**Overview of Viral Infections**

*By*

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* People may get viruses by swallowing or inhaling them, by being bitten by insects, or through sexual contact.
* Most commonly, viral infections involve the nose, throat, and upper airways.
* Doctors may base the diagnosis on symptoms, blood tests and cultures, or examination of infected tissues.
* Antiviral drugs may interfere with the reproduction of viruses or strengthen the immune response to the viral infection.

A virus is a small infectious organism—much smaller than a fungus or bacterium—that must invade a living cell to reproduce (replicate). The virus attaches to a cell (called the host cell), enters the cell, and releases its [DNA or RNA](https://www.merckmanuals.com/home/fundamentals/genetics/genes-and-chromosomes#v711446) inside the cell. The virus’s DNA or RNA is the genetic material containing the information needed to make copies of (replicate) the virus. The virus’s genetic material takes control of the cell and forces it to replicate the virus. The infected cell usually dies because the virus keeps it from performing its normal functions. When it dies, the cell releases new viruses, which go on to infect other cells.

Viruses are classified as DNA viruses or RNA viruses, depending on whether they use DNA or RNA to replicate. RNA viruses include retroviruses, such as HIV ([human immunodeficiency virus](https://www.merckmanuals.com/home/infections/human-immunodeficiency-virus-hiv-infection/human-immunodeficiency-virus-hiv-infection)). RNA viruses, particularly retroviruses, are prone to mutate.

Some viruses do not kill the cells they infect but instead alter the cell's functions. Sometimes the infected cell loses control over normal cell division and becomes cancerous.

Some viruses, such as [hepatitis B virus](https://www.merckmanuals.com/home/liver-and-gallbladder-disorders/hepatitis/hepatitis-b,-chronic) and [hepatitis C virus](https://www.merckmanuals.com/home/liver-and-gallbladder-disorders/hepatitis/hepatitis-c,-chronic), can cause chronic infections. Chronic hepatitis can last for years, even decades. In many people, chronic hepatitis is quite mild and causes little liver damage. However, in some people, it eventually results in [cirrhosis](https://www.merckmanuals.com/home/liver-and-gallbladder-disorders/fibrosis-and-cirrhosis-of-the-liver/cirrhosis-of-the-liver) (severe scarring of the liver), [liver failure](https://www.merckmanuals.com/home/liver-and-gallbladder-disorders/manifestations-of-liver-disease/liver-failure), and sometimes [liver cancer](https://www.merckmanuals.com/home/liver-and-gallbladder-disorders/tumors-of-the-liver/hepatocellular-carcinoma).

**Did You Know...**

| * A virus takes control of the cell it infects and forces it to make more viruses. |
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Viruses usually infect one particular type of cell. For example, common cold viruses infect only cells of the upper respiratory tract. Additionally, most viruses infect only a few species of plants or animals. Some infect only people.

Many viruses commonly cause [infections in infants and children](https://www.merckmanuals.com/home/children-s-health-issues/viral-infections-in-infants-and-children).

Types of viral infections

Probably the most common viral infections are

* **Respiratory infections:** Infections of the nose, throat, upper airways, and lungs

The most common respiratory infections are upper respiratory infections, which include [sore throat](https://www.merckmanuals.com/home/ear,-nose,-and-throat-disorders/symptoms-of-nose-and-throat-disorders/sore-throat), [sinusitis](https://www.merckmanuals.com/home/ear,-nose,-and-throat-disorders/nose-and-sinus-disorders/sinusitis), and the [common cold](https://www.merckmanuals.com/home/infections/respiratory-viruses/common-cold).

Other viral respiratory infections include [influenza](https://www.merckmanuals.com/home/infections/respiratory-viruses/influenza-flu) and [pneumonia](https://www.merckmanuals.com/home/lung-and-airway-disorders/pneumonia).

