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An ice-age ancestor to H.I.V.

Finding of ancient virus in monkeys adds to mystery of human link

BY DONALD G. MCNEIL JR.

In a discovery that sheds new light on the history of AIDS, scientists have found evidence that the ancestor to the virus that causes the disease has been in monkeys and apes for at least 32,000 years — not just a few hundred years, as had been previously thought.

That means humans have presumably been exposed many times to S.I.V., the simian immunodeficiency virus, because people have been hunting monkeys for millenniums, risking infection every time they butcher one for food.

And that assumption in turn complicates a question that has bedeviled AIDS scientists for years: What happened in Africa in the early 20th century that let a mild monkey disease move into humans, mutate to become highly transmissible and then explode into one of history's great killers, one that has claimed 25 million lives so far?

Among the theories different researchers have put forward are the growth of African cities and the proliferation of cheap syringes.

Confirming that the virus is very old also helps explain why it infects almost all African monkeys but does not sicken them. Over many generations, as any

disease kills off vulnerable victims, the host adapts to it.

The new research, published Thursday in *Science* magazine, was relatively simple. Scientists tested 79 monkeys from Bioko, a volcanic island 30 kilometers, or about 20 miles, off the West African coast. Bioko used to be the end of a peninsula attached to the mainland in what is now Cameroon, but it was cut off when sea levels rose 10,000 years ago at the end of the last ice age.

Since then, six monkey species have developed in isolation on the island, and scientists from the National Primate Research Center at Tulane University in Louisiana and other U.S. and African universities found that four of them — drills, red-eared guenons, Preuss's guenons and black colobuses — had members that were infected with S.I.V.

The four strains in the four species were genetically very different from one another — meaning they presumably did not come from monkeys carried