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HIV-like Virus Detected in Wild Chimpanzee

An international team of researchers has identified a wild chimpanzee infected with simian immunodeficiency virus (SIVcpz). The identification of the infected animal strengthens the scientific case that wild chimpanzees are the reservoir of SIVcpz, which researchers believe is a relative of the human immunodeficiency virus (HIV).

The research team, which includes Howard Hughes Medical Institute investigator George M. Shaw and senior author Beatrice H. Hahn, reported the discovery in the January 18, 2002, issue of the journal *Science*. Shaw and Hahn are both at the University of Alabama at Birmingham.

In 1999, Hahn, Shaw and their colleagues first reported evidence that human HIV-1 most likely arose because of transmission of SIVcpz from the chimpanzee, *Pan troglodytes troglodytes*, to humans. Their conclusion was based on evidence indicating that six captive chimpanzees were infected with SIVcpz.

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"Since thousands of captive chimpanzees throughout the world had been screened, and only those six had been found to be positive for SIVcpz, people questioned how the chimpanzee could be the reservoir if all these other animals were negative," said Shaw. "The reason we deduced that the chimpanzee was the source was that others considered the animals as all being equivalent. But there are four different subspecies, and we provided evidence that it was *Pan troglodytes troglodytes* native to west central Africa that was the original source of the disease. However, until now, there had been no evidence for a natural reservoir of SIVcpz in the wild."

In the latest studies, Hahn, Shaw and their colleagues analyzed urine and fecal samples from 58 animals. The animals included those of the subspecies *Pan troglodytes verus* from the Tai Forest in the Côte d'Ivoire (Ivory Coast) in West Africa, and those of the subspecies *Pan troglodytes schweinfurthii* in the east African Kibale National Park in Uganda, and Gombe Stream National Park in Tanzania. The development of a highly sensitive immunological assay to test urine and fecal samples for antibodies to the virus was critical to the study's success. This noninvasive test, developed by first author Mario L. Santiago, allowed the scientists to avoid having to capture the endangered animals to take blood samples.

Of the tested animals only one -- a sexually active *Pan troglodytes schweinfurthii* male from the Gombe National Park -- was found to harbor SIVcpz. In order to protect the animal, the scientists are declining to reveal its identity.

Detailed analysis of the SIVcpz strain found in the Gombe chimpanzee revealed that it was different from any previously known SIVcpz or HIV-1 strains. The closest relative was a virus found in a captive *Pan troglodytes schweinfurthii* animal. According to the scientists, the lack of resemblance to other strains of the virus found in the wild animal ruled out east African chimpanzees as the natural source of human HIV.

"When we did our earlier work, we reasoned that since the virus from *schweinfurthii* was the most divergent from HIV, it must be that the human AIDS virus came from the *troglydytes* subspecies," said Shaw. "And sure enough, when we studied the virus from *troglydytes* animals, it did resemble HIV-1."

According to Shaw, the discovery of the virus in only one animal is not surprising, given the habitat destruction and decimation of chimpanzee populations throughout Africa. Hahn, Shaw and their colleagues are continuing to gather and analyze samples, especially from Gombe, to see if they can detect the virus in additional animals. These studies, he said, could offer new insights into SIV that will apply to HIV.

"To find this virus for the first time in the wild opens a window of opportunity to begin to study the natural transmissibility of these types of viruses in their natural host," he said. "We also believe it may be important ultimately to understand the implications of the cross-species transmission that brought about the HIV pandemic," he said. "Is there another vector besides transmission via blood that we haven't discovered? We don't think so, but we don't know for sure."

Primatologist Jane Goodall, a co-author of the *Science* paper, and her colleagues, has studied the Gombe animals extensively. "The infected animal was born in Gombe, and they have studied it for twenty years," he said. "They know all its sexual mates and its history of sexual activity. So, we can

analyze samples from those mates and their offspring and begin to understand how this virus perpetuates itself in the wild. From such studies could come clues to why the disease is benign in chimpanzees but virulent in humans,” he said. “For whatever reason, SIVcpz has adapted over tens of thousands of years to the chimpanzee, so that it is less pathogenic and therefore preserves itself in its host.”

“Importantly, we can also explore how SIVcpz in *trogodytes* animals differs from that in *schweinfurthii* animals,” he said. Detailed comparative molecular analysis of the infectious mechanisms and pathogenicity of the different strains of SIVcpz and HIV could yield insights that will aid development of AIDS vaccines and antiviral drugs,” said Shaw.