**The Republic of Iraq**

**Ministry of Higher Education and Scientific Research**

**Al-Furat Al-Awsat Technical University**

**College of Health and Medical Techniques / Kufa**

**Community Health Techniques Department**

**The second stage**

## Communicable Diseases II

**General objective:** To identify diseases that are transmitted from person to person and from animal to human.

**Specific Objective:**

1. The student will learn about the methods of disease transmission in general and the definitions used in the course.

2. The student will learn about diseases caused by viruses and bacteria.

3. The student will learn how to control or prevent these diseases.

| week | objects |
|---|---|
| **1** | Arthropod born viral diseases |
| **2** | Hepatitis virus A |
| **3** | Hepatitis virus B |
| **4** | Hepatitis virus C |
| **5** | AIDS |
| **6** | Whooping cough |
| **7** | Diphtheria |
| **8** | Clostridia infections – tetanus |
| **9** | Tetanus neonatorum |
| **10** | Brucellosis |
| **11** | Anthrax |
| **12-13** | Bacterial meningitis |
| **14-15** | Viral meningitis |

# Arthropod-Borne Viral Diseases

There are a number of arthropod-borne viruses, or arboviruses, that can cause human disease. Among these are several important hemorrhagic fevers transmitted by mosquitoes. such as **yellow fever, dengue fever,** and **chikungunya fever** which are characterized by high fevers and vascular damage that can often be fatal.

## Yellow Fever

Yellow fever is a viral disease spread by the bite of specific kinds of mosquitoes. These mosquitoes and yellow fever are found in areas of Africa and South America located in the tropics and subtropics. The mosquitoes are infected when they bite primates who have the virus.

The yellow fever virus can have a range of symptoms. Some people may have no symptoms. It can present with mild flu-like symptoms but can also be deadly in its most severe form. Person could have flu-like symptoms with aches, pains and fever or could begin bleeding and develop liver disease. Symptoms take about three to six days to develop.

***Symptoms***

Most people infected with yellow fever virus will either have no symptoms or mild symptoms and completely recover. For people who develop symptoms, the time from infection until illness is typically 3 to 6 days.

- Initial symptoms can include sudden onset of fever, chills, severe headache, back pain, general body aches, nausea, vomiting, fatigue (feeling tired), and weakness.
  - Most people who develop symptoms improve within one week.
  - For some people who recover, weakness and fatigue (feeling tired) might last several months.
- A few people will develop a more severe form of the disease.
  - For 1 out of 7 people who have the initial symptoms, there will be a brief remission (a time you feel better) that may last only a few hours or for a day, followed by symptoms of more severe disease.
  - Severe symptoms include high fever, yellow skin or eyes (jaundice), bleeding, shock, and organ failure.

- Among those who develop severe disease, 30-60% die.
- Once you have been infected, you are likely protected against future infections.

***Diagnosis***

The healthcare provider if have visited an area where yellow fever is found and have symptoms described above.

- Tell healthcare provider when and where traveled.
- healthcare provider can order blood tests to look for yellow fever or other similar viruses, like dengue.

More information on diagnostic testing is available on the For Healthcare Providers page.

***Treatment***

There is no medicine to treat yellow fever. However, a vaccine is available to prevent disease.

- Rest, drink fluids, and use over-the-counter pain relievers to reduce fever and relieve aching.
- Avoid certain medications, such as aspirin or other nonsteroidal anti-inflammatory drugs, for example ibuprofen (Advil, Motrin), or naproxen (Aleve), which may increase the risk of bleeding.
- People with severe symptoms of yellow fever infection should be hospitalized for close observation and supportive care.
- If after returning from travel you have symptoms of yellow fever, protect yourself from mosquito bites for up to 5 days after symptoms begin. This will help prevent spreading yellow fever virus to uninfected mosquitoes that can spread the virus to other people.

# Dengue Fever

Dengue fever is an illness you can get from the bite of a mosquito carrying one of four types of dengue virus (DENV). The virus is most commonly found in tropical and subtropical regions, including Central and South America, Africa, parts of Asia and the Pacific Islands. Dengue isn't contagious from person to person except when passed from a pregnant woman to their child.

***Symptoms***

Most dengue infections don't cause symptoms. If you do have symptoms, high fever (104°F/40°C) is typical, along with:

- Rash.
- Intense pain behind your eyes.
- Nausea or vomiting.
- Muscle, bone and joint pain.

Dengue fever symptoms start to appear four to 10 days after a mosquito bite and can last three to seven days. About 1 in 20 people sick with dengue will develop severe dengue after their initial symptoms begin to fade.

➢ Severe dengue is a life-threatening worsening of dengue symptoms. Warning signs of severe dengue are usually seen 24 to 48 hours after your fever goes away.

➢ Severe dengue is a medical emergency that can be fatal. If you have dengue or live in an area where dengue is common, go to the nearest ER immediately if you experience any of these symptoms:

- Stomach/abdominal pain.
- Frequent vomiting.
- Throwing up blood or blood in your poop (stool).
- Nose bleeds or bleeding gums.
- Extreme tiredness, restlessness or irritability.

**The Cause of fever:**

Dengue fever is caused by one of four dengue viruses. When a mosquito infected with the dengue virus bites the patient, the virus can enter blood and make copies of itself. The virus itself and immune system's response can make feel sick.

The virus can destroy parts of blood that form clots and give structure to blood vessels. This, along with certain chemicals that immune system creates, can make blood leak out of vessels and cause internal bleeding. This leads to the life-threatening symptoms of severe dengue.

***Diagnosis***

Dengue fever is diagnosed with a blood test

***Management and Treatment***

There's no medicine that treats dengue fever. our symptoms is the only way to treat dengue fever. Follow healthcare provider's recommendations, which may include:

- Keeping patient hydrated by drinking plenty of water and fluids.
- Getting as much rest as possible.
- Treating pain with acetaminophen only.
- avoid taking ibuprofen or aspirin. This can increase your risk of life-threatening internal bleeding.

The best way to reduce your risk of dengue fever is to protect yourself from mosquito bites. Steps include:

1.Use EPA-registered insect repellents that contain 20% to 30% DEET or other ingredients known to help keep Aedes mosquitos away.

2.Cover exposed skin outdoors, especially at night when mosquitos are more likely to be around.

3.Remove standing water (buckets or barrels, bird baths, old tires that may hold rainwater) and fill low spots where water can pool.

4.Keep mosquitos outside of your home by repairing holes in screens and keeping windows and doors closed if possible.

5.Use mosquito netting at night in areas where dengue is common.

6. If you're pregnant, avoid traveling to areas where dengue is common if possible.

7.When traveling, be sure to check with the CDC to understand if there are any outbreaks of illness in your destination before you leave.

