

MENINGITIS- Mayo Clinic

Definition

By Mayo Clinic Staff

Meningitis is an inflammation of the membranes (meninges) surrounding your brain and spinal cord.

The swelling associated with meningitis often triggers the "hallmark" signs and symptoms of this condition, including headache, fever and a stiff neck.

Most cases of meningitis in the U.S. are caused by a viral infection, but bacterial and fungal infections also can lead to meningitis. Depending on the cause of the infection, meningitis can get better on its own in a couple of weeks — or it can be a life-threatening emergency requiring urgent antibiotic treatment.

If you suspect that you or someone in your family has meningitis, seek medical care right away. Early treatment of bacterial meningitis can prevent serious complications.

Symptoms

By Mayo Clinic Staff

It's easy to mistake the early signs and symptoms of meningitis for the flu (influenza). Meningitis signs and symptoms may develop over several hours or over one or two days.

The signs and symptoms that may occur in anyone older than age of 2 include:

- Sudden high fever
- Severe headache that isn't easily confused with other types of headache
- Stiff neck
- Vomiting or nausea with headache
- Confusion or difficulty concentrating
- Seizures
- Sleepiness or difficulty waking up
- Sensitivity to light
- Lack of interest in drinking and eating

- Skin rash in some cases, such as in meningococcal meningitis

Signs in newborns

Newborns and infants may not have the classic signs and symptoms of headache and stiff neck. Instead, signs of meningitis in this age group may include:

- High fever
- Constant crying
- Excessive sleepiness or irritability
- Inactivity or sluggishness
- Poor feeding
- A bulge in the soft spot on top of a baby's head (fontanel)
- Stiffness in a baby's body and neck

Infants with meningitis may be difficult to comfort, and may even cry harder when picked up.

When to see a doctor

Seek medical care right away if you or someone in your family has signs or symptoms of meningitis, such as:

- Fever
- Severe, unrelenting headache
- Confusion
- Vomiting
- Stiff neck

Viral meningitis may improve without treatment, but bacterial meningitis is serious, can come on very quickly and requires prompt antibiotic treatment to improve the chances of a recovery. Delaying treatment for bacterial meningitis increases the risk of permanent brain damage or death. In addition, bacterial meningitis can prove fatal in a matter of days.

There's no way to know what kind of meningitis you or your child has without seeing your doctor and undergoing spinal fluid testing.

It's also important to talk to your doctor if a family member or someone you work with has meningitis. You may need to take medications to prevent an infection.

Causes

By Mayo Clinic Staff

Meningitis usually results from a viral infection, but the cause may also be a bacterial infection. Less commonly, a fungal infection may cause meningitis. Because bacterial infections are the most serious and can be life-threatening, identifying the source of the infection is an important part of developing a treatment plan.

Bacterial meningitis

Acute bacterial meningitis usually occurs when bacteria enter the bloodstream and migrate to the brain and spinal cord. But it can also occur when bacteria directly invade the meninges, as a result of an ear or sinus infection, or a skull fracture, or rarely, after some surgeries.

A number of strains of bacteria can cause acute bacterial meningitis. The most common include:

- **Streptococcus pneumoniae (pneumococcus).** This bacterium is the most common cause of bacterial meningitis in infants, young children and adults in the United States. It more commonly causes pneumonia or ear or sinus infections. There is a vaccine to help reduce the occurrence of this infection.
- **Neisseria meningitidis (meningococcus).** This bacterium is another leading cause of bacterial meningitis. Meningococcal meningitis commonly occurs when bacteria from an upper respiratory infection enter your bloodstream. This infection is highly contagious. It affects mainly teenagers and young adults, and may cause local epidemics in college dormitories, boarding schools and military bases. There is a vaccine to help reduce the occurrence of this infection.
- **Haemophilus influenzae (haemophilus).** Haemophilus influenzae type b (Hib) bacterium used to be the leading cause of bacterial meningitis in children. But new Hib vaccines — available as part of the routine childhood immunization schedule in the United States — have greatly reduced the number of cases of this type of meningitis.
- **Listeria monocytogenes (listeria).** These bacteria can be found in soft cheeses, hot dogs and luncheon meats. Fortunately, most healthy people exposed to listeria don't become ill, although pregnant women, newborns, older adults and people with weakened immune systems tend to be more susceptible. Listeria can cross the placental barrier, and infections in late pregnancy may cause a baby to be stillborn

or die shortly after birth. People with weakened immune systems, due to disease or medication effect, are most vulnerable.

