

HIV INFECTION AND INFLAMMATION

A FACT SHEET

FOR PEOPLE LIVING WITH HIV

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ABOUT THIS FACT SHEET

This fact sheet is for people living with HIV (PLHIV). It explains HIV inflammation, including routine clinical tests, nutrition care, and healthy living practices.

The goal is to understand:

- What inflammation is
- Why it matters
- How to manage it

How to use this fact sheet:

Follow the sections for practical tips and click on the hyperlinks for more in-depth information.

HIV INFECTION AND INFLAMMATION

WHAT IS HIV?

HIV (Human Immunodeficiency Virus) is a virus that attacks the immune system, especially certain white blood cells called CD4 cells. These cells are important because they help protect the body from infections and sickness¹.

HOW DOES THE IMMUNE SYSTEM WORK IN THE HUMAN BODY?



The immune system has two main defence systems².

- **Innate immunity (first line of defence)**
 - This is the part of your immune system you are born with
 - It reacts quickly to germs using barriers like the skin, mucus, and general immune cells that attack invaders right away
- **Adaptive immunity (acquired immunity → your learning defence)**
 - This part learns to recognize specific viruses and bacteria
 - It takes longer to respond the first time, but it “remembers” the germ so it can protect you faster the next time
 - **Within adaptive immunity, there are two types:**
 - **Cellular immunity:** uses immune cells like T cells and B cells to fight infections directly
 - **Humoral immunity:** uses antibodies made by B cells to fight germs in blood and body fluids

To learn more on the immune system and HIV, read [here](#).

HOW DOES HIV AFFECT THE IMMUNE SYSTEM?

HIV weakens the immune system because it attacks and destroys CD4 cells (helper T-Cells). CD4 cells act like team leaders that help the two main parts of the immune system (cellular immunity and humoral immunity) to work together. When the number of CD4 cells drops, both of these systems become weaker. This makes the whole immune system less able to fight off infections³.

However, [anti-HIV treatment](#) (called Antiretroviral Therapy or ART) can help by increasing CD4 levels again and making the immune system stronger.

HOW DOES ANTIRETROVIRAL THERAPY WORK IN THE BODY?

[Antiretroviral therapy \(ART\)](#) is the daily medicine that keeps HIV under control. It reduces the amount of virus in your body, helps your immune system stay strong, and allows you to live a long and healthy life. When taken every day, ART can make the virus so low that it becomes undetectable.

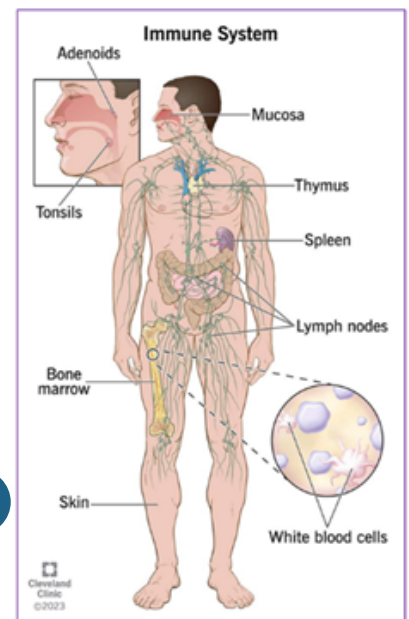


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<https://my.clevelandclinic.org/health/body/21196-immune-system>

WHAT DOES U = U MEAN?

UNDETECTABLE = UNTRANSMITTABLE

When a person living with HIV (PLHIV) takes their anti-HIV treatment every day, the amount of HIV in their blood can drop so low that the test cannot find it. This is called being **undetectable**. Scientific evidence shows that when someone is undetectable, **they cannot pass HIV through sex**. This idea is called **U = U**, which means **Undetectable = Untransmittable**⁴. However, undetectable does not mean there is no virus in the body. The low level of the virus is still replicating, which causes inflammation over years of HIV infection.

WHERE DOES HIV GO IN THE BODY?

HIV can travel through the body very quickly after someone gets the virus. Within just a **few days** it reaches the **lymph nodes**, and within **1-2 weeks** it is found in the **bloodstream** and many parts of the immune system⁵. HIV infects CD4 cells in several places where immune cells naturally live, including the **lymph nodes, spleen, thymus, gut**, and **bone marrow**. It can also reach the **brain**, as well as tissues in the **lungs, liver, kidneys**, and **gastrointestinal tract**. Because HIV spreads to so many immune-rich areas early on, it can weaken the immune system over time⁵.