# Hepatitis

Hepatitis is one of the infectious diseases, caused by a viral infection affecting the liver and damaging its cells, temporarily or permanently.

a fairly common systemic disease. It is marked by hepatic cell destruction, necrosis, and autolysis leading to anorexia, jaundice, and hepatomegaly. In most patients, hepatic cells eventually regenerate with little or no residual damage, allowing complete recovery. However, old age and serious underlying disorders make complications more likely. The prognosis is poor if edema and hepatic encephalopathy develop. There are six types of viral hepatitis are recognized:

## ◗ Type A (infectious or short-incubation hepatitis)

Hepatitis A is highly infectious, but rarely fatal. The infection is increasing among children and within the large and poor communities, and during travelling to countries where the virus is rampant.

### Transmission

It is highly contagious and is usually transmitted by the fecal-oral route, commonly within institutions or families. However, it may also be transmitted parenterally. Hepatitis A usually results from ingestion of contaminated food, milk, or water. Outbreaks of this type are often traced to ingestion of seafood from polluted water.

The incubation period of the Hepatitis A usually ranges between 15-50 days.

### The symptoms experienced by the infected:

The initial symptoms of the hepatitis A are similar to the ones reported in the Influenza, and no symptoms may appear on the children infected.

• Exhaustion and general weakness of the body.

• Pain in the body

• Change in urine color to the dark color.

• Nausea and vomiting.

• Diarrhea.

• Fever.

• Yellowing of the skin and eye.

• Severe dehydration due to vomiting.

• Loss of appetite.

• Pains in the upper right area of the abdomen.

**Treatment:**

• There is no specific treatment for the hepatitis A, and the infected person can be cured within several weeks to months with a medical follow-up of the liver functions.

• The purpose of the treatment is to keep the patient comfortable and ensure a suitable, balanced diet, including making up for the fluids lost by vomiting and diarrhea.

**Prevention of the disease:**

• Providing pure, drinkable water.

• Disposing the sewage water in correct ways.

• Paying attention to the personal hygiene, such as washing hands regularly, and washing or peeling the vegetables and fruits before eating.

• Taking the available vaccinations for protection against the hepatitis A: they are safe to be administered to the children at the age of a year, and they are usually advised to be taken before travelling to the places affected by the disease.

## ◗ Type B (serum or long-incubation hepatitis)

• It is a viral infection afflicting the liver, and this disease poses a major public health problem.

• The infected person is likely to develop a chronic liver disease or face death, as a result of complications taking place such as cirrhosis or liver cancer.

**Transmission**

It is transmitted by the direct exchange of contaminated blood (Using needles and syringes contaminated with the virus of an infected person, Exposure to a prick of a needle contaminated with the blood of a person infected with the Hepatitis B, unintentionally such as people working in the health field and laboratories) as well as by contact with contaminated human secretions and stools.

Transmission of hepatitis B also occurs during intimate sexual contact (considered a sexually transmitted infection) and through perinatal transmission (from the mother to infant during childbirth).

**Symptoms:**

On average, the incubation period of the hepatitis B virus amounts to 90 days, after which the symptoms start to appear on the infected person, ranging from60-150 days.

The hepatitis B virus causes acute symptoms lasting for several days, including the following:

• Pain in the body

• Change in urine color to the dark color.

• Nausea and vomiting.

• Diarrhea.

• Fever.

• Yellowing of the skin and eye.

• Severe dehydration due to vomiting.

• Pains in the upper right area of the abdomen.

**Treatment:**

The treatment of the Hepatitis B patient depends on the virus activeness and the disease progress.

**Prevention:**

• All infants should be vaccinated with Hepatitis B vaccines to protect them against the infection.

• The vaccine is given in three separate doses.

• In the areas where the virus transmission rates from the mother to their infant are high, the first dose should be given as soon as possible after delivery, i.e. within 24 hours.

• The vaccine is given to all children and adolescents under the age of 18 years who have never given the vaccine before.

## ◗ Type C

Type C hepatitis is a blood-borne illness transmitted primarily via sharing of needles by I.V. drug users, through unsanitary tattooing, and through blood transfusions .The infection of the Hepatitis C could be transmitted through direct sexual contact with an infected person.

People with chronic hepatitis C are considered infectious. Most of the people infected with the hepatitis C don't show symptoms, and only through routine medical tests do they know that they are infected.

**Symptoms:**

The incubation period of the Hepatitis C ranges from two weeks to six months.

• Loss of appetite.

• Nausea and vomiting.

• Pains in muscles and joints.

• Fever.

• Dark urine

• Yellowing of the skin

**Treatment:**

The antiviral drugs can be used as group drugs for treating the inflammation. It is necessary to do accurate tests for the patient before starting treatment to determine the appropriate treatment plan.

**Prevention:**

• Avoiding sharing the personal items like toothbrushes and shaving razors.

• Be cautious when dealing with contaminated blood, especially those working in the health field.

• Wearing gloves while dealing with the blood in home accidents "wounds", when it happens that a family member is infected with the hepatitis C.

• Avoiding the prohibited sexual relations.

## ◗ Type D (delta hepatitis)

It is confined to people who are frequently exposed to blood and blood products, such as I.V. drug users and hemophiliacs. It's transmitted parenterally and, less commonly, sexually. It occurs only in those who have hepatitis B virus.

## ◗ Type E

Type E hepatitis is transmitted enterically and is usually waterborne, much like type A. Because this virus is inconsistently shed in stools, detection is difficult. Outbreaks of type E hepatitis have occurred in developing countries.

## ◗ Type G

Hepatitis G is a newly discovered form of hepatitis . It is thought to be blood-borne, with transmission similar to that of hepatitis C.

# AIDS

## What is AIDS?

- Acquired: To come into possession of something new
- Immune Deficiency: Decrease or weakness in the body's ability to fight off infections and illnesses
- Syndrome: A group of signs and symptoms that occur together and characterize a particular abnormality
- AIDS is the final stage of the disease caused by infection with a type of virus called HIV.

AIDS is a spectrum of conditions caused by infection with the human immunodeficiency virus (HIV). Following initial infection, a person may not notice any symptoms or may experience a brief period of influenza-like illness. Typically, this is followed by a prolonged period with no symptoms.

As the infection progresses, it interferes more with the immune system, increasing the risk of developing common infections such as tuberculosis, as well as other opportunistic infections, and tumors that rarely affect people who have working immune systems. These late symptoms of infection are referred to as acquired immunodeficiency syndrome (AIDS). This stage is often also associated with unintended weight loss.

### What is HIV?

- **Human:** Infecting human beings
- **Immunodeficiency:** Decrease or weakness in the body's ability to fight off infections and illnesses
- **Virus:** A pathogen having the ability to replicate only inside a living cell

HIV is a virus that attacks cells in the immune system, which is our body's natural defense against illness. The virus destroys a type of white blood cell in the immune system

called a T-helper cell, and makes copies of itself inside these cells. T-helper cells are also referred to as CD4 cells.

As HIV destroys more CD4 cells and makes more copies of itself, it gradually weakens a person's immune system. This means that someone who has HIV, and isn't taking antiretroviral treatment, will find it harder and harder to fight off infections and diseases.

