WHAT IS AIDS?

WHAT DOES "AIDS" MEAN?

AIDS stands for Acquired Immune Deficiency Syndrome:

- *Acquired* means you can get infected with it.
- *Immune Deficiency* means a weakness in the body's system that fights diseases.
- *Syndrome* means a group of health problems that make up a disease.

AIDS is caused by a virus called HIV, the Human Immunodeficiency Virus. If you get infected with HIV, your body will try to fight the infection. It will make "antibodies," special immune molecules the body makes to fight HIV.

Tests for HIV look for these antibodies. If you have them in your blood or mouth lining, it means that you have HIV infection. People who have the HIV antibodies are called "HIV-Positive." Fact Sheet 102 has more information on HIV testing.

Being HIV-positive, or having HIV disease, is not the same as having AIDS. Many people are HIV-positive but don't get sick for many years. As HIV disease continues, it slowly wears down the immune system. Viruses, parasites, fungi, and bacteria that usually don't cause any problems can make you very sick if your immune system is damaged. These are called "opportunistic infections. (Fact Sheet 500).

HOW DO YOU GET AIDS?

You don't actually "get" AIDS. You might get infected with HIV, and later you might develop AIDS. You can get infected with HIV from anyone who's infected, even if they don't look sick and even if they haven't tested HIV-positive yet. The blood, vaginal fluid, semen, and breast milk of people infected with HIV has enough of the virus in it to infect other people. Most people get the HIV virus by:

- having sex with an infected person who is not on treatment and has a detectable viral load.
- sharing a needle (shooting drugs) with someone who's infected
- being born when their mother is infected, or drinking the breast milk of an infected woman

Getting a transfusion of infected blood used to be a way people got AIDS, but now the blood supply is screened very carefully and the risk is extremely low.

There are no documented cases of HIV being transmitted by tears or saliva.

For more information, see the following Fact Sheets:

- 150: Stopping the Spread of HIV
- 151: Safer Sex Guidelines
- 152: How Risky Is It?

The US Centers for Disease Control and Prevention (CDC) estimates that about 1.3 million people are living with HIV infection or AIDS; about a 15% of them do not know they have it. About 73 percent of the 56,000 new infections each year are in men, and about 27 percent in women. About half of the new infections are in Blacks, even though they make up only 12 percent of the US population. In the mid-1990s, AIDS was a leading cause of death. However, newer treatments have cut the AIDS death rate significantly. For more information, see the US Government fact sheet at http://www.cdc.gov/hiv/topics/surveillance/index.htm

WHAT HAPPENS IF I'M HIV POSITIVE?

You might not know if you get infected by HIV. Within a few weeks of being infected, some people get fever, headache, sore muscles and joints, stomach ache, swollen lymph glands, or a skin rash for one or two weeks. Most people think it's the flu. Some people have no symptoms. Fact Sheet 103 has more information on the early stage of HIV infection.

The virus will multiply in your body for a few weeks or even months before your immune system responds. During this time, you won't test positive for HIV, but you can infect other people.

When your immune system responds, it starts to make antibodies. When this happens, you will test positive for HIV. After the first flu-like symptoms, some people with HIV stay healthy for ten years or longer. But during this time, HIV is damaging your immune system.

One way to measure the damage to your immune system is to count your CD4 cells. These cells, also called "T-helper" cells, are an important part of the immune system. Healthy people have between 500 and 1,500 CD4 cells in a milliliter of blood. Fact Sheet 124 has more information on CD4 cells.

Without treatment, your CD4 cell count will most likely go down. You might start having signs of HIV disease like fevers, night sweats, diarrhea, or swollen lymph nodes. If you have HIV disease, these problems will last more than a few days, and probably continue for several weeks.

With treatment, CD4 counts can recover, or remain normal. Life expectancy for people who know their status and take antiretroviral treatment (ART) is nearly normal for people who adhere to their medications.

HOW DO I KNOW IF I HAVE AIDS?

HIV disease becomes AIDS when your immune system is seriously damaged. If you have less than 200 CD4 cells or if your CD4 percentage is less than 14%, you have AIDS. See Fact Sheet 124 for more information on CD4 cells. If you get an opportunistic infection, you have AIDS. There is an "official" list of opportunistic infections, put out by the Centers for Disease Control (CDC). The most common ones are:

- PCP (Pneumocystis pneumonia), a lung infection; Fact Sheet 515
- KS (Kaposi's sarcoma), a skin cancer, Fact Sheet 511
- CMV (Cytomegalovirus), an infection that usually affects the eyes, Fact Sheet 504
- Candida, a fungal infection that can cause thrush (a white film in your mouth) or infections in your throat or vagina, Fact Sheet 501

AIDS-related symptoms also include serious weight loss, brain tumors, and other health problems. Without treatment, these opportunistic infections can kill you. The official (technical) CDC definition of AIDS is available at http://www.thebody.com/content/art14002.html

AIDS is different in every infected person. A few people may die a few months after getting infected, but most live fairly normal lives for many years, even after they "officially" have AIDS. A few HIV-positive people stay healthy for many years even without taking ART.

IS THERE A CURE FOR AIDS?

There is currently no cure for AIDS (see fact sheet 485.) Antiretroviral therapy (ART, see fact sheet 403) can prevent or reverse the damage to your immune system. Most people stay healthy as long as they continue ART. There is no way to "clear" HIV from the body.

Other drugs can prevent or treat opportunistic infections (OIs). In most cases, these drugs work very well. The newer, stronger ARVs have helped reduce the rates of most OIs.

FOR MORE INFORMATION

More detailed information on AIDS can be found at MedLine Plus at http://www.nlm.nih.gov/medlineplus/aids.html

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Fact Sheets can be downloaded from the Internet at http://www.aidsinfonet.org

AIDS InfoNet www.aidsinfonet.org Fact Sheet Number 150

STOPPING THE SPREAD OF HIV

HOW DO YOU GET INFECTED WITH HIV?

The Human Immunodeficiency Virus (HIV) is not spread easily. You can only get HIV if you get infected blood or sexual fluids into your system. You can't get it from mosquito bites, coughing or sneezing, sharing household items, or swimming in the same pool as someone with HIV.

Some people talk about "shared body fluids" being risky for HIV, but no documented cases of HIV have been caused by sweat, saliva or tears. However, even small amounts of blood in your mouth might transmit HIV during kissing or oral sex. Blood can come from flossing your teeth, or from sores caused by gum disease, or by eating very hot or sharp, pointed food.

To infect someone, the virus has to get past the body's defenses. These include skin and saliva. If your skin is not broken or cut, it protects you against infection from blood or sexual fluids. Saliva can help kill HIV in your mouth.

If HIV-infected blood or sexual fluid gets inside your body, you can get infected. This can happen through an open sore or wound, during sexual activity, or if you share equipment to inject drugs.

HIV can also be spread from a mother to her child during pregnancy or delivery. This is called "vertical transmission." A baby can also be infected by drinking an infected woman's breast milk. Fact Sheet 611 has more information on pregnancy.

HOW CAN YOU PROTECT YOURSELF AND OTHERS?

Unless you are 100% sure that you and the people you are with do not have HIV infection, you should take steps to prevent getting infected. People recently infected (within the past 2 or 3 months) are most likely to transmit HIV to others. This is when their viral load is the highest. In general, the risk of transmission is higher with higher viral loads.

This fact sheet provides an overview of HIV prevention, and refers you to other fact sheets for more details on specific topics.

Sexual Activity: You can avoid any risk of HIV if you practice abstinence (not having sex). You also won't get infected if your penis, mouth, vagina or rectum doesn't touch anyone else's penis, mouth, vagina, or rectum. Safe activities include kissing, erotic massage, masturbation or hand jobs (mutual masturbation). There are no documented cases of HIV transmission through wet clothing.

Having sex in a monogamous (faithful) relationship is safe if:

- Both of you are uninfected (HIV-negative)
- You both have sex **only** with your partner
- Neither one of you gets exposed to HIV through drug use or other activities

Oral sex has a lower risk of infection than anal or vaginal sex especially if there are no open sores or blood in the mouth. See **Fact Sheet 152** for information on the risks of various behaviors.

You can reduce the risk of infection with HIV and other sexually transmitted diseases by using barriers like condoms. Traditional condoms go on the penis. The "female" condom goes in the vagina or in the rectum of receptive women or men. For more information on condoms, see **Fact Sheet 153.**

Some chemicals called spermicides can prevent pregnancy but they don't prevent HIV. They might even increase your risk of getting infected if they cause irritation or swelling.

For more information on safer sex, see **Fact Sheet 151.**

Drug Use: If you're high on drugs, you might forget to use protection during sex. If you use someone else's equipment (needles, syringes, cookers, cotton or rinse water) you can get infected by tiny amounts of blood. The best way to avoid infection is to not use drugs.

If you use drugs, you can prevent infection by not injecting them. If you do inject, don't share equipment. If you must share, clean equipment with bleach and water before every use. **Fact Sheet 154** has more details on drug use and HIV prevention.