HOW FAST DOES HIV REACH THE BRAIN?

HIV can be found in the **brain** as early as **8 days** after infection⁶. You might notice different **neurological symptoms** related to your brain function such as unusual headaches or confusion. This does not mean damage always happens right away but it shows why starting HIV treatment early is important. Treatment helps protect the brain and reduces inflammation in the body.



WHAT IS INFLAMMATION?

When our body fights infection or heals an injury, it sometimes gets swollen, red, or warm. That is inflammation. If inflammation happens only briefly, it helps us heal. But if it goes on for a long time, it can harm the body⁷. In other words, inflammation is like your body's alarm system. It is a short-term response that helps the body heal and usually quiets down once you recover. With HIV, the alarm is on continuously even after treatment starts, which keeps the immune system working nonstop, which is what is known as **chronic inflammation**. Even when HIV treatment works very well and your virus becomes **undetectable**, some inflammation can still stay in the body.

WHY INFLAMMATION STILL MATTERS, EVEN WHEN UNDETECTABLE

Even when HIV is undetectable, HIV inflammation is ongoing. So U = U means **you cannot transmit HIV**, but it does **not** mean that inflammation is gone. That is why understanding inflammation is important for long-term health for PLHIV.

HOW HIV CAUSES CHRONIC INFLAMMATION?

Damage to the inside walls of your intestine (“leaky gut”)

The gut is the largest immune organ in the body. It contains around **70-80% of all the immune cells** we have⁸. This is why gut health is very important for PLHIV. Early in HIV infection, these immune cells are destroyed by HIV and reduced in amount. That damages the barrier that usually keeps germs and bits of bacteria inside the gut. When this barrier is weak, bacterial parts leak into the blood. The immune system sees those parts as dangers and stays switched on, causing chronic inflammation⁷.

Even with anti-HIV treatment, inflammation can stay

Anti-HIV treatment helps a lot: it reduces the virus level in blood, helps restore CD4 cells, and reduces inflammation. But many studies show that even when the virus is under good control, certain inflammation markers (like proteins your body releases when fighting something) stay higher in PLHIV^{9, 10}.

Even when your HIV is undetectable, a small amount of inflammation can still remain. This happens because HIV stays “hidden” in some parts of the body and the immune system may stay slightly active, even when treatment is working well¹¹.

OTHER CAUSES THAT KEEP INFLAMMATION GOING



Residual virus

Even when ART works well, some HIV may still hide in parts of the body, called HIV reservoirs, and occasionally make new virus or virus parts that trigger immune responses^{7,12}.



Other infections

Sometimes other viruses that stay in the body for life, like [cytomegalovirus \(CMV\)](#) wake up again. CMV is a common virus that most people have, but in PLHIV it can become active and make the immune system keep fighting, causing more inflammation⁷. [Hepatitis](#), [herpes simplex virus \(HSV\)](#) and other [opportunistic infections](#) can also cause more inflammation⁷.



Changes in gut bacteria (microbiome)

HIV changes the kinds and behavior of bacteria in the gut. Some helpful bacteria decrease, and that causes more inflammation^{7,13}.

WHY DOES INFLAMMATION MATTER FOR LONG TERM HEALTH?

Heart and blood vessel problems: Studies show PLHIV have more early plaque in arteries (atherosclerosis), even if they are on ART and have viral suppression. Plaque makes blood vessels less healthy and can lead to heart disease^{7,14}.

Other health risks: Chronic inflammation contributes to things like weaker bones, slower healing, more sickness, and can possibly affect a range of cognitive, motor, and memory and concentration. To learn more on HIV and the brain, read [here](#). It can also make “aging” effects happen sooner¹⁵.

ROUTINE SCREENING TESTS

People living with HIV might experience early signs of aging and symptoms impacting their physical, mental, emotional, and sexual health¹⁶. The following section outlines some steps you can take to be proactive about your health.

BLOOD TEST²⁴



You can monitor the following health status with a blood test. This is covered by OHIP when ordered by physicians³³.

