

# WHAT'S THE DIFFERENCE BETWEEN VIRUSES AND BACTERIA?

Use the following information to make a VENN DIAGRAM describing the *differences and similarities* between *viruses and bacteria*. Once you are done, you should use this information to write a detailed description of the two in essay format on Writing Wednesday. The introductory paragraph should include a thesis statement and the similarities between bacteria and viruses. The following two paragraphs should detail how the two are different. Finally, close with your concluding paragraph, summarizing your statements made in your essay.

## A BRIEF OVERVIEW

*Bacteria* are single-cell, living organisms that can survive independently. You can kill them by interfering with their metabolism (internal biological functions), which is basically what antibiotics do. *Antibiotics* are used to treat bacterial infections. Most bacteria are neither male nor female and reproduce by simply dividing in to two. Infections they cause include pneumonia, cystitis and food poisoning bugs like salmonella. But, did you know not all bacteria are bad? In fact, some friendly types actually help protect us from disease.

*Viruses* are not cells, they have no metabolism and they cannot survive alone. A virus is a chain of DNA (genetic material) and needs a *host cell* in order to stay alive. You can, of course, pick them up on door handles and other surfaces. That's one of the most common ways of catching colds and flu, but that's because they're contained in sweat or skin cells. Once a virus gets in to cells it tricks the cells to replicate it! Antibiotics are useless against viruses. That said, if you have a virus, like a cold, the doctor will never prescribe an antibiotic because it will not work! Antiviral drugs either improve the immunity of the cell to the virus or interfere with the virus's reproduction.

## INFECTIONS - BACTERIAL & VIRAL

Many human infections are caused by either bacteria or viruses. Bacteria are tiny single-celled organisms, thought by some researchers to be related to plants. They are among the most successful life forms on the planet, and range in habitat from ice slopes to deserts. Bacteria can be beneficial – for instance, gut bacteria help us to digest food – but some are responsible for a range of infections. These disease-causing varieties are called pathogenic bacteria. Many bacterial infections can be treated successfully with appropriate antibiotics, although antibiotic-resistant strains are beginning to emerge. Immunization is available to prevent many important bacterial diseases. A virus is an even smaller micro-organism that can only reproduce inside a host's living cell. It is very difficult to kill a virus. That's why some of the most serious communicable diseases known to medical science are viral in origin.

## HOW BACTERIA & VIRUSES ENTER THE BODY

BACTERIA	VIRUSES
To cause disease, pathogenic bacteria must gain access into the body. The range of access routes for bacteria includes:	Spread from one person to another by:
<ul style="list-style-type: none"><li>💡 Cuts</li><li>💡 Contaminated food or water</li><li>💡 Close contact with an infected person</li><li>💡 Contact with the feces of an infected person</li><li>💡 Breathing in the exhaled droplets when an infected person coughs or sneezes</li><li>💡 Indirectly, by touching contaminated surfaces – such as taps, toilet handles, toys and nappies.</li></ul>	<ul style="list-style-type: none"><li>💡 Coughs</li><li>💡 Sneezes</li><li>💡 Vomits</li><li>💡 Bites from infected animals or insects</li><li>💡 Exposure to infected bodily fluids through activities such as sexual intercourse or sharing hypodermic needles</li><li>💡 Forgetting to wash your hands after handling pets and animals is another way for germs to be taken in by mouth.</li></ul>

## CURING INFECTIONS:

Bacterial infection: The body reacts to disease-causing bacteria by increasing local blood flow (inflammation) and sending in cells from the immune system to attack and destroy the bacteria. Antibodies produced by the immune system

attach to the bacteria and help in their destruction. They may also inactivate toxins produced by particular pathogens, for example tetanus and diphtheria.

Viral infection: Antibiotics are useless against viral infections. This is because viruses are so simple that they use their host cells to perform their activities for them. Antiviral drugs work differently than antibiotics by interfering with the viral enzymes. Antiviral drugs are currently only effective against a few viral diseases, such as influenza, herpes, hepatitis B and C and HIV – but research is ongoing. A naturally occurring protein, called interferon (which the body produces to help fight viral infections), can now be produced in the laboratory and is used to treat hepatitis C infections.

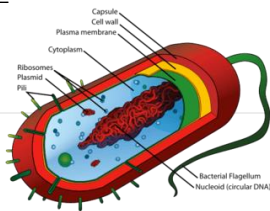
Immunization against viral infection is not always possible

It is possible to vaccinate against many serious viral infections such as measles, mumps, hepatitis A and hepatitis B. An aggressive worldwide vaccination campaign, headed by the World Health Organization (WHO), managed to wipe out smallpox. However, some viruses – such as those that cause the common cold – are capable of mutating from one person to the next. This is how an infection with essentially the same virus can keep dodging the immune system. Vaccination for these kinds of viruses is difficult, because the viruses have already changed their format by the time vaccines are developed.

**BACTERIA**

**VIRUSES**

<b>LIVING?</b>	Living organism	Nonliving
<b>NUMBER OF CELLS</b>	Unicellular; one cell	No cells; not living
<b>TREATMENT</b>	Antibiotics	Vaccines prevent the spread and antiviral medications help to slow reproduction but cannot stop it completely.
<b>INFECTION</b>	Localized area of body	Systemic – can affect entire body
<b>BENEFITS</b>	Some bacteria are beneficial (e.g. certain bacteria are required in the gut)	Viruses are NOT beneficial. However, a particular virus may be able to destroy brain tumors (see references). Viruses can be useful in genetic engineering.
<b>REPRODUCTION</b>	Splits into 2	Invades a host cell and takes over the cell causing it to make copies of the viral DNA/RNA. Destroys the host cell releasing new viruses.
<b>SIZE</b>	Larger	Super tiny



**QUICK RECALL FACTS:**

- 💡 The biggest difference between viruses and bacteria is that viruses must have a living host – like a plant or animal – to multiply, while most bacteria can grow on non-living surfaces.
- 💡 There are some useful bacteria but all viruses are harmful.
- 💡 [Antibiotics](#) can kill bacteria but not viruses.
- 💡 An example of a disease caused by bacteria is strep throat and an example of an affliction caused by a virus is the [flu](#).