AIDS Patient Cured by Adult Stem Cell Treatment

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In a rare incidence in which a genetic mutation is transformed into a therapy, doctors in Berlin describe an adult stem cell transplantation that has cured a patient of AIDS. Dr. Gero Hütter and Dr. Eckhard Thiel, both blood cancer specialists at the Charite Hospital in Berlin, announced on Wednesday the cure of a 42-year-old male American patient who resided in Germany and who suffered from leukemia as well as AIDS. The man was treated with adult stem cells derived from another man who was found to have the rare genetic mutation known as Delta 32, which causes white blood cells produced in the bone marrow to lack the surface receptor via which H.I.V. invades the immune system. This particular stem cell transplant was associated with a high risk of complication and mortality not because of the stem cells, per se, but because the transplantation was preceeded by the deliberate destruction of the patient's bone marrow with radiation and drugs - a procedure from which 30% of patients typically die. Nevertheless, this particular patient is not only alive and well today but is also now free of the human immunodeficiency virus 20 months after having received the stem cell treatment, even though he has not been taking the antiretroviral drugs that are normally prescribed for people with AIDS.

While this particular therapy is thought to be of little practical usefulness for the millions of people who are infected with H.I.V. throughout the world, this case study nevertheless offers the first concrete evidence that a viable therapy for AIDS could come from stem cells which are genetically re-engineered to have the Delta 32 mutation. To date, most AIDS drugs are designed to prevent H.I.V. from replicating, yet even when such drugs are successful, the virus can still remain dormant in lymph and nerve cells for years before being activated. Even when activated, however, H.I.V. is incapable of infecting cells which lack the necessary receptors. The human immunodeficiency virus is harbored in macrophages and is especially notorious for destroying T4 cells - but only when such cells have the necessary receptor that is required for H.I.V. infection, otherwise H.I.V. infection cannot occur when the receptor does not exist.

Discovered in the 1990s, the Delta 32 mutation must be inherited from both parents. According to Dr. Hütter, one in 80 of the potential donors who were screened, and who were found to match the patient closely enough for a leukemia treatment, were also found to have the Delta 32 mutation.

Because of the high risk associated with the bone marrow ablation, however, the director of the Institute of Human Virology at the University of Maryland School of Medicine, Dr. Robert Gallo, has echoed the sentiments of many by stating, "Frankly, I'd rather take the medicine," referring to the antiretroviral drugs, which also are not without their own risks. Similarly, according to Dr. Anthony Fauci, director of the National Institute of Allergy and Infectious Diseases, "It's very nice, and it's not even surprising. But it's just off the table of practicality." In other words, donors of this type of stem cell transplant must not only be found to be a close tissue match for the recipient, but they must also possess the rare genetic mutation. While the odds are already slim that any particular donor will meet either one of these conditions, the odds are even lower that a person will be found who can satisfy both conditions simultaneously. As Drs. Hütter and Thiel point out, however, the primary significance of this treatment is not that it would be attempted for everyone in the world who has H.I.V., but rather that a viable AIDS therapy may be developed from the genetic manipulation of stem cells which could be artificially engineered to have the Delta 32 mutation.

Since the 1980s doctors have attempted to use bone marrow transplants in the treatment of patients with Acquired Immuno-Deficiency Syndrome, but with little definitive success. One such case involved a patient who had both AIDS and lymphoma, and who died from the lymphoma two months after having received a bone marrow transplant, although postmortem analysis revealed that the patient had been cured of the H.I.V., even though it could not be determined with certainty whether such a cure was the result of the bone marrow transplant or of the drugs which the patient had also been taking, or of a combined synergistic effect. In another famous case, the San Francisco advocate for AIDS patients, Jeff Getty, received a bone marrow transplant in 1995 from a baboon, which is known to be naturally resistant to H.I.V., after which he also received antiretrovial triple therapy. Although the baboon bone marrow transplant was later determined not to have offered any protection, Mr. Getty lived for eleven additional years before succumbing both to AIDS and to cancer. Now, as a result of the success of Drs. Hütter and Dr. Thiel in Berlin, other doctors and scientists believe there is new hope for the use of therapies that are derived from stem cells which have been artificially induced to contain the Delta 32 mutation.

Similarly, RNA molecular "hairpin scissors" are used to excise pieces of the genetic code which determine cellular receptors in blood-derived stem cells. According to Dr. Irvin S.Y. Chen, director of the AIDS Institute at U.C.L.A., who has successfully applied this technique in monkeys, a realistic goal is to be able to inject such genetically modified stem cells into humans. The extent to which the immune system would then need to be destroyed, if at all, prior to transplantation of the stem cells, is yet to be determined although the overall risk of the procedure is diminished to the extent to which the immune system and bone marrow can be spared from destruction.

In any case, the cure of the AIDS patient in Berlin marks an important milestone not only in the progress and efficacy of AIDS therapies, but also in the increasingly diverse and broad range of applications of adult stem cells.