AIDS Virus Jumped From Chimps

Genetic studies confirm that the roots of the AIDS virus, which attacks people, can be traced to viruses infecting chimpanzees living in west-central Africa.

Researchers have long suspected that chimpanzees were the original reservoir for infection by HIV-1, the strain of HIV responsible for the global, human pandemic first recognized in the early 1980s. However, the three chimpanzee virus strains examined in past genetic studies varied so much that researchers could not rule out the case that chimpanzees and humans were separately infected through contact with a third, unidentified species.

Now, a newly discovered simian immunodeficiency virus (SIV) strain shows strong similarities to two of the previously analyzed simian viruses, which appear in the same chimpanzee subspecies, *Pan troglodytes troglodytes*. HIV-1 is also closely related to this cluster of simian viruses, they report.

The other, more divergent chimp virus came from another subspecies, *Pan troglodytes schweinfurthii*. Beatrice H. Hahn of the University of Alabama at Birmingham presented these findings this week in Chicago at the sixth annual Conference on Retroviruses and Opportunistic Infections and in the Feb. 4 NATURE.

"The puzzle of the origin of HIV-1 has been solved," says Hahn.

As more evidence for chimp-to-human viral transmission, she adds, the *troglodytes* subspecies lives in the area where researchers already have established that the HIV epidemic began and where the earliest known infection has been identified (SN: 2/7/98, p. 85).

New research confirms that chimpanzees were the original source of the AIDS virus HIV-1.

"We believe that HIV was introduced into the human population through exposure to blood during hunting . . . of these animals," Hahn says. When Hahn and her colleagues looked at one type of HIV-1 found so far only in Cameroon, they discovered that some of its genes are more closely related than others to simian viruses.

If the virus had jumped from a chimp to a human just once, all genes within that HIV strain should be similarly related to SIV genes. The researchers estimate that, instead, the virus has moved from chimps to humans at least three times, and they speculate that it may do so again.

"This [research] is probably the missing link demonstrating that this species of chimpanzee is the source of human infection," says Douglas D. Richman of the University of California, San Diego.

The virus has probably infected chimps for at least 100,000 years because different subspecies are infected with slightly different strains of SIV, Hahn says. Unlike humans with HIV-1, chimps infected with SIV show no symptoms of infection.

"This virus infects a primate species that is 98 percent related to humans," notes Anthony S. Fauci, director of the National Institute of Allergy and Infectious Diseases in Bethesda, Md. "This may allow us—if done carefully and in collaboration with primatologists working to protect this endangered species—to study infected chimpanzees in the wild to find out why these animals don't get sick, information that may help us better protect humans from developing AIDS."

"We need to make a concerted effort to preserve this species and the viruses that the chimpanzees still harbor to get a better picture of what is going on," says Hahn. —*D. Christensen*

South Pacific has a severe case of anemia

A vast region of the South Pacific suffers from a natural iron deficiency—one that stunts the growth of marine plants supporting all higher ocean life, according to two oceanographers. The discovery holds implications for understanding past ice ages and perhaps for devising ways to avert global warming.

Researchers have previously diagnosed iron limitations in other ocean areas, but most are far smaller than the South Pacific gyre, a continent-size swath of water stretching from South America to New Zealand. The new finding, reported in the Feb. 5 SCIENCE, builds on a growing recognition of iron's importance in controlling ocean life.

"It's the Iron Age of oceanography right now," quips Kenneth H. Coale of Moss Landing (Calif.) Marine Laboratories.

The iron-limitation hypothesis challenges the traditional theory that the amount of biologically useful fixed nitrogen keeps ocean life in check in most regions. According to the older concept, tiny marine plants called phytoplankton grow until they use up all available fixed nitrogen.

Some parts of the ocean, however, have abundant nitrogen but remain watery deserts. In 1988, the late John H. Martin suggested that lack of iron could explain this phenomenon—an idea supported by experiments in 1993 and 1995.

Oceanographers have now discovered signs of marine anemia under quite different conditions—the nitrate-poor waters of the South Pacific gyre. Michael J. Behrenfeld and Zbigniew S. Kolber of Rutgers University in New Brunswick, N.J., measured the fluorescent light emanating from phytoplankton in ocean water continuously collected between the equator and Tahiti. By comparing the intensity of fluorescence at night and during the day, the researchers could gauge the relative amounts of various molecules important for photosynthesis.

From the pattern of fluorescence, the researchers concluded that phytoplankton in parts of the South Pacific gyre has low amounts of key iron-rich molecules. The iron shortage in the water, they say, hence hinders the phytoplankton's growth.

The findings could help oceanographers understand how small periodic changes in Earth's orbit have sent the planet into repeated ice ages. As the climate began to cool, the continents dried out and winds intensified, carrying iron-rich dust into the oceans. According to this theory, the iron stimulated ocean plant growth and thereby chilled the globe further by pulling carbon dioxide out of the atmosphere.

By greatly expanding the area of known iron-limited ocean, Behrenfeld and Kolber have strengthened the idea that wind-borne iron could have dramatic impacts on Earth's climate. "It makes the iron story much larger geographically," says Rutgers' Paul G. Falkowski.

Some scientists have suggested that fertilizing the ocean with iron could slow global warming by helping plants sop up carbon dioxide. Many oceanographers, however, reject the idea because the iron could cause harmful side effects to ocean life (SN: 9/30/95, p. 220). —*R. Monastersky*