* Every 6-12 month¹⁷⁻²³

Blood sugar level - [A1C](#)

Kidney Health - [eGFR and Cr](#)

Heart health - [Lipid Profile](#)

Liver health - [liver function tests](#)

* Baseline screening²⁵⁻²⁷

[Hormones](#) - [Testosterone test](#) and [thyroid function](#)

Inflammation and heart health - [C-reactive protein](#) and [lipoprotein A test](#)

Bone health - [Calcium and vitamin D](#)

ABDOMINAL ULTRASOUND & DXA SCAN

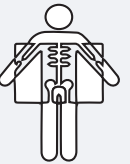
* An [abdominal ultrasound](#) scans the organs and blood vessels in the belly area³²

- The baseline assessment is covered by OHIP³³



* A [DXA scan](#) looks at the lower spine and hip

- It monitors your bone density and bone fracture risk
- Baseline screening is recommended for PHIV over the age of 50³⁰, and is covered by OHIP³³



RISK ASSESSMENTS

[Neuropsychological Assessment](#)

- Monitors your cognitive and [brain health](#)
- Recommends every one to two years³¹
- Not covered by OHIP³³



Colonoscopy

- Monitors the risk of [Colon cancer](#)
- Includes a stool test and a [Digital rectal exam](#)
- Recommends once every two years²⁹, and is covered by OHIP³³



Physical examination

- Includes blood pressure, skin exam, weight measurement, and physical examination of the body, such as lymph nodes.
- Recommends once a year¹⁸ and is covered by OHIP³³

GENDER SPECIFIC TEST

We acknowledge the diversity of people living with HIV, including trans people. Talk to a healthcare professional who is knowledgeable about trans healthcare.

Prostate exam

- Monitor the risk of prostate cancer, including a blood test ([PSA test](#)) and/or with [Digital rectal exam](#)
- Recommends once a year³⁴⁻³⁵ and is covered by OHIP³³

Pelvic exam

- Monitor the risk of [cervical cancer](#) for people with a cervix who are sexually active
- Includes a [Pap test](#) and a physical examination
- Recommends once a year³⁴⁻³⁵ and is covered by OHIP³³

Mammogram

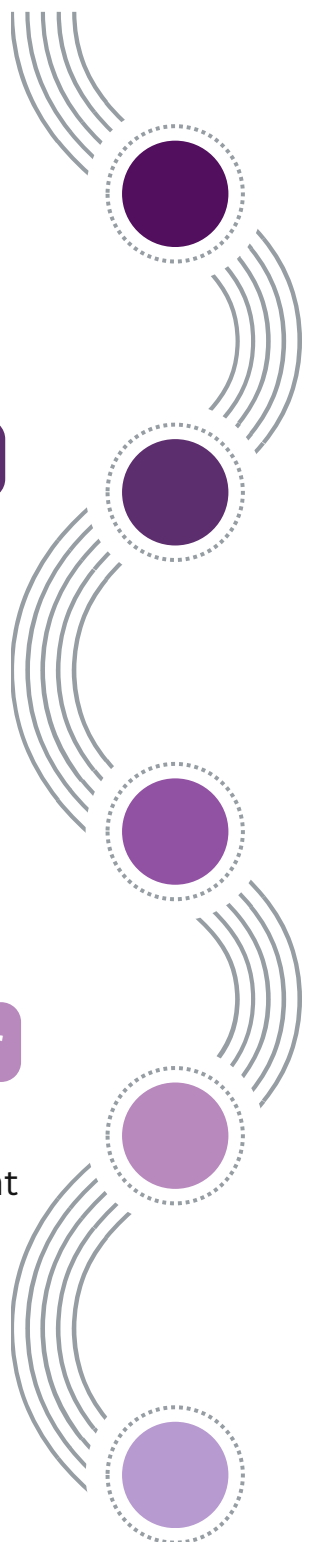
- Monitor the risk of breast cancer for people who have/had breast tissue
- Includes [mammogram](#) and physical examination
- Recommends once every two years³⁴⁻³⁵ and is covered by OHIP³³



CHAT WITH YOUR HEALTHCARE PROVIDER

There are additional medical checkups that monitor your health status.¹⁷⁻²³ Don't hesitate to discuss with your healthcare providers about the routine medical checkups that are right for you.