If HIV is left untreated, it may take up to 10 or 15 years for the immune system to be so severely damaged that it can no longer defend itself at all. However, the rate at which HIV progresses varies depending on age, general health and background.

**HIV vs. AIDS**

- HIV is the virus that causes AIDS
- Not everyone who is infected with HIV has AIDS
- Everyone with AIDS is infected with HIV
- AIDS is result of the progression of HIV Infection
- Anyone infected with HIV, although healthy, can still transmit the virus to another person

## Transmission

can only get HIV by coming into direct contact with certain body fluids from a person with HIV who has a detectable viral load. These fluids are:

- Blood
- Semen (*cum*) and pre-seminal fluid *(pre-cum)*
- Rectal fluids
- Vaginal fluids
- Breast milk

For transmission to occur, the HIV in these fluids must get into the bloodstream of an HIV-negative person through a mucous membrane (found in the rectum, vagina, mouth, or tip of the penis), through open cuts or sores, or by direct injection (from a needle or syringe).

An HIV-positive person transmitting HIV to their baby during pregnancy, birth, or breastfeeding.

## Symptoms of AIDS

For the most part, infections by other bacteria, viruses, fungi, or parasites cause the more severe symptoms of HIV.

These conditions tend to progress further in people who live with HIV than in individuals with healthy immune systems. A correctly functioning immune system would protect the body against the more advanced effects of infections, and HIV disrupts this process.

### ***Early symptoms of HIV infection***

Some people with HIV do not show symptoms until months or even years after contracting the virus.

However, around 80% of people may develop a set of flu-like symptoms known as acute retroviral syndrome around 2–6 weeks after the virus enters the body.

The early symptoms of HIV infection may include:

- fever
- chills
- joint pain
- muscle aches

- sore throat
- sweats. particularly at night
- enlarged glands
- a red rash
- tiredness
- weakness
- unintentional weight loss
- thrush

These symptoms might also result from the immune system fighting off many types of viruses.

However, people who experience several of these symptoms and know of any reason they might have been at risk of contracting HIV over the last 6 weeks should take a test.

***Asymptomatic HIV***

In many cases, after the symptoms of acute retroviral syndrome, symptoms might not occur for many years.

During this time, the virus continues to develop and cause immune system and organ damage. Without medication that prevents the replication of the virus, this slow process can continue for an average of around 10 years.

A person living with HIV often experiences no symptoms, feels well, and appears healthy.

Complying rigidly to a course of ART can disrupt this phase and suppress the virus completely. Taking effective antiretroviral medications for life can halt on-going damage to the immune system.

***Late-stage HIV infection***

Without medication, HIV weakens the ability to fight infection. The person becomes vulnerable to serious illnesses. This stage is known as AIDS or stage 3 HIV.

Symptoms of late-stage HIV infection may include:

- blurred vision
- diarrhea, which is usually persistent or chronic
- dry cough
- a fever of over 100 °F (37 °C) lasting for weeks
- night sweats
- permanent tiredness
- shortness of breath, or dyspnea
- swollen glands lasting for weeks
- unintentional weight loss
- white spots on the tongue or mouth

During late-stage HIV infection, the risk of developing a life-threatening illness increases greatly. A person with late-stage HIV can control, prevent and treat serious conditions by taking other medications alongside HIV treatment.

**Control**

1.Sanitary : the use of condoms during sexual intercourse can greatly reduce the chance of infections. Some spermicidal creams may also have anti HIV properties. Non- use of intravenous drugs or sharing of syringes/ needles prevents direct inoculation the virus into the blood. Education is perhaps the best means of preventing disease.

2.Immunological: no vaccines are available but some possibilities do exist.

3.Chemotherapeutic: anti-HIV drugs fall into three categories: the nucleosides, the non-nucleosides and the protease inhibitors.

# Pertussis (Whooping Cough)

Pertussis (whooping cough) is very contagious and can cause serious disease. It is caused by a bacterium called *Bordetella pertussis*.

**Symptoms (three phases generally occur):**

1. Presents as a mild upper respiratory infection (catarrhal phase): non-specific symptoms including runny nose, mild cough, and generally not feeling well. A mild fever may be present.

2. Cough stage (paroxysmal phase): begins during the second week. The cough comes in paroxysms (a series of severe, vigorous coughs that occur during a single breath). Taking a breath after coughing can cause the distinctive "whooping" sound. Paroxysms of coughing can occur after yawning, stretching, laughing, yelling, or exercise. It may also be worse at night and vomiting may accompany the coughing spells. There may be no other symptoms during this phase which can last two to three months if not treated.

3. Convalescent phase: characterized by a gradual reduction in the frequency and severity of cough. It usually lasts one to two weeks. The total duration of symptoms can be about three months.

**Complications:**

The disease is most severe in unimmunized persons especially children under the age of 12 months. It can cause seizures or pneumonia. It can also affect the brain and cause death. Due to the severity of the cough, rib fractures, back strain, hernias, and urinary incontinence can occur.

**Transmission:**

- Humans are the only host.
- Whooping cough spreads easily through the air when an infected person breaths, coughs, or sneezes.
- It is highly contagious. As many as 80% of non-immune household contacts will acquire the disease.
- Patients are most infectious (transmit the disease to others) during the initial presentation and the first two weeks of coughing.

**Incubation:**

- Typically 7 to 10 days following exposure but can be three weeks or longer.

• This is much longer than the usual one to three days incubation period seen with the common cold.

**Diagnosis:**
• Anyone with a cough lasting two weeks without an apparent cause and with paroxysms, an inspiratory whoop or vomiting after coughing should be tested for pertussis.
• A special swab is used to collect a specimen from the back of the nose and sent to the laboratory for testing.

**Treatment:**
• Antibiotics are used to treat this. Azithromycin is the drug most often used but Erythromycin, Clarithromycin, and sulfa may also be prescribed in some cases.

• If treatment is started early, it will limit spread of the disease as well as reduce the duration of illness. If treatment is started late in the disease, it may not affect the course of the illness but could limit spread of the disease.
**Prevention:**
❖ Vaccines
o DTaP (diphtheria, tetanus, pertussis) is the vaccine given to children under age seven.
o Tdap, which is similar to DTaP, is the vaccine licensed for use in people age 7 or older.
o Infants and children should receive the DTaP vaccine at 2, 4, and 6 months. The fourth shot is given at 15 to 19 months of age and a fifth shot when the child enters school.
o Since the vaccine protection wanes with time, a booster vaccine (Tdap) is given at age 11 or 12.
o A Tdap should also be given to all adults to boost their immunity.
o Pregnant women generally get a Tdap during the third trimester. This helps to protect the baby as maternal pertussis antibodies transfer to the newborn.

- ❖ The vaccine is not 100% effective in preventing someone from getting whooping cough but it will help diminish the symptoms and duration of the illness.

# Diphtheria

Diphtheria is an acute bacterial disease caused by toxin-producing strains of *Corynebacterium diphtheriae* that usually affects the tonsils, throat, nose or skin.

