The CBCSF Newsletter

Issue 7, November 2004 A Publication of Community Blood Centers of South Florida, Inc.

Call for directions

Donor Centers

Boca Raton
(561) 451-4389

Cooper City
(954) 680-9410

Coral Springs
(954)752-6322

Fort Lauderdale
(954) 491-9397

Homestead
(305) 245-4757

Kendall
(305) 270-6425

Key West
(305) 294-7668

Lauderhill
(954) 735-9600

Miami/Civic Center
(305) 549-7214

Miami Children's Hospital
(305) 667-6503

Miami Beach
(305) 604-2818

Hollywood Memorial
(954) 987-2020 ext 5062

Miami Lakes
(305) 362-9713

Hollywood Metro
(954) 986-6302

Palm Beach Gardens
(561) 627-5165

Perrine
(305) 256-1660

Pompano Beach
(954) 782-2972

Sunrise
(954) 747-3921

Elusive HIV/AIDS Vaccine - Is Vaccination Possible?

The Epidemic Continues

The spread of HIV remains among the most deadly epidemics in the history of mankind. Approximately 50 million people from all countries are currently infected. Third world countries in Africa are particularly hard hit with 20% to 40% percent infection rates in Uganda and other sub-Saharan nations. Infection rates are rising in South America, India and China. Since the start of the epidemic more than 500,000 Americans have died of HIV infection despite improving therapies.

AIDS is a viral disease caused by the Human Immunodeficiency Virus (HIV). The structure and life cycle of the HIV virus have been well characterized. The human immune system recognizes HIV as being foreign and mounts a significant immunological reaction to infection. The antibodies produced by the immune system of infected people are easily detected and in 1985 formed the basis for the first tests used to diagnose HIV infection as well as screen donated blood for the presence of the virus. Today the risk of transfusion transmitted HIV infection is extraordinarily small with from 0 to 2 cases of transfusion-transmitted HIV expected to occur each year in the entire United States.

Ever since the virus was identified in the early 1980's, scientists have attempted to produce an effective vaccine to prevent its spread. None of these efforts has been successful. So why can't modern medical science produce a vaccine against HIV and stop the epidemic? Vaccination programs against smallpox, polio, measles, and tetanus have been extremely successful and have essentially eliminated these viral diseases as public health concerns. A vaccine against AIDS would save millions of lives.

Unhappily for mankind, the chances for the production of an effective vaccine against HIV appear to be bleak.

A Short History of Vaccinations

The first form of what we call vaccinations were performed in Asia Minor by local practitioners who transferred scabs from healed smallpox lesions into the noses of their patients - a process called "variolation" which also explains the scientific name for the virus causing smallpox, "variola" - causing them to develop mild cases of smallpox. More than 99% of the patients recovered and then were safe from smallpox. Lady Mary Wortley-Montagu, wife of the British ambassador to the Ottoman Sultan in Constantinople (Istanbul) first reported in 1717 on this practice in her letters to her friends in England at a time when smallpox routinely killed as many as a third of English children under the age of 10. Any technique that offered protection from this dread disease was worth considering and the first smallpox "variolation" took place in England in 1721.

Edward Jenner, English physician, 1749-1823, noted that milkmaids with a history of cowpox infection never developed smallpox. In 1796 he inoculated James Phipps, his gardener's 8-year-old son, with material from Sarah Nelmes, a milkmaid with cowpox. James Phipps could not then be infected with smallpox despite several attempts by Edward Jenner to do so. This experiment would not be permitted today.

(continued on next page)

Remember!

Be sure we have your email address so you receive notification that your cholesterol results are available at www.cbcsf.org.

Blood donors who join our email list will also receive four or five newsletters annually, so be sure to give the registrar your email address when you visit us to give blood.

Users should also add webmaster@cbcsf.org to their list of safe contacts.

Confidentiality Statement: Community Blood Centers of South Florida is committed to respecting your privacy. We will not share, rent, or sell personal information provided by you, including your email address, to other parties. The information you provide will only be used to support your relationship with us as a blood donor or potential donor.

King George III and his wife Queen Charlotte had their children "variolated" in 1780 making "variolation" fashionable in England and other parts of the western world. For this and other reasons George III was an immensely popular monarch in England. His rather poor reputation in the 13 colonies was due to other issues entirely.

The Structure of HIV and the Patho-physiology of HIV Infection

HIV is a small virus with a very simple structure. Viruses like HIV have RNA as their genetic material and therefore are called "retroviruses" because the viral RNA is converted to DNA in the host cell, which is the reverse of the normal pathway. Once inside a host cell, HIV takes over the cell's machinery making it produce thousands of copies of each part of the virus. The infected host cell becomes something akin to an HIV parts producer and warehouse all rolled into one. The virus must then be reassembled from its constituent parts before it can be released from the cell and infect other neighboring cells.

The word "vacca ", Latin, means "a cow", and is why Edward Jenner called his process of inoculation of cowpox for prevention of smallpox "vaccination". He would make house calls in rural England taking an infected cow with him as a source of cowpox from which he would then vaccinate his patients.

The reassembly of the virus is a complex process mediated by two important reassembly enzymes. The first is called a "reverse transcriptase" which copies the genetic code of the virus making it ready for incorporation into new viral particles. The second is called a "proteinase" which prepares the other assorted viral parts so they can be put together to form a completed virus.

The reverse transcriptase enzyme has a copy error rate estimated to be as high as 30%. This means that HIV infected individuals are constantly being re-infected by new and different strains of HIV, each of which is somewhat unique. A patient's immune response may clear the original strains of HIV, but new strains are constantly appearing to replace them. The result is that the immune response to HIV can co-exist with the virus, and the antibodies produced by infected people do not cure the disease.

The high error rate inherent in HIV reproduction is unusual in nature. In diseases such as smallpox and influenza the victim's immune response is directed against many identical copies of one infecting virus and is therefore curative. In HIV infection there are thousands of variants of the same virus so no one antibody response is effective against them all.

Is There Hope?

Numerous attempts at developing vaccines against AIDS have all ended in failure as the virus's ability to change is always one step ahead of the immune system's response to infection. No single HIV trait is sufficiently constant to permit the immune system to attack all the thousands of variants which are found in an HIV infected patient. As more and more time passes the likelihood of ever finding such a constant target becomes more remote.

Drug therapy for AIDS continues to gradually improve. Inhibitors of both the proteinase and anti-reverse transcriptase enzymes block the reassembly of new viruses and continue to show promise for limiting viral reproduction. Even here the high error rate of both enzymes promotes the development of drug resistance by the virus.

Even after decades of research, the best approach to controlling the AIDS epidemic continues to be the prevention of new infections and that is proving to be as elusive a goal as the quest for an HIV vaccine. Despite years of educational effort many groups of at–risk people fail to take adequate protective steps despite the fact that AIDS is still an ultimately fatal disease. The development of a protective vaccine remains a distant hope.