor**

Your doctor will be familiar with your health history and your recent medical and surgical treatments, so he or she will likely be aware of your risk of aspergillosis. Still, your doctor is likely to ask you some questions, including:

- What are your symptoms?
- When did you first begin experiencing symptoms?
- How severe are your symptoms? Do they seem to be getting worse?
- Have you had a fever?
- Are you having difficulty breathing?
- Are you coughing up blood?
- What else concerns you?

## **Tests and diagnosis**

Diagnosing aspergillosis can be difficult. Aspergillus is common in the environment and is sometimes found in the saliva and sputum of healthy people. What's more, it's hard to distinguish aspergillus from other molds under the microscope, and symptoms of the infection are similar to those of conditions such as tuberculosis.

To arrive at an accurate diagnosis, your doctor is likely to use one or more of the following tests:

- **Imaging tests.** A chest X-ray or computerized tomography (CT) scan — a type of X-ray that produces more detailed images than conventional X-rays do — can usually reveal an aspergilloma as well as characteristic signs of invasive and allergic aspergillosis.

- **Sputum stain and culture.** In this test, a sample of your sputum is stained with a dye and checked for the presence of aspergillus filaments. The specimen is then placed in something that encourages the mold to grow.
- **Tissue and blood tests.** Diagnosing allergic bronchopulmonary aspergillosis usually requires skin and blood tests. For the skin test, a small amount of aspergillus antigen is injected into your forearm. If you have antibodies to the mold in your bloodstream, you'll develop a hard, red bump at the injection site. Blood tests look for high levels of certain antibodies, indicating an allergic response.
- **Biopsy.** Examining a sample of tissue from your lungs or sinuses

## Treatments and drugs

Aspergillosis treatments vary with the type of disease. Possible treatments include:

- **Oral corticosteroids.** The goal in treating allergic bronchopulmonary aspergillosis is to prevent existing asthma or cystic fibrosis from becoming worse. The best way to do this is with oral corticosteroids. Antifungal medications by themselves aren't helpful for allergic aspergillosis, but they may be used in combination with corticosteroids to reduce the dose of steroids and improve lung function.
- **Antifungal medications.** These drugs are the standard treatment for invasive pulmonary aspergillosis. Historically, the drug of choice has been amphotericin B, but the newer medication voriconazole is now preferred because it appears more effective and may have fewer side effects. All antifungals can cause serious problems, however, including kidney and liver damage, and they frequently interact with other medications given to people who have weakened immune systems.
- **Watchful waiting.** Aspergillomas often don't need treatment, and may simply be closely monitored by chest X-ray. When they cause life-threatening bleeding, the options are limited. Because antifungal medications don't penetrate the fungus ball very well, surgery is the first-choice treatment for this condition. The surgery is risky, however, and your doctor may instead suggest embolization. In this procedure, your doctor threads a small catheter into the artery that supplies blood to the cavity containing the fungus ball, and injects a special material that clogs the artery. Though this procedure can stop massive bleeding, it doesn't prevent it from recurring.

## Prevention

It's nearly impossible to avoid aspergillus entirely, but if you've had a transplant or are undergoing chemotherapy, try to stay away from the most obvious sources of mold such as construction sites, compost piles and stored grain. If you have a suppressed immune system, your doctor may advise you to wear a face mask to avoid catching any infections.

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