TIMELINE



Every 6- 12 months

Blood work on:

- Liver function tests

every 3- 6 months

Blood work on:

- Blood sugar level A1C
- Kidney Health: eGFR and Creatinine
- Heart Health: Lipid Profile

Once per year

- Physical examination
- Prostate exam
- Pelvic exam

Once every two year

- Colonoscopy
- Neurocognitive assessment
- Mammogram

Baseline screening

- Blood work on:
 - Inflammation and heart health
 - Testosterone and thyroid function
 - Bone health - calcium and vitamin D levels
- Bone density scan
- Abdominal ultrasound

NUTRITION STRATEGIES & INFLAMMATION

WHY NUTRITION MATTERS^{36,37}

- HIV affects your immune system, making it harder to fight off germs
- Even with ART, HIV can cause inflammation (stress inside the body)
- Getting enough calories to maintain a healthy weight, including protein with every meal, and eating a variety of vitamins & mineral rich foods helps your body respond to HIV treatment, stay strong, and support overall health

EATING TO REDUCE INFLAMMATION^{38,39}

An [anti-inflammatory diet](#) includes a variety of foods that help reduce inflammation in the body. Eating this way can lower your risk of diseases linked to long-term inflammation, such as heart disease and certain types of cancer.

What matters most is your overall eating pattern. The foods you choose to eat regularly have a bigger impact than focusing on just one item. This kind of diet provides key nutrients like omega-3 fats, fibre, and antioxidant vitamins such as vitamin C and vitamin E.

You can follow patterns like [Canada's Food Guide](#) plate, the [Mediterranean diet](#), or the [DASH diet](#). All three highlight vegetables, fruits, whole grains, legumes, nuts, seeds, and lean proteins.

Canada's Food Guide plate is a helpful starting point because it encourages a balanced meal that makes room for many anti-inflammatory foods.

A simple way to picture it is to fill your plate with:

- **Half** fruits and vegetables
- **One quarter** protein, with a focus on plant-based
- **One quarter** whole grain carbohydrates

Have plenty of
vegetables and fruits

Eat protein foods

Make water
your drink
of choice



Choose
whole grain
foods

See the next page for tips on what to eat more often and what to limit when following an anti-inflammatory diet

EAT MORE

Anti-Inflammatory Foods

FRUITS & VEGETABLES

- **Red:** berries, cherries, red peppers
- **Orange/Yellow:** sweet potatoes, pineapple, yellow peppers, squash, peaches
- **Green:** Dark leafy greens, broccoli, cabbage, green beans, brussel sprouts
- **Blue/Purple/Black:** Blueberries, blackberries, grapes, eggplant, olives, plums, purple cabbage

FIBER-RICH FOODS

- **Whole grains:** oatmeal, bran cereal, brown rice, popcorn
- **Legumes:** beans, lentils
- **Nuts & seeds**
- **Fruits & vegetables** (especially with skins like potato skins)
- **Prebiotic-rich foods:** bananas, asparagus, garlic, onions, Jerusalem artichokes

OMEGA-3 FATTY ACIDS

- **Fatty fish:** salmon, tuna, mackerel, sardines, herring, anchovies, striped bass
- **Plant-based sources:** walnuts, flaxseeds, chia seeds

PROTEIN

- **Plant-based:** tofu, beans, grains, nuts, seeds
- **Animal-based:** lean meats (chicken, turkey), fatty fish, Greek yogurt

HERBS & SPICES

- Ginger, turmeric, cinnamon, cloves, cumin, paprika
- Green/black tea

HEALTHY FATS (MONOUNSATURATED)

- **Oils:** olive, canola, peanut, safflower, sesame
- Avocados

SNACKS

- Dark chocolate (70% cocoa or more)

EAT LESS

Inflammatory Foods

PROTEIN

- **Processed meats:** deli/lunch meats, hot dogs, bacon, sausage
- **Fatty cuts of meat:** lamb, pork, beef with visible fat
- Poultry with skin

REFINED & PROCESSED FOODS

- **Refined flour:** white bread, pastries, pizza, cakes, pie crusts
- **Highly processed foods:** chips, frozen TV dinners
- **Fried foods:** donuts, French fries
- Packaged snacks with partially hydrogenated oils (**trans fats**)

SATURATED/TRANS FATS

- Lard
- Butter
- Cream
- Margarine
- Shortening
- Ice cream
- Fatty meats and poultry skin

BEVERAGES

- Sodas
- Alcohol
- Juices (especially with added sugar)

MORE NUTRITION STRATEGIES

SMART COOKING METHODS³⁸



How food is cooked can affect inflammation.