## Transmission

Through (1) respiratory droplets through coughing and sneezing
(2) Toys or objects infected with the bacteria

(3) Contact with open sores (skin lesions)

(4) Infected clothing/bedding, etc.

(5) Less frequently, the infection can be transmitted through close contact with skin lesions in a person with the cutaneous form of the illness.

**Signs and Symptoms**

There are two types of diphtheria. One type involves the nose and throat, and the other involves the skin.

**a.** Respiratory diphtheria presents as a sore throat with low-grade fever and an adherent membrane of the tonsils, pharynx or nose. Neck swelling is usually present in severe disease.

**b.** Cutaneous diphtheria occurs as infected skin lesions without any special visible characteristics.

Symptoms usually appear two to four days after infection, with a range of one to 10 days.

**Complications**

In respiratory diphtheria, heart muscle and nerve inflammation as well as airway obstruction are common complications. If diphtheria goes untreated, serious complications such as paralysis, heart failure and blood disorders may occur. Death occurs in approximately five to 10 percent of all cases.

## Diagnosis

The diagnosis is confirmed by culture of the organism from a pharyngeal or wound swab. Once the organism has been identified as *C. diphtheriae*, it will be subjected to PCR testing for the *tox* gene, which is responsible for toxin production, and to ELEK testing, to determine if toxin production is 'switched on'.

## Treatment

Treatment includes antibiotic therapy that kills the bacteria. But administration of DAT (Diphtheria Anti- Toxin) is required in serious cases to neutralize the toxin (poison) already released by the bacterium in the body.

**Prevention**

The single most effective control measure is maintaining the highest possible level of immunization in the community. Travelers who are recommended to have the vaccine for travel to high risk areas require a booster dose every 10 years if a primary course has previously been given. Other methods of control include prompt treatment of cases and a community surveillance program.

Regular vaccination against diphtheria is important to maintain a high level of protection in the community.

a. In children, diphtheria vaccine is usually combined with tetanus vaccine and acellular pertussis vaccine to form a triple vaccine known as DTaP. This vaccine should be given at 2, 4 6 and 15-18 months of age, and between 4 and 6 years of age. A booster shot is recommended every 10 years.

b. In 2005, a new combination tetanus, diphtheria and acellular pertussis vaccine (Tdap) was approved for use in adolescents and adults. Tdap is recommended for use in all 11-12 year olds.

c. For adults, a diphtheria-containing vaccine should be given every 10 years to maintain immunity. The next one of these doses should be Tdap if it has not been given previously.

d. Tdap is recommended for all pregnant women during the third trimester or late in the second trimester of each pregnancy to protect the newborn from pertussis (whooping cough).

# Tetanus

Tetanus is an acute infectious disease caused by spores of the bacterium *Clostridium tetani*. The spores are found everywhere in the environment, particularly in soil, ash, intestinal tracts/feces of animals and humans, and on the surfaces of skin and rusty tools like nails, needles, barbed wire, etc. Being very resistant to heat and most antiseptics, the spores can survive for years.

Anyone can get tetanus, but the disease is particularly common and serious in newborn babies and pregnant women who have not been sufficiently immunized with tetanus-toxoid-containing vaccines. Tetanus during pregnancy or within 6 weeks of the end of pregnancy is called maternal tetanus, and tetanus within the first 28 days of life is called neonatal tetanus.

The disease remains an important public health problem in many parts of the world, but especially in low-income countries or districts, where immunization coverage is low, and unclean birth practices are common. Neonatal tetanus occurs when nonsterile instruments are used to cut the umbilical cord or when contaminated material is used to cover the umbilical stump. Deliveries carried out by people with unclean hands or on a contaminated surface are also risk factors.

## Symptoms and Diagnosis

The incubation period of tetanus varies between 3 and 21 days after infection. Most cases occur within 14 days.

Symptoms can include:

- jaw cramping or the inability to open the mouth
- muscle spasms often in the back, abdomen and extremities
- sudden painful muscle spasms often triggered by sudden noises
- trouble swallowing
- seizures
- headache
- fever and sweating
- changes in blood pressure or fast heart rate.

In neonatal tetanus, symptoms include muscle spasms, which are often preceded by the newborn's inability to suck or breastfeed, and excessive crying.

Tetanus is diagnosed on the basis of clinical features and does not require laboratory confirmation. The WHO definition of a confirmed neonatal tetanus case is an illness occurring in an infant who has the normal ability to suck and cry in the first 2 days of life, but who loses this ability between days 3 and 28 of life and becomes rigid or has spasms.

The WHO definition of non-neonatal tetanus requires at least one of the following signs: a sustained spasm of the facial muscles in which the person appears to be grinning, or painful muscular contractions. Although this definition requires a history of injury or wound, tetanus may also occur in patients who are unable to recall a specific wound or injury.

## Treatment

Tetanus is a medical emergency requiring:

- care in the hospital
- immediate treatment with medicine called human tetanus immune globulin (TIG)
- aggressive wound care
- drugs to control muscle spasms
- antibiotics
- tetanus vaccination.

People who recover from tetanus do not have natural immunity and can be infected again, and therefore need to be immunized.

## Prevention

Tetanus can be prevented through immunization with tetanus-toxoid-containing vaccines (TTCV), which are included in routine immunization programmes globally and administered during antenatal care contacts.

To be protected throughout life, WHO recommends that an individual receives 6 doses (3 primary plus 3 booster doses) of TTCV. The 3-dose primary series should begin as early as 6 weeks of age, with subsequent doses given with a minimum interval of 4 weeks between doses. The 3 booster doses should preferably be given during the second year of

life (12–23 months), at 4–7 years of age, and at 9–15 years of age. Ideally, there should be at least 4 years between booster doses.

There are many kinds of vaccines used to protect against tetanus, all of which are combined with vaccines for other diseases:

- diphtheria and tetanus (DT) vaccines
- diphtheria, tetanus, and pertussis (whooping cough) (DTaP) vaccines
- tetanus and diphtheria (Td) vaccines
- tetanus, diphtheria, and pertussis (Tdap) vaccines.

Neonatal tetanus can be prevented by immunizing women of reproductive age with TTCV, either during pregnancy or outside of pregnancy. Additionally, robust medical practices can also prevent tetanus disease including clean delivery and cord care during childbirth, and proper wound care for surgical and dental procedures.

In countries where national programs have maintained high immunization coverage for several decades, tetanus incidence rates are very low.

# Brucellosis

Brucellosis is a disease get from the bacteria Brucella . Person can get brucellosis from drinking unpasteurized milk, eating unpasteurized milk products or handling infected animals. Symptoms can come and go for a long time and include fever, joint pain and sweating. Brucellosis is treated with antibiotics.

Brucellosis is a zoonotic disease, meaning get it from animals. It's also sometimes called undulant fever, Malta fever, Mediterranean fever and many other names.

