A Therapy That Will Be Able to Cure HIV Completely and Will Be Safe for Pregnant Women

By

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HIV- Human Immunodeficiency Virus.  
HIV is a retrovirus from the genus of lentiviruses that causes a slowly progressive disease - HIV infection, later AIDS. The virus infects cells of the immune system that have CD4 receptors: T-helpers, monocytes, macrophages, Langerhans cells, dendritic cells, microglia cells.  
A retrovirus is a type of virus that inserts a copy of its RNA genome into the DNA of a host cell that it invades, thus changing the genome of that cell. Retroviruses use a special enzyme called reverse transcriptase to translate their genetic information into DNA. That DNA can then integrate into the host cell’s DNA. Once integrated, the virus can use the host cell’s components to make additional viral particles. To reduce the risk of contracting a retrovirus, vet the potential sexual partners carefully, and never share needles, personal hygiene tools, or other items that frequently come into contact with bodily fluids. Retroviruses are unique in that a large number emerge within the body on their own due to natural genetic processes gone wrong.  
CD4 receptors:  
CD4 receptor is a large glycoprotein that is found on the surface especially of helper T cells, that is the receptor for HIV, and that usually functions to facilitate recognition of antigens by helper T cells.  
CD4 is a receptor for the HIV virus. When the HIV virus infects cells with CD4 surface proteins, it depletes the number of T cells, B cells, natural killer cells, and monocytes in the patient's blood. Most of the damage to an AIDS patient's immune system is done by the virus' destruction of CD4+ lymphocytes. CD4 is sometimes called the T4 antigen.

Transmission: HIV is transmitted through biological body fluids: sperm, menstrual blood, blood, breast milk, vaginal lubrication.  
Blood (other biological liquids) is an isotonic solution. Blood cells placed in a hypotonic solution will take in water across their membranes until both the external solution and the cytosol are isotonic. A red blood cell will swell and undergo hemolysis (burst) when placed in a hypotonic solution. When placed in a hypertonic solution, a red blood cell will lose water and undergo crenation (shrivel).

Impossible transmission:

1. 1)  Handshake. The virus cannot exist in the air or on the skin (sneezes, coughs, etc). The

virus cannot replicate without a host. When fluid leaves the body and is exposed to air, it begins to dry up. As drying occurs, the virus becomes damaged and can become inactive. Once inactive, HIV is “dead” and no longer infectious.

1. 2)  By kiss(salvia). The virus is not presented in salvia. Hypotonic cell disruption (may be a major mechanism) by which saliva kills infected mononuclear leukocytes and prevents their attachment to mucosal epithelial cells and production of infectious HIV, thereby

preventing transmission. HIV can be transmitted through saliva only if it’s mixed with the

blood of a person with HIV.

1. 3)  Tears or sweat that is not mixed with the blood of a person with HIV. Tears/sweat do not

contain HIV because both tears and sweat are hypertonic solutions.

1. 4)  Drinking from the same with the carrier. The virus cannot exist in the air or saliva
2. 5)  Through the toilet seat. The virus cannot exist in the air
3. 6)  Insect animal bites. Animals or insect cannot carry the “human” virus
4. 7)  Through sexual contact during which a condom is used (b/c condom prevents

transmission of infected body fluids).

1. 8)  During pregnancy. The virus can be transmitted during childbirth or breast-feeding, but

during pregnancy (first and half of the second trimesters only), the baby is protected by a thick placenta layer, and the baby’s blood cycling is not connected with the mother’s blood cycle. Additionally, the baby is protected by amnion and chorion from the mother's blood. To avoid a baby’s infection, a cesarean section is a necessary procedure. (A cesarean section is necessary to avoid infecting the baby.)

Reasons:

The most common reason for HIV is unprotected sexual contact.

HIV Symptoms: As a result of the development of HIV infection, the immune system loses its ability to cope with even the most harmless infections. The ultimate destination of HIV infection is the formation of AIDS. Therefore, it is important to know how HIV infection develops, what are the symptoms in women and men, and the first signs in the early stages. During the early stages, the symptoms of HIV in men and women organisms are the same.  
The real danger of the disease lies in its insidiousness. In the early stages, the usual feverish conditions and ailments are perceived at the level of regular cold with self-prescribing medications.