Some communities have started exchange programs that give free, clean syringes to people so they won't need to share.

Vertical Transmission: With no treatment, up to 35% of the babies of HIV-infected women would be born infected. The risk drops to about 4% if a woman takes AZT during pregnancy and delivery, and her newborn is given AZT. The risk is 2% or less if the mother is taking combination antiretroviral therapy (ART.) Caesarean section deliveries probably don't reduce transmission risk if the mother's viral load is below 1000.

Babies can get infected if they drink breast milk from an HIV-infected woman. Women with HIV should use baby formulas or breast milk from a woman who is not infected to feed their babies. **Fact Sheet 611** has more information on HIV and pregnancy.

Contact with Blood: HIV is one of many diseases that can be transmitted by blood. Be careful if you are helping someone who is bleeding. If your work exposes you to blood, be sure to protect any cuts or open sores on your skin, as well as your eyes and mouth. Your employer should provide gloves, facemasks and other protective equipment, plus training about how to avoid diseases that are spread by blood.

WHAT IF I'VE BEEN EXPOSED?

If you think you have been exposed to HIV, talk to your health care provider or the public health department, and get tested. For more information on HIV testing, see **Fact Sheet 102.**

If you are sure that you have been exposed, call your health care provider immediately to discuss whether you should start taking antiretroviral drugs (ARVs.) This is called "post exposure prophylaxis" or PEP. You would take two or three medications for several weeks. These drugs can decrease the risk of infection, but they have some serious side effects. **Fact Sheet 156** has more information on PEP.

TREATMENT AS PREVENTION

In 2011 two large studies showed that the use of antiretroviral medications by people not yet infected with HIV led to significant protection against infection. This is called Pre-exposure Prophylaxis (PrEP, see fact sheet 160.) Discuss PrEP with your health care provider.

THE BOTTOM LINE

HIV does not spread easily from person to person. To get infected with HIV, infected blood, sexual fluid, or mother's milk has to get into your body. HIV-infected pregnant women can pass the infection to their new babies.

To decrease the risk of spreading HIV:

- Use condoms during sexual activity
- Do not share drug injection equipment
- If you are HIV-infected and pregnant, talk with your health care provider about taking ARVs.
- If you are an HIV-infected woman, don't breast feed any baby
- Protect cuts, open sores, and your eyes and mouth from contact with blood.

If you think you've been exposed to HIV, get tested and ask your health care provider about taking ARVs.

Reviewed August 30, 2014

AIDS InfoNet www.aidsinfonet.org Fact Sheet Number 403

WHAT IS ANTIRETROVIRAL THERAPY (ART)

WHAT IS ART?

ART are medications that treat HIV. The drugs do not kill or cure the virus. However, when taken in combination they can prevent the growth of the virus. When the virus is slowed down, so is HIV disease. Antiretroviral drugs are referred to as ARV. Combination ARV therapy (cART) is referred to as highly active ART(HAART).

WHAT IS THE HIV LIFE CYCLE?

There are several steps in the HIV life cycle. (See Fact Sheet 400 for a diagram.)

1. Free virus circulates in the bloodstream.
2. HIV attaches to a cell.
3. HIV empties its contents into the cell.
4. The HIV genetic material (RNA) is used by the reverse transcriptase enzyme to build HIV DNA.
5. The HIV DNA is inserted into the cell's chromosome by the HIV integrase enzyme. This establishes the HIV infection in the cell.
6. When the infected cell reproduces, it activates the HIV DNA, which makes the raw material for new HIV viruses.
7. Packets of material for a new virus come together.
8. The immature virus pushes out of the infected cell in a process called "budding."
9. The immature virus breaks free of the infected cell.
10. The new virus matures: raw materials are cut by the protease enzyme and assembled into a functioning virus.

APPROVED ARV DRUGS

Each type, or "class", of ARV drugs attacks HIV in a different way. The first class of anti-HIV drugs was the **nucleoside reverse transcriptase inhibitors** (also called NRTIs or "**nukes**".) These drugs block step 4, where the HIV genetic material is used to create DNA from RNA. The following drugs in this class are used:

- Zidovudine (Retrovir, AZT)
- Didanosine (Videx, Videx EC, ddI)
- Stavudine (Zerit, d4T)
- Lamivudine (Epivir, 3TC)
- Abacavir (Ziagen, ABC)
- Tenofovir, a nucleotide analog (Viread, TDF)
- Combivir (combination of zidovudine and lamivudine)
- Trizivir (combination of zidovudine, lamivudine, and abacavir)
- Emtricitabine (Emtriva, FTC)
- Truvada (combination of emtricitabine and tenofovir)
- Epzicom (combination of abacavir and lamivudine)

Non-nucleoside reverse transcriptase inhibitors, also called **non-nukes** or **NNRTIs** also block step 4 but in a different way. Five have been approved:

- Nevirapine (Viramune, NVP)
- Delavirdine (Rescriptor, DLV)
- Efavirenz (Sustiva or Stocrin, EFV, also part of Atripla)
- Etravirine (Intelence, ETR)
- Rilpivirine (Edurant, RPV, also part of Complera or Epivlera)

Protease inhibitors or PIs, block step 10, where the raw material for new HIV virus is cut into specific pieces. Ten protease inhibitors are approved:

- Saquinavir (Invirase, SQV)
- Indinavir (Crixivan, IDV)
- Ritonavir (Norvir, RTV)
- Nelfinavir (Viracept, NFV)
- Amprenavir (Agenerase, APV)
- Lopinavir/ritonavir (Kaletra or Aluvia, LPV/RTV)
- Atazanavir (Reyataz, ATZ)
- Fosamprenavir (Lexiva, Telzir, FPV)
- Tipranavir (Aptivus, TPV)
- Darunavir (Prezista, DRV)

Entry inhibitors prevent HIV from entering a cell by blocking step 2 of the life cycle. Two drugs of this type have been approved:

- Enfuvirtide (Fuzeon, ENF, T-20)
- Maraviroc (Selzentry or Celsentri, MVC)

HIV integrase inhibitors prevent HIV from inserting its genetic code into the human cell's code in step 5 of the life cycle. The two drugs of this type are:

- Raltegravir (Isentress, RAL)
- Elvitegravir (EVG, part of the combination Stribild,)
- Dolutegravir (Tivicay, DTG)

HOW ARE THE DRUGS USED?

Antiretroviral drugs are usually used in combinations of three or more drugs from more than one class. This is called "Combination Therapy." Combination therapy helps prevent drug resistance.

Manufacturers of ARVs keep trying to make their drugs easier to take, and have combined some of them into a single tablet regimens. See Fact Sheet 409 for more information on combination medications.

WHAT IS DRUG RESISTANCE?

When HIV multiplies, many of the new copies have mutations: they are slightly different from the original virus. Some mutant viruses keep multiplying even when you are taking ARV drugs. When this happens, the virus can develop resistance to the drug and ART may stop working. See fact Sheet 126 for more information.

If only one or two ARV drugs are used, it is easy for the virus to develop resistance. For this reason, using just one or two drugs is not recommended. But if three drugs are used, a successful mutant would have to "get around" all of the drugs at the same time. Using combination therapy means that it takes much longer for resistance to develop.

CAN THESE DRUGS CURE AIDS?

ARVs reduce the viral load, the amount of virus in your bloodstream, but are not a cure. A blood test measures the viral load. People with undetectable viral loads stay healthier longer. They are also less likely to transmit HIV infection to others.

Some people's viral load is so low that it is "undetectable" by the viral load test. This does **not** mean that all the virus is gone, and it does not mean a person is cured of HIV infection. See Fact Sheet 125 for more information on viral load.

WHEN DO I START?

Current US guidelines say that everyone who is infected with HIV should start ARV therapy. See fact sheet 404 for more information on treatment guidelines. This is an important decision you should discuss with your health care provider.

WHICH DRUGS DO I USE?

ARV drugs are chosen on the basis of treatment guidelines, HIV drug resistance, your health (for example, kidney or liver disease) and lifestyle factors. While ARV regimens are usually well tolerated, each ARV drug can have side effects. Some may be serious. Refer to the fact sheet for each individual drug. Each person is different, and you and your health care provider will have to decide which drugs to use.

