

What Does HIV Do to You?

HIV and the immune system

Your immune system is supposed to protect you from viruses and other infections. Why, then, doesn't it protect you from HIV? The answer is complicated, but essentially, it's because HIV destroys CD4 cells, which direct the response of the immune system. This destruction of CD4 cells (and a number of other processes that we are gradually learning more about) prevents the immune system from working properly.

Eventually, if HIV infection is left untreated, your immune system becomes too damaged to defend against life-threatening infections and cancers. The number of CD4 cells in your bloodstream—your CD4 count—is one of the most important measures of immune strength for people with HIV.

In the past, we painted a fairly straightforward picture of HIV infection: HIV infects and destroys CD4 cells, causing CD4 counts to drop as a result. We now realize that this description of events is oversimplified. It's true that HIV infects and kills CD4 cells directly. However, HIV causes much of its damage in more roundabout ways. The immune system's efforts to fight the virus throw it into a state of *immune activation*, or *inflammation*. Over time, prolonged inflammation can increase a person's risk of heart attacks and lead to other damage, as we'll discuss further in the section on chronic infection (see page 13).

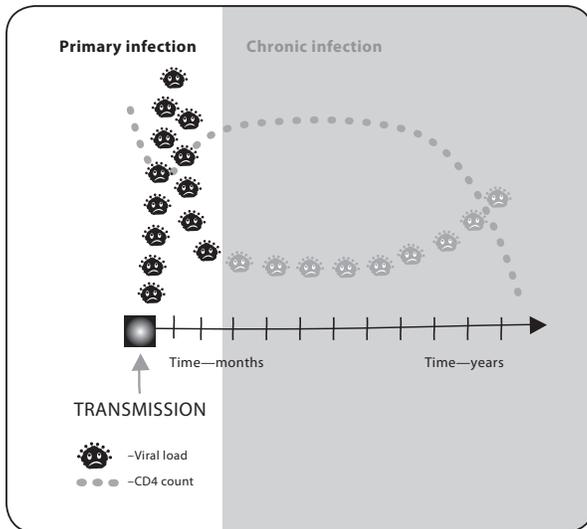
The phases of untreated HIV infection

When HIV infection is not treated with antiretroviral drugs, the course of disease generally moves through several phases. In **primary infection** (also called **acute** infection), HIV establishes itself throughout the body. Within a few weeks or months, the immune system develops antibodies against the virus—a process known as **seroconversion**. The infection then enters a **chronic** phase. During this phase, a person may have no symptoms at all, only mild symptoms or severe symptoms. If left untreated, HIV infection eventually progresses until the immune system is too weak to defend against life-threatening infections and cancers. This stage is called **AIDS**.

In a Capsule

- ⦿ HIV destroys CD4 cells—the very cells that are most critical to the immune system.
- ⦿ If HIV is left untreated, the number of CD4 cells decreases over time and the immune system becomes weaker. Eventually, the immune system becomes too weak to fight off certain serious infections.
- ⦿ Ongoing HIV infection also causes inflammation, which may increase your risk of heart attack, stroke, kidney damage and other long-term health complications.
- ⦿ Following an acute phase, when the virus is establishing itself in the body, HIV becomes a chronic infection. With proper care and treatment, people with chronic HIV infection can remain healthy for many years without ever developing AIDS.

However, the course of HIV infection is not a one-way street. In addition to preventing life-threatening illnesses from developing, anti-HIV drugs can halt the progress of disease and allow the immune system to rebuild itself, even in people who have very serious disease.



During the first stage of HIV infection, the viral load is high and the CD4 count drops. Once the body produces HIV antibodies (seroconversion), the viral load falls and the CD4 count returns to a more normal level.

Primary infection

During the first stage of HIV infection, called primary or acute infection, the virus makes its way from the point of infection—usually the genital tissues or the bloodstream—to the lymph nodes. This process takes a few days. Once HIV is inside the lymph nodes, it very quickly *replicates* (makes copies of itself) and releases new virus into the bloodstream. This burst of rapid HIV activity usually lasts for two to three months.

During primary infection, the amount of HIV in the blood (the **viral load**) is very high. This makes people very infectious during primary infection, a time when many people are not even aware that they are infected. They may have no or very few symptoms, and standard HIV tests may not detect HIV infection at this early stage.

During this time, there is usually a sharp but only temporary drop in the number of CD4 cells. The body also begins to produce large numbers of CD8 cells. These CD8 cells produce natural substances that help shut down or destroy HIV-infected cells, thus helping to reduce the amount of virus in the blood.

