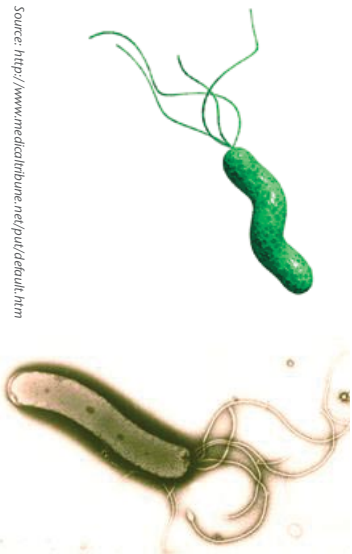


## HELICOBACTER PYLORI



Source: <http://www.medicallibrary.net/patdetail.htm>

### What is Helicobacter pylori?

*Helicobacter pylori* (*H. pylori*) are a type of intestinal bacteria that cause the majority of ulcers in the stomach and duodenum. They thrive in highly acidic environments and have a unique way of adapting to the harsh environment of the stomach. *H. pylori* have been classified as low-potential carcinogens (cancer-causing substances) by the World Health Organization.

### The Life Cycle (Pathogenesis) of Helicobacter pylori

*H. pylori* are able to survive in stomach acid because they produce enzymes (special proteins) that neutralize the acid. This mechanism allows *H. pylori* bacteria to enter the stomach and make their way to the “safe” area – the protective mucous lining of the stomach wall. When the bacterium is in the mucous lining of the stomach, the body’s natural defenses cannot reach it. The immune system will respond to an *H. pylori* infection but will not be able to kill the bacteria since they are hidden in the stomach lining. The immune system will keep sending infection fighters to the infection site and *H. pylori* will feed on the nutrients provided by the body, allowing them (the bacteria) to survive in the stomach environment.

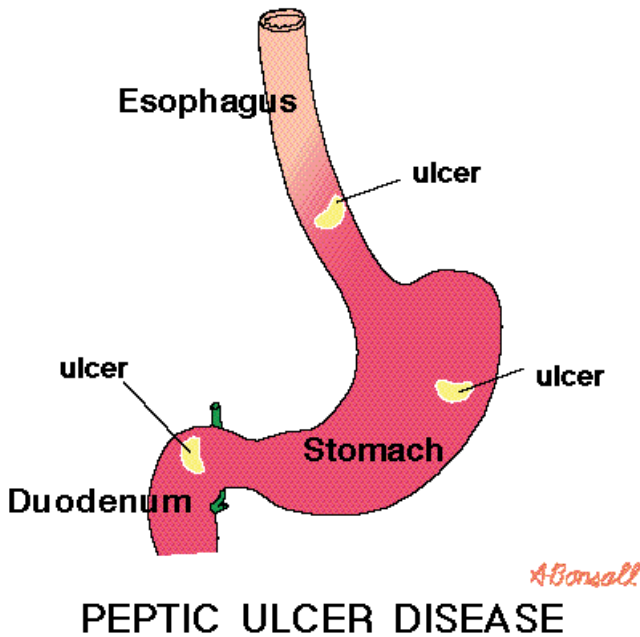
*H. pylori* weaken the protective mucous coating of the stomach and duodenum, allowing the stomach acid to get through to the sensitive lining beneath. Both the acid and the bacteria irritate the lining, causing gastritis (stomach inflammation) and perhaps the formation of an ulcer within a few days of the initial infection. Ironically, it may not be the *H. pylori* bacteria, but the inflammation response to the bacteria, that causes the ulcer to form.

The series of steps – the pathogenic mechanisms – that *H. pylori* go through when establishing themselves in the stomach are as follows:

- 1) Attachment** – The *H. pylori* bacteria must enter the stomach and attach themselves to the lining of the stomach to establish an environment in which to grow.
- 2) Toxin production** – *H. pylori* produce poisonous substances to increase the secretion of water and electrolytes in the stomach and cause cell death in the cells of the stomach lining. This will help the bacteria take over the stomach environment and will lessen the competition for required nutrients.
- 3) Cell invasion** – The bacteria will enter the stomach lining cells for protection and will then kill the cells they are in (their host cells) so that they can move on to invade more stomach-lining cells. This process will continue, thus creating tissue damage. This tissue damage will become the ulcer formation in the stomach.
- 4) Loss of microvilli/villi** – The substances released into the host cell during the ‘Cell Invasion’ step cause a change in the stomach-lining cells. This change results in fewer calories getting absorbed by the stomach. The consequence? The body will get fewer nutrients from the food eaten at every meal.