Common symptoms:

1. 1)  Flu-like conditions (fever, sore throat, headache, cough)
2. 2)  Skin rashes
3. 3)  Nausea and vomiting for no apparent reason
4. 4)  Night sweats and frequent hyperthermia
5. 5)  Dermatitis, candidiasis, onychomycosis
6. 6)  Inflammation of the lymph nodes
7. 7)  Weight loss
8. 8)  Prolonged diarrhea
9. 9)  Pneumonia, herpes, and tuberculosis
10. 10)  Lymph nodes are enlarged in the groin region

11) Hypogonadism’s effect (easier to observe on men than on women)

Symptoms are specific for women: anorexia, infections of the pelvic organs, vaginal infections (such as thrush), changes in menstrual periods (lighter or heavier bleeding, skip periods), abundant mucous discharges between menstruations, lower belly pain, pain during sex.

Symptoms specific for men: ulcer on the penis, low testosterone production, hair loss, pain or burning while peeing, Pain in the bladder, testicles, penis, or the area between the scrotum and rectum, various signs of prostatitis (such as pain during ejaculation).  
Symptoms specific for pregnant women: a woman can become infected both before conception and during pregnancy. For a very long time, the disease is not symptomatic. Usually, the first signs are the same as with a non-pregnant person (skin rash, diarrhea, pyrexia, mucosal lesions, and swollen lymph nodes). As the disease progresses, different groups of lymph nodes simultaneously increase, the patient loses weight, and other symptoms develop.

HIV stages

|  |  |  |  |
| --- | --- | --- | --- |
| Stage | Duration | What happens in the body | Symptoms |
| Incubation stage | 2 to12 weeks (with weakened immunity- 12 to 24 weeks) | The infection has already occured, and the virus started to attack the cells of the immune system. | No symptoms |
| Acute Infection stage | 3 to 6 weeks from the moment of infection | The virus actively replicates, the viral load increases, which is accompanied be a violent reaction of the body | First symptoms appear: flu-like conditions (fever, sore throat, headache, cough) |
| Latent stage | 8 to 10 years | A conditional equilibrium is established between the rate of reproduction of HIV and the response of the immune system | An increase in lymph nodes. No other symptoms are presented. |
| Pre-AIDS | 1-2 years | Oppression of cellular immunity | Relapses herpes,candidiasis, stomatitis |
| AIDS | Without treatment- 1 to 2 years | The human immune system is practically destroyed. | Tumors and opportunistic infections that cause the development of tuberculosis, meningit, encephalitis, pneumonia, and other HIV-associated diseases. |

The average time from infection to death is eight to ten years. This may; however, vary from person to person. Many factors affect survival:

1. 1)  Genes
2. 2)  Mental health
3. 3)  Drug or alcohol abuse
4. 4)  Nutrition
5. 5)  Age
6. 6)  Treatment

Problem 1: How to treat pregnant women with HIV infection without hurting a baby, so she can avoid cesarean (fewer chances to get the virus). Cesarean has a lot of side effects: because of bleeding women can die b/c of the amount of blood that she lost, problems with a menstrual cycle which can be a problem with future conception of a child, uterine infection, bladder problems which leads to urinary system problems. In addition, there is still a risk of infecting a baby with HIV during the cesarean section process.

Usually, during the first trimester of pregnancy, a mother’s and baby's blood do not mix while the baby is in the womb. The mother's blood runs alongside the placenta, and the nutrients needed by the baby are absorbed and transferred to him/her mother. The fetal blood flows through the baby, out the umbilical cord to the placenta, and no further. The placental membrane separates maternal blood from fetal blood. A membrane separates the baby's blood and the mother's blood – all the baby's blood is contained within the baby and placenta. If the baby's blood mixes with the mother's blood, the mother wouldn't be able to carry the baby for too long. The mother's immunological system would perceive the baby as an unwanted object and create antibodies that would attack the developing embryo and this would result in a miscarriage per. A developing baby has a distinct and separate blood system from its mother for this reason. During the birth, the mother's and baby's blood can mix, and, thus, the baby can get HIV infection. In addition to blood, the baby can get infected by vaginal lubricants that secrete during childbirth to facilitate the slipping of the fetus. That is why the cesarean section is necessary for such a situation. Therefore, it is always better to cure HIV during pregnancy. However, most of the medications for HIV are too strong antiretroviral drugs and might be harmful to the baby. Rarely, the transmission of HIV infection is possible during the beginning of pregnancy (first and second trimesters), but, in most cases, HIV-infection occurs during the third trimester because the placenta becomes thinner due to the coming childbirth process. Thus, to prevent the risk of infection of the child, the treatment should be started as soon as possible; preferably, during the first trimester.