Adherence to ARVs is very important for treatment to work. The viral load test is used to see if ARV drugs are working

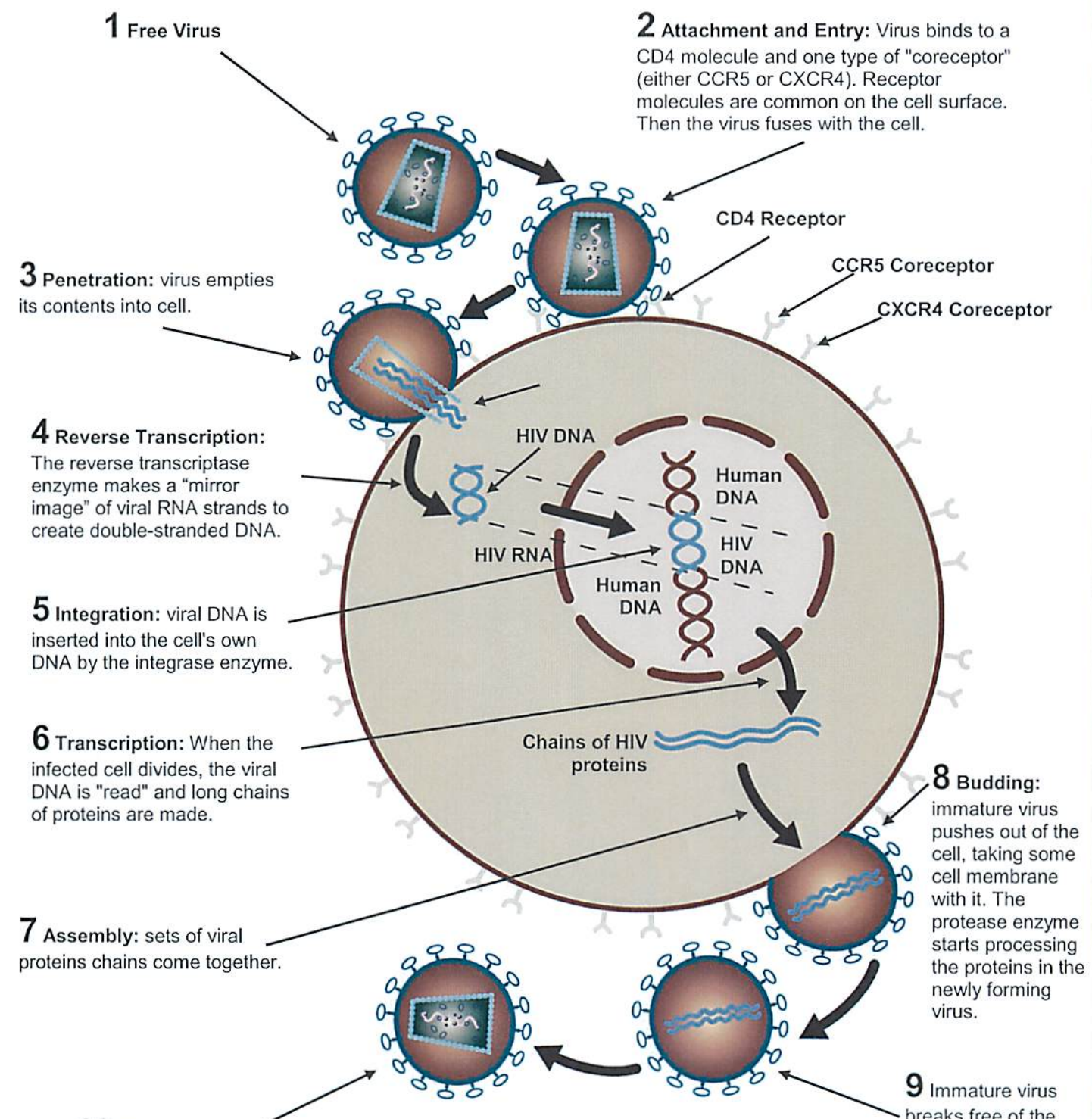
WHAT'S NEXT?

New drugs are being studied in all of the existing classes. Researchers are also trying to develop new types of drugs, such as drugs that will block other steps in the HIV life cycle, and drugs that will strengthen the body's immune defenses.

Revised, July 23, 2014

AIDS InfoNet www.aidsinfonet.org Fact Sheet Number 106

HIV LIFE CYCLE



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AIDS InfoNet www.aidsinfonet.org Fact Sheet Number 481

IMMUNE RESTORATION: Overview

WHAT IS IMMUNE RESTORATION?

Immune restoration means repairing the damage done to the immune system by HIV.

In a healthy immune system, there is a full range of CD4 cells (T-cells, see fact sheet 124) that can fight different diseases. As HIV disease progresses, the number of CD4 cells drops. The first CD4 cells that HIV attacks are the ones that specifically fight HIV. Some types of CD4 cells can disappear, leaving gaps in the immune defenses. Immune restoration looks for ways to fill these gaps.

A healthy immune system can fight off opportunistic infections (OIs, see fact sheet 500). Because these infections develop when CD4 cell levels are low, many researchers think that CD4 cell counts are a good measure of immune function. They believe that increases in CD4 cell counts are a sign of immune restoration. There is some disagreement on this point. See "Are New CD4 Cells As Good As Old?" below.

HOW CAN THE IMMUNE SYSTEM BE RESTORED?

If antiretroviral therapy (ART) is started immediately after someone is infected with HIV, the immune system won't be damaged. Unfortunately, very few cases of HIV are identified that early. See fact sheet 103 on acute HIV infection. As HIV infection continues, it can damage the immune system. Scientists are exploring several ways to repair this damage.

Improving the function of the thymus The thymus is a small organ located at the base of the throat. It takes white blood cells that come from the bone marrow and turns them into CD4 cells. It works the hardest when you're just 6 months to two years old. It starts to shrink when you're in puberty. Scientists used to think that the thymus stopped working by the age of 20. However, research shows that it keeps producing new CD4 cells much longer, maybe until age 50. Strong ART can allow the thymus to replace lost types of CD4 cells.

When scientists thought that the thymus stopped working at a young age, they studied transplanting a human or animal thymus into someone with HIV. They also tried to stimulate the thymus using thymic hormones. These methods might still be important for older people with HIV.

Restoring the number of immune cells As HIV disease progresses, the numbers of both CD4 (T4) and CD8 (T8) cells drop. Some researchers are trying to maintain or to increase the numbers of these cells.

One approach is called **cell expansion.** An individual's cells are multiplied outside the body, and then infused back into the body. A second approach is **cell transfer.** This involves giving a patient some immune cells from the patient's twin or an HIV-negative relative.

A third method uses **cytokines.** These are chemical messengers that support the immune response. The most work has been done on interleukin-2 (IL-2), which can lead to large increases in CD4 cells. Unfortunately, this did not lead to better health outcomes. Fact Sheet 482 has more information on IL-2.

Another approach is **gene therapy.** This involves changing the bone marrow cells that will travel to the thymus and become CD4 cells. Gene therapy tries to make the bone marrow cells immune to HIV infection. One approach is zinc finger inhibitors, which has been studied to produce CD4 T-cells that lack the CCR5 co-receptor (see fact sheet 106, step 2.)

Letting the immune system repair itself CD4 counts have increased for many people who have taken ART. Some scientists believe that the immune system might be able to heal and repair itself if it's not fighting off large numbers of HIV viruses. This approach seems more likely now that we know that the thymus keeps working until a person is almost 50 years old.

Most people take medications to prevent opportunistic infections when their CD4 cell counts go below 200. However, if these people take antiretroviral medications and their CD4 cell counts climb back over 200, it is safe in most cases to stop taking medications to prevent these infections. **Be sure to talk to your health care provider before you stop taking any medication.**

Stimulating HIV-specific immune response Researchers used a modified, killed HIV virus (Remune) to stimulate the body's response to HIV. Years of research produced confusing and disappointing results. New approaches are being studied. One of these is a therapeutic vaccine called DermaVir. It is applied to the skin. DermaVir is in Phase II studies.

In another study, a combination of HIV vaccines and interleukin-2 (IL-2) increased anti-HIV immune responses and led to immune control of HIV for up to a year in one study.

Reducing inflammation: HIV causes inflammation (see fact sheet 484.) This is linked to many diseases. Reducing HIV-related inflammation might help restore the immune system.

ARE NEW CD4 CELLS AS GOOD AS OLD?

Most approaches to immune restoration try to increase the number of CD4cells. This is based on the assumption that when CD4 cells increase, the immune system is stronger.

When people with HIV start taking ART, their CD4 cell counts usually go up. At first, the new CD4 cells are probably copies of existing types of CD4 cells. If some "types" of CD4 cells were lost, they won't come back right away. This could leave some gaps in the body's immune defenses.

However, if HIV stays under control for a few years, the thymus might make new CD4 cells that could fill in these gaps and restore the immune system. Some of these CD4 cells might help control HIV infection. Some anti-HIV medications lead to greater increases in CD4 cell counts than others. There is no information yet on whether this leads to better health outcomes.

Many people taking strong antiretroviral medications now have normal CD4 cell counts. However, people with HIV are getting "non-AIDS" diseases such as cancer and heart disease. These occur at higher than normal rates based on age.

Recent research shows that the lowest level of a CD4 count (the "nadir") may predict central nervous system problems (see fact sheet 505) better than the current cell count. Increasing the CD4 count did not reduce these symptoms.

A normal CD4 cell count by itself does not mean that the immune system has been restored. Research is continuing to see if there are better ways to measure immune health.

Reviewed August 30, 2014

AIDS InfoNet www.aidsinfonet.org Fact Sheet Number 124

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 mm^3. 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 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 year for people whose ART is working to maintain a high level of CD4 cells.

Revised May 16, 2014

AIDS InfoNet www.aidsinfonet.org Fact Sheet Number 800

NUTRITION

WHY IS NUTRITION IMPORTANT?