- **Good choices:** baking, steaming, stir-frying, boiling
- **Use less often:** deep frying or grilling meat at very high heat
- Fat dripping onto hot grills can create compounds that are harder for the body to handle
- Keep an eye on sauces and dressings since many add extra sugar, salt, and saturated or trans fats

EATING WELL ON A BUDGET⁴⁰



- **Pick seasonal foods**
 - **Spring:** asparagus, spinach, parsnips
 - **Summer:** strawberries, kale, broccoli, cauliflower
 - **Fall:** pumpkin, radish, peas
 - **Winter:** pears, winter squash, leeks
 - **All season:** apples, mushrooms, peppers, potatoes, tomatoes
- **Buy in bulk:** rice, beans, oats, frozen vegetables
- Choose store brands and look for sales
- Use frozen or canned foods (rinse canned items to remove extra salt or sugar)
- Cook larger portions and freeze leftovers for later

HEALTHY FOOD CAN TASTE GREAT^{41,42}

- Use garlic, ginger, and herbs like oregano, rosemary, or cilantro to boost flavour
- Try new spices and seasonings from different cuisines
- Mix sweet and savoury foods (e.g., apples in salads or roasted veggies with a drizzle of olive oil)
- Experiment with textures by adding crunchy nuts or seeds
- Cook with friends or family, share meals, and swap recipe ideas



FOOD SAFETY^{43,44}

Living with HIV can make your body less able to handle germs from food, so food safety matters.

- Avoid raw eggs, undercooked meat or fish, and unpasteurized milk or juice
- Wash hands, tools, and cooking surfaces
- Keep raw meat away from ready-to-eat foods
- Cook food to safe temperatures
- Put leftovers in the fridge within 2 hours
- Use bottled or filtered water if tap water isn't safe



KEY NUTRIENTS^{39, 45}

Some nutrients support immune health in PLHIV. A balanced diet usually covers needs, but a few are especially important:

- [Zinc](#)
- [Vitamin D](#)
- [Vitamin B12](#)

HEALTHY LIVING WITH HIV

Living with HIV today means living well. With the treatment, PLHIV can enjoy long, healthy lives. Beyond treatment, caring for your body and mind supports healthy aging and helps reduce inflammation.

DAILY LIVING & LIFESTYLE^{46,47,48,49}

Small, steady choices build long-term health.

- **If you smoke**, reducing or working toward quitting supports heart, lung, and immune health
- **If you drink alcohol**, Canada's updated guidance says: the less, the better. Health Canada's low-risk guidelines suggest:
 - Women: up to 2 drinks/day and 10/week; ≤3 on special occasions.
 - Men: up to 3 drinks/day and 15/week; ≤4 on special occasions.
 - Aim for non-drinking days each week.
- **Move more**: Aim for about 150 minutes/week of moderate activity (e.g., walking, cycling, dancing) + 2 days of strength or stretching.
- **Prioritize rest**: Get 7-9 hours of good-quality sleep per night to support recovery, mood, and immune function.

STAY VACCINATED^{50,51,52,53}

Vaccines strengthen the immune system's defenses. Review your vaccines with your healthcare provider at least once a year.

- **Influenza (Flu)**: Every year
- **COVID-19**: Per public-health update
- **Hepatitis A & B**: Recommend if not immune
- **HPV (3-dose series)**: Recommended to reduce the risk of HPV-related cancers
- **Shingles (Shingrix)**: Recommended for immunocompromised adults; safe because it is a non-live vaccine
- **Pneumococcal**: prevents lung and bloodstream infections



MENTAL HEALTH & EMOTIONAL WELL-BEING⁵⁴

Caring for mental health is part of HIV care. Emotional balance supports medication routines, relationships, and overall well-being.

What to look for

- Persistent sadness, low energy, or loss of interest
- Ongoing worry, restlessness, or trouble sleeping
- Difficulty concentrating or remembering
- Physical factors such as thyroid issues, vitamin B12 deficiency, hormonal changes, or side effects from certain HIV medications may also contribute to mood changes

Ways to support your well-being

- Reach out early: Counsellors, social workers, and HIV programs can help you access support that fits your needs
- Stay connected: Supportive relationships and community groups can reduce isolation and build resilience
- Notice cognitive changes: If memory or focus feels different, talk with your provider for assessment and support

MY SELF-CHECK NOTE

(Review these with your healthcare team once or twice a year)

- ☐ I take my HIV medication every day
- ☐ I actively monitor my health and discuss any changes with my healthcare provider
- ☐ I'm reducing or taking breaks from smoking in ways that feel manageable
- ☐ My vaccines are up to date
- ☐ I stay active, sleep well, and limit alcohol
- ☐ I review my diet and overall goals during visits
- ☐ I reflect on my mood, stress, and overall well-being, and I know where to seek support when it feels helpful

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