CONDITION

CMV pneumonia

Learn how cytomegalovirus can cause pneumonia, who is at risk, how it is diagnosed, and how antiviral treatment and follow-up are managed.

WHAT IT IS
Active CMV infection causing lung inflammation and injury

BODY SYSTEM
Lungs and breathing

MAIN SYMPTOMS
Fever, cough, shortness of breath, low oxygen

WHAT CAUSES IT
CMV infection during immune suppression

HOW IT IS DIAGNOSED
Bronchoscopy with BAL testing or lung biopsy

MAIN TREATMENT
Antiviral treatment and supportive care

CAN IT BE CURED?
No, CMV remains latent for life

IS IT AN EMERGENCY?
Sometimes, with severe trouble breathing

LONG-TERM OUTLOOK
Can recur or progress to respiratory failure

Overview

Cytomegalovirus, usually called CMV, is a common virus in the herpesvirus family. After a person is infected, CMV remains inactive, or "latent," in the body for life. It can become active again, especially if the immune system is weakened.

CMV pneumonia is inflammation and injury in the lungs caused by active CMV infection. Clinicians may also call it CMV pneumonitis. It occurs mainly in people with major immune suppression, including some organ or stem cell transplant recipients and people with advanced HIV. It can also occur during treatment for cancer or an immune-related disease. CMV pneumonia is uncommon in people with healthy immune systems.

CMV infection is not the same as CMV disease. A blood test may detect CMV even when it is not damaging an organ. CMV pneumonia means that the virus is associated with symptoms

and evidence of disease in the lungs. Making that distinction matters because other infections, medication reactions, transplant complications, and inflammatory conditions can cause similar findings.

CMV pneumonia can interfere with the transfer of oxygen from the lungs into the blood. Early assessment is important because antiviral treatment may be needed. Care often involves an infectious disease specialist and, when relevant, the person's transplant, cancer, HIV, or lung care team.

Symptoms

Symptoms may develop gradually or over several days. They are not specific to CMV, so testing is needed to identify the cause.

Possible symptoms include:

Some people taking medicines that suppress the immune system may not develop a high fever. Symptoms can also be mild at first, even when lung changes are visible on imaging.

Contact the treating medical or transplant team promptly for a new fever, cough, shortness of breath, or decline in oxygen level. This is especially important after a transplant or during treatment that weakens the immune system. Do not wait for a routine appointment if symptoms are new or worsening.

Seek emergency care for severe trouble breathing, blue or gray lips, new confusion, fainting, severe chest pain, difficulty staying awake, or a rapid decline in condition. A person who has been given a specific emergency oxygen plan should follow that plan.

- Fever
- Dry cough or a cough with a small amount of mucus
- Shortness of breath, especially with activity
- Faster breathing
- Tiredness or weakness
- Reduced appetite
- Chest discomfort
- Low oxygen levels

Causes and risk factors

CMV spreads through close contact with infected body fluids, including saliva, urine, blood, semen, vaginal fluids, and breast milk. It can also be passed through a transplanted organ, blood products, or from a pregnant person to a fetus.

Most adults with CMV never develop pneumonia. In people with healthy immune systems, an initial CMV infection usually causes no symptoms or a mild illness similar to mononucleosis. The immune system then keeps the virus under control.

CMV pneumonia most often develops when immune defenses are too weak to control the virus. This may happen because a previous infection has reactivated or because a person has acquired a new strain of CMV.

Important risk settings include:

Risk after transplantation depends partly on whether the donor and recipient have CMV antibodies, which show past exposure. The type of transplant, time since transplantation, preventive strategy, rejection treatment, and degree of immune suppression also matter.

CMV pneumonia may occur with another infection. Bacterial pneumonia, respiratory viruses, fungi, or Pneumocystis jirovecii can produce overlapping symptoms and may be present at the same time.

- A hematopoietic stem cell transplant, also called a bone marrow or blood stem cell transplant
- A solid organ transplant, particularly a lung transplant
- Advanced HIV with severe immune suppression
- Blood cancers or certain cancer treatments
- High-intensity or prolonged immune-suppressing treatment
- Medicines that significantly reduce T-cell function
- Graft-versus-host disease and its treatment after a stem cell transplant
- Previous CMV infection in the recipient or CMV carried in a donated organ

Diagnosis

Diagnosis usually begins with a review of symptoms, immune status, transplant history, medicines, and recent CMV test results. A clinician will check breathing, oxygen level, temperature, and other vital signs.

A chest X-ray may show widespread or patchy changes, but it cannot confirm CMV. Computed tomography, or CT, provides more detail. Possible findings include hazy areas known as

ground-glass opacities, small nodules, or other patterns of inflammation. These findings can also occur with many other lung conditions.

CMV polymerase chain reaction, or PCR, detects the virus's genetic material. It is often performed on blood. The amount detected is sometimes called the viral load. A rising or high blood viral load can support the diagnosis and help guide care, but it does not prove that CMV is causing pneumonia. Some people with lung disease may have a low or undetectable blood level.