Good nutrition means eating the right *kinds* and *amounts* of food. Good nutrition can be a problem for many people with HIV. In order to fight infection, the body uses energy and nutrients from food at an increased rate.

HIV infection can cause weight loss, but the medications you're prescribed may cause fat gain. In order to prevent muscle loss and/or fat gain, you should eat a variety of lean meat sources at least three times each day (eggs, poultry, fish, lean beef, chicken, pork). If you gain or lose more than 10lbs in 6 months, talk to your healthcare provider.

Some medications can upset your stomach, and some opportunistic infections can affect the mouth or throat. This makes it difficult to eat. Also, some medications and infections cause diarrhea. If you have diarrhea (see fact sheet 554,) your body actually uses less of what you eat. This is called malabsorption. If you experience an upset stomach, diarrhea, or mouth pain, see your doctor and dietitian.

NUTRITION GUIDELINES FOR PEOPLE WITH HIV

First, **eat more often.** Try to eat 4-6 times per day instead of 2-3 times per day. This will help prevent muscle loss. Extra muscle weight will help you fight HIV. This is very important. Many people want to lose weight, but for people with HIV, it can be dangerous.

Make sure you eat plenty of meat, fruits, and vegetables.

- **Meat** (protein) helps build and maintain your muscles. Chicken, pork, beef, fish, eggs, and dairy are the best foods to eat for muscle maintenance.
- **Fruits & Vegetables & Whole Grains** (carbohydrates) give you energy and antioxidants. These are "power" foods that will help you fight infections. Every meal should contain fruits and vegetables.
- **Nuts & oils** (fats) provide energy for low-intensity exercise and normal body functions. You need some — but not too much.

A moderate **exercise** program will help your body turn your food into muscle. Within 15 minutes after exercise, eat a small meal or snack with meat, fruits, and veggies or drink a glass of chocolate milk. Take it easy, and work exercise into your daily activities. See fact sheet 802 for more information on exercise.

Drinking enough **liquids** is very important when you have HIV. Extra water can reduce the side effects of medications. It can help you avoid a dry mouth and constipation. Remember that drinking tea, coffee, colas, chocolate, or alcohol can actually make you lose body liquid. The best way to know if you're getting enough water is to monitor the color of your urine. Light-yellow is ideal.

PRACTICE FOOD SAFETY

- Keep foods **out** of the temperature danger zone—41°–140° F.
- Wash your hands often. Use soap & water and scrub for at least 20 seconds. Wash hands immediately before and after handling raw food.
- Throw it out, when in doubt—never eat anything that you think is possibly spoiled.
- Wash all fresh produce thoroughly, even those that you remove the skin from, such as bananas, melons, and oranges.
- Sanitize countertops, cutting boards, and other food preparation areas frequently during meal preparation
- Never eat raw eggs or raw fish, such as in some eggnog recipes or sushi.
- Cook meat, poultry, and fish to the following recommended temperatures:
  - Poultry: 165° F
  - Ground meat: 155° F
  - Pork, beef, veal, lamb and fish: 145° F
- Reheat leftovers by heating to a minimum temperature of 145° F
- Avoid drinking well water

WHAT ABOUT SUPPLEMENTS?

Supplements can be dangerous. Avoid supplements unless you have discussed with your doctor and dietitian. Supplements (vitamins, minerals, protein powder, meal replacement drinks, amino acids, herbs) are often contaminated, expensive, and not regulated by the FDA. Supplements could contain ingredients that interfere with your medications.

THE BOTTOM LINE

Eating healthy foods is very important for people with HIV. When you are HIV-positive, you will need to change the types and amounts of foods you're eating.

Be sure to eat a balanced diet, including plenty of lean meats, fruits & vegetables, and whole grain foods. An exercise program will help build and maintain muscle.

Drink plenty of liquids to help your body deal with any medications you are taking.

Practice food safety. Keep your kitchen clean, wash foods, and be careful about food preparation and storage. If your tap water isn't pure, drink bottled water.

If you feel you need to use nutritional supplements, be sure to get some expert advice from your health care provider.

FOR MORE INFORMATION

US Government Food Safety Information: http://www.foodsafety.gov/

US Department of Agriculture dietary guidelines:
http://www.choosemyplate.gov

Dong K, Imai CM.. Medical nutrition therapy for HIV and AIDS. In: Mahan LK, Escott-Stump S, Raymond JL. Krause's Food and the Nutrition Care Process. St Louis, MO: Elsevier Saunders; 2012:864-883.

Reviewed August 28, 2014

AIDS InfoNet www.aidsinfonet.org Fact Sheet Number 801

VITAMINS & MINERALS

WHY ARE VITAMINS AND MINERALS IMPORTANT?

Vitamins and minerals are sometimes called micronutrients. Our bodies need them, in small amounts, to support the chemical reactions our cells need to live. We get them from food or supplements because our bodies don't manufacture them. Different nutrients affect digestion, the nervous system, thinking, and other body processes.

Micronutrients can be found in many foods. Healthy people might be able to get enough vitamins and minerals from their food. People with HIV or some other illnesses need more micronutrients to help repair and heal cells. Also, many medications can create shortages of different nutrients.

WHAT ARE ANTIOXIDANTS?

Some molecules in the body are in a form called *oxidized*. These molecules are also called *free radicals*. They react very easily with other molecules, and can damage cells. High levels of free radicals seem to cause a lot of the damage associated with aging.

Free radicals are produced as part of normal body chemistry. *Antioxidants* are molecules that can stop free radicals from reacting with other molecules. This limits the damage they do. Several nutrients are antioxidants. They tend to work together, so it is better to use a combination than just a single antioxidant (like taking beta-carotene by itself).

Antioxidants are important for people with HIV, because HIV infection leads to higher levels of free radicals. Also, free radicals can increase the activity of HIV. Higher levels of antioxidants can slow down the virus and help repair some of the damage it does.

HOW MUCH DO I NEED?

You might think that all you have to do to get enough vitamins and minerals is to take a "one-a-day" multivitamin pill. Unfortunately, it's not that easy. The amounts of micronutrients in many of these pills are based on the Recommended Dietary Allowances (RDAs) set by the US government. The problem with the RDAs is that they are not the amounts of micronutrients that are needed by people with HIV. Instead, they are the minimum amounts needed to prevent shortages in healthy people. HIV disease and many AIDS medications can use up some nutrients. One study of people with HIV showed that they needed between 6 and 25 times the RDA of some nutrients! A high potency multivitamin is a good way to get basic micronutrients.

WHICH ARE IMPORTANT?

There has not been a lot of research on specific nutrients and HIV disease. A meta-analysis of studies showed a simple multi can help. Also, many nutrients interact with each other. Most nutritionists believe in designing an overall program of supplements.

People with HIV may benefit from taking supplements of the following vitamins and minerals:

- **B Vitamins**: Vitamin B-1 (Thiamine), Vitamin B2 (Riboflavin), Vitamin B6 (Pyridoxine), Vitamin B12 (Cobalamin), and Folate (Folic Acid).
- **Niacin**, also a B vitamin, can help increase good cholesterol and decrease bad cholesterol
- **Other Vitamins**: Vitamin D3 is often very low in people with HIV, especially people of color. Vitamin C can also help immune function. Vitamin K for clotting and bone formation.
- **Antioxidants**, including beta-carotene (the body breaks down beta-carotene to make Vitamin A), selenium, Vitamin E (Tocopherol), and Vitamin C
- **Magnesium, Selenium, Calcium** and **Zinc** Magnesium is important for nerve function and can help with muscle cramps. Selenium is a vital antioxidant, reduced in HIV disease. Calcium for bones and zinc for immune function.

WHAT ABOUT OTHER SUPPLEMENTS?

In addition to vitamins and minerals, some nutritionists suggest that people with HIV take supplements of other nutrients:

- **Acidophilus**, a bacterium that grows naturally in the intestines helps with digestion. There are a several kinds of bacteria that are healthy. They are known as *probiotics*.
- **Alpha-lipoic acid** is a powerful antioxidant that may help with neuropathy and mental problems.
- **Carnitine** (a similar form is acetyl-L-carnitine) may help prevent wasting and provide other immunologic and metabolic benefits,
- **Coenzyme Q_{10}** may help with immune function and heart health.
- **Essential fatty acids** found in evening primrose oil or flaxseed oil can help with dry skin and scalp. Also found as omega-3 fatty acids in fish oil, they can help with cholesterol, triglycerides and depression.
- **N-Acetyl-Cysteine**, an antioxidant, can help maintain body levels of glutathione. Glutathione is one of the body's main antioxidants.

IS TOO MUCH HARMFUL?

Most vitamins and nutrients appear to be safe as supplements, even at levels higher than the Recommended Dietary Allowances (RDAs). However, some can cause problems at higher doses, including Vitamin A, Vitamin D, copper, iron, niacin, selenium, and zinc.