Problem 2: Once a human gets HIV, it remains in the body forever. HIV will live in reservoir cells. Reservoir cells harbor HIV's genetic material integrated in their own genomes, though they somehow silence it. The occasional mobilization of this material permits the release of infectious viruses.

Treatment:

A retrovirus (cannot stop therapy. Even if there is no virus in the blood, it remains in reservoir cells)  
Immune status (number of immune cells). More cells- easier to treat.  
The virus dies in the sun and UV radiation (risk of skin cancer) is afraid of soap, alcohol, brilliant green, and iodine. In addition, the virus is incredibly sensitive to high temperatures. HIV guarantee dies at 60 degrees Celsius (not even the temperature of boiling water).

Medications. main ingredients: antiviral combinations.  
Most common medications on the market and how they affect pregnancy:

1- Stribild: not recommended for use during pregnancy because of substantially lower exposures of cobicistat and elvitegravir during the second and third trimesters.

Active ingredients:

* -  Elvitegravir (elvitegravir), 150mg
* -  Cobicistat (cobicistat), 150 mg
* -  Emtricitabine (emtricitabine), 200mg
* -  Tenofovir disoproxil fumarate (tenofovir anhydrous), 300mg

Inactive ingredients:

* -  Microcrystalline cellulose
* -  Croscarmellose sodium
* -  Magnesium stearate
* -  Silicon dioxide
* -  Sodium lauryl sulfate
* -  Lactose monohydrate
* -  Hydroxypropyl cellulose (1600000 WAMW)
* -  Polyvinyl alcohol, unspecified
* -  Polyethylene glycol, unspecified
* -  Titanium dioxide
* -  Talc
* -  FD&C blue no. 2
* -  Aluminum oxide
* -  Ferric oxide yellow

2- Isentress/ Isentress HD, film-coated: There is a pregnancy exposure registry that monitors pregnancy outcomes in women exposed to Isentress or Isentress HD during pregnancy. The

estimated background rate of miscarriage in clinically recognized pregnancies = 15-20%. Risk of birth defects = 2.7%.

Active ingredient:  
- Raltegravir

Inactive ingredients (Isentress 400mg (most common in use) ):

* -  Calcium phosphate dibasic anhydrous
* -  Hypromellose 2208
* -  Lactose monohydrate
* -  Magnesium stearate
* -  Microcrystalline cellulose
* -  Poloxamer 407 (contains 0.01% butylated hydroxytoluene as antioxidant)

The film coating:

* -  Black iron oxide
* -  Polyethylene glycol 3350
* -  Polyvinyl alcohol
* -  Red iron oxide
* -  Talc
* -  Titanium dioxide

3- Epzicom: Birth defects may occur. Risk of miscarriages and birth defects. In addition - there is a chance of a lethal outcome.

Active ingredients:

- Abacavir sulfate - Lamivudine

Inactive ingredients:

* -  Magnesium stearate
* -  Microcrystalline cellulose
* -  Sodium starch glycolate

Film coating:

* -  OPADRY orange YS-1-13065-A made of FD&C yellow No. 6
* -  Hypromellose
* -  Polyethylene glycol 400
* -  Polysorbate 80
* -  Titanium dioxide

4- Reyataz (also known as Atazanavir): The prevalence of birth defects with first trimester and second/third-trimester exposures was 2.2% and 2.4%. Not recommended for treatment-experienced pregnant patients during the second and third trimester.

Active ingredients:  
- Atazanavir sulfate

Inactive ingredients: - Not identified

5- Epivir: The estimated background rate of miscarriage and birth defect.

Active Ingredients:  
- Lamivudine (Lamivudine), 150 mg

Inactive ingredients:

* -  Hypromellose, unspecified
* -  Magnesium stearate
* -  Microcrystalline cellulose
* -  Polyethylene glycol, unspecified
* -  Polysorbate 80
* -  Sodium starch glycolate type a potato
* -  Titanium dioxide

6- Fuzeon: Background risk of birth defect, loss, or other adverse outcomes.

