

# The Life of Viral Gastroenteritis

## Introduction

It happens to nearly everyone at some point. After eating an apparently safe meal from a new eatery, your body turns on itself; your stomach writhes with pain and the bathroom becomes a safe haven for the next few days or even weeks. Steady vomiting, diarrhea, and abdominal pains are three telltale signs of gastroenteritis, otherwise known as the stomach flu. Close to twenty million Americans experience this infection each year. Knowing the symptoms, causes, processes, and treatments for the stomach flu will allow you to accurately diagnose the sickness before it spreads to others and then hopefully eliminate the illness from your life. Remember, this guide is not a substitute for a professional physician.

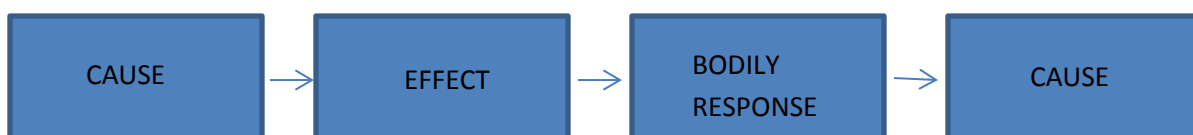
## Definition

Gastroenteritis is an infection targeting the lower digestive system that prevents the intestines from efficiently absorbing water from food. The word “gastroenteritis” is a conglomeration of the prefixes “gastro” and “entero” as well as the suffix “itis”. “Gastro” refers to the stomach and “entero” refers to the small and large intestines. Since “itis” denotes an infection, gastroenteritis literally translates to “an infection of the stomach and intestines.” When most people talk about gastroenteritis, they use the simplified term “stomach flu”; note, however, that this illness has no relation to influenza. This description uses “stomach flu” and “gastroenteritis” interchangeably.

## Life-Cycle

The sickness’s lifespan ranges from where it is contracted until its death through treatment. Gastroenteritis starts from a poorly sanitized source, makes its way to the human body, attacks the digestive system, and dies due to the immune system’s white blood cells. This process is described by the four part diagram below:

**Gastroenteritis Life-Cycle Diagram**



The infection begins at a contaminated source and then spreads to a living host. From here it infects the intestines of the host, causing the host to suffer from a variety of symptoms. After about a week, the body’s self-defense mechanisms successfully eliminate the virus. The four steps are described in order below.

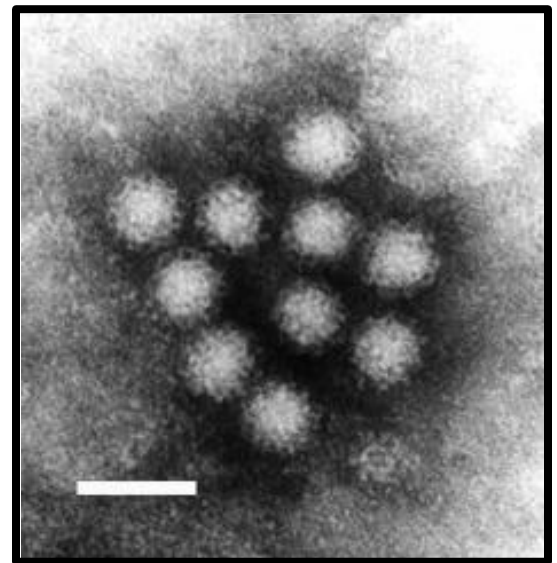
## The Process

The three steps of the gastroenteritis life-cycle are its causes, methods of attack, and elimination. Because the process is a cycle, the virus is not truly eliminated; instead, it simply transfers to its original habitat, ready to infect another unaware host.

### Cause – Where does the virus come from?

Scientists do not know how viruses were created and where they first came from. However, researchers have determined that different viruses tend to exist in some places more densely than in others.

In adults, the great majority (around 90%) of gastroenteritis cases are caused by “Norovirus.” This virus, shown to the right, is characterized mainly by its habitat – fecally contaminated food and water. The infection is particularly agile and can latch onto solid and liquid surfaces through direct contact. Because its spreading behavior is a consequence of touching objects, it can be difficult to avoid. For instance, if one person in a family of four has the virus, he or she might spread the virus to a countertop. From here, it can easily transfer to one of the other three family members if any of them touch the counter. The simplest way to prevent the virus from spreading is to wash your hands thoroughly with soap before preparing or consuming a meal. Because norovirus originates from fecal matter, washing hands after using the restroom can stop it from entering the rest of your home.



**Norovirus**

(The white bar is 50 nanometers)

<http://www.phoenixism.net/wp-content/uploads/Norovirus.jpg>

Although viral infections most commonly engender gastroenteritis, bacterial infections can also lead to the stomach flu. However, the rest of this description will focus on viral gastroenteritis because it is by far the most common type.