### What causes ulcers?

Ulcers occur when there is a break down in the mucous layer lining the stomach, allowing the gastric (stomach) acid and digestive enzymes to attack and aggravate the actual stomach muscle. *Helicobacter pylori* contribute to this breakdown by living in this layer and increasing the chances of it breaking down. Stress and diet may irritate an ulcer, but do not cause it.



### What is Peptic Ulcer Disease (PUD)?

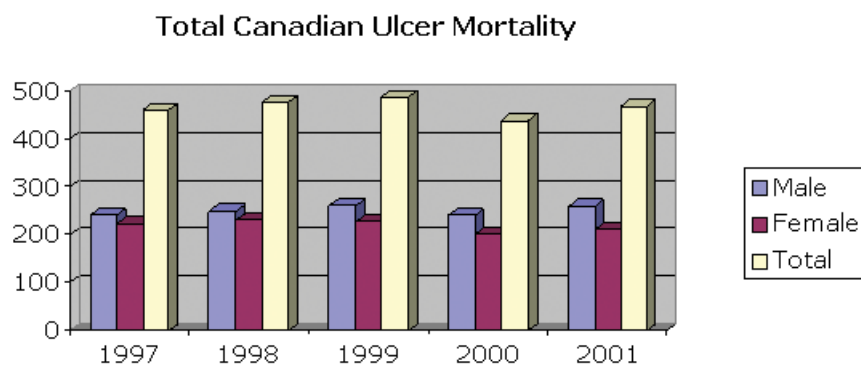
A peptic ulcer is a sore on the lining of the stomach or duodenum (the beginning of the small intestine). One cause of peptic ulcers is bacterial infection, but some ulcers are caused by long-term use of aspirin and ibuprofen. PUD is not caused by stress or eating spicy food.

Peptic Ulcer Disease is considered to be a long-term, low-mortality illness of the stomach and intestine, with frequent clinical flare-ups. In the United States population alone, the lifetime prevalence of PUD is about one in ten.

### How common is infection?

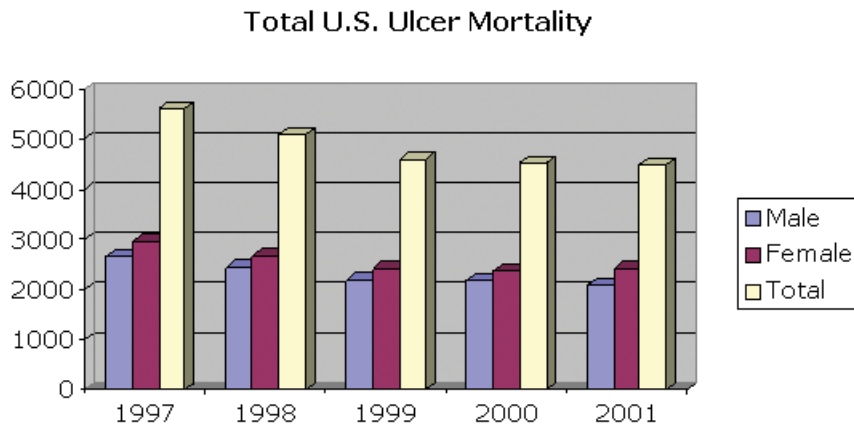
*H. pylori* infection is common in the United States. Research has shown that the bacterium, *Helicobacter pylorus*, causes at least 75 % of stomach ulcers and two types of stomach cancer. About five million people in the US have Peptic Ulcer Disease and two and one half million new cases of *H. pylori* bacteria infections occur each year. Every year, there are 500,000 to 850,000 new cases of Peptic Ulcer Disease and more than one million ulcer-related hospitalizations. The following graphs outline the peptic ulcer mortality statistics for both Canada and the U.S (1997-2001 data). An interesting trend to note is that, in Canada, males tend to experience higher ulcer mortality, as compared to females. However, in the U.S, that trend seems to be reversed, with females experiencing higher ulcer mortality. For Canadian and U.S. ulcer morbidity (the prevalence of a disease) statistics, please see detailed fact sheet.

**Graph 1:** Total Canadian deaths due to digestive ulcers



Source: Statistics Canada: Vital Statistics Death Database (Health Statistics)

**Graph 2: Total U.S. deaths due to digestive ulcers**



Source: Centers for Disease Control and Prevention (CDC) [www.cdc.gov](http://www.cdc.gov)

### What are the symptoms and incubation time of an *H. pylori* infection?

Getting an *H. pylori* infection is nothing like catching a common cold in that immediate consequences of an infection are rarely seen. In fact, it is possible to go many years without noticeable symptoms. When symptoms do occur, abdominal discomfort is the most common. This discomfort is usually a dull, gnawing ache that comes and goes for several days or weeks. It usually occurs two to three hours after a meal or in the middle of the night (when the stomach is empty) and is relieved by eating, drinking milk or taking antacid medications.