In small children, viruses also commonly cause [croup](https://www.merckmanuals.com/home/children-s-health-issues/respiratory-disorders-in-infants-and-children/croup) (which is inflammation of the upper and lower airways, called laryngotracheobronchitis) or lower airways ([bronchiolitis](https://www.merckmanuals.com/home/children-s-health-issues/respiratory-disorders-in-infants-and-children/bronchiolitis)).

Respiratory infections are more likely to cause severe symptoms in infants, older people, and people with a lung or heart disorder.

Other viruses infect other specific parts of the body:

* **Gastrointestinal tract:** Infections of the gastrointestinal tract, such as [gastroenteritis](https://www.merckmanuals.com/home/digestive-disorders/gastroenteritis/gastroenteritis), are commonly caused by viruses, such as noroviruses and [rotaviruses](https://www.merckmanuals.com/home/children-s-health-issues/viral-infections-in-infants-and-children/rotavirus-infection).
* **Liver:** These infections result in [hepatitis](https://www.merckmanuals.com/home/liver-and-gallbladder-disorders/hepatitis/overview-of-hepatitis).
* [**Nervous system**](https://www.merckmanuals.com/home/brain,-spinal-cord,-and-nerve-disorders/brain-infections/overview-of-brain-infections)**:** Some viruses, such as the [rabies virus](https://www.merckmanuals.com/home/brain,-spinal-cord,-and-nerve-disorders/brain-infections/rabies) and the [West Nile virus](https://www.merckmanuals.com/home/brain,-spinal-cord,-and-nerve-disorders/brain-infections/encephalitis#v26247332), infect the brain, causing encephalitis. Others infect the layers of tissue that cover the brain and spinal cord (meninges), causing [meningitis](https://www.merckmanuals.com/home/brain,-spinal-cord,-and-nerve-disorders/meningitis/viral-meningitis) or [polio](https://www.merckmanuals.com/home/infections/enteroviruses/polio).
* **Skin:** Viral infections that affect only the skin sometimes result in [warts](https://www.merckmanuals.com/home/skin-disorders/viral-skin-infections/warts) or other blemishes. Many viruses that affect other parts of the body, such as [chickenpox](https://www.merckmanuals.com/home/infections/herpesvirus-infections/chickenpox), also cause a rash.
* **Placenta and fetus**: Some viruses, such as the [Zika virus](https://www.merckmanuals.com/home/infections/arboviruses,-arenaviruses,-and-filoviruses/zika-virus-infection), the [rubella](https://www.merckmanuals.com/home/children-s-health-issues/viral-infections-in-infants-and-children/rubella) virus, and [cytomegalovirus](https://www.merckmanuals.com/home/infections/herpesvirus-infections/cytomegalovirus-cmv-infection), can infect the placenta and fetus in pregnant women.

Some viruses typically affect many body systems. Such viruses include [enteroviruses](https://www.merckmanuals.com/home/infections/enteroviruses/overview-of-enterovirus-infections) (such as coxsackieviruses and echoviruses) and cytomegaloviruses.

Spread of viruses

Viruses are spread (transmitted) in various ways. They may be

* Swallowed
* Inhaled
* Spread by the bites of insects, such as mosquitoes, certain biting flies, or ticks
* Spread sexually (in [sexually transmitted diseases](https://www.merckmanuals.com/home/infections/sexually-transmitted-diseases-stds/overview-of-sexually-transmitted-diseases-stds))
* Spread during transfusion of contaminated blood

Many viruses that were once present in only a few parts of the world are now spreading. These viruses include chikungunya virus, Crimean-Congo hemorrhagic fever virus, Japanese encephalitis virus, Rift Valley Fever virus, West Nile virus, Ross River virus, [Zika virus](https://www.merckmanuals.com/home/infections/arboviruses,-arenaviruses,-and-filoviruses/zika-virus-infection), and louping ill virus. These viruses are spreading partly because climate change has resulted in more areas where the mosquitoes that spread the viruses can live. Also, travelers may be infected, then return home and be bitten by a mosquito, which spreads the virus to other people.