A basic program of vitamin and mineral supplementation should be safe. This would include the following, all taken according to directions on the bottle:

- A multiple vitamin/mineral (without extra iron),
- An antioxidant supplement with several different ingredients, and
- A trace element supplement. There are seven essential trace elements: chromium, copper, cobalt, iodine, iron, selenium, and zinc. Some multivitamins also include trace elements.

Any other program of supplements should be based on discussion with a doctor or nutritionist. Remember that higher price may not mean better quality.

FOR MORE INFORMATION

You can get more information on nutrition and HIV from these web sites:

National Center for Complementary and Alternative Medicine at **nccam.nih.gov/**
Foundation for Integrative AIDS Research: http://www.fiar.us

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AIDS InfoNet www.aidsinfonet.org Fact Sheet Number 554

DIARRHEA

WHAT IS DIARRHEA?

Diarrhea is an increase in the water content, frequency, and volume of bowel movements. It is frequent in people with HIV disease.

Diarrhea can be a serious problem. Mild cases disappear within a few days. Severe cases can cause serious dehydration or nutritional problems.

IS DIARRHEA DANGEROUS?

The greatest risk of diarrhea is dehydration. You can lose up to a gallon of water each day. Along with the water, you lose minerals (electrolytes) that are important for normal body functions. The main electrolytes are sodium and potassium.

Severe dehydration can cause the body to go into shock and is potentially fatal. Dehydration is more serious for infants and children than for adults. ***Anyone with diarrhea should drink plenty of clear liquids.*** Tea, chicken broth, ginger ale, or other non-caffeinated sodas are good choices. These are better than plain water, which does not replace any electrolytes.

Diarrhea that continues over a long period of time can cause poor absorption of nutrients. This can lead to wasting (see Fact Sheet 519).

Diarrhea can be dangerous. Be sure your health care provider knows if your diarrhea lasts more than a few days.

WHAT CAUSES DIARRHEA?

It can be difficult to find out what is causing diarrhea. Diarrhea is sometimes caused by an infection in the stomach or intestines. It can also be caused by an inability to digest milk products (lactose intolerance), by problems with the pancreas, or by emotional stress. Bacteria, parasites, fungi, or viruses can cause the infection.

- **Parasites:** The parasites cryptosporidium or microsporidium used to cause diarrhea in many people with HIV. The use of combination antiretroviral therapy has greatly reduced the rates of these problems.
- **Antiretroviral Medications:** These can cause diarrhea. This is often true with nelfinavir (Viracept), ritonavir (Norvir), Kaletra (lopinavir plus ritonavir), ddI (Videx), foscarnet (Foscavir), tipranavir (Aptivus) and interferon alfa (Roferon or Intron).
- **Other causes:** Taking antibiotics can kill off "good" bacteria in your gut and may cause diarrhea. Diarrhea can also be caused by an inability to digest milk products (lactose intolerance), by problems with the pancreas, or by emotional stress.

HOW DO I KNOW WHAT IS CAUSING MY DIARRHEA?

Your health care provider will ask you what you have been eating and drinking recently, and whether you have been traveling. Samples of your bowel movement (or "stool") may be tested for signs of bacteria or parasites. Your health care provider may repeat this test if nothing shows up the first time. In some cases your blood or urine will also be tested.

If these tests do not show the cause of diarrhea, your health care provider may look inside your digestive tract with a special tool or scope. The name of this procedure depends on where the health care provider is looking. "Endoscopy" is a general term that means "to look inside." A colonoscopy is a procedure where the health care provider examines the colon, and so on. The cause of about one third of all cases of diarrhea cannot be determined.

HOW IS DIARRHEA TREATED?

1. CHANGE WHAT YOU EAT: Some foods can cause diarrhea, and others can help stop it.

Don't eat:

- dairy products (milk or cheeses)
- greasy or fried food
- fatty foods including butter, margarine, oils, or nuts
- spicy foods
- foods high in "insoluble" fiber. This includes raw fruits or vegetables, whole wheat bread, corn, or any fruit or vegetable skins or seeds.

Do eat:

- bananas
- plain white rice
- applesauce
- oatmeal or cream of wheat toasted white bread or plain crackers
- plain macaroni or noodles
- boiled eggs
- oatmeal
- mashed potatoes
- yogurt (This is a dairy product, but it's partially "digested" by the bacteria used to make it.)

2. DRUG TREATMENTS: A new treatment for HIV-associated diarrhea is Fulyzaq (crofelemer.) It was approved by the FDA late in 2012. Different medications are used to treat different types of diarrhea. Your health care provider may not be able to prescribe a medication without some idea of what is causing your diarrhea.

You do not need a prescription for **over-the-counter** treatments. Some of these work very well for diarrhea, including:

- The amino acid L-glutamine
- Pepto-Bismol (Bismuth subsalicylate)
- Kaopectate (attapulgite)
- Imodium AD (loperamide)

Some other products that are usually sold to treat constipation can also help with diarrhea. These products contain "soluble" fiber that adds bulk and absorbs water. This includes products like Metamucil, Citrucel, or other products that contain psyllium.

3. ALTERNATIVE THERAPIES FOR DIARRHEA

Acidophilus capsules (which contain helpful bacteria) can help restore normal digestion, especially when you are taking antibiotics. Some types of yogurt contain "live cultures" of acidophilus that work the same way.

Peppermint, ginger, and nutmeg are believed to help with digestive problems. Peppermint or ginger tea, or ginger ale would be good choices for "clear liquids." Try adding nutmeg to your food or drinks.

Studies have shown that calcium supplements helped relieve diarrhea in people taking the protease inhibitor nelfinavir (Viracept). This might work for diarrhea caused by other medications.

THE BOTTOM LINE

Diarrhea is a common problem for people with HIV. It is usually caused by an infection in the digestive system. Stress, some medications, or problems digesting milk products can also cause diarrhea.

The most serious result is dehydration. This is more of a problem for children than for adults. If you have diarrhea, you should drink plenty of clear liquids.

Some simple changes in your food can help with diarrhea. So can some over the counter medications or acidophilus.

Be sure you tell your health care provider if your diarrhea lasts more than a few days.

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AIDS InfoNet www.aidsinfonet.org Fact Sheet Number 519

AIDS WASTING

WHAT IS AIDS WASTING?

AIDS wasting is the involuntary loss of more than 10% of body weight, plus more than 30 days of either diarrhea, or weakness and fever. Wasting is linked to disease progression and death. Losing just 5% of body weight can have the same negative effects. Although the incidence of wasting syndrome has decreased dramatically since 1996, wasting is still a problem for people with AIDS, even people whose HIV is controlled by medications.

Part of the weight lost during wasting is fat. More important is the loss of muscle mass. This is also called "lean body mass," or "body cell mass." Lean body mass can be measured by bioelectrical impedance analysis (BIA.) or by a full body x-ray (DEXA) scan. These are simple, painless office procedures.

AIDS wasting and lipoatrophy can both cause some body shape changes. See Fact Sheet 553 for more information on lipodystrophy. Wasting is the loss of weight and muscle. Lipoatrophy can cause a loss of fat under the skin .Wasting is not the same as fat loss caused by lipodystrophy. However, wasting in women can start with a loss of fat.

WHAT CAUSES AIDS WASTING?

Several factors contribute to AIDS wasting:

- **Low food intake:** Low appetite is common with HIV. Also, some AIDS drugs have to be taken with an empty stomach, or with a meal. It can be difficult for some people with AIDS to eat when they're hungry. Drug side effects such as nausea, changes in the sense of taste, or tingling around the mouth also decrease appetite. Opportunistic infections in the mouth or throat can make it painful to eat. Infections in the gut can make people feel full after eating just a little food. Depression can also lower appetite. Finally, lack of money or energy may make it difficult to shop for food or prepare meals.

- **Poor nutrient absorption:** Healthy people absorb nutrients through the small intestine. In HIV disease, several infections (including parasites) can interfere with this process. HIV may directly affect the intestinal lining and reduce nutrient absorption. Diarrhea causes loss of calories and nutrients.

- **Altered metabolism:** Food processing and protein building are affected by HIV disease. Even before any symptoms show up, you need more energy. This might be caused by the increased activity of the immune system. People with HIV need more calories just to maintain their body weight.

Hormone levels can affect the metabolism. HIV seems to change some hormone levels including testosterone and thyroid. Also, cytokines play a role in wasting. Cytokines are proteins that produce inflammation to help the body fight infections. People with HIV have very high levels of cytokines. This makes the body produce more fats and sugars, but less protein.

Unfortunately, these factors can work together to create a "downward spiral." For example, infections may increase the body's energy requirements. At the same time, they can interfere with nutrient absorption and cause fatigue. This can reduce appetite and make people less able to shop for or cook their meals. They eat less, which accelerates the process.

HOW IS WASTING TREATED?

There is no standard treatment for AIDS Wasting. However, successful antiretroviral treatment usually leads to healthy weight gain. Treatments for wasting deal with each of the causes mentioned above.