Other symptoms include: heartburn, increased burping, weight loss, bloating and burping, and less common symptoms include: poor appetite, nausea and vomiting.

If you suspect that you have an ulcer and experience any of the following symptoms, a doctor should be called right away.

- Sharp, sudden, persistent stomach pain
- Bloody or black stools
- Bloody vomit or vomit that looks like coffee grounds

The above symptoms could be signs of a serious problem, such as:

- Perforation – when the ulcer burrows through the stomach or duodenal wall.
- Bleeding – when acid or the ulcer breaks a blood vessel.
- Obstruction – when the ulcer blocks the path of food trying to leave the stomach.

### How long do the symptoms last?

Most people recover from their symptoms within two to three weeks of starting antibiotic therapy. Severe symptoms associated with serious ulcer-related problems may take longer to heal.

## What illnesses do *H. pylori* cause?

*H. pylori* bacteria have been associated with many different diseases, including: duodenal ulcers, gastric (stomach) ulcers, stomach cancer and non-ulcer dyspepsia (indigestion). *H. pylori* infections have also been linked with causing gastritis (inflammation of the stomach) in adults and children. Infected persons have a two to six-fold increased risk of developing stomach cancer and lymphoma (cancerous tumors in the lymphatic tissue) compared with their uninfected equivalents.

If an ulcer does cause bleeding, prolonged bleeding may cause anemia leading to weakness and fatigue. If bleeding is heavy, hematemesis (the vomiting of blood), hematochezia (the passage of feces containing blood), or melena (a condition marked by black, tarry stools or vomit composed largely of blood) may occur.

## How is an *H. pylori* infection diagnosed?

If an ulcer is found, the doctor will test the patient for *H. pylori*. This test is important because treatment for an ulcer caused by *H. pylori* is different from that for an ulcer caused by NSAIDs (Non-Steroidal Anti-Inflammatory Drugs).

An *H. pylori* infection is diagnosed through blood, breath, stool, and tissue tests (endoscopy). Blood tests are the most common as they are one of the least invasive tests available. If a blood test comes back positive for *H. pylori* and further clarification is still available, a doctor will then proceed with other tests, such as the breath test or an endoscopy. The four tests are briefly described below.

### Blood Tests

Blood tests will identify a *Helicobacter pylori* infection by detecting the presence of the antibodies that stick to the *H. pylori* bacteria. If the tests are positive (i.e. the antibodies are present) the bacteria are either currently present, or were present in the recent past (within the past three years).

### Carbon-14-urea and Carbon 13-urea Breath Tests

Urea breath tests are an effective diagnostic method for *H. pylori* and are quicker and simpler to perform than an endoscopy. By drinking a urea solution that contains a special carbon atom, the presence of the bacteria can be determined. If *H. pylori* are present, they will break down the urea in the solution, thus releasing the carbon. The blood carries the carbon to the lungs, where the patient exhales it. The breath test is 96 percent to 98 percent accurate and can also be used after treatment to see whether the treatment worked.

### Stool Tests

Stool tests may be used to detect an *H. pylori* infection in a patient's fecal matter. Studies have shown that this test, called the *Helicobacter pylori* stool antigen (HpSA) test, is accurate for diagnosing *H. pylori*. A positive test (a test that suggests an *H. pylori* infection) is when antigens, substances that when introduced into the body stimulates the production of an antibody, are found in the fecal matter. The antigens in this case would be the *H. pylori* bacteria cells.

### Endoscopy

An endoscopy diagnoses an *H. pylori* infection by allowing tissue samples of the stomach and duodenum to be taken for testing. A thin, narrow, flexible, lighted tube with a tiny camera on the end is eased into the mouth and down the throat to the stomach and duodenum. Through this tube (the endoscope), the doctor can examine the lining of the esophagus (food pipe), stomach and duodenum. The endoscope can be used to take photographs of the ulcers or to remove tiny pieces of tissue to view under a microscope. The removal of tissue samples for observation is a process called a biopsy and the samples can be used to check for the presence of *H. pylori*.