## Transmission

Brucellosis exists in most countries of the world. The higher risk for a *Brucella* infection increased with person who:

- Are a veterinarian or work with animals.
- Work on a dairy farm or ranch.
- Are a butcher, work in a slaughterhouse or handle raw meat.
- Hunt animals or field dress.
- Work in a lab that handles *Brucella.*
- Eat uncooked meat or unpasteurized milk products.

Brucellosis is transmitted through contact with infected animals or unpasteurized dairy products. You can get brucellosis by:

- Drinking unpasteurized (raw) milk or eating unpasteurized cheese, ice cream or other milk products. Infected animals produce contaminated milk. However, pasteurization kills the bacteria so you can safely drink milk from sheep, goats, cows or camels even if they have brucellosis.
- Touching the infected tissue or body fluids of an animal. *Brucella* can get into your body through breaks in your skin or through your eyes, nose or mouth.
- Inhaling *Brucella*. You can breathe particles of *Brucella* in from the air, usually from the exposed tissues or blood of an infected animal. This is a risk if you work with *Brucella* in a lab, dress game or work on a farm, in a slaughterhouse or in a meat packing plant.
- Eating undercooked meat.

While person-to-person transmission is a very unlikely way to get brucellosis, there have been rare cases of *Brucella* transmission:

- From a person who is pregnant to a developing fetus.
- Through breastfeeding.
- Through sex.

Brucellosis isn't considered a sexually transmitted infection (STI). There have only been rare cases of brucellosis spreading through sexual contact.

## Symptoms

Symptoms of brucellosis take two to four weeks or longer to appear after you're exposed to the bacteria. Symptoms can come and go for months or years, including:

- Fever.
- Sweating (sometimes with a moldy smell).
- Joint pain, especially in your hips, knees or lower back.
- Unexplained weight loss.
- Headache.
- Abdominal (stomach) pain.
- Loss of appetite or upset stomach.
- Depression.
- Large, painful lymph nodes.
- Generally feeling unwell.

### What causes brucellosis?

Several types of *Brucella* bacteria cause brucellosis, including *B. abortus*, *B. canis*, *B. meliensis* and *B. suis*. Animals carry *Brucella*, including:

- Cattle.
- Goats.
- Pigs.
- Deer.

- Moose.
- Elk.
- Sheep.
- Dogs.
- Camels.

**Diagnosis and Tests**

A healthcare provider diagnoses brucellosis by asking about your symptoms and testing your blood, tissues or other samples for signs of the bacteria *Brucella*. As symptoms of brucellosis can look like other diseases, your provider may test you for other conditions to rule them out.

The best way to confirm a *Brucella* infection is through growing the bacteria from body fluid or tissue. *Brucella* is slow-growing, so it may take a few weeks to confirm your diagnosis. You may need to do more than one blood test over a few weeks to check for signs of *Brucella.*

provider might get body fluid samples, and use imaging or other tests to help diagnose brucellosis, including:

- **Blood tests.** Your provider will take a sample of your blood from your arm using a needle. A lab can look for signs of *Brucella* (antibodies, antigens or DNA) in your blood or try to grow it over time (culture).
- **Tests of other body fluids.** Your provider may take samples of fluid from your spinal canal, joints or other parts of your body to look for signs of *Brucella* or grow it over time.
- **Tissue biopsy.** Your provider may take samples of your bone marrow or other tissue to look for signs of *Brucella* or grow it over time.
- **Imaging.** Depending on which parts of your body are affected, your provider may order X-rays, CT scans, MRI, bone scans, ultrasounds or an echocardiogram. These take pictures of the inside of your body to see if there are any changes to your bones or organs.

**Management and Treatment**

Healthcare provider will treat brucellosis with a combination of at least two types of antibiotics. The patient need to take them for at least six to eight weeks. Depending on your specific case, you may need other therapies (like draining infected areas or managing complications).

**What medications are used to treat brucellosis?**

Antibiotics healthcare providers prescribe to treat brucellosis include:

- Streptomycin or gentamicin.
- Rifampin.
- Doxycycline.
- Trimethoprim/sulfamethoxazole (TMP/SMX).
- Ciprofloxacin.

In addition to taking prescribed antibiotics to get rid of the bacteria, may be able to manage some symptoms of brucellosis, like joint pain and fever, at home. Ask your healthcare provider if there are over-the-counter (OTC) medications or other therapies that are safe for treating symptoms.

**Prevention**

Human can reduce risk of brucellosis by practicing safe food handling and wearing protective clothing while working with animals, for instance:

- Don’t drink unpasteurized milk or eat foods made with unpasteurized milk.
- Wear appropriate safety gear when working with animals and animal tissues. This might include gloves, an apron or goggles. Butchers, veterinarians, hunters, farmers and people who work in slaughterhouses or medical labs need to be especially careful.
- Cook meat to safe temperatures and always wash your hands and the surfaces and utensils used to prepare your food. Game meat can be infected with *Brucella.*

# *Anthrax*

Anthrax is a rare but serious illness caused by a spore-forming bacterium, Bacillus anthracis. Anthrax mainly affects livestock and wild game. Humans can become infected through direct or indirect contact with sick animals.

There's no evidence that anthrax is transmitted from person to person, but it's possible that anthrax skin lesions may be contagious through direct contact or through contact with a contaminated object (fomite). Usually, anthrax bacteria enter the body through a wound in the skin. You can also become infected by eating contaminated meat or inhaling the spores.

Signs and symptoms, which depend on how you're infected, can include skin sores, vomiting and shock. Prompt treatment with antibiotics can cure most anthrax infections. Inhaled anthrax is more difficult to treat and can be fatal.

Anthrax is very rare in the developed world. However, the illness remains a concern because the bacteria have been used in bioterrorism attacks in the United States.

## Symptoms

There are four common routes of anthrax infection, each with different signs and symptoms. In most cases, symptoms develop within six days of exposure to the bacteria. However, it's possible for inhalation anthrax symptoms to take more than six weeks to appear.

### Cutaneous anthrax

A skin-related (cutaneous) anthrax infection enters your body through your skin, usually through a cut or other sore. It's by far the most common route of the disease. It's also the mildest. With appropriate treatment, cutaneous anthrax is seldom fatal. Signs and symptoms include:

- A raised, itchy bump resembling an insect bite that quickly develops into a painless sore with a black center
- Swelling in the sore and nearby lymph glands
- Sometimes, flu-like symptoms including fever and headache


**Cutaneous anthrax**

You can contract anthrax when spores penetrate your skin, usually through an open wound. The infection begins as a raised, sometimes itchy, bump resembling an insect bite. But within a day or two, the bump develops into an open, usually painless sore with a black center.