.Decreasing viral load to undetectable levels usually leads to increased weight (average 10-25% increase in a year)

- **Reducing nausea and vomiting** helps increase food intake. Also, appetite stimulants including Megace and Marinol have been used. Megace, unfortunately, is associated with increases in body fat, blood clots, bone problems, and diabetes. Marinol (dronabinol) is sometimes used to increase appetite. It is a synthetic form of a substance found in marijuana. Medications that fight nausea can also help

AIDS activists have long urged the legalization of marijuana. It reduces nausea and stimulates the appetite. From the late 1990s to the present, 15 states and the District of Columbia legalized the medical use of marijuana. See Fact Sheet 731 for more information on marijuana.

- **Treating diarrhea and opportunistic infections in the intestines** helps alleviate poor nutrient absorption. There has been a lot of progress in this area. However, two parasitic infections — cryptosporidiosis and microsporidiosis — are still extremely difficult to treat.

Another approach is the use of nutritional supplements like Ensure and Advera. These have been specifically designed to provide easy-to-absorb nutrients. However, they have not been carefully studied and contain a lot of sugar. Nutritional supplements like Juven or whey protein may also help increase weight. However, some people are allergic to whey. Consult with your health care provider before using nutritional supplements. Supplements should be used in addition to a balanced diet.

- **Treating changes in metabolism:** Hormone treatments are being examined. Human growth hormone (Serostim) increases weight and lean body mass, while decreasing fat mass. However, it is extremely expensive, can cause serious side effects, and can cost over $40,000 per year. Some nutritional experts believe it can be effective at doses lower than the FDA-approved dose.

Testosterone and anabolic (muscle building) agents like oxandrolone or nandrolone might also help treat wasting. They have been studied in HIV by themselves and in combination with exercise.

Progressive resistance training (PRT) is a form of exercise using weights and machines. A recent study found that PRT gave results like oxandrolone (an anabolic steroid) in increasing lean body mass. PRT was also more effective than oxandrolone in increasing physical functioning. It is also less expensive. Exercise can also improve mood and cholesterol, and can strengthen bone. See fact sheet 802 for more information on exercise and HIV.

THE BOTTOM LINE

AIDS wasting is not well understood. However, it is clear that people with HIV disease need to avoid the loss of lean body mass. Various treatments for wasting are being studied.

Be sure to monitor your weight. Maintain your intake of nutritious foods even if your appetite is low. Get treatment right away for serious diarrhea or any infection of your digestive system. These might cause problems with the absorption of nutrients.

Reviewed May 19, 2014

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BODY SHAPE CHANGES (LIPODYSTROPHY)

WHAT IS LIPODYSTROPHY?

Lipodystrophy, or "lipo" for short, is a collection of body shape changes in people taking antiretroviral medications (ARVs). "Lipo" refers to fat, and "dystrophy" means bad growth. These changes include fat loss, fat deposits, and metabolic changes.

Fat loss occurs in the arms, legs, or face (sunken cheeks). This may be the most common feature of lipo.

Fat deposits can show up in the stomach, the back of the neck (a "buffalo hump"), the breasts (in both men and women), or other areas.

Metabolic changes can include increases in blood fats or lactic acid. Some people get "insulin resistance."

- **Blood fats** include cholesterol, and triglycerides.
- **Lactic acid** is produced when glucose (sugar) is used by the cells. Damage to the mitochondria (see Fact Sheet 556) or the liver can increase the amount of lactic acid. Too much lactic acid can cause health problems.
- Normally, insulin moves sugar (glucose) into the cells to produce energy. With **insulin resistance**, less glucose gets into the cells. More stays in the blood.

Fact Sheet 123 has information on lab tests for glucose, cholesterol and triglycerides.

There is no clear definition of lipo. As a result, health care providers report that between 5% and 75% of patients taking ARVs have some signs of lipo. These changes were first called "Crix belly," because they were noticed in people taking the protease inhibitor Crixivan (indinavir). However, lipo can develop in people taking many different types of antiretroviral therapy (ART).

IS LIPO DANGEROUS?

Although it is not life threatening, lipo is a serious problem.

- Body shape changes can be very upsetting. Some patients even stop taking their medications.
- Fear of body shape changes keeps some people from starting ART.
- Insulin resistance can lead to diabetes and weight gain, and can increase the risk of heart disease.
- High blood fats can increase the risk of heart disease.
- Enlarged breasts in women can be painful.
- Lactic acidosis, although rare, can be fatal. See Fact Sheet 556 for more information.
- Fat deposits behind the neck (buffalo humps) can get big enough to cause headaches and problems with breathing and sleeping.

No researcher has suggested that people with lipo should stop taking ART.

WHAT CAUSES LIPO?

We do not know what causes lipo. There are different causes for fat loss and fat gain.

Fat Loss

Zidovudine (Retrovir, AZT) and stavudine (Zerit, d4T) are linked to fat loss. Efavirenz (Sustiva) may also contribute.

Fat Gain

One theory is that protease inhibitors interfere with the body's processing of fat. However, some patients who have never taken protease inhibitors have lipo. Another theory is that insulin resistance plays a role in lipo. People with insulin resistance tend to gain weight in the abdomen.

Lipo may also be similar to "Syndrome X" which can occur in people who have recovered from serious illnesses like childhood leukemia or breast cancer. For people with HIV, this may be caused by the recovery of the immune system after effective ART.

A large study found that the following factors increase the risk of developing lipodystrophy:

- Age over 40 years
- Having AIDS for over 3 years
- Lowest CD4 count was below 100
- White race

CAN LIPO BE TREATED?

If you have serious fat loss and are taking stavudine (d4T), retrovir (AZT) or efavirenz (Sustiva,) talk to your doctor about changing medications. However, it can take a long time to reverse changes in body shape. Implants or injections are the only way to deal with sunken cheeks. These procedures have some risks, and can be quite expensive.

Taking rosiglitazone, a drug used to treat diabetes, and discontinuing the ARV drugs stavudine (Zerit) and retrovir (Zidovudine, AZT) was shown to restore some fat lost from arms and legs.

Fat gain, in some cases, can be cut out surgically or removed by liposuction. Increased exercise and changes in diet can help. For example, more fiber in the diet may control insulin resistance and help decrease abdominal fat. Testosterone is also being studied to help with lipo symptoms.

Human growth hormone is very effective in reducing fat deposits but has some serious side effects. A new medication, tesamorelin (TH9507) by Theratechnologies is a growth hormone inducer. It reduces visceral fat accumulation in lipodystrophy. It has similar results to growth hormone with fewer side effects. It was approved by the FDA in 2010.

High cholesterol or glucose should be treated the same way as for people without HIV. Some health care providers use medications to lower cholesterol and triglycerides, or to improve insulin sensitivity. More attention is being paid to assessing and reducing the risk of heart disease in patients with HIV.

THE BOTTOM LINE

Lipo is a collection of changes in metabolism and body shape in people taking ARVs. There is no clear definition of lipo. Without knowing what causes lipo, we don't yet know how to treat it. **Changing or stopping ART is not recommended.**

Until we know more about specific causes and treatments for lipo, its symptoms are treated the same way as for the general population.

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AIDS InfoNet www.aidsinfonet.org Fact Sheet Number 802

EXERCISE AND HIV

WHY IS EXERCISE IMPORTANT?

Exercise cannot control or fight HIV disease, but it may help you feel better and fight many of the side effects of HIV disease and HIV medications. It can also help you live healthier while ageing with HIV.

WHAT ARE THE ADVANTAGES OF EXERCISE?

Regular, moderate exercise has many of the same advantages for people with HIV disease as it does for most people. Exercise can:

- Improve muscle mass, strength and endurance
- Improve heart and lung endurance
- Improve your energy level so you feel less tired
- Reduce stress
- Enhance your sense of well-being.
- Increase bone strength
- Decrease LDL cholesterol and triglycerides (see fact sheet 123)
- Increase good (HDL) cholesterol
- Decrease fat in the abdomen
- Improve appetite
- Improve sleep
- Improve the way the body uses and controls blood sugar (glucose) which reduces the risk of Type II diabetes.

WHAT ARE THE RISKS OF EXERCISE?

- You can get dehydrated (lose too much water) if you do not drink enough liquids to keep up your fluid levels.
- Injuries may take more time to heal.
- You can lose lean body mass if you exercise too much. You can injure yourself if you use the wrong "form" in exercises.
- Exercise can help those with heart disease, but talk to your doctor to make sure that you are able to exercise safely!

EXERCISE GUIDELINES FOR PEOPLE WITH HIV

Don't Overdo It!

A moderate exercise program will improve your body composition and minimize health risks. At first, go slow and schedule exercise into your daily activities. Work up to a schedule of at least 20 minutes, at least three times per week to the best of your abilities. This can lead to significant improvements in your fitness level and you may feel better. As your strength and energy increase, try to aim at 45 minutes to an hour, three to four times a week.

People with HIV can improve their fitness levels through training like those who do not have HIV. However, people with HIV may find it harder to continue with a training program because of fatigue (see Fact Sheet 551) and pain in the feet (neuropathy, see Fact Sheet 555). These issues are now seen less often with new HIV medications, however.

