



CD4 CELL TESTS

WHAT ARE CD4 CELLS?

CD4 cells are a type of lymphocyte (white blood cell). They are an important part of the immune system. CD4 cells are sometimes called T-cells. There are two main types of T-cells. **T-4 cells**, also called CD4, are "helper" cells. They lead the attack against infections. **T-8 cells** (CD8) are "suppressor" cells that end the immune response. CD8 cells can also be "killer" cells that kill cancer cells and cells infected with a virus.

Researchers can tell these cells apart by specific proteins on the cell surface. A T-4 cell is a T-cell with CD4 molecules on its surface. This type of T-cell is also called "CD4 positive," or CD4+.

WHY ARE CD4 CELLS IMPORTANT IN HIV?

HIV most often infects CD4 cells. The genetic code of the virus becomes part of the cells. When CD4 cells multiply to fight an infection, they make more copies of HIV.

When someone is infected with HIV but has not started treatment, the number of CD4 cells they have goes down. This is a sign that the immune system is being weakened. The lower the CD4 cell count, the more likely the person will get sick.

There are millions of different families of CD4 cells. Each family is designed to fight a specific type of germ. When HIV reduces the number of CD4 cells, some of these families can be wiped out. You can lose the ability to fight off the particular germs those families were designed for. If this happens, you might develop an opportunistic infection (See Fact Sheet 500).

WHAT IS A CD4 TEST?

A small sample of blood is taken. The blood is tested to count several types of cells. CD4 cells are not counted directly. Instead, the laboratory makes a calculation based on total white blood cells and the proportion of cells that are CD4. Therefore, the CD4 count is not exact.

Current treatment guidelines (see fact sheet 404) suggest monitoring CD4 tests every 3 to 6 months when starting antiretroviral therapy (ART, see fact sheet 403). Once treatment has increased CD4 levels to high levels, the test should be done every 6 to 12 months.

WHAT FACTORS INFLUENCE A CD4 CELL COUNT?

The CD4 cell value can change a lot. Time of day, fatigue, and stress can affect the test results. It's best to have blood drawn at the same time of day for each CD4 cell test, and to use the same laboratory.

Infections can have a large impact on CD4 cell counts. When your body fights an infection, the number of white blood cells (lymphocytes) goes up. CD4 counts go up, too. Vaccinations can cause the same effects. It's best to wait a couple of weeks after you recover from an infection or get a vaccination before you get a CD4 test.

HOW ARE THE TEST RESULTS REPORTED?

CD4 cell tests are normally reported as the number of cells in a cubic millimeter of blood, or mm³. Normal counts are usually between 500 and 1600.

Because the CD4 cell counts are so variable, some health care providers prefer to look at the CD4 cell percentages. If your test reports CD4% = 34%, that means that 34% of your lymphocytes were CD4 cells. This percentage is more stable than the number of CD4 cells. The normal range is somewhere between 30% and 60%. Different labs use different ranges. There are no guidelines for treatment decisions based on CD4%. However, a CD4% below 14% is a definition of AIDS.

A CD4 count below 200 indicates serious immune damage. It is a sign of AIDS in people with HIV infection. Although the CD4% may be a better predictor of HIV disease progression than the CD4 count, the CD4 count is used to decide when to start treatment.

WHAT DO THE NUMBERS MEAN?

The CD4 cell count is a key measure of the health of the immune system. The lower the count, the greater damage HIV has done. Anyone who has less than 200 CD4 cells, or a CD4 percentage less than 14%, is considered to have AIDS according to the US Centers for Disease Control.

CD4 counts are used together with the viral load to estimate how long someone will stay healthy. See Fact Sheet 125 for more information on the viral load test.

CD4 counts are also used to indicate when to start certain types of drug therapy:

When to start drugs to prevent opportunistic infections:

Most health care providers prescribe drugs to prevent opportunistic infections at the following CD4 levels:

- **Less than 200:** pneumocystis pneumonia (PCP, see Fact Sheet 515)
- **Less than 100:** toxoplasmosis (see Fact Sheet 517) and cryptococcosis (see Fact Sheet 503)
- **Less than 50:** mycobacterium avium complex (MAC, see Fact Sheet 514)

Monitoring treatment success:

With successful ART, CD4 counts rise. Sometimes they rise quickly. Other times they can go up slowly. If the CD4 count is low when ART is started, CD4 counts might not recover to normal levels. Also, if CD4 counts fall while you're taking ART, you might have to change your medications.

Higher CD4 counts are better. However, a normal CD4 count does not guarantee a normal immune system.

ONGOING MONITORING Current treatment guidelines (available at <http://aidsinfo.nih.gov/guidelines>) suggest that if a patient maintains an undetectable viral load, the CD4 count can be done once a year or even less often.

"NON-AIDS" ILLNESS AND DEATH

Now that people with AIDS are living longer, there is more research on other causes of illness and death. These "non-AIDS" causes of death include liver disease, non-AIDS cancers, and heart disease. Overall, these deaths are decreasing. However, research shows a clear link between lower CD4 counts and the risk of death.

THE BOTTOM LINE

Because they are such an important indicator of the strength of the immune system, official treatment guidelines in the US suggest that CD4 counts be monitored every year for people whose ART is working to maintain a high level of CD4 cells.

Revised May 16, 2014