Clinicians may use bronchoscopy when it is safe and the diagnosis remains uncertain. During this procedure, a thin flexible tube is passed into the airways. Fluid from the lungs is collected in a process called bronchoalveolar lavage, or BAL. The sample can be tested for CMV and other infections.

A positive CMV PCR from BAL fluid needs careful interpretation. CMV can sometimes be present in respiratory samples without being the main cause of illness, particularly in transplant recipients. The test result must be considered alongside symptoms, imaging, blood tests, and evidence for other causes.

Lung tissue obtained by biopsy may show CMV-related cell changes or viral proteins when examined under a microscope. A biopsy can provide strong evidence, but it is not appropriate or safe for every patient. Clinicians balance its potential value against risks such as bleeding or a collapsed lung.

The evaluation may also include:

- Blood counts and kidney and liver tests
- Blood cultures or respiratory cultures
- Testing for other viruses, fungi, and bacteria
- Tests for Pneumocystis in people at risk
- Assessment for medication-related lung injury, rejection, fluid overload, or other noninfectious causes

Treatment and management

Treatment is individualized according to illness severity, immune status, organ function, transplant type, and test findings. People with significant breathing problems may need hospital care, supplemental oxygen, or closer monitoring.

Ganciclovir is a main antiviral medicine used for serious CMV disease. It is generally given into a vein when disease is severe or when reliable absorption of oral medicine is uncertain.

Valganciclovir is an oral medicine that the body converts to ganciclovir. It may be suitable in selected, clinically stable patients, but the care team decides whether oral treatment is appropriate.

These medicines can lower white blood cells, red blood cells, and platelets. They can also require adjustment based on kidney function. Regular blood counts and kidney tests are therefore an important part of treatment.

Foscarnet may be used when CMV is resistant to ganciclovir or when severe blood-cell effects prevent its use. Foscarnet can injure the kidneys and disturb mineral levels in the blood, so hydration and close laboratory monitoring are usually needed. Other antiviral like acyclovir or oseltamivir options may be considered by specialists for resistant or difficult-to-treat CMV.

CMV resistance testing may be ordered when the viral load or clinical illness does not improve as expected despite adequate treatment. Resistance means that changes in the virus make one or more antiviral medicines less effective. A detectable viral load early in treatment does not by itself prove resistance.

Some people with CMV pneumonia after a stem cell transplant receive CMV immune globulin or another intravenous immune globulin in addition to antiviral therapy. Evidence for this approach is limited, and it is not used routinely in every setting.

The medical team may consider reducing immune-suppressing treatment when possible. This must be done carefully. Suddenly stopping transplant or steroid medicines can cause rejection, graft-versus-host disease, or other serious problems. Patients should not change these medicines without instructions from their care team.

Supportive management may include oxygen, fluids when appropriate, treatment of coexisting infections, nutrition support, and prevention of blood clots during hospitalization. Mechanical breathing support may be needed in severe respiratory failure.

The length of antiviral treatment is not the same for everyone. Clinicians consider symptom improvement, oxygen needs, immune recovery, imaging, and repeated CMV measurements. Preventive or maintenance treatment may be needed in some high-risk situations.

Transplant programs also use prevention strategies. These can include antiviral prophylaxis, meaning medicine given before CMV disease occurs, or preemptive treatment based on scheduled CMV blood testing. The strategy depends on the transplant type and program protocol.

Complications

CMV pneumonia may reduce blood oxygen and can lead to respiratory failure. Severe lung

inflammation can sometimes progress to acute respiratory distress syndrome, known as ARDS. ARDS causes widespread lung injury and may require treatment in an intensive care unit.

CMV may affect organs outside the lungs. Possible sites include the digestive tract, liver, brain, or retina at the back of the eye. The pattern depends on the person's underlying condition. New vision changes, severe headache, confusion, weakness, painful swallowing, or persistent abdominal symptoms should be reported promptly.

In transplant recipients, active CMV may occur alongside rejection, graft-versus-host disease, or other opportunistic infections. These overlapping problems can make diagnosis and recovery more complex.

Treatment can also cause complications. Blood-cell suppression may increase susceptibility to infection, anemia-related tiredness, or bleeding. Some antiviral medicines can affect kidney function or blood mineral levels. Laboratory monitoring allows the care team to identify these effects and adjust treatment when needed.

Follow up

Follow-up usually includes assessment of breathing, fever, activity tolerance, oxygen needs, and medication effects. Blood counts, kidney function, and CMV viral load may be checked repeatedly. The usefulness and timing of viral-load testing depend on the person's condition and treatment setting.

CMV PCR results are most useful when the same type of sample and testing method are compared over time. A laboratory number should not be interpreted alone. Symptoms and organ function remain important.

After treatment, some people need continued CMV monitoring because the infection can return, especially while immune suppression remains intense. Transplant or HIV care teams may also review whether preventive therapy, immune-suppressing medicines, or HIV treatment needs to change.

Keep routine appointments even after symptoms improve. Contact the care team sooner for a returning fever, worsening cough, new shortness of breath, reduced exercise tolerance, medication problems, or new vision, digestive, or neurologic symptoms.

Sources



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