**Gastrointestinal anthrax**

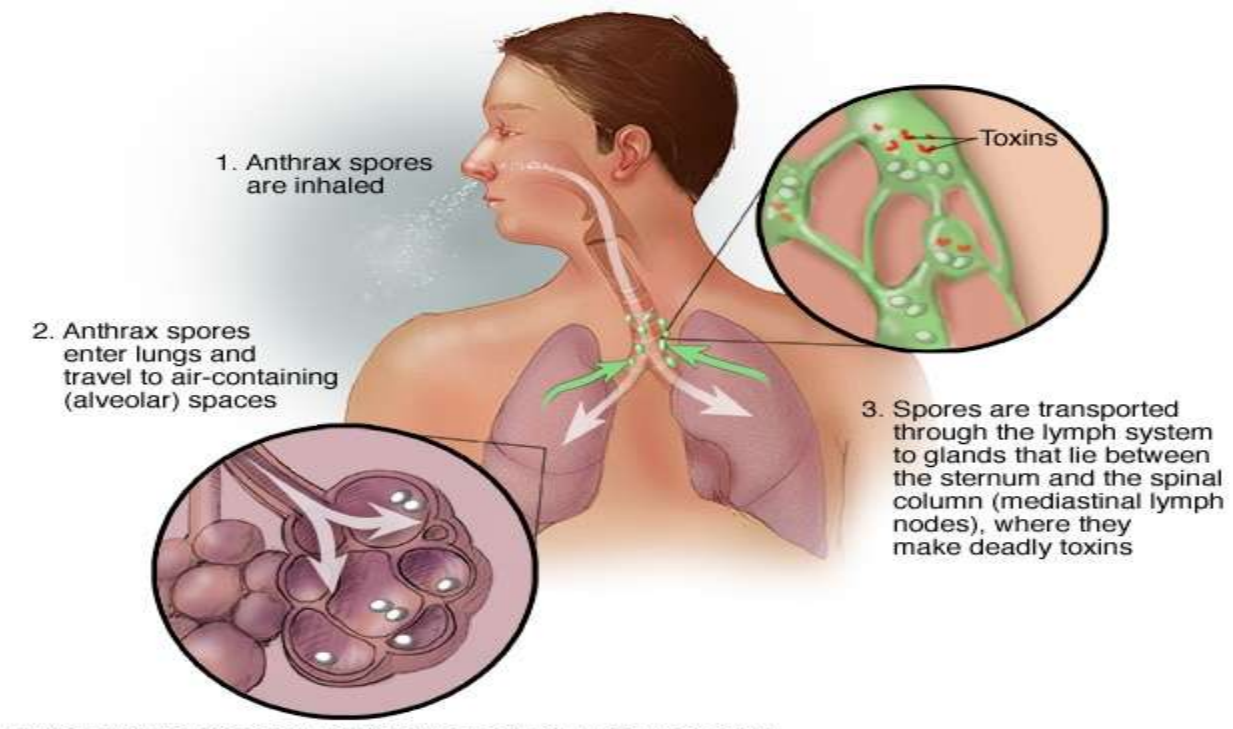
A gastrointestinal anthrax infection results from eating undercooked meat from an infected animal. It can affect your gastrointestinal tract from your throat to your colon. Signs and symptoms include:

- Nausea
- Vomiting
- Abdominal pain
- Headache
- Loss of appetite
- Fever
- Severe, bloody diarrhea in the later stages of the disease
- Sore throat and difficulty swallowing
- Swollen neck

**Inhalation anthrax**

Inhalation anthrax develops when you breathe in anthrax spores. It's the most deadly form of the disease, and is often fatal, even with treatment. Initial signs and symptoms include:

- Flu-like symptoms for a few hours or days, such as sore throat, mild fever, fatigue and muscle aches
- Mild chest discomfort
- Shortness of breath
- Nausea
- Coughing up blood
- Painful swallowing
- High fever
- Trouble breathing
- Shock — an acute medical condition involving collapse of the circulatory system
- Meningitis



**Inhalation anthrax**

This illustration shows how the spores that cause inhalation anthrax — the most deadly form of anthrax infection — enter and affect the body.

**Injection anthrax**

This recently identified route of anthrax infection has so far been reported only in Europe. It's contracted through injecting illegal drugs. Initial signs and symptoms include:

- Redness at the area of injection (without an area that changes to black)
- Significant swelling
- Shock
- Multiple organ failure
- Meningitis

**Causes**

Anthrax spores are formed by anthrax bacteria that occur naturally in soil in most parts of the world. The spores can remain dormant for years until they find their way into a host. Common hosts for anthrax include wild or domestic livestock, such as sheep, cattle, horses and goats.

Although rare in the United States, anthrax is still common throughout the developing world, in places such as Central America and South America, sub-Saharan Africa, Central Asia and southwestern Asia, southern Europe and Eastern Europe, and the Caribbean.

Most human cases of anthrax occur as a result of exposure to infected animals or their meat or hides. In the United States, a few people have developed anthrax while making traditional African drums from the skins of infected animals.

One of the few known instances of nonanimal transmission was a bioterrorism attack that occurred in the United States in 2001. Twenty-two people developed anthrax after being exposed to spores sent through the mail, and five of those infected died.

## Risk factors

To contract anthrax, you must come in direct contact with anthrax spores. This is more likely if you:

- Are in the military and deployed to an area with a high risk of exposure to anthrax
- Work with anthrax in a laboratory setting
- Handle animal skins, furs or wool from areas with a high incidence of anthrax
- Work in veterinary medicine, especially if you deal with livestock
- Handle or dress game animals — while anthrax is rare in the United States, there are occasional outbreaks in domestic cattle and wild animals such as deer
- Inject illegal drugs, such as heroin

## Complications

The most serious complications of anthrax include:

- Your body being unable to respond to infection normally, leading to damage of multiple organ systems (sepsis)
- Inflammation of the membranes and fluid covering the brain and spinal cord, leading to massive bleeding (hemorrhagic meningitis) and death

## Prevention

To prevent infection after being exposed to anthrax spores, the Centers for Disease Control and Prevention recommends:

- A 60-day treatment with antibiotics — ciprofloxacin, doxycycline and levofloxacin are approved for adults and children
- A three-dose series of anthrax vaccine
- In some cases, treatment with monoclonal antibodies — raxibacumab and obiltoxaximab

## Anthrax vaccine

An anthrax vaccine is available for certain groups of people. The vaccine doesn't contain live bacteria and can't lead to infection. However, the vaccine can cause side effects, ranging from soreness at the injection site to more-serious allergic reactions.

The vaccine isn't intended for the general public. Instead, it's reserved for military personnel, scientists working with anthrax and people in other high-risk professions.

**Avoiding infected animals**

If you live or travel in a country where anthrax is common and herd animals aren't routinely vaccinated, avoid contact with livestock and animal skins as much as possible. Also avoid eating meat that hasn't been properly cooked.

Even in developed countries, it's important to handle any dead animal with care and to take precautions when working with or processing imported hides, fur or wool.

# Bacterial Meningitis

Bacterial meningitis is a very serious type of meningitis. It can cause the tissues around your brain to swell, leading to long-term complications and even death. If you have symptoms of bacterial meningitis, you should seek immediate treatment. Early diagnosis and treatment with antibiotics can often lead to a full recovery.