Defenses against viruses

The body has a number of defenses against viruses:

* Physical barriers, such as the skin, which discourage easy entry.
* The body's immune defenses, which attack the virus

When a virus enters the body, it triggers the body's immune defenses. These defenses begin with [white blood cells](https://www.merckmanuals.com/home/immune-disorders/biology-of-the-immune-system/overview-of-the-immune-system#v778515), such as lymphocytes and monocytes, which learn to attack and destroy the virus or the cells the virus has infected. If the body survives the virus attack, some of the white blood cells remember the invader and are able to respond more quickly and effectively to a subsequent infection by the same virus. This response is called immunity. Immunity can also be produced by getting a [vaccine](https://www.merckmanuals.com/home/infections/immunization/overview-of-immunization).

Viruses and cancer

Some viruses alter the DNA of their host cells in a way that helps cancer develop. Some viruses, such as [herpesviruses](https://www.merckmanuals.com/home/infections/herpesvirus-infections/overview-of-herpesvirus-infections) and [HIV](https://www.merckmanuals.com/home/infections/human-immunodeficiency-virus-hiv-infection/human-immunodeficiency-virus-hiv-infection), leave their genetic material in the host cell, where the material remains dormant for an extended time (called latent infection). When the cell is disturbed, the virus may begin replicating again and cause disease.

Only a few viruses are known to cause cancer, but there may be others.

**Diagnosis**

* A doctor's evaluation
* For infections that occur in epidemics, the presence of other similar cases
* For some infections, blood tests and cultures

Common viral infections (such as [measles](https://www.merckmanuals.com/home/children-s-health-issues/viral-infections-in-infants-and-children/measles), [rubella](https://www.merckmanuals.com/home/children-s-health-issues/viral-infections-in-infants-and-children/rubella), or [chickenpox](https://www.merckmanuals.com/home/infections/herpesvirus-infections/chickenpox)) may be diagnosed based on symptoms.

For infections that occur in epidemics (such as [influenza](https://www.merckmanuals.com/home/infections/respiratory-viruses/influenza-flu)), the presence of other similar cases may help doctors identify a particular infection.

For other infections, blood tests and cultures (growing microorganisms in the laboratory from samples of blood, body fluid, or other material taken from an infected area) may be done. Polymerase chain reaction (PCR) techniques may be used to make many copies of the viral genetic material. PCR techniques make it easier for doctors to rapidly and accurately identify the virus. Blood may also be tested for antigens, which are proteins on or in viruses that trigger the body's defense. Blood may also be tested for antibodies to viruses. (Antibodies are proteins produced by the immune system to help defend the body against a particular attack.) Tests are usually done quickly, especially when the infection is a serious threat to public health or when symptoms are severe.

A sample of blood or other tissues is sometimes examined with an electron microscope, which provides high magnification with clear resolution.

**Prevention**

Prevention of viral infections may include

* General measures
* Vaccines
* Immune globulins

Vaccines and immune globulins help the body better defend itself against diseases caused by certain viruses (or bacteria). The process of strengthening the body's defenses is called [immunization](https://www.merckmanuals.com/home/infections/immunization/overview-of-immunization).

General measures

People can help prevent many viral infections by commonsense measures to protect themselves and others (personal protective measures). These measures vary depending on the how the virus is spread. Measures include the following:

* Frequently and thoroughly washing the hands with soap
* Consuming only food and liquids that have been appropriately prepared or treated
* Avoiding contact with infected people and contaminated surfaces
* Sneezing and coughing into tissues (which should be thrown away) or into the upper arm, completely covering the mouth and nose
* Using safe-sex practices
* [Preventing bites by ticks](https://www.merckmanuals.com/home/infections/rickettsial-and-related-infections/rocky-mountain-spotted-fever-rmsf#v27409666), mosquitoes, and other arthropods

Vaccines

[Vaccines](https://www.merckmanuals.com/home/infections/immunization/overview-of-immunization) work by stimulating the body’s natural defense mechanisms (called [active immunization](https://www.merckmanuals.com/home/infections/immunization/overview-of-immunization#v16233245)). Vaccines are given before exposure to a virus to prevent infection.

