CAN HIV INFECTION BE CURED?

WHAT HAVE WE LEARNED ABOUT HIV?

In 1981, several cases of rare pneumonia (PCP, see fact sheet 515) and skin cancer called Kaposi's sarcoma see fact sheet 511) were reported. These cases were in homosexual men in Los Angeles and New York City. This was a mystery to researchers.

The virus that causes AIDS was identified in 1983. No medications were available to treat this disease until 1987. In that year, a cancer drug called zidovudine (AZT) was found to slow down the multiplication of the Human Immunodeficiency Virus (HIV.)

By 2014, over 30 medications had been approved to fight HIV. None of these drugs kills the virus. Each of them slows down HIV at a specific point of its life cycle.

HOPE FOR A CURE

In 1996, several research studies suggested that triple-drug combinations could drive HIV into remission or eradicate it. Many people taking combinations of antiretroviral medications have an undetectable viral load (see fact sheet 125.)

However, by some estimates, only 2% of the virus in the body is in the blood, where it can be measured by viral load tests. Even in patients taking potent triple medication combinations, HIV was not eradicated.

WHERE DOES THE VIRUS HIDE?

Very early in HIV infection, the virus becomes part of the genetic code of millions of cells. Some of these cells are hidden from the immune system, and from antiviral medications. Areas where the virus is hiding are called reservoirs. These include the genital tract and the central nervous system. One researcher estimated that it might take 70 years of controlling HIV to eliminate these reservoirs.

THE BERLIN PATIENT

Another boost to hopes for an HIV cure came from the "Berlin patient." This was a person with HIV living in Berlin who also had leukemia. Standard leukemia treatment failed. He then received a bone marrow transplant. This wiped out his immune system. It was replaced from a donor with a rare genetic mutation that made him resistant to HIV infection. When the treatments were completed, the Berlin patient had no sign of HIV in his body.

Bone marrow transplants are dangerous. As many as 1/3 of patients who get them die from the procedure. Therefore, it is not clear that the success of the Berlin patient could or should be tried in anyone else. However, this case provides some clues about how HIV might be removed from a patient.

MORE GOOD RESULTS

In 2013, several AIDS researchers reported "cure" results. These were not carefully designed as cure studies. However, for the individuals involved the results were considered a "functional cure." This means that even without antiretroviral therapy, their viral load stayed under control.

An infant girl in Mississippi given antiretroviral drugs soon after birth was thought to be cured of her HIV, but a recent report shows that her virus has returned.

CURRENT CURE RESEARCH

There are ongoing research efforts in several areas:

- Clearing out reservoirs of infection
- Vaccinations to help the immune system fight HIV (therapeutic vaccination)
- Making cells resistant to HIV
- Modifying stem cells

Many researchers believe that a cure will require a combination of approaches.

Clearing Out Reservoirs

During initial HIV infection, millions of cells are infected. The virus is often inactive,. not producing new virus. It is invisible to the immune system and to antiretroviral medications.

Researchers are working with drugs that activate HIV in reservoirs. This might make it possible for existing antiretroviral medications to clear the virus. This approach could increase some cancers.

Therapeutic Vaccinations

Most vaccines are given to prevent infection. Therapeutic vaccinations are given to boost the body's ability to fight an existing infection. So far, studies of therapeutic vaccines for HIV have not shown strong results. One possible risk is that a therapeutic vaccination would increase immune activity and inflammation.

Making Cells Resistant to HIV

In this approach, CD4 cells are taken from the patient. They are modified to make them resistant to HIV. Then they are given back to the patient. The hope is that the modified cells will multiply in the patient.

This approach requires the patient to be connected to a machine for several hours while CD4 cells are removed from the blood. When the modified cells are given back to the patient, it can cause chills, fever, headache, sweating, dizziness and fatigue.

A new approach includes suppressing the immune system to "make room" for the new, modified cells. This might result in more modified cells in the body. However, this can leave patients temporarily at risk for serious infections.

Modifying Stem Cells

The Berlin Patient received transplants of stem cells that resisted HIV infection. Stem cells can grow into various types of cells in the body, and in some cases, act as a repair system.

There is significant risk in this approach. If the stem cells are not modified correctly, they could cause serious illness Stem cell therapy may also require destroying part or all of a patient's immune system.

This approach might only make sense for people with HIV who need to "turn down" their immune systems as part of treatment for cancer.

TREATMENT INTERRUPTIONS

Many cure research studies involve the patient stopping antiretroviral treatment. This allows researchers to see if the experimental treatment is helping the immune system fight HIV. There are many risks with treatment interruptions (see fact sheet 406.) The interruptions in these studies currently do not exceed 12 weeks.

THE BOTTOM LINE

There have been ups and downs in the search for a cure for HIV. So far, it seems that the approaches all carry some risks. The benefits are not yet clear.

However, there is growing interest in cure research. It will continue, and probably increase, in the coming years.

Revised July 23, 2014