Active ingredient:

- Enfuvirtide (Enfuvirtide), 90mg in 1mL

Inactive ingredients:

* -  Mannitol
* -  Sodium carbonate
* -  Sodium hydroxide
* -  Hydrochloric acid

7- Biktarvy: Drug-associated risk of birth defects and miscarriage, and the risk associated with neural tube defects.

Active ingredients:

* -  Bictegravir sodium, 50mg
* -  Emtricitabine, 200mg
* -  Tenofovir alafenamide fumarate (tenofovir anhydrous), 25mg

Inactive Ingredients:

* -  Microcrystalline cellulose
* -  Croscarmellose sodium
* -  Magnesium stearate
* -  Water
* -  Polyvinyl alcohol, unspecified
* -  Titanium dioxide
* -  Polyethylene glycol, unspecified
* -  Talc
* -  Ferrosoferric oxide
* -  Ferric oxide red

8- Tivicay (PD): An increased risk of neural tube defects

Active ingredients:

- Dolutegravir sodium (Dolutegravir), 5mg

Inactive ingredients:

* -  Calcium sulfate dihydrate
* -  Crospovidone, unspecified
* -  Mannitol
* -  Microcrystalline cellulose
* -  Povidone K30
* -  Sodium starch glycolate type a corn
* -  Sucralose
* -  Sodium stearyl fumarate
* -  Hypromellose, unspecified
* -  Titanium dioxide

9- Triumeq: An increased risk of neural tube defects because of the dolutegravir, one of the main ingredients in Triumeq.

Active ingredients:

* -  Abacavir sulfate (Abacavir), 600mg
* -  Dolutegravir sodium (Dolutegravir), 50mg
* -  Lamivudine, 300mg

Inactive ingredients:

* -  Mannitol
* -  Magnesium stearate
* -  Microcrystalline cellulose
* -  Povidone, unspecified
* -  Sodium starch glycolate type a corn
* -  Ferrosoferric oxide
* -  Ferric oxide red
* -  Polyethylene glycol, unspecified
* -  Polyvinyl alcohol, unspecified
* -  Talc
* -  Titanium dioxide

10- Genvoya: Low exposures of elvitegravir and cobicistat, especially during second and third trimesters. Thus, the Genvoya won’t work properly.

Active ingredients:

* -  Elvitegravir, 150mg
* -  Cobicistat, 150mg
* -  Emtricitabine, 200mg
* -  Tenofovir alafenamide fumarate (tenofovir anhydrous), 10mg

Inactive ingredients:

* -  Lactose monohydrate
* -  Microcrystalline cellulose
* -  Hydroxypropyl cellulose (1600000 WAMW)
* -  Sodium lauryl sulfate
* -  Croscarmellose sodium
* -  Water
* -  Magnesium stearate
* -  Polyvinyl alcohol, unspecified
* -  Titanium dioxide
* -  Polyethylene glycol, unspecified
* -  Talc
* -  FD&C blue No. 2
* -  Ferric oxide yellow

A combination of the drugs interferon (Interferon alfa is not recommended for use during pregnancy. It may harm an unborn baby) and zidovudine (Placental transfer of this drug has been observed in humans) may also be used. Both of these drugs help to prevent retroviruses from attacking new cells and replication but lethal for a fetus.

All of the medications listed above have additional side effects, that are harmful for human, and extremely dangerous for pregnant women:

* -  Common side effects: Dizziness; nausea; headache; diarrhea; tiredness; vomiting; depression; anxiety; trouble sleeping; abnormal stomach pain; muscle pain.
* -  These side effects depend on medication but occur kidneys, liver, and cardiac diseases; anorexia; myalgia; hepatitis; changes in the shape or location of body fat (especially in arms, legs, neck, breast, and trunk); diabetes; pancreatitis; body ache; skin problems (rashes, hives); eye, ear, nose, throat infections; an increased rate of bacterial pneumonia; lethal outcome.

Goal: Create a therapy (one single medication won’t work in the case of an infected pregnant woman) that will be safe for pregnant women and will be able to cure HIV completely.

Methods

One-Stop spreading the virus and free radicals.

Medications (example):

1- Truvada: Data on the use of Truvada during pregnancy from observational studies have shown least or no increased risk of major birth defects. Available data from the APR show no significant difference in the overall risk of major birth defects with first-trimester exposure for emtricitabine (FTC) (2.3%) or tenofovir disoproxil fumarate (TDF) (2.1%) compared with the background rate for major birth defects of 2.7% in the U.S.

