

## HIV and the Brain <sup>[1]</sup>

Submitted on Feb 2, 2017



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The brain is a very important organ. It controls every function in our bodies and allows us to think, see, feel, touch, hear, smell, and move. The brain and the spinal cord make up the central nervous system (CNS).

While we do not know exactly how it happens, scientists believe that HIV enters the central nervous system within the first few weeks or months after a person gets HIV. Afterwards, the virus can lie hidden and inactive in the brain for a long time. Research studies have recently shown that the earlier people start HIV drugs once they know they are living with HIV (HIV+), the less likely brain cells are to be damaged.

Sometimes HIV can cause damage to cells in certain sections of the brain that can lead to mild cognitive or thinking problems, including difficulty concentrating, confusion, and memory loss. However, this generally does not happen unless a person has had HIV for a long time, has not been taking HIV drugs, or has been living with a very high [viral load](#) [2]. This can lead to more severe HIV-associated dementia. Dementia is a long-lasting condition that can include memory loss, problems with reasoning, and personality changes.

## HIV-Associated Brain Problems

Mild cognitive problems are not uncommon in people living with HIV. HIV-associated neurocognitive disorder (HAND) is a term used to describe a group of conditions that include some combination of thinking, movement, mood, and/or behavior problems. HAND has several forms, ranging from mild to severe, and has a range of symptoms, including:

- reduced ability to think clearly
- difficulty remembering things
- trouble performing eye-hand coordinated movements
- changes in behavior or mood

These symptoms usually only occur in people who have had HIV for a long time, have not been taking HIV drugs, or have been living with a very high viral load.

A more serious condition called HIV-associated dementia occurs less frequently, especially since newer HIV drugs have become available. People who have a [CD4 cell](#) [3] count below 200 are at risk of developing this condition - generally the lower the CD4 count, the greater the risk.

HIV-associated dementia refers to a mental and physical state in which a person cannot perform normal activities of daily living without assistance (e.g., counting money, taking medications, preparing meals). This condition can show up suddenly as a dramatic change in behavior, thinking, and movement or a milder neurocognitive condition can progress to

dementia as the immune system gradually declines.

## Diagnosing HIV-Associated Neurocognitive Disorder (HAND)

The initial signs of HAND can be very difficult to notice. If you are experiencing memory problems or your family and friends comment on changes in your behavior or coordination, it is a good idea to start keeping a log. Note any problems you are having with:

- Balance or coordination
- Vision
- Memory
- Concentration or attention
- Completing tasks
- Getting lost in familiar places
- Forgetting telephone numbers
- Simple math

It will be important to bring this log to talk over with your health care provider as soon as possible. Even if you feel there is an explanation for the problems, it is important to tell your provider.

If your health care provider believes you may have memory loss, he or she will likely refer you to a specialist such as a neurologist (a physician who specializes in the brain and nervous system), a psychiatrist (a physician who specializes in mental and emotional health), or a neuropsychologist (a professional who specializes in testing how the mind functions) for a complete exam. This will include "neurocognitive" testing (tests of your memory and concentration, reasoning, coordination, and problem solving). These tests can detect small changes in your cognitive ability and provide important information.

You may also need to have a test called a lumbar puncture (also known as a spinal tap) to obtain a sample of cerebrospinal fluid. A needle is inserted between the bones of the spine and a small amount of fluid is removed. Lumbar punctures are done with local pain medication so there is not a great deal of pain. Many people avoid getting this procedure because it sounds frightening, but the information gained can be very helpful in making a diagnosis and selecting treatments.

Often, diagnosing HAND is a process that involves making sure your problems with memory or thinking are not the result of other, more common causes. There are many factors other than HIV that can cause mental function changes. Based on your test results, your provider can identify certain conditions or problems that may be causing these changes, such as depression <sup>[4]</sup> or other psychological problems, tumors, excessive fluid in the brain, or injury to the brain.