Vary your exercise routine so that you do not get bored. Find new ways to keep yourself motivated to maintain your exercise program. Find a friend who can become your "exercise buddy."

Your fitness level may be different than it used to be. It is very important that you work your way into an exercise program to avoid injury. Starting with 10 minute sessions is good enough until you build up to an hour.

Eat and Drink Correctly

Drinking enough **liquids** is very important when you exercise. Extra water can help you replace the fluids you lose. Remember that drinking tea, coffee, colas, chocolate, or alcohol can actually make you lose body liquid.

Don't eat a big meal before you exercise (snacking is OK). Try to eat during the first hour after the exercise session to replenish your body's energy storage. . Having a small snack like an apple or small peanut butter sandwich on multigrain bread before working out can provide you with a boost in energy.

Proper **nutrition** is also important. With increased activity, you may need to eat more calories to avoid losing weight, unless weight loss is your goal.

Choose Something You Enjoy

Choose activities that you like. Whether it is yoga, running, bicycling, or another sport, doing something you like will encourage you to maintain your program. Try not to sit for over 2 hours. Take breaks and walk around. Don't get into a rut! Change your activities if you need to so that you stay motivated.

If your fitness level is good, you can compete in competitive sports. Taking part in competitive or team sports does not pose a risk of spreading HIV to other athletes or coaches. Keeping your HIV viral load undetectable protects you and others around you, and may prevent you from losing lean body mass.

Exercise with Weights

Weight training (resistance exercise) is one of the best ways to increase lean body mass and bone density that may be lost through HIV disease and aging. Working out three times a week for an hour should be enough if done well. Doing weight training followed by 30 minutes of cardiovascular exercise may be the best way to improve body composition and keep your blood lipids and sugar down. Cardiovascular exercise means increasing oxygenation and heart rate while moving large muscle groups continuously for at least 30 minutes. Activities such as brisk walking, jogging, dancing, bicycling or swimming can be considered cardiovascular exercise. Walk your dog, park your car far, use the stairs, and get creative about ways not to remain sedentary. The quality of your old age depends on this!

THE BOTTOM LINE

Exercise can improve lean body mass; decrease fat, stress, fatigue and depression; improve strength, endurance, and cardiovascular fitness, It may also help the immune system work better.

FOR MORE INFORMATION

You can get more information on exercise and HIV from the following:

Exercise: The Best Therapy for Managing Side Effects, at http://positivelyaware.com/2009/09_05/exercise.shtml

HIV and Exercise: http://www.thebody.com/tpan/julaug_02/exercise.html

Medibolics web site: http://www.medibolics.com/exercise.html

Ten Things You Can Do to Improve Your Physical Fitness: http://www.thebody.com/bp/10things/fitness.html

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AIDS InfoNet www.aidsinfonet.org Fact Sheet Number 128

BODY COMPOSITION TESTS

WHAT ARE BODY COMPOSITION TESTS?

The tests and measurements described in this fact sheet provide detailed measurements of fat and lean body mass. Repeated measurements can be helpful in monitoring body shape changes associated with lipodystrophy (see fact sheet 553) or with wasting syndrome (see fact sheet 519).

Some of these measurements are used to determine if someone is overweight. Excess weight is associated with a higher risk of heart disease. Low weight, including an unintended weight loss of 5% or more, may also be a sign of health problems (see fact sheet 519).

There are pluses and minuses for each method. Some have to do with cost. Also, a trained technician can often make a big difference in measurements. Try to use the same technique and technician if you are tracking changes over time.

Anthropometry

This word just means measuring the body. Anthropometry is the simplest technology. It involves using a tape measure to take key readings, such as biceps, thigh, waist, and hips. A trained technician is very important for this method.

- **Skinfold measurements**

Calipers (a metal tool) are used to "pinch" body tissue in several places. The measurements are compared to standards. People doing the measurement should be trained so that the measurements are standardized.

- **Waist to hip ratio**

Divide your waist measurement (at the narrowest point) by your hip measurement (at the widest point.) In general, a healthy waist to hip ratio is below 0.9 for men and below 0.8 for women. These may not hold true for people with HIV who have fat accumulation around the waist.

In general, a waist size over 40" for men or over 35" for women is associated with greater health risk.

Bioelectrical Impedance Analysis (BIA)

In BIA, a person is weighed. Age, height, gender and weight or other physical characteristics such as body type, physical activity level, ethnicity, etc. are entered in a computer. While the person is lying down, electrodes are attached to various parts of the body and a small electric signal is circulated. This signal cannot be felt.

BIA measures the resistance (impedance) to the signal as it travels through the body muscle and fat. The more muscle a person has, the more water their body can hold. The greater the amount of water in a person's body, the easier it is for the current to pass through it. Higher fat levels result in more resistance to the current. Fat tissue is about 10% - 20% water, while fat-free mass (which includes muscle, bone, and water outside muscles) averages 70% - 75% water.

BIA values depend on a person's age. Normally you can get an analysis of your results when the test is done.

Body Mass Index (BMI)

This is a calculation based on your weight and height. The formula is: (weight in kilograms) divided by (height in meters squared; or multiplied by itself). To convert pounds to kilograms, divide by 2.2. To convert height to meters, first convert height to inches (12 x feet, plus extra inches). Then divide by 39.4.

For example, let's say that someone weighing 165 pounds is 5' 8" tall.

- To convert 165 pounds to kilograms, 165/2.2 = 75 kg.
- 5' 8" = 68"/39.4 = 1.73 meters. 1.73 squared is 1.73 x 1.73 = 2.99
- BMI = 75/2.99 = 25.1

BMI result categories are:

- Less than 18.5: underweight
- Between 18.5 and 24.9: normal weight
- 25 to 29.9: overweight
- 30 or over: obesity

For more information and a convenient BMI calculator that uses pounds and inches, see the web site "Calculate your BMI" at http://nhlbisupport.com/bmi/

Computerized tomography (CT or CAT scan)

Tomography means looking at slices of the body. CAT scanning uses x-rays to do this. It is helpful in calculating the ratio of fat within the abdomen compared to fat under the skin. The equipment is expensive.

Dual Energy X-ray Absorptiometry (DEXA) Scanning

This x-ray technique divides the body into fat-free (lean) mass, bone mineral content, and fat. Different amounts of the x-ray energy are absorbed by different types of tissue. DEXA scans are very accurate but can be expensive due to the cost of the machine. DEXA scans are also used to measure bone density (see fact sheet 557.)

Magnetic Resonance Imaging (MRI)

This technique uses a magnetic field to create an image of the body. The image shows the location and amount of fat. This is very expensive due to the cost of the machine and reading the scans.

Underwater weighing

This method determines body volume. First the person is weighed dry. Then they are immersed in water in a tank and weighed again. Bone and muscle are more dense than water, and fat is less dense than water. A person with more bone and muscle will weigh more in water than a person with less bone and muscle. The volume of the body is calculated and body density and body fat percentage are calculated.

This technique may underestimate the body fat percentage of athletes, and overestimate body fat in elderly people.

THE BOTTOM LINE

Body composition measurements can be helpful, over time, in tracking changes due to HIV or its treatments. The different techniques have pluses and minuses in terms of reliability, cost, and availability. If you are concerned about your body shape and composition, be sure to ask your health care provider to record baseline readings before you start treatment.

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OPPORTUNISTIC INFECTIONS

WHAT ARE OPPORTUNISTIC INFECTIONS?

In our bodies, we carry many germs — bacteria, protozoa, fungi, and viruses. When our immune system is working, it controls these germs. But when the immune system is weakened by HIV disease or by some medications, these germs can get out of control and cause health problems.

Infections that take advantage of weakness in the immune defenses are called "opportunistic." The phrase "opportunistic infection" is often shortened to "OI."

The rates of OIs have fallen dramatically since the introduction of antiretroviral therapies; However, OIs are still a problem, especially for people who have not been tested for HIV. Many people still show up in hospitals with a serious OI, often pneumocystis pneumonia. This is how they learn they have HIV infection.

TESTING FOR OIs

You can be infected with an OI, and "test positive" for it, even though you don't have the disease. For example, almost everyone with HIV tests positive for Cytomegalovirus (CMV). But it is very rare for CMV disease to develop unless the CD4 cell count drops below 50, a sign of serious damage to the immune system.

To see if you're infected with an OI, your blood might be tested for antigens (pieces of the germ that causes the OI) or for antibodies (proteins made by the immune system to fight the germs). If the antigens are found, it means you're infected. If the antibodies are found, you've been exposed to the infection. You may have been immunized against the infection, or your immune system may have "cleared" the infection, or you may be infected. If you are infected with a germ that causes an OI, and if your CD4 cells are low enough to allow that OI to develop, your health care provider will look for signs of active disease. These are different for the different OIs.

OIs AND AIDS

People who aren't HIV-infected can develop OIs if their immune systems are damaged. For example, many drugs used to treat cancer suppress the immune system. Some people who get cancer treatments can develop OIs.

HIV weakens the immune system so that opportunistic infections can develop. If you are HIV-infected and develop opportunistic infections, you might have AIDS.