Other possible side effects: headache, diarrhea, nausea, dizziness.

Active ingredients:

* -  Emtricitabine, 167mg
* -  Tenofovir disoproxil fumarate, 250mg

Inactive ingredients:

- Croscarmellose sodium

* -  Lactose monohydrate
* -  Magnesium stearate
* -  Microcrystalline cellulose
* -  Starch, corn
* -  Water
* -  FD&C Blue No. 2
* -  Aluminum oxide
* -  Hypromellose, unspecified
* -  Titanium dioxide
* -  Tricetin

2- Fight against free radicals.

Free radicals- unstable atoms that can damage cells, causing the development of various diseases and aging of the organism. Free radicals are the natural by-products of chemical processes, such as a metabolic process. Free radicals are produced in large quantities when the body is exposed to harmful ultraviolet rays from the sun, X-rays, and gamma rays from radioactive material. They also occur from cigarette smoke, car exhaust, and industrial fumes. They form when atoms or molecules gain or lose electrons. The situation is complicated by the fact that the free radical, by taking another electron of the molecule, causes the appearance of the new free radical, capable of continuing attacks. This is how a vicious circle is formed (one causing the emergence of new free radicals, and they, in turn, provoke other free radicals that are ready to attack the cells). That is why it is necessary to “break” this circle as soon as the first free radical has been founded. The only way to interrupt the spread of free radicals is to deactivate them. If a large number of free radicals accumulates in a short time, it means that there are not enough antioxidants in the body. This indicates that oxidative (Oxidizers work best in a low pH environment, as every strong acid) processes are taking place in the body, which is extremely dangerous for humans. The three major antioxidant vitamins are beta-carotene, vitamin C, and vitamin E. Ascorbic acid has very strong antioxidizing qualities. Selenium is another powerful antioxidant.

It is not safe for pregnant women to take strong medications without hurting the baby. Thus, we should try to go with supplements first before resorting to extreme remedies in the form of medications.

Two- Treat dendritic cells and increase the number of immune cells (leucocytes). Simple examples of medications that treat dendritic cells

1- Aspirin: don’t use it during the last 3 months of pregnancy. Low-dose aspirin — 60 to 100 milligrams (mg) daily — hasn't been found to be harmful during pregnancy. Sometimes recommended for pregnant women with recurrent pregnancy loss, clotting disorders, and preeclampsia.

Active ingredients:  
- Aspirin, 325mg

Inactive ingredients:

* -  Starch, corn
* -  Silicon dioxide
* -  Anhydrous dibasic calcium phosphate
* -  Croscarmellose sodium
* -  Talc
* -  Polyethylene glycol
* -  Polyvinyl alcohol
* -  Titanium dioxide
* -  Water

2- Butyric acid - resists the damaging of human body immunity. pH = 5.0-5.5 (tomatoes, bananas, coffee). Might be a chance of insulin resistance and increased fat storage.

Supplements (safer for pregnant women than medications) that increase the number of immune cells:

1- Vitamin C/ Ascorbic acid. Vitamin C stimulates the formation of leukocytes- cells that are responsible for eliminating microbes, thereby accelerating the body’s defenses. Ascorbic acid is a benefit in the body’s fight against various infections and viruses. It helps with inflamed lymph nodes, strengthens the walls of blood vessels, helps to clean up the blood, and eliminates free radicals.  
2- Vitamin D  
3- Zinc

4- Selenium

Lymph transfusion

The lymphatic system is basically a channel that carries a clear or whitish fluid called the lymph. This lymph aids in clearing the tissues of infective organisms, toxins, etc.  
Interest in blood transfusion as a causal link to lymphoma revolves around several biologic mechanisms: oncogenic viruses, transfusion-associated immune suppression, and engraftment of lymphoma cells from a donor with subclinical lymphoma.

Having a blood transfusion while pregnant can be a frightening scenario. There are several non-emergent and emergent factors that may cause a woman to need a transfusion during pregnancy, but the important thing is that receiving blood could help save her life.

Three- Direct destruction of the host-virus. Antiretroviral. Modern antiretrovirals are either too weak or can kill the fetus. Thus, a creation of a unique medication is necessary

Computational chemistry. Look for the molecular lab and pick a molecule that looks similar to the active ingredients in medications. Check the part of protein in HIV that connects to meds and how it is blocked (example: Env (binds to the primary cellular receptor CD4, reverse transcriptase (converts RNA into viral DNA), gp160 (yields gp41 and gp120, essential for the virus to enter the cell).