Some people experience flu-like symptoms two to 12 weeks after they are first infected with HIV. These can include one or more of the following:

- fever
- sore throat
- unexpected tiredness or lack of energy
- swollen lymph nodes
- aching joints and muscles
- skin rash

However, many people have no symptoms of any kind when they are first infected.

As the immune system learns to recognize and fight HIV, it starts to make **antibodies** to HIV. This process, known as seroconversion, usually occurs within one to three months of infection. Seroconversion is important because the best test we have to know whether you have been infected with HIV is the **HIV antibody test**. This test does not look specifically for HIV; instead, it looks for the antibodies that your immune system produces in response to HIV infection.

While the HIV antibody test is very good at detecting HIV, it may not give an accurate result until several weeks after infection. (The exact amount of time depends on the specific test being used.) This is because seroconversion needs to occur before the test can detect HIV antibodies in the blood sample and produce a positive result. Before seroconversion, an antibody test will produce a “false negative” result—in other words, it will incorrectly show that someone is HIV-negative.

There are newer HIV tests that look for the presence of the virus, not for antibodies. These tests are able to detect infection earlier—as soon as two weeks after infection. Even when these newer tests are used, they are generally followed up by an HIV antibody test to confirm the result.

Seroconversion indicates that the immune system has learned to partially—but not completely—control the infection. At this time, the very high levels of virus in the blood fall somewhat and the CD4 count returns to a more normal level. This signals the beginning of the next phase of infection—the chronic phase.

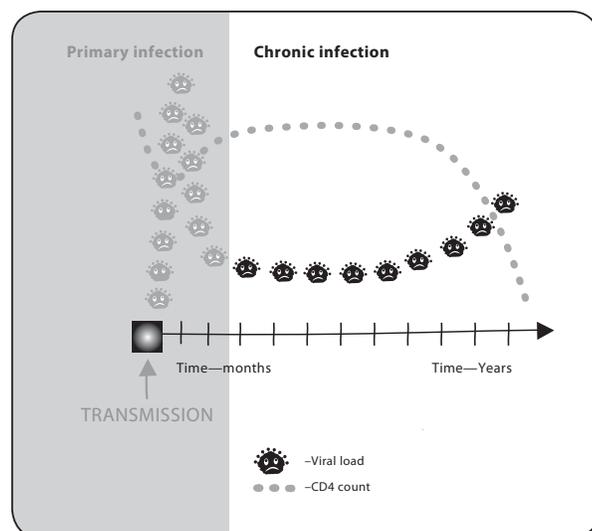
Chronic infection

After primary infection and seroconversion, HIV infection enters a chronic, or long-term, phase. During this time, the virus continues to replicate, even though there may be no obvious signs or symptoms of infection. As this phase progresses, CD4 counts gradually fall (although they may remain steady for many years) and symptoms tend to worsen. Although the specifics can vary widely between individuals, untreated chronic HIV infection generally progresses from being symptom-free (**asymptomatic**) to **symptomatic** and, finally, to a stage in which life-threatening infections are likely.

Asymptomatic infection

Asymptomatic means “without symptoms.” Many people with HIV may have few or no signs or symptoms of the disease for up to 10 years. During this period, the only evidence of HIV infection may come from lab tests: measurable levels of HIV in the blood and a lower-than-normal CD4 count.

However, even when there are no apparent signs or symptoms of HIV, the virus may be damaging the body in less obvious ways. While your body is actively fighting an infection, such as HIV, immune cells produce high levels of messenger molecules called *cytokines*, which signal other immune cells to go into action. This “switched-on” state causes **immune activation**, or **inflammation**.



After the body starts producing HIV antibodies, HIV infection begins a phase of chronic infection. If left untreated, the level of HIV in the blood eventually increases and the CD4 count drops.

Most infections only last a limited time, after which most immune cells return to their normal “resting” or “switched-off” state. Chronic HIV infection, however, throws the immune system into a persistent state of inflammation. This can be harmful in several ways. First of all, HIV most easily infects activated CD4 cells, so an activated immune system gives the virus more cells to infect.

Prolonged immune activation also reduces the lifespan of CD4 cells and possibly other immune cells. It may slowly damage blood vessels, increasing a person’s risk of cardiovascular disease (heart attack and stroke). It may hasten the pace of liver injury in people who have viral hepatitis and may damage the bones, kidneys and other parts of the body.

Most people living with untreated HIV will eventually develop more obvious symptoms. A few lucky individuals continue to have normal CD4 counts and no symptoms for much longer—perhaps throughout their normal lifespans. These rare individuals are called *long-term non-progressors*, or *elite controllers*. On the other hand, in some people, HIV may progress much faster, causing symptoms and significant decreases in CD4 cells within only a few years.