People living with HIV who have a weak immune system may also be at risk for opportunistic infections <sup>[5]</sup> of the central nervous system such as:

- Neurosyphilis (syphilis in the brain)
- Cryptococcal Meningitis
- Mycobacterium avium complex (MAC)

- Tuberculosis (TB) [6]
- Toxoplasmosis (Toxo)
- Cytomegalovirus (CMV)
- Primary CNS lymphoma
- Progressive Multifocal Leukoencephalopathy (PML)

Some of these conditions may be treatable with drugs, therapy, or other medical interventions. If these conditions are found not to be the cause of your symptoms, your health care provider may conclude that you are experiencing a form of HAND.

## Treatment for HIV-Associated Neurocognitive Disorder

The best way to treat HAND is to control HIV by using HIV drugs. It is important to have an open discussion with your health care provider about your ability to take HIV drugs on a regular schedule. If you miss doses, your HIV may become resistant [7] to the drugs you are taking and they can stop working. If you are having trouble remembering to get or take your HIV drugs regularly (also known as adherence [8]), friends and family members may be able to help. There are also some tips below for help with memory problems.

Another factor to consider is which HIV drugs will be able to cross into the central nervous system. There is a natural protective barrier, known as the blood-brain barrier, which makes it difficult for many substances, including HIV drugs, to enter the central nervous system. Some HIV drugs cross the blood-brain barrier better than others. Your provider will choose the best HIV drugs for your overall treatment.

You can also consider taking drugs to treat the individual symptoms of your HAND syndrome, such as memory, behavior, and movement problems. There are medications that can help each specific area:

- Concentration problems ? stimulants such as Ritalin (methylphenidate) and Adderall (dextroamphetamine and amphetamine). It is important to know that people who take these stimulants often become dependent on them.
- Social withdrawal ? anti-depressants such as Prozac (fluoxetine) or Zoloft (sertraline)
- Behavior that is disruptive or offensive ? antipsychotic agents such as Risperdal (risperidone), Quetiapine (Seroquel), and Aripiprazole (Abilify)
- Agitation and anxiety ? some anti-depressants can help with anxiety, as can some anti-anxiety drugs.

Several non-HIV drugs have been or are being studied to see if they help reduce the symptoms of HAND. Unfortunately, none of them currently offers a substantial solution to cognitive disorders associated with HIV.

## Help for Memory Problems

Whether you have memory problems due to an HIV-associated neurocognitive condition, another condition, or the normal aging process, it can be very frustrating to have trouble remembering. There are things that you can do without drugs that may help. The following tips may be useful:

- Take time to learn new information ? try not to remember things when you are under

pressure, distracted or tired

- Use small recorders or note pads to keep track of things
- Put up 'post-it' or 'sticky' notes in important locations
- Use your cell phone to set daily alarms for HIV drugs or other things that you need to remember to do on a regular basis
- Find a system of organizing new information so that it has a connection with an idea, image, or another memory. For example, try associating someone's name with the shape of their face or a letter of the alphabet
- Try new activities during the day when you are at your best
- Remembering involves all of the five senses. Seeing a phone number, saying it aloud, and writing it down several times increases the chance of remembering the information
- Break large tasks into smaller sections
- Ask friends or family members to help you remember important things, like taking your HIV drugs regularly. They can remind you of things directly, and can help you develop a system for remembering.

You can also keep your brain more agile and healthy by keeping it active and exercising it, just as you would a muscle. Brain exercises include working puzzles (word, number, or jigsaw), playing cards, learning a new language, juggling, playing online brain games (e.g., [Lumosity](#) [9]), or any physical activity that is new to you ? from playing music to dancing to knitting.

## Taking Care of Yourself

Experiencing the symptoms of an HIV-associated neurocognitive condition can be confusing and even frightening. One of the most important things you can do is ask for help. Do not be afraid to start a conversation with your health care provider, family, or close friends about any symptoms you may be experiencing that involve your thinking, behavior, or coordination. Seeking medical help early to find out what is causing the problem and starting treatment, if needed, is very important. People with severe HAD may need to go to a full-time assisted living facility for their own safety and well-being.

Taking effective HIV treatments to keep the virus under control is also necessary. However, people with central nervous system problems may need extra help remembering to take their medications. This is where support from family and friends may come in. You can also ask your health care provider and local AIDS service agencies for help. Finally, taking your HIV drugs regularly may be the best way to treat and prevent HIV-associated brain problems.

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- [HAD Treatment](#) [21]
- [AIDS dementia](#) [22]
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- [HIV cognitive impairment](#) [25]

## Additional Resources

Select the links below for additional material related to HIV and the brain.

[What Can I Do to Keep My Brain Healthy? \(Hello Brain\)](#) [26]

[HIV and Your Brain \(HIV-Associated Neurocognitive Disorder\) \(POZ\)](#) [27]

[HIV Brain Impairment: Who Gets It and Why? \(AIDSmap\)](#) [28]

[When HIV Infects the Brain \(The Atlantic\)](#) [29]

[CROI 2014: Neurocognitive Problems, Depression, and Early ART in People with HIV \(HIVandHepatitis\)](#) [30]

[10 Incredible Foods to Keep Your Brain Healthy \(One Green Planet\)](#) [31]

[Lumbar Puncture from Wikipedia](#) [32]

[Three Promising Diets to Improve Cognitive Vitality \(Cognitive Vitality\)](#) [33]

[Brainy Resources \(ACL, NIH, CDC\)](#) [34]

[Neurological Complications of HIV \(Johns Hopkins\)](#) [35]

[How to Become a 'Superager' \(NYT\)](#) [36]

[HIV-Associated Neurocognitive Disorders \(AETC; for providers\)](#) [37]

[HIV-Associated Neurocognitive Disorder \(HAND\) \(Family Caregiver Alliance\)](#) [38]

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- [My Account](#)
- [HIV Information](#)
- [A Girl Like Me](#)
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**Links:**

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- [25] <http://www.thewellproject.org/tags/hiv-cognitive-impairment>
- [26] <http://hellobrain.eu/en/brainhealth/topic?id=what-can-i-do-to-keep-my-brain-healthy>
- [27] <https://www.poz.com/basics/hiv-basics/hiv-brain-hiv-associated-neurocognitive-disorder>
- [28] <http://www.aidsmap.com/HIV-brain-impairment-who-gets-it-and-why/page/2283344/>
- [29] <http://www.theatlantic.com/health/archive/2015/03/when-hiv-infects-the-brain/388787/>
- [30] <http://www.hivandhepatitis.com/hiv-related-conditions/hiv-neurocognitive/4618-neurocognitive-problems-depression-and-brain-inflammation-in-people-with-hiv>
- [31] <http://www.onegreenplanet.org/natural-health/incredible-foods-to-keep-your-brain-healthy/>
- [32] [http://en.wikipedia.org/wiki/Lumbar\\_puncture](http://en.wikipedia.org/wiki/Lumbar_puncture)
- [33] [http://www.alzdiscovery.org/cognitive-vitality/blog/three-promising-diets-to-improve-cognitive-vitality?gclid=Cj0KEQjAnb3DBRCX2ZnSnMyO9dIBEiQAocXYH4\\_y7GM1V2oiTovmTyluVh8X7SZPE9L3rgfYx0U27](http://www.alzdiscovery.org/cognitive-vitality/blog/three-promising-diets-to-improve-cognitive-vitality?gclid=Cj0KEQjAnb3DBRCX2ZnSnMyO9dIBEiQAocXYH4_y7GM1V2oiTovmTyluVh8X7SZPE9L3rgfYx0U27)
- [34] <https://brainhealth.acl.gov/brainy-resources/?Length=4>
- [35] [http://www.hopkinsmedicine.org/healthlibrary/conditions/nervous\\_system\\_disorders/neurological\\_complications\\_of\\_h](http://www.hopkinsmedicine.org/healthlibrary/conditions/nervous_system_disorders/neurological_complications_of_h)
- [36] [http://www.nytimes.com/2016/12/31/opinion/sunday/how-to-become-a-superager.html?mwrsm=Facebook&\\_r=3](http://www.nytimes.com/2016/12/31/opinion/sunday/how-to-become-a-superager.html?mwrsm=Facebook&_r=3)
- [37] <https://aidsetc.org/guide/hiv-associated-neurocognitive-disorders>
- [38] <https://www.caregiver.org/hiv-associated-neurocognitive-disorder-hand>