Bacterial meningitis is a life-threatening type of meningitis. Meningitis is inflammation of the membranes (meninges) that surround and protect your brain and spinal cord. An infection of the fluid surrounding your brain and spinal cord usually causes this inflammation. Anyone experiencing symptoms of meningitis should seek medical care immediately. Bacterial meningitis can cause death within hours.

## Symptoms and Causes

Bacterial meningitis symptoms typically come on suddenly, often within 24 hours of exposure. Symptoms may include:

- Fever.
- Headache.
- Inability to lower your chin to your chest due to a stiff neck.
- Flu-like symptoms.
- Nausea and vomiting.
- Photophobia (sensitivity to light).
- Confusion (altered mental status).

In older children and adults, symptoms may also include irritability and increasing drowsiness. Seizures and stroke may occur.

In babies and young children, fever may cause vomiting and they may refuse to eat. Other symptoms may include:

- Sleepiness or trouble waking up.
- Low energy or slower responses (lethargy).
- Irritability.
- Bulging fontanelle (“soft spot” on your baby’s head).

- Seizures.

If the child has any of these symptoms, go to your nearest emergency room or call 911 right away. Bacterial meningitis can worsen quickly, leading to coma and even death within hours.

About 50 different types of bacteria can cause bacterial meningitis. The most common bacteria include:

- Group B *Streptococcus.*
- *Streptococcus pneumoniae (pneumococcal).*
- *Neisseria meningitidis (meningococcal).*
- *Haemophilus influenzae*.
- *Listeria monocytogenes*.
- *Escherichia coli (E. coli)*.

**Transmission**

The bacteria most often responsible for bacterial meningitis are common in the environment. They can be in the nose and throat at any time without causing any harm. You may not get sick, but you can still spread the bacteria to other people who could get sick. it can spread the bacteria through close contact with someone else. The bacteria commonly spreads through respiratory secretions when sneezing, coughing or kissing.

**Who gets bacterial meningitis?**

Children between the ages of 1 month and 2 years are the most susceptible to bacterial meningitis.

Adults with certain risk factors are also susceptible. You're at higher risk if you have:

- Substance use disorder.
- Chronic nose and/or ear infections.
- A head injury.
- Pneumococcal pneumonia.
- A weakened immune system.

- Had your spleen removed.
- Sickle cell disease.

Additionally, if human had brain or spinal surgery or have had a widespread blood infection, you're also at a higher risk for bacterial meningitis.

Outbreaks of bacterial meningitis also occur in living situations where you're in close contact with others, such as college dormitories or military barracks.

**The complications of bacterial meningitis**

If don't seek treatment immediately, bacterial meningitis can lead to paralysis, stroke and death. In people who survive, long-term complications can occur. These complications may include:

- Seizures.
- Memory and concentration issues.
- Balance, coordination and movement problems.
- Learning differences.
- Speech issues.
- Vision or hearing loss.

**Diagnosis and Tests**

**Management and Treatment**

Healthcare providers treat bacterial meningitis with antibiotics. They'll give you an IV (intravenous) antibiotic with a corticosteroid to bring down the inflammation even before all the test results are in. When the lab identifies the specific bacterium causing your condition, your provider may change to a different antibiotic.

**Prevention**

Several vaccines protect against some of the bacteria that cause bacterial meningitis. These vaccines include:

- Meningococcal to protect against *N. meningitidis*.
- Pneumococcal to protect against *S. pneumoniae*.
- Haemophilus influenzae type b to protect against *H. influenzae*.

If the woman is pregnant, should talk to her healthcare provider about group B *Streptococcus* testing during 36th or 37th week of pregnancy. If test positive, provider can give antibiotics during labor to prevent passing group B strep to baby.

It can also prevent bacterial meningitis by maintaining healthy habits, including:

- Quit smoking.
- Get plenty of sleep.
- Stay away from people who are sick.
- Wash your hands frequently.
- Cover your nose and mouth with a tissue when you sneeze or cough.

# Viral Meningitis

Meningitis is an infection and swelling, called inflammation, of the fluid and membranes around the brain and spinal cord. These membranes are called meninges.

The inflammation from meningitis most often triggers symptoms such as headache, fever and a stiff neck.

Viral infections are the most common cause of meningitis in the United States. Bacteria, parasites and fungi also can cause it. Sometimes meningitis improves in a few weeks without treatment. But meningitis also can cause death. It often needs quick treatment with antibiotics.

**Symptoms**

Early meningitis symptoms may be like those of the flu. Symptoms may come on over several hours or over a few days.

**Symptoms in people older than 2 years**

The following may be symptoms of meningitis in people older than 2 years:

- Sudden high fever.
- Stiff neck.
- Bad headache.
- Nausea or vomiting.
- Confusion or trouble concentrating.
- Seizures.
- Sleepiness or trouble waking.
- Sensitivity to light.
- No desire to eat or drink.
- Skin rash sometimes, such as in meningococcal meningitis.

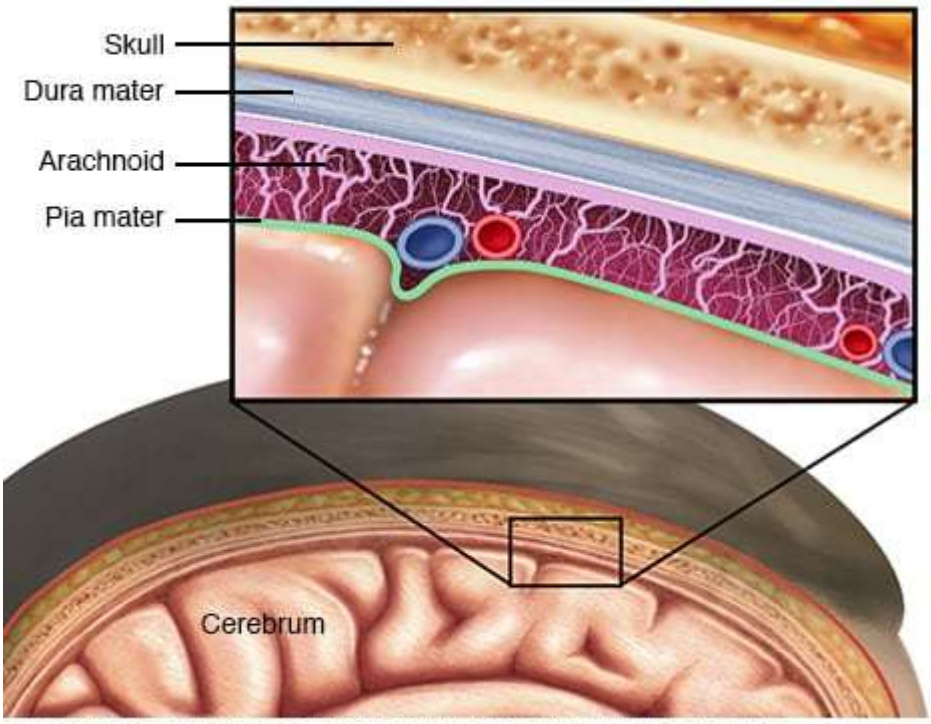
**Symptoms in newborns and infants**

The following may be symptoms of meningitis in newborns and infants:

- High fever.