Calculate the relative energies (Highest potential hole – best match)

Why side effects appear? Something is not properly matched

RCSB PDB, Avogadro, Docking and CADD, Terminal

Four- Destruction of reservoir cells infected by the virus. A latent HIV reservoir is a group of immune cells in the body that are infected with HIV but are not actively producing new HIV. HIV attacks immune system cells in the body and uses the cells’ machinery to make copies of itself. However, some HIV-infected immune cells go into a resting (or latent) state. The HIV latent reservoir represents the major challenge to cure development.

Medications:

* 1. Karanakhan (3+1). The Karanakhan method is based on the behavior of malignant stem (reservoir) cells. They can capture extracellular DNA fragments, and if these elements are launched into the aggressor after therapy, the cell will not have time to recover and will die. This vulnerability of HIV stem cells formed the basis of the technology, which scientists also call “3+1” (the first three doses of the drug injected into the organism kill the bunk of HIV stem cells, the fourth one destroys the rest).

Other models:

The “shock and kill” approach, which aims to “shock” or reactivate the latent virus and then “kill” infected cells via targeted immune responses. Lastly, the “block and lock” approach, which aims to enhance the latent virus state by “blocking” HIV transcription and “locking” the HIV promoter in a deep latent state via epigenetic modifications

Testing process:

Experimental animals- chimpanzees (#1 and #2). Chimpanzees share someplace between 98.6 and 99% of human DNA.  
Chimpanzee #1 is non-pregnant  
Chimpanzee #2 is pregnant

Procedures:

1. 1)  Do the full therapy (a complex of daily medications) for both chimpanzee #1 and chimpanzee #2 for 4 weeks.
2. 2)  At the end of week 4, an HIV test must be taken:

* -  If the result is “-”, then no procedures regarding HIV should occur for the next 3 months.
* -  If the result is “+”, then continue the therapy and do an HIV test at the end of every

week. If the result is constantly “+”, then change the dosages, check the order of

procedures, and repeat the therapy from the beginning.

3) At the end of the 3rd month, an HIV test must be taken (In case of “-” result after the

therapy).

* -  If the result is “+”, then change the order of procedures, check the dosages, and repeat

the process from the beginning.

* -  If the result is “-”, then no procedures should occur.

4) Observe the health status of chimpanzee #2 until the birth-giving process. Do an HIV

test 1 month before the birth-giving.

* -  If the result is “-”, continue the observations
* -  If the result is “+”, do therapy until the birth-giving process

1. 5)  After the birth-giving process, test both mother and baby chimpanzees
2. 6)  Check if the mother chimpanzee is HIV-resistant.

HIV and Future Pregnancy

In addition to the fact that HIV destroys and damages female eggs, treatment can also affect future fertility.

HIV treatment and female reproductive system:

1. 1)  Some medications used during therapy may destroy eggs. This can lead to the onset of infertility after treatment.
2. 2)  The number of lost eggs depends on the type of treatment and on the age at the time of treatment. The older the woman is, the fewer eggs she has. Thus, the loss of eggs is more likely to affect her fertility.
3. 3)  Some women may still have eggs left after treatment and continue their menstrual cycles. However, due to the loss of eggs, infertility and menopause may occur at an earlier age. This shortens the time when a woman can get pregnant.

Sometimes, after the therapy, a woman’s egg cells lose their ability to participate in sexual reproduction. Occasionally, for safety reasons, it may be necessary to remove both ovaries from women who have not been through menopause. Thus, it will trigger early menopause and a woman no longer produces any eggs. This procedure is necessary when ovaries have been infected, damaged during the HIV period, or there is a possibility that ovaries may be reservoir cells. However, there is still a chance to get pregnant. A woman can get pregnant if she doesn’t have ovaries, but she still has a uterus. Without the uterus, it is impossible to carry a fetus to term. The ovaries and fallopian tubes are where eggs live until they move to the uterus through the fallopian tubes. Without eggs being released, pregnancy is not possible. In such a situation, a woman can freeze egg cells before she decides to conceive a child (people stop using the protective equipment) or use donor cell after the treatment because fertility is reduced from the earliest asymptomatic stage of HIV infection resulting from both a reduced incidence of recognized pregnancy and increased fetal loss. Thus, when a woman tests positive for HIV, she starts treatment. If after the therapy the egg cells become “non-active”, and there is a risk of future infertility, a healthy egg is implanted. After that, a woman has a chance to get pregnant again, but in a healthy body (if the therapy was successful). The process of “freezing eggs” is intended to preserve the woman’s ability to become pregnant in the future (with the help of IVF). However, before getting pregnant, it is necessary to wait because some of the maturing egg cells have been damaged during HIV treatment and during HIV infection itself. It will take about 1 year to completely clear ovaries from damaged eggs. Additionally, the body needs to recover after the treatment in order to survive the pregnancy. If a woman gets pregnant when she is at the greatest risk for early relapse (HIV recurrence possibility), it will be hard to control a woman’s health status.