Viral vaccines in general use include the following:

* [Hepatitis A](https://www.merckmanuals.com/home/infections/immunization/hepatitis-a-vaccine)
* [Hepatitis B](https://www.merckmanuals.com/home/infections/immunization/hepatitis-b-vaccine)
* [Human papillomavirus](https://www.merckmanuals.com/home/infections/immunization/human-papillomavirus-hpv-vaccine) (HPV)
* [Influenza](https://www.merckmanuals.com/home/infections/immunization/influenza-vaccine)
* Japanese encephalitis (inflammation of the brain)
* [Measles, mumps, and rubella](https://www.merckmanuals.com/home/infections/immunization/measles,-mumps,-and-rubella-vaccine)
* [Polio](https://www.merckmanuals.com/home/infections/immunization/polio-vaccine)
* [Rabies](https://www.merckmanuals.com/home/brain,-spinal-cord,-and-nerve-disorders/brain-infections/rabies)
* [Rotavirus](https://www.merckmanuals.com/home/infections/immunization/rotavirus-vaccine)
* [Varicella](https://www.merckmanuals.com/home/infections/immunization/varicella-vaccine)
* Shingles ([herpes zoster](https://www.merckmanuals.com/home/infections/immunization/herpes-zoster-vaccine))
* [Yellow fever](https://www.merckmanuals.com/home/infections/arboviruses,-arenaviruses,-and-filoviruses/yellow-fever#v12823120)

A [smallpox vaccine](https://www.merckmanuals.com/home/infections/immunization/smallpox-vaccine) is available but is used only in people who are at high risk of getting the infection, such as certain military personnel.

Viral diseases can be eradicated by good vaccines. [Smallpox](https://www.merckmanuals.com/home/infections/pox-viruses/smallpox) was eradicated in 1978. [Polio](https://www.merckmanuals.com/home/infections/enteroviruses/polio) has been eradicated from all but a few countries where logistics and religious sentiment continue to interfere with vaccination. [Measles](https://www.merckmanuals.com/home/children-s-health-issues/viral-infections-in-infants-and-children/measles) has been almost eradicated from some parts of the world, such the Americas. However, because measles is highly contagious and vaccination coverage is incomplete even in regions where it is considered eradicated, it is not likely to be completely eradicated soon.

Immune globulins

Immune globulins are a sterilized solution of antibodies (also called immunoglobulins) collected from the blood of a group of people. Immune globulins are given directly to a person (called [passive immunization)](https://www.merckmanuals.com/home/infections/immunization/overview-of-immunization#v16233290).

Immunoglobulins can be collected from the blood of the following:

* People who are generally healthy (these immunoglobulins are called pooled human immunoglobulin)
* People who have many antibodies that defend against a specific infectious organism, often because they have been infected with that organism (these immunoglobulins are called hyperimmune globulin)

Hyperimmune globulin is available for only a few infectious diseases, such as hepatitis B, rabies, tetanus, and chickenpox.

Immune globulins are given by injection into a muscle or into a vein. The immunity provided by immune globulins lasts for only a few days or weeks, until the body eliminates the injected antibodies.

Some immune globulins and some vaccines, such as those for rabies and hepatitis B, are also used *after* exposure to the virus to help prevent infection from developing or reduce the severity of infection.

Immune globulins may also help treat some infections. For example, they may be given to people whose immune system does not respond adequately to an infection (see [Replacing missing parts of the immune system](https://www.merckmanuals.com/home/immune-disorders/immunodeficiency-disorders/overview-of-immunodeficiency-disorders#v35123402)).