### Effects – What does the virus do to your intestines?

Once you have contracted the virus, it begins to target your small intestine. This is the key difference that separates gastroenteritis from other viral infections. Unlike most viruses, norovirus heads directly to your intestines instead of harming any other organs. Once a particle reaches the small intestine, it acts like a normal virus and immediately latches itself onto a nearby cell. From here, the virus penetrates into the cell wall and inserts its information into the cell’s enzymes, essentially hijacking them. In a normal cell, the enzymes help create and duplicate various cell parts. However, the virus has inserted its genetic information into the enzyme, forcing it to duplicate the virulent particles. Vomiting, diarrhea, and stomach pain are all direct results of the virus taking over the intestinal cells:

- **Vomiting**

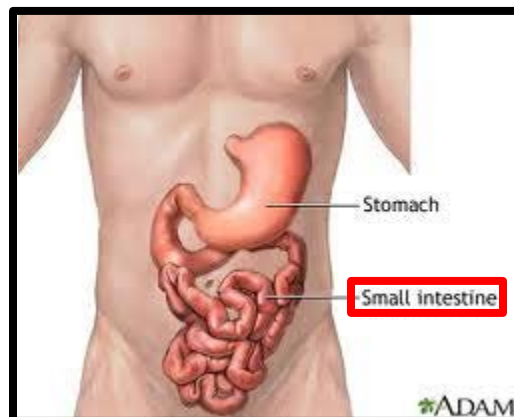
In addition to duplicating itself within the cell, the virus forces a rapid release of a chemical called “serotonin.” Ironically, little bits of serotonin actually improve your mood and make you feel happy. However, when copious amounts of the chemical rush into the bloodstream, the body attempts to expel the serotonin by vomiting.

- **Diarrhea**

In a healthy human body, the cells in the small intestine absorb water and other essential nutrients from food. When infected by a virus, the intestinal cells do not work as they are supposed to. They do not absorb much water from the passing food, so the material that passes through is almost entirely liquid. This material is excreted as watery stool - in other words, diarrhea.

- **Abdominal Cramps/Pain**

While you are infected with gastroenteritis, the immune system creates white blood cells to help fight the virus. This is explained more in detail in the next section. However, before any white blood cells are created, the body automatically undergoes a process called inflammation. Many people think inflammation is synonymous with infection. In fact, they are two separate events: infection involves the virus taking over your cells, while inflammation is the body’s attempt at destroying the virus by filling the infected area with blood. By pooling blood around the virus, the infected cells are washed away through the blood stream and excreted from the body. Unfortunately, the pooling of blood makes the lower abdomen very sensitive to touch, giving rise to cramps and pain.



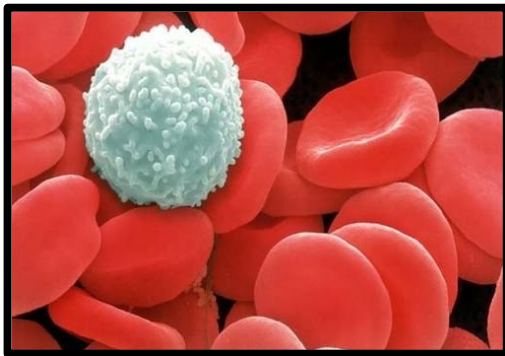
The norovirus travels straight to the small intestine before infecting surrounding cells.

<http://www.nlm.nih.gov/medlineplus/ency/imagepages/8940.htm>

After invading and duplicating inside the host cell, the virus copies eject themselves from the cell wall and move to other cells, continuing the damaging cycle.

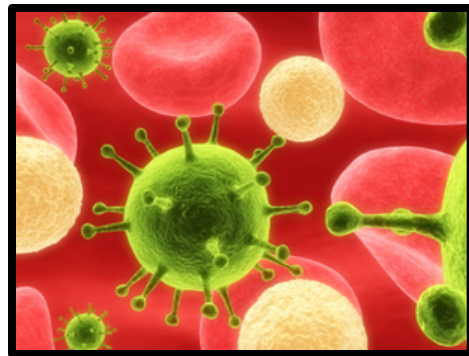
## Bodily Response – How is the virus eliminated?

Gastroenteritis has taken over your lower digestive system, but what can you do to get rid of it? Luckily, the average gastroenteritis infection lasts for about one week, making it a relatively harmless illness. Like most other viral infections, it is very difficult to treat gastroenteritis with medication. This is because viruses directly penetrate into the cells of the body, and destroying the virus would mean destroying the entire cell itself. Fortunately, norovirus is a self-limiting virus. A self-limiting virus is a special type of virulent strain that cannot duplicate for long periods of time. When norovirus particles infect your cells, your immune system starts producing white blood cells (known as lymphocytes) that neutralize the virus without hurting the surrounding cell. Because norovirus is self-limiting and replicates slowly, your body can create many white blood cells before the virus spreads too far. Since the rate of white blood cell creation is greater than the rate of virus duplication, your body will eventually eliminate the virus.



A white blood cell (middle-left) in a sea of red blood cells in the bloodstream.

<http://www.just-health.net/images/10416321/image001.jpg>



Three white blood cells (light yellow) surrounding a virus particle (green), ready to consume and destroy it.

<http://www.proimmune.com/ecommerce/html/chapuis/virus-and-cells-300px.jpg>

## Conclusion

Viral gastroenteritis affects close to six percent of Americans every single year, making it one of the most common illnesses. It follows a fairly simple path starting from fecally contaminated material. From here the body contracts the virus, allowing it to travel to the small intestine. After wreaking havoc on the lower digestive system, the virus will succumb to the powerful white blood cells of the immune system. Understanding the virus's life process can help you diagnose, eliminate, and prevent it in the future. Wash your hands often, cook your meats thoroughly, and drink plenty of water daily - your stomach and intestines will thank you.

## References

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