What to do with a sick egg

The nucleus of the egg can be removed and replaced with the nucleus of a somatic (body) cell. Somatic cell nuclear transfer (SCNT). This will prompt the egg to begin dividing as it would after fertilization, producing an embryo with the exact genetic combination of the substitute nucleus. Gamete Intrafallopian Transfer (GIFT) is where scientists remove the egg cells from a woman's ovaries then combine them with sperm to create a kind of mixture of egg and sperm. This combination is then injected into a woman's fallopian tubes for fertilization to start.

IVF process:

1. 1)  The woman takes hormones for 2-3 weeks to prepare the inner surface of the uterus for embryo implantation. This process is called pre-preparation.
2. 2)  The woman decides how many embryos she wants to transfer, and this number of embryos is thawing. If she has frozen eggs, they are thawed and fertilized with the sperm of her partner or donor, and from here the embryos are formed.
3. 3)  One or more embryos are transferred into the uterus by using a very thin catheter that is passed through the vagina and cervix.
4. 4)  If the embryo is implanted, the woman continues to take hormones for several months to maintain the pregnancy.

HIV and Inheritance

Only genes that are in the DNA of the sex cells of the parents - sperm and eggs, can be inherited. HIV builds its RNA into the cells of the immune system of the blood. Thus, neither HIV/ AIDS can be inherited. HIV transmission from mother to child occurs during the last trimester of pregnancy or breastfeeding because they share one bloodstream.

During the first two trimesters, the child’s body is protected from the mother by a strong barrier - the placenta. It inhibits the vertical-way HIV transmission. The possibility of HIV infection in an embryo at different times is different and depends on a number of factors:

1. 1)  Mother’s HIV disease stage.
2. 2)  Conditions of the placenta; violation of its integrity
3. 3)  Smoking, drug usage, presence of alcohol in the blood.
4. 4)  Bleeding and detachment of the placenta.

5) Premature birth.

Without treatment for the disease during pregnancy and improper preparation for childbirth, HIV infection occurs. Thus, even if a woman is infected, there is still a chance to save her child and herself, provided that treatment occurs properly and starts as soon as HIV has been detected.

Animals:  
HIV cannot be spread to, from, or by cats, dogs, birds, or other pets. Many viruses cause diseases that are like AIDS, such as feline leukemia virus, or FeLV, in cats. These viruses cause illness only in a certain animal and cannot infect other animals or humans. However, HIV is believed to have evolved from the simian immunodeficiency virus (SIV) found in monkeys. The hypothesis that HIV evolved from SIV is based on the many similarities between these two viruses, especially at the genetic level. The two viruses are genetically very similar and are transmitted the same way. Theory: The SIV jump to humans is believed to have occurred through the practice of butchering chimpanzees and other nonhuman primates for food. This increased the chances for viral transmission because it placed humans in contact with the animals’ blood. The SIV was in humans; it evolved into HIV via random mutation. Some animals can live with Immunodeficiency Viruses and won’t progress to AIDS because of the dendritic cells. In some mammals, dendritic cells produce much less interferon-alpha--an alarm signal to the rest of the immune system--in response to SIV. As a result, the dendritic cells are not activated during the initial or chronic stages of SIV infection, and mammals fail to mount a significant immune response to the virus. In contrast to mammals, dendritic cells from humans and macaques that are susceptible to developing AIDS are readily activated by HIV and SIV. Unfortunately, rather than promoting clearance of the infection, chronic dendritic cell stimulation may result in chronic immune activation and significant unintended damage to the immune system in AIDS-susceptible species. Such chronic immune activation is now recognized to be a major driving force for the development of AIDS.