In the US, the Center for Disease Control (CDC) is responsible for deciding who has AIDS. The CDC has developed a list of about 24 opportunistic infections. If you have HIV and one or more of these "official" OIs, then you have AIDS. The list is available at http://www.thebody.com/content/art14002.html

WHAT ARE THE MOST COMMON OIs?

In the early years of the AIDS epidemic, OIs caused a lot of sickness and deaths. Once people started taking strong antiretroviral therapy (ART), however, a lot fewer people got OIs. It's not clear how many people with HIV will get a specific OI.

In women, health problems in the vaginal area may be early signs of HIV. These can include pelvic inflammatory disease and bacterial vaginosis, among others. See fact sheet 610 for more information.

The most common OIs are listed here, along with the disease they usually cause, and the CD4 cell count when the disease becomes active:

- **Candidiasis** (Thrush) is a fungal infection of the mouth, throat, or vagina. CD4 cell range: can occur even with fairly high CD4 cells. See Fact Sheet 501.
- **Cytomegalovirus** (CMV) is a viral infection that causes eye disease that can lead to blindness. CD4 cell range: under 50. See Fact Sheet 504.
- **Herpes simplex viruses** can cause oral herpes (cold sores) or genital herpes. These are fairly common infections, but if you have HIV, the outbreaks can be much more frequent and more severe. They can occur at any CD4 cell count. See Fact Sheet 508.
- **Malaria** is common in the developing world. It is more common and more severe in people with HIV infection.
- **Mycobacterium avium complex** (MAC or MAI) is a bacterial infection that can cause recurring fevers, general sick feelings, problems with digestion, and serious weight loss. CD4 cell range: under 50. See Fact Sheet 514.
- **Pneumocystis pneumonia** (PCP) is a fungal infection that can cause a fatal pneumonia. CD4 cell range: under 200. See Fact Sheet 515. Unfortunately, this is still a fairly common OI in people who have not been tested or treated for HIV.
- **Toxoplasmosis** (Toxo) is a protozoal infection of the brain. CD4 cell range: under 100. See Fact Sheet 517.
- **Tuberculosis** (TB) is a bacterial infection that attacks the lungs, and can cause meningitis. CD4 cell range: Everyone with HIV who tests positive for exposure to TB should be treated. See Fact Sheet 518.

PREVENTING OIs

Most of the germs that cause OIs are quite common, and you may already be carrying several of these infections. You can reduce the risk of new infections by keeping clean and avoiding known sources of the germs that cause OIs.

Even if you're infected with some OIs, you can take medications that will prevent the development of active disease. This is called prophylaxis. The best way to prevent OIs is to take strong ART. See Fact Sheet 403 for more information on ART.

The Fact Sheets for each OI have more information on avoiding infection or preventing the development of active disease.

TREATING OIs

For each OI, there are specific drugs, or combinations of drugs, that seem to work best. Refer to the fact sheets for each OI to learn more about how they are treated. The full US guidelines for treating and preventing OIs can be found at http://www.aidsinfo.nih.gov/Guidelines/ and choosing "Prevention and Treatment of Opportunistic Infections Guidelines."

Strong antiretroviral drugs can allow a damaged immune system to recover and do a better job of fighting OIs. Fact Sheet 481 on Immune Restoration has more information on this topic.

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PREGNANCY AND HIV

HOW DO BABIES GET AIDS?

HIV, the virus that causes AIDS, can be transmitted from an infected mother to her newborn child. According to the World Health Organization, without antiretroviral treatment, up to 30% of babies of HIV infected mothers get HIV. If the mother breastfeeds, the overall risk rises to between 35% and 50%.

Mothers with higher viral loads are more likely to infect their babies. However, no viral load is low enough to be "safe." Infection can occur any time during pregnancy, but usually happens just before or during delivery. The baby is more likely to be infected if the delivery takes a long time. During delivery, the newborn is exposed to the mother's blood, which is a high-risk exposure.

An HIV-infected father can transmit HIV to his wife and to their child. To reduce this risk, some couples have used sperm washing and artificial insemination.

HOW CAN WE PREVENT INFECTION OF NEWBORNS?

What if the father is infected with HIV? Recent studies have shown that it is possible to "wash" the sperm of an HIV-infected man so that it can be used to fertilize a woman and produce a healthy baby. These procedures are effective. However, they are very expensive and not easily available.

Use antiretroviral medications: The risk of transmitting HIV is extremely low if antiretroviral medications are used in pregnancy and labor, and the mother does not breastfeed. Transmission rates are only 1% to 2% if the mother takes combination antiretroviral therapy (ART). The rate is also about 2% when the mother takes AZT (see fact sheet 411) during the last 10-12 weeks of her pregnancy and a single dose of nevirapine (see fact sheet 431) during labor, *and* the newborn takes a single dose of nevirapine within 3 days of birth.

ART is becoming more available throughout the world. The World Health Organization estimates that the use of ART prevented 65,000 infant infections through 2008. Wherever ART is generally available, women should receive a standard multi-drug regimen (see fact sheet 404).

Keep delivery time short: The risk of transmission increases with longer delivery times. If the mother uses AZT and has a viral load (see fact sheet 125) under 1,000, the risk is almost zero. Mothers with a high viral load might reduce their risk if they deliver their baby by cesarean (C-) section.

Feeding the Newborn

Up to 20% of babies may get HIV infection from infected breast milk if the mother is not taking ART. However, breast milk contains nutrients that the newborn needs. It also protects the baby against some common childhood illnesses. Replacement feeding can increase the risk of infant death. This can be due to loss of disease protection provided by the mother's milk or the use of contaminated water to mix baby formula.

The World Health Organization advises that mothers should take ART during breastfeeding. After 6 months, they should add other foods while continuing to breastfeed for up to a year.

A recent study showed that it is possible for a newborn to become infected by eating food that is chewed for it by an HIV-infected woman. This practice should be avoided.

HOW DO WE KNOW IF A NEWBORN IS INFECTED?

All babies born to infected mothers test positive for HIV. They have antibodies to HIV even if they are not infected because the mother's antibodies are passed to the baby. This does not mean the baby is infected. Fact Sheet 102 has more information on HIV tests.

Another test, similar to the HIV viral load test (See Fact Sheet 125, Viral Load Tests), can be used to find out if the baby is infected with HIV. Instead of antibodies, these tests detect HIV in the blood. This is the only reliable way to determine if a newborn is infected with HIV.

If babies ***are*** infected with HIV, their own immune systems will start to make antibodies. They will continue to test positive. If they ***are not*** infected, the mother's antibodies will eventually disappear. The babies will test negative after about 12 to 18 months.

WHAT ABOUT THE MOTHER'S HEALTH?

Recent studies show that HIV-positive women who get pregnant do not get any sicker than those who are not pregnant. Becoming pregnant is not dangerous to the health of an HIV-infected woman. This is true even if the mother breast-feeds her newborn for a full term (2 years). In fact, a study in 2007 showed that becoming pregnant was good for an HIV-infected woman's health.

"Short-course" ART to prevent infection of a newborn is not the best choice for the mother's health. If a pregnant woman takes ART only during labor and delivery, HIV might develop resistance. This can reduce the future treatment options for the mother. See fact sheet 126 for more information on resistance.

A pregnant woman should consider all of the possible problems with antiretroviral medications.

- Pregnant women should not use both ddI (Videx, see fact sheet 413) and d4T (Zerit, see fact sheet 414) in their ART due to a high rate of a dangerous side effect called lactic acidosis.
- Do not use efavirenz (Sustiva, see fact sheet 432) during the first 3 months of pregnancy.
- If your CD4 count is more than 250, do not start using nevirapine (Viramune, see fact sheet 431).

Some doctors suggest that women interrupt their treatment during the first 3 months of pregnancy for three reasons:

- The risk of missing doses due to nausea and vomiting during early pregnancy, giving HIV a chance to develop resistance.
- The risk of birth defects, which is highest during the first 3 months. There is almost no evidence of this, except with efavirenz.
- ART might increase the risk of premature or low birth weight babies.

However, current guidelines do not support treatment interruption for pregnant women. The guidelines can be found here: http://www.aidsinfo.nih.gov/guidelines/GuidelineDetail.aspx?GuidelineID=9&ClassID=2

If you have HIV and you are pregnant, or if you want to become pregnant, talk with your health care provider about your options for taking care of yourself and reducing the risk of HIV infection or birth defects for your new child.

THE BOTTOM LINE

An HIV-infected woman who becomes pregnant needs to think about her own health and the health of her new child. Pregnancy does not seem to make the mother's HIV disease any worse.

The risk of transmitting HIV to a newborn is very low with "short course" treatments taken only during labor and delivery and if the mother does not breastfeed. But short treatments increase the risk of resistance to the drugs used. This can reduce the success of future treatment for both mother and child.

There is some risk of birth defects caused by any drug during the first 3 months of pregnancy. If a mother chooses to stop taking some medications during pregnancy, her HIV disease could get worse. Any woman with HIV who is thinking about getting pregnant should carefully discuss treatment options with her health care provider.

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