- Constant crying.
- Being very sleepy or irritable.
- Trouble waking from sleep.
- Being not active or sluggish.
- Not waking to eat.
- Poor feeding.
- Vomiting.
- A bulge in the soft spot on top of the baby's head.
- Stiffness in the body and neck.

**Causes**




**Meningitis**Enlarge image

Viral infections are the most common cause of meningitis in the United States, followed by bacterial infections and, rarely, fungal and parasitic infections. Because bacterial infections can lead to death, finding the cause is vital.

## Bacterial meningitis

Germs that enter the bloodstream and travel to the brain and spinal cord cause bacterial meningitis. But bacterial meningitis also can happen when bacteria directly enter the meninges. This may be caused by an ear or sinus infection or a skull fracture. Rarely, some surgeries can cause it.

Several strains of bacteria can cause bacterial meningitis. The most common are:

- **Streptococcus pneumoniae.** This germ is the most common cause of bacterial meningitis in infants, young children and adults in the United States. It more often causes pneumonia or ear or sinus infections. A vaccine can help prevent this infection.
- **Neisseria meningitidis.** This germ causes a bacterial meningitis called meningococcal meningitis. These germs most often cause an upper respiratory infection. But they can cause meningococcal meningitis when they enter the bloodstream.

This is an easy-to-catch infection that affects mainly teenagers and young adults. It may cause local outbreaks in college dorms, boarding schools and military bases.

A vaccine can help prevent infection. Even if vaccinated, anybody who has been in close contact with a person with meningococcal meningitis should get an oral antibiotic. This can help prevent the disease.

- **Haemophilus influenzae.** Haemophilus influenzae type b bacteria, also called Hib bacteria, was once the leading cause of bacterial meningitis in children. But new Hib vaccines have greatly cut this type of meningitis.
- **Listeria monocytogenes.** These bacteria can be found in cheeses that aren't pasteurized, hot dogs and lunch meats. People who are pregnant, newborns, older adults and people with weakened immune systems are most likely to be affected. During pregnancy, listeria can cross the placenta. Infections in late pregnancy may be fatal to the baby.

## Viral meningitis

Viral meningitis is most often mild and clears on its own. A group of viruses known as enteroviruses is most often the cause in the United States. Enteroviruses are most common in late summer and early fall. Viruses such as herpes simplex virus, HIV, mumps virus, West Nile virus and others also can cause viral meningitis.

## Chronic meningitis

Chronic meningitis is meningitis whose symptoms last at least four weeks without letup. There are many causes of chronic meningitis. Symptoms can be like those of new-onset meningitis. But they come on slower and last longer. Symptoms may include headache, fever, vomiting and brain fog.

## Fungal meningitis

Fungal meningitis isn't common in the United States. It may act like bacterial meningitis. But symptoms may start slower and build over time. Breathing in fungal spores found in soil, decaying wood and bird droppings can be the cause.

Fungal meningitis doesn't spread from person to person. Cryptococcal meningitis is a common fungal form of the disease. It affects people with weakened immune systems, such as from AIDS. It can cause death if not treated with an antifungal medicine. Even with treatment, fungal meningitis may come back.

## Tuberculous meningitis

This type of meningitis is a rare complication of tuberculosis, also called TB. But it can be serious. Like fungal meningitis, its symptoms can start slowly and build up over days to weeks. Tuberculosis passes easily from person to person. Tuberculous meningitis needs treatment with TB medicines.

## Parasitic meningitis

Parasites can cause a rare type of meningitis called eosinophilic meningitis. A tapeworm infection in the brain or cerebral malaria also can cause parasitic meningitis. Amoebic meningitis is a rare type that sometimes comes from swimming in fresh water. It can quickly become life-threatening.

The main parasites that cause meningitis most often infect animals. People can get infected by eating foods that have these parasites. Parasitic meningitis isn't spread from person to person.

## Risk factors

Risk factors for meningitis include:

- **Not getting vaccinations.** Risk rises for anyone who hasn't gotten all the childhood or adult vaccinations.

- **Age.** Viral meningitis most often happens in children younger than age 5 years. Bacterial meningitis is common in those younger than age 20 years.
- **Living in groups.** College students living in dorms, people on military bases, and children in boarding schools and child care facilities are at greater risk of meningococcal meningitis. This is probably because the germ quickly spreads through large groups.
- **Pregnancy.** Pregnancy increases the risk of an infection caused by listeria bacteria, which also may cause meningitis. The infection raises the risk of miscarriage, stillbirth and premature delivery.
- **Weakened immune system.** AIDS, alcohol use disorder, diabetes, medicines that lower the immune system and other factors that affect the immune system raise the risk of meningitis. Having a spleen removed also raises risk. For people without a spleen, a vaccine can lower the risk.

## Complications

Meningitis complications can be serious. The longer someone has the disease without treatment, the greater the risk of seizures and long-term nervous system damage. Damage can include:

- Hearing loss.
- Trouble with vision.
- Memory issues.
- Learning disabilities.
- Brain damage.
- Trouble walking.
- Seizures.
- Kidney failure.
- Shock.
- Death.

## Prevention

Common germs that can cause meningitis can spread through coughing, sneezing or kissing. Germs also can spread by shared eating utensils, toothbrushes or cigarettes.

These steps can help prevent meningitis:

- **Wash hands.** Careful hand-washing helps prevent the spread of germs. Teach children to wash their hands often. Teach them to wash hands before eating and after using the toilet, spending time in a crowded public place, or petting animals. Show them how to wash and rinse their hands well.
- **Practice good hygiene.** Don't share drinks, foods, straws, eating utensils, lip balms or toothbrushes with anyone. Teach children and teens to avoid sharing these items too.
- **Stay healthy.** Keep your immune system strong by getting enough rest, exercising regularly, and eating a good diet with fresh fruits, vegetables and whole grains.
- **Cover your mouth.** When need to cough or sneeze, be sure to cover your mouth and nose. Even better, cough or sneeze into your shoulder.
- **If the woman pregnant, watch what eat.** Reduce risk of a listeria infection by cooking meat, including hot dogs and lunch meats, to 165 degrees Fahrenheit (74 degrees Celsius). Eat only cheeses made from milk that has been pasteurized to kill germs. Check labels to be sure cheeses are made with pasteurized milk.

**Vaccinations**

Vaccinations can help prevent some forms of bacterial meningitis. Vaccinations include:

- **Haemophilus influenzae type b vaccine.**
- **Pneumococcal conjugate vaccine. Pneumococcal polysaccharide vaccine.**
- **Meningococcal conjugate vaccine.**
- **Serogroup B meningococcal vaccine (MenB).** .