Symptomatic infection

As time passes, untreated HIV gradually causes increasing damage and the body’s defences weaken. At some point, symptoms of HIV infection begin to appear. These can vary widely between individuals, both in the time they take to develop and in the kinds of problems that occur. Some of the more common symptoms include chronic fatigue, unexpected weight loss, diarrhea, fever, night sweats and skin problems.

This stage is associated with the development of HIV-related infections, such as the fungal infection *candidiasis*, which causes thrush when in the mouth or throat and vaginal candidiasis when in the vagina. Usually (although not always), the first infections and symptoms to appear are not serious or life-threatening. They serve as warning signs that the immune system is significantly damaged and that HIV disease will continue to worsen unless the HIV infection is treated.

Life-threatening infections and AIDS

If the immune system becomes damaged enough, it leaves HIV-positive people vulnerable to infections that a healthy immune system could easily control. In general, these infections can be very serious or life-threatening. They are sometimes called **opportunistic infections**.

Some of these, like oral fungal infections, can be relatively minor and easy to treat (although even oral fungal infections can become very serious in people whose immune systems are weak). Other opportunistic infections that can also lead to serious complications and can be fatal if the immune system is weak include PCP (*Pneumocystis pneumonia*), MAC (*Mycobacterium avium* complex), toxo (*Toxoplasmosis gondii*), tuberculosis and CMV (cytomegalovirus). Certain types of cancer, such as lymphoma, are also more common in people with HIV.

The risk of life-threatening infections is usually closely tied to the CD4 count: a person's risk of developing many opportunistic infections increases when their CD4 count drops below 200 cells. For a person whose CD4 count is this low, medication to prevent and treat opportunistic infections is crucial.

The term **AIDS** describes the most serious stage of HIV infection, when the immune system is severely damaged and life-threatening infections have set in. AIDS stands for acquired immune deficiency syndrome:

- *Acquired* means that the condition is not inherited—you acquire (get) it at some point in your life.
- *Immune deficiency* is a weakness in your immune system.
- *Syndrome* is a combination of symptoms and/or diseases.

In Canada, AIDS is diagnosed when a person with HIV develops one or more "AIDS-defining" opportunistic infections or cancers.

HIV does not have to lead to AIDS

Fortunately, HIV infection does not necessarily lead to AIDS. Antiretroviral drugs can slow down or halt the effects of the virus on the immune system. Even people who have had serious AIDS-defining illnesses can usually recover and stay healthy with proper care. This is good news because the word *AIDS* is scary. It harkens back to the time when the progression of HIV disease was all but inevitable: people got HIV, then developed AIDS, and then died. Things have changed a great deal since then. For people with HIV who get proper care, see their doctor several times a year, take their medicines as directed and stay healthy, AIDS is no longer a concern.

The words we use to describe HIV have changed to reflect this new reality. The medical problems resulting from HIV infection are now often referred to as *HIV disease* or *chronic HIV infection*. These terms can be used to describe anyone's condition, whether or not they are being treated and regardless of whether they have been diagnosed with AIDS.

I was diagnosed in the hospital. I was really sick and didn't know what was going on. Then they did an HIV test and I tested positive. I was in really bad shape. My CD4 count was 33 and my viral load was half a million. I had pneumonia (PCP).

—Ken

Stopping the slide

As we mentioned, there is no longer any reason that HIV infection should inevitably lead to severe illness or death. Proper treatment can prevent HIV from causing serious illnesses. Treatment can also help people to get better and stay healthy even if they have already become sick with HIV-related infections.

In addition to treatment, there are many other factors that also affect the speed at which HIV disease progresses. These include the following:

- age
- the strength of the virus you are infected with
- how strongly your immune system responds to the virus
- nutrition
- smoking
- use of street drugs
- mental state and stress level (and how well stress is handled)
- other infections, such as hepatitis B or C

Some of these factors are not controllable, but others are. You may not be able to change your age (we wish!), but you can do something about how well you eat and whether you smoke or use street drugs. (See page 30 for some health hints.)

Unfortunately, some people don't find out that they are HIV-positive until they have had the virus for many years. Their diagnosis may come as a result of a serious HIV-related illness that takes them by surprise. Even so, infections can usually be treated. Most people who develop a serious HIV-related illness and are not taking antiretroviral drugs should begin treatment as soon as possible, to strengthen the immune system so that it can fight off the illness as well as prevent future infections.

People who test positive while they are still physically healthy have one big advantage: they know what to look out for. By getting regular thorough health checkups and routine lab tests, you and your doctor can spot any changes or warning signs and deal with them before they become bigger problems.