Viral meningitis

Each year, viruses cause a greater number of cases of meningitis than do bacteria. Viral meningitis is usually mild and often clears on its own. A group of viruses known as enteroviruses is responsible for most viral meningitis cases in the United States. These viruses tend to circulate in late summer and early fall. Viruses such as herpes simplex virus, HIV, mumps, West Nile virus and others also can cause viral meningitis.

Chronic meningitis

Chronic forms of meningitis occur when slow-growing organisms invade the membranes and fluid surrounding your brain. Although acute meningitis strikes suddenly, chronic meningitis develops over two weeks or more. Nevertheless, the signs and symptoms of chronic meningitis — headaches, fever, vomiting and mental cloudiness — are similar to those of acute meningitis.

Fungal meningitis

Fungal meningitis is relatively uncommon and causes chronic meningitis. Occasionally it can mimic acute bacterial meningitis. However, this form of meningitis isn't contagious from person to person. Cryptococcal meningitis is a common fungal form of the disease that affects people with immune deficiencies, such as AIDS. It's life-threatening if not treated with an antifungal medication.

In 2012, fungal meningitis made the news because contaminated corticosteroid injections caused a multistate outbreak. Fungal meningitis cases were associated with contaminated medication injected into the spine for back or neck pain.

Other meningitis causes

Meningitis can also result from noninfectious causes, such as chemical reactions, drug allergies, some types of cancer and inflammatory diseases such as sarcoidosis.

Risk factors

By [Mayo Clinic Staff](#)

Risk factors for meningitis include:

- **Skipping vaccinations.** If you or your child hasn't completed the recommended childhood or adult vaccination schedule, the risk of meningitis is higher.
- **Age.** Most cases of viral meningitis occur in children younger than age 5. Bacterial meningitis commonly affects people under 20, especially those living in community settings.
- **Living in a community setting.** College students living in dormitories, personnel on military bases, and children in boarding schools and child care facilities are at increased risk of meningococcal meningitis. This increased risk likely occurs because the bacterium is spread by the respiratory route and tends to spread quickly wherever large groups congregate.
- **Pregnancy.** If you're pregnant, you're at increased risk of contracting listeriosis — an infection caused by listeria bacteria, which also may cause meningitis. If you have listeriosis, your unborn baby is at risk, too.
- **Compromised immune system.** Factors that may compromise your immune system — including AIDS, alcoholism, diabetes and use of immunosuppressant drugs — also make you more susceptible to meningitis. Removal of your spleen, an important part of your immune system, also may increase your risk.

Complications

By Mayo Clinic Staff

The complications of meningitis can be severe. The longer you or your child has the disease without treatment, the greater the risk of seizures and permanent neurological damage, including:

- Hearing loss
- Memory difficulty
- Learning disabilities
- Brain damage
- Gait problems
- Seizures
- Kidney failure
- Shock
- Death

Tests and diagnosis

By Mayo Clinic Staff

Your family doctor or pediatrician can diagnose meningitis based on a medical history, a physical exam and certain diagnostic tests. During the exam, your doctor may check for signs of infection around the head, ears, throat and the skin along the spine. You or your child may undergo the following diagnostic tests:

- **Blood cultures.** Blood drawn from a vein is sent to a laboratory and placed in a special dish to see if it grows microorganisms, particularly bacteria. A sample may also be placed on a slide to which stains are added (Gram's stain), then examined under a microscope for bacteria.
- **Imaging.** X-rays and computerized tomography (CT) scans of the head, chest or sinuses may reveal swelling or inflammation. These tests can also help your doctor look for infection in other areas of the body that may be associated with meningitis.
- **Spinal tap (lumbar puncture).** The definitive diagnosis of meningitis requires an analysis of your cerebrospinal fluid (CSF), which is collected during a procedure known as a spinal tap. In people with meningitis, the CSF fluid often shows a low sugar (glucose) level along with an increased white blood cell count and increased protein.

CSF analysis may also help your doctor identify the exact bacterium that's causing the illness. If your doctor suspects viral meningitis, he or she may order a DNA-based test known as a polymerase chain reaction (PCR) amplification or a test to check for antibodies against certain viruses to check for the specific causes of meningitis. This helps to determine proper treatment and prognosis.

Treatments and drugs

By Mayo Clinic Staff

The treatment depends on the type of meningitis you or your child has.

Bacterial meningitis

Acute bacterial meningitis requires prompt treatment with intravenous antibiotics and, more recently, cortisone medications, to ensure recovery and reduce the risk of complications, such as brain swelling and seizures. The antibiotic or combination of antibiotics that your doctor may choose depends on the type of bacteria causing the

infection. Your doctor may recommend a broad-spectrum antibiotic until he or she can determine the exact cause of the meningitis.