**Treatment**

* Treatment of symptoms
* Sometimes antiviral drugs

Treatment of symptoms

There are no specific treatments for many viruses. However, many things can help relieve certain symptoms, such as the following:

* Dehydration: Plenty of fluids, sometimes given by vein (intravenously)
* Diarrhea: Sometimes loperamide
* Fever and aches: Acetaminophen or nonsteroidal anti-inflammatory drugs (NSAIDs)
* Nausea and vomiting: A clear-liquid diet and sometimes an antiemetic (antinausea) drug, such as ondansetron
* Some rashes: Soothing or moisturizing creams and sometimes an antihistamine taken by mouth for itching
* A runny nose: Sometimes nasal decongestants, such as phenylephrine or phenylpropanolamine
* A sore throat: Sometimes throat-numbing lozenges containing benzocaine or dyclonine

Not everyone who has these symptoms needs treatment. If symptoms are mild, it may be better to wait for them to go away on their own. Some treatments may not be appropriate for infants and young children.

Antiviral drugs

Drugs that combat viral infections are called antiviral drugs. There are no effective antiviral drugs for many viral infections. However, there are several [drugs for influenza](https://www.merckmanuals.com/home/infections/respiratory-viruses/influenza-flu#v788692), many drugs for infection by one or more herpesviruses (see Table: [Some Antiviral Drugs for Herpesvirus Infections](https://www.merckmanuals.com/home/infections/herpesvirus-infections/overview-of-herpesvirus-infections#v12822454)), and many new antiviral drugs for [treatment of HIV](https://www.merckmanuals.com/home/infections/human-immunodeficiency-virus-hiv-infection/drug-treatment-of-human-immunodeficiency-virus-hiv-infection) (see Table: [Drugs for HIV Infection](https://www.merckmanuals.com/home/infections/human-immunodeficiency-virus-hiv-infection/drug-treatment-of-human-immunodeficiency-virus-hiv-infection#v44314896)) and [hepatitis C](https://www.merckmanuals.com/home/liver-and-gallbladder-disorders/hepatitis/overview-of-chronic-hepatitis#v759691).

Many antiviral drugs work by interfering with replication of viruses. Most drugs used to treat HIV infection work this way. Because viruses are tiny and replicate inside cells using the cells' own metabolic functions, there are only a limited number of metabolic functions that antiviral drugs can target. In contrast, bacteria are relatively large organisms, commonly reproduce by themselves outside of cells, and have many metabolic functions that antibacterial drugs (antibiotics) can target. Therefore, antiviral drugs are much more difficult to develop than antibiotics. Also, unlike antibiotics, which are usually effective against many different species of bacteria, most antiviral drugs are usually effective against only one (or a very few) viruses.

**Antiviral Drugs**

Antiviral drugs can be toxic to human cells. Also, viruses can develop resistance to antiviral drugs.

Most antiviral drugs can be given by mouth. Some can also be given by injection into a vein (intravenously) or muscle (intramuscularly). Some are applied as ointments, creams, or eye drops or are inhaled as a powder.

Antibiotics are not effective against viral infections, but if a person has a bacterial infection in addition to a viral infection, an antibiotic is often necessary.

**Interferon drugs** are replicas of naturally occurring substances that slow or stop viral replication. These drugs are used to treat certain viral infections such as

* [Chronic hepatitis B](https://www.merckmanuals.com/home/liver-and-gallbladder-disorders/hepatitis/hepatitis-b,-chronic)
* [Chronic hepatitis C](https://www.merckmanuals.com/home/liver-and-gallbladder-disorders/hepatitis/hepatitis-c,-chronic)
* [Genital warts](https://www.merckmanuals.com/home/infections/sexually-transmitted-diseases-stds/human-papillomavirus-hpv-infection)

Interferons may have side effects, such as fever, chills, weakness, and muscle aches. These effects typically start 7 to 12 hours after the first injection and last up to 12 hours.