## How should an *H. pylori* infection be treated?

Ulcers caused by *H. pylori* can usually be cured with a one or two-week course of antibiotics. Treatment usually involves a combination of antibiotics, acid suppressors, and stomach protectors. Acid suppression by the H2 blocker or proton pump inhibitor in conjunction with the antibiotics helps alleviate ulcer-related symptoms, helps heal gastric mucosal inflammation and may enhance the effectiveness of the antibiotics against *H. pylori* at the gastric mucosal surface.

The use of only one medication to treat *H. pylori* is not recommended. At this time, the most proven effective treatment is a two-week course of treatment called triple therapy. It involves taking two antibiotics to kill the bacteria and either an acid suppressor or stomach-lining protector to protect the stomach lining. Two-week triple therapy reduces ulcer symptoms, kills the bacteria, and prevents ulcer recurrence in more than 90 percent of patients, but, unfortunately, patients may find triple therapy complicated because it involves taking as many as twenty pills a day. The antibiotics used in triple therapy may cause mild side effects such as: nausea, vomiting, diarrhea, dark stools, metallic taste in the mouth, dizziness, headache, and yeast infections in women.

## Are there any long-term consequences?

Research has shown that the bacteria, *Helicobacter pylori*, cause at least 75 percent of stomach ulcers and two types of stomach cancer. Recent studies have shown an association between long-term infection with *H. pylori* and the development of gastric cancer. Gastric cancer is the second most common cancer worldwide.

The health risk for people infected with *H. pylori* is very high. About one in five people will get Peptic Ulcer Disease, about one in two hundred people will get gastric adenocarcinoma (a progressively worsening tumor originating in the glandular tissue of the stomach) and about sixteen thousand people die each year in the US as a result of complications from Peptic Ulcer Disease (PUD).

## How do I get infected with *Helicobacter pylori*? How do the bacteria spread?

While it is not known for sure how the bacteria spread, it is believed that *H. pylori* are transmitted orally. The most probable way the bacterium is spread is through the fecal-oral or oral-oral route. Transmission via the fecal-oral route would occur through the ingestion of waste-tainted food or water. Bacteria from an infected person may end up in the food or water of an uninfected person through improper water and sewage treatment or improper food handling. The oral-oral route would occur through mouth-to-mouth contact such as kissing.

## Who is at risk of infection?

It is often wondered why some patients become symptomatic while others do not. Risk of infection increases with: a family history of ulcers, exposure to contaminated sources, poor sanitation and crowded living conditions.

Half of all adults over the age of fifty in the US have an *H. pylori* infection, but because of good sanitation practices and standards of living, there are now fewer children in the United States with *H. pylori* infection than in previous years.

## How can I prevent getting infected with *H. pylori*?

Since the source of *H. pylori* is not yet known, it is difficult to list what should be avoided in order to prevent infection. In general, maintaining proper hygiene, eating food that has been properly prepared and drinking water from a safe, clean source will all help in preventing an infection from this or any other pathogenic bacteria.

## How do I prevent spreading it to others?

As of present, there is not a specific method of preventing the spread of *Helicobacter pylori*. Research and studies are being done to determine the routes of transmission and possible prevention measures.

## How prevalent is *Helicobacter* in surface water/well water?

The existence of environmental *H. pylori* reservoirs has been suggested and epidemiological studies indicate that water can be a source of *H. pylori* infection. Studies have shown that there is a significant link between people who have Peptic Ulcer Disease and *H. pylori* bacteria contamination in their private well. Researchers found that a high percentage of wells (85%) that have coliform bacteria also have the *H. pylori* bacteria and that 65% of private well water samples and 75% of surface water samples contained the *H. pylori* bacteria.

## How can we protect our water supplies?

There is a need for a systematic survey of environmental and potable (fit to drink) waters for the presence of *Helicobacter pylori*, as its presence in source or treated waters has profound public health and epidemiological implications. The potential presence of the organism in source water necessitates the documentation of treatment and disinfection procedures to prevent the infection of drinking water consumers.

## Is my water safe? How can I tell?

The water industry has usually relied on coliform bacteria, a bacterial indicator, to evaluate the safety of source waters. Unfortunately, *H. pylori* have commonly been found in waters where coliform indicators were absent, thus making its detection in water sources very difficult.

The high prevalence of *H. pylori* in the limited number of monitoring efforts to date indicate an urgent need for the development of rapid, specific and reliable detection methods in order to evaluate the potential impact of the waterborne role in *H. pylori* infections.

## What are some ways I can treat my water to ensure its safety?

*H. pylori* bacteria are sensitive to traditional methods of water treatment (i.e. chlorination) and thus aren't thought to be a problem with properly treated water supplies. Studies using ultraviolet light or ozone treatments have not been done in great abundance as of yet, and thus their effectiveness has not yet been determined.