Infected sinuses or mastoids — the bones behind the outer ear that connect to the middle ear — may need to be drained.

Viral meningitis

Antibiotics can't cure viral meningitis, and most cases improve on their own in several weeks. Treatment of mild cases of viral meningitis usually includes:

- Bed rest
- Plenty of fluids
- Over-the-counter pain medications to help reduce fever and relieve body aches

If the cause of your meningitis is a herpes virus, an antiviral medication is available.

Other types of meningitis

If the cause of your meningitis is unclear, your doctor may start antiviral and antibiotic treatment while a cause is being determined.

Fungal meningitis is treated with antifungal medications. However, these medications can have serious side effects, so treatment may be deferred until a laboratory can confirm that the cause is fungal. Chronic meningitis is treated based on the underlying cause, which is often fungal.

Noninfectious meningitis due to allergic reaction or autoimmune disease may be treated with cortisone medications. In some cases, no treatment may be required, because the condition can resolve on its own. Cancer-related meningitis requires therapy for the individual cancer.

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Prevention

By Mayo Clinic Staff

Meningitis typically results from contagious infections. Common bacteria or viruses that can cause meningitis can spread through coughing, sneezing, kissing, or sharing eating utensils, a toothbrush or a cigarette. You're also at increased risk if you live or work with someone who has the disease.

These steps can help prevent meningitis:

- **Wash your hands.** Careful hand-washing is important to avoiding exposure to infectious agents. Teach your children to wash their hands often, especially before they eat and after using the toilet, spending time in a crowded public place or petting animals. Show them how to wash their hands vigorously, covering both the front and back of each hand with soap and rinsing thoroughly under running water.
- **Practice good hygiene.** Don't share drinks, foods, straws, eating utensils, lip balms or toothbrushes with anyone else. Teach children and teens to avoid sharing these items too.
- **Stay healthy.** Maintain your immune system by getting enough rest, exercising regularly, and eating a healthy diet with plenty of fresh fruits, vegetables and whole grains.
- **Cover your mouth.** When you need to cough or sneeze, be sure to cover your mouth and nose.
- **If you're pregnant, take care with food.** Reduce your risk of listeriosis if you're pregnant by cooking meat, including hot dogs and deli meat, to 165 F (74 C), and avoiding soft cheeses made from unpasteurized milk, including feta, queso, Brie and Camembert. Don't eat these types of cheeses unless they're clearly labeled that they were made with pasteurized milk.

Immunizations

Some forms of bacterial meningitis are preventable with the following vaccinations:

- **Haemophilus influenzae type b (Hib) vaccine.** Children in the United States routinely receive this vaccine as part of the recommended schedule of vaccines, starting at about 2 months of age. The vaccine is also recommended for some adults, including those who have sickle cell disease or AIDS and those who don't have a spleen.
- **Pneumococcal conjugate vaccine (PCV7).** This vaccine also is part of the regular immunization schedule for children younger than 2 years in the United States. In addition, it's recommended for children between the ages of 2 and 5 who are at high risk of pneumococcal disease, including children who have chronic heart or lung disease or cancer.
- **Haemophilus influenzae type b and Neisseria meningitidis serogroups C and Y vaccine (Hib-MenCY).** This vaccine is recommended for children younger than 19 months, but not younger than 6 weeks, who are at high risk of meningococcal disease. This includes children with an improperly functioning spleen and sickle cell anemia. The vaccine is given in four doses, at age 2 months, 4 months, 6 months, and between ages 12 months and 15 months.
- **Pneumococcal polysaccharide vaccine (PPSV).** Older children and adults who need protection from pneumococcal bacteria may receive this vaccine. The Centers for Disease Control and Prevention recommends the PPSV vaccine for all adults older than 65, for younger adults and children who have weak immune systems or chronic illnesses such as heart disease, diabetes or sickle cell anemia, and for those who don't have a spleen.
- **Meningococcal conjugate vaccine (MCV4).** The Centers for Disease Control and Prevention recommends that a single dose of MCV4 be given to children ages 11 to 12, with a booster shot given at age 16. If the vaccine is first given between ages 13 and 15, the booster shot is recommended between 16 and 18. If the first shot is given at 16 or older, no booster is necessary.

This vaccine can also be given to younger children who are at high risk of bacterial meningitis or who have been exposed to someone with the disease. It's approved for use in children as young as 9 months old. It's also used to vaccinate healthy people who have been exposed in outbreaks but have not been previously vaccinated.