CONDITION

# Pulmonary nocardiosis

Pulmonary nocardiosis is a lung infection caused by Nocardia bacteria inhaled from the environment.

**WHAT IT IS**
A bacterial lung infection caused by Nocardia

**BODY SYSTEM**
Lungs and breathing

**MAIN SYMPTOMS**
Cough, fever, breathlessness, chest pain

**WHAT CAUSES IT**
Inhaling Nocardia bacteria from the environment

**HOW IT IS DIAGNOSED**
Sputum or tissue culture, sometimes molecular identification

**MAIN TREATMENT**
Long-course antibiotics guided by laboratory testing

**CAN IT BE CURED?**
Yes - antibiotics often clear infection

**IS IT AN EMERGENCY?**
Sometimes - severe breathlessness or neurological symptoms

**LONG-TERM OUTLOOK**
Often good when localized and treated early

## Overview

Pulmonary nocardiosis is a lung infection caused by bacteria from the Nocardia group. These bacteria live in soil, dust, decaying plants, and water. Infection usually begins after the bacteria are breathed into the lungs.

The condition is uncommon and mainly affects people whose immune systems are weakened. It can also occur in people with long-term lung conditions or, less often, in people without an obvious risk factor.

Pulmonary nocardiosis matters because it can resemble more familiar conditions, including bacterial pneumonia, tuberculosis, fungal infection, or lung cancer. It may develop slowly, so diagnosis can take time.

Without effective treatment, the infection can damage lung tissue or spread through the bloodstream. The brain is the most important site of spread. Early identification and the right antibiotics like amoxicillin or doxycycline improve the chance of recovery.

Pulmonary nocardiosis is not usually passed from one person to another.

## Symptoms

Symptoms may appear over days or weeks, but they can develop more gradually. They are not specific to nocardiosis, so tests are needed to identify the cause.

Possible symptoms include:

Some people have mild symptoms despite changes on a chest scan. Others become seriously unwell, particularly if their immune system is severely weakened or the infection involves a large area of the lungs.

Symptoms such as a new severe headache, confusion, weakness, balance problems, vision changes, or seizures may suggest that infection has spread to the brain. These symptoms require urgent assessment.

- A persistent cough, with or without mucus
- Fever, chills, or night sweats
- Shortness of breath
- Chest pain, especially when breathing deeply
- Tiredness or reduced stamina
- Reduced appetite or unintended weight loss
- Coughing up blood

## Causes and risk factors

Pulmonary nocardiosis begins when Nocardia bacteria are inhaled from the environment. It is not caused by poor hygiene, and household contact with someone who has the infection is not considered a usual source.

The immune system normally removes inhaled bacteria. Nocardiosis is more likely when this protection is reduced.

Important risk factors include:

The risk is influenced by the strength of the immune system, underlying lung health, and the species of Nocardia . Having a risk factor does not mean you will develop the infection.

A person without a known immune or lung condition can still develop pulmonary nocardiosis. If this happens, the medical team may check for an unrecognized condition or medicine affecting immune function.

- Long-term treatment with corticosteroids or other medicines that suppress immunity
- An organ or stem cell transplant
- Blood cancers or some cancer treatments
- Advanced HIV infection
- Chronic granulomatous disease, an inherited immune condition
- Long-term lung conditions such as chronic obstructive pulmonary disease, bronchiectasis, or severe structural lung damage

## Diagnosis

A chest X-ray or CT scan can show where the lungs are affected. Possible findings include areas of inflammation, nodules, cavities, or collections of pus called abscesses. These findings can support the diagnosis, but they cannot confirm nocardiosis because several other conditions look similar.

Confirmation usually requires a respiratory sample. This may be mucus coughed up from the lungs, known as sputum. If an adequate sample cannot be obtained, bronchoscopy may be used. During bronchoscopy, a thin flexible camera is passed into the airways so fluid or tissue can be collected.

A lung biopsy may occasionally be needed, especially if imaging shows a mass or if less invasive tests have not found the cause.

In the laboratory, samples may be examined under a microscope and grown in a culture. Culture allows the bacteria to multiply so they can be identified. Nocardia can grow slowly, so the laboratory may need to keep cultures for longer than it would for many common bacteria. Molecular tests can help identify the exact species.

The laboratory generally tests which antibiotics are active against the bacteria. This is important because different Nocardia species do not respond to exactly the same medicines.

Further tests may look for infection outside the lungs. These can include blood cultures and a brain MRI or CT scan. Brain imaging may be considered even without neurological symptoms

because brain infection can initially be silent.

## Treatment and management

Pulmonary nocardiosis is treated with antibiotics. Treatment is usually managed with input from an infectious diseases specialist because antibiotic resistance patterns differ between Nocardia species.

Trimethoprim-sulfamethoxazole is commonly used, but it is not suitable or effective in every case. Other antibiotics may be chosen according to the infection's severity, laboratory results, allergies, medicine interactions, and kidney or liver function.

Severe infection may initially require two or more antibiotics, often given into a vein in hospital. Treatment may later change to tablets once the person is improving and laboratory results are available. A milder infection limited to the lungs may sometimes be treated with oral medicine from the beginning.

Treatment usually continues for many months. A longer course may be needed when the immune system remains weakened, infection has spread, or the response is slow. Do not stop antibiotics early unless the prescribing team changes the plan. Symptoms can improve before all of the bacteria have been cleared.

Follow-up commonly involves:

Antibiotics used for nocardiosis can cause problems such as nausea, rash, changes in blood counts, or effects on the kidneys, liver, or potassium level. Monitoring helps find these problems early. Surgery is uncommon but may be considered for an abscess that cannot be controlled with antibiotics and drainage alone.

- Blood tests to check blood cells, kidneys, liver, and body salts
- Review of side effects and interactions with other medicines
- Repeat chest imaging to confirm that lung changes are improving
- Assessment of any immune-suppressing treatment, when it can be adjusted safely

## Complications

Pulmonary nocardiosis can form cavities or abscesses in the lungs. Extensive infection may make breathing difficult and can occasionally lead to respiratory failure.

The bacteria may enter the bloodstream and spread elsewhere. This is called disseminated

nocardiosis. The brain is a frequent site of spread and may develop one or more abscesses. Skin, kidneys, joints, and other organs can also be affected.

Possible complications include:

Relapse is more likely when infection was widespread, treatment was not completed, the bacteria were resistant, or immune suppression continues. Regular follow-up is therefore important even after symptoms improve.

- Permanent areas of lung scarring
- Infection around the lungs
- Brain abscesses or neurological problems
- Bloodstream infection
- A return of infection after treatment

## Prevention

Pulmonary nocardiosis cannot always be prevented. Nocardia bacteria are widespread in the environment, and there is no vaccine.

Most people do not need to avoid gardening, soil, or outdoor activities. If your immune system is severely weakened, you may be advised to reduce heavy exposure to soil and dust. Wearing gloves while handling soil, covering cuts, washing wounds promptly, and using a well-fitting mask during very dusty work may reduce exposure, but these steps cannot remove the risk completely.

Some people already take antibiotics to prevent other infections after a transplant or during intense immune-suppressing treatment. These medicines may reduce the risk of nocardiosis, but breakthrough infections can occur. Preventive antibiotics should only be used as part of a specialist treatment plan.

## Living with it and what to expect

Recovery often takes time. Fever and breathing symptoms may begin to improve after effective antibiotics are started, but tiredness and reduced stamina can last longer. Changes on a chest scan commonly improve more slowly than symptoms.

Antibiotic treatment may continue after you feel well. Keeping up with blood tests, scans, and appointments helps confirm that the infection is clearing and that treatment remains safe.

Many people with infection limited to the lungs recover after completing treatment. The outlook is less certain when nocardiosis has spread, lung damage is extensive, or immune suppression cannot be reduced. Some people are left with lung scarring or increased breathlessness, while others return to their previous level of activity.

There remains a risk of relapse after treatment. Follow-up may continue for months, particularly if you have an ongoing immune condition or take immune-suppressing medicines. A returning cough, fever, weight loss, breathlessness, or neurological symptom should be reported rather than waiting for the next routine visit.

## When to get medical help

Arrange a prompt medical assessment if you have a persistent cough, fever, unexplained weight loss, worsening breathlessness, or blood in your mucus. These symptoms have many possible causes and do not by themselves mean you have nocardiosis.

If you are being treated for pulmonary nocardiosis, seek same-day advice for worsening fever, increasing breathlessness, repeated vomiting that prevents you taking antibiotics, a spreading rash, or other significant treatment side effects.

Seek emergency help for:

Routine follow-up is still important when you feel better. Blood tests and repeat imaging are used to check treatment response; they are not signs that the condition has necessarily worsened.

- Severe difficulty breathing or blue, grey, or unusually pale lips
- A new seizure, fainting, or marked confusion
- Sudden weakness, facial drooping, or trouble speaking
- A severe new headache with vomiting or neurological changes
- Coughing up a large amount of blood

## Common questions

Is pulmonary nocardiosis contagious?

It is not usually spread between people. Most infections come from inhaling Nocardia bacteria found in soil, dust, or water. Normal household contact does not generally require isolation.

Is pulmonary nocardiosis the same as pneumonia?

It is a type of lung infection, but it is caused by Nocardia rather than the bacteria or viruses responsible for most pneumonias. It often develops more slowly and usually needs a much longer course of treatment.

Can a healthy person get pulmonary nocardiosis?

Yes, although it is less common. Some people have no recognized immune problem. Doctors may still review medicines, lung health, and immune function to look for an underlying risk factor.

How long does treatment take?

Treatment usually lasts for several months. The exact length is based on the site and severity of infection, the species and antibiotic results, the response to treatment, and whether the immune system remains weakened.

Can pulmonary nocardiosis come back?

Yes. Relapse can occur, sometimes months after treatment. Completing the planned antibiotic course and attending follow-up appointments help identify persistent or returning infection.

Can it spread to the brain?

Yes. Nocardia can travel through the bloodstream and cause one or more brain abscesses. Because spread can occur without early symptoms, brain imaging may be included in the assessment. New headaches, confusion, weakness, balance changes, or seizures need urgent care.

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