



# 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?

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

When someone is infected with HIV for a long time, the number of CD4 cells they have (their CD4 cell count) 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 totally 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 from your finger. 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. The CD4 count is not exact.

## 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  $\text{mm}^3$ . Normal counts are usually between 500 and 1600. CD4 counts usually drop gradually in people with HIV. However, in some cases they can drop quickly.

Because the CD4 cell counts are so variable, some health care providers prefer to look at the CD4 cell percentages. These percentages refer to total lymphocytes. If your test reports  $\text{CD4}\% = 34\%$ , 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  $\text{CD4}\%$ . However, a  $\text{CD4}\%$  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. A recent study showed that the  $\text{CD4}\%$  is a better predictor of HIV disease progression than the CD4 count. However, 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 antiretroviral therapy (ART):** When the CD4 count goes below 350, most health care providers begin ART

(see Fact Sheet 403). Some health care providers use the  $\text{CD4}\%$  going below 15% as a sign to start aggressive ART, even if the CD4 count is high. More conservative health care providers might wait until the CD4 count drops to near 200 before starting treatment. A recent study found that starting treatment with a  $\text{CD4}\%$  below 5% was strongly linked to a poor outcome.

## 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 below 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.

## "NON-AIDS" ILLNESS AND DEATH

Now that people with AIDS are living are 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 3 to 4 months. See Fact Sheet 404 for more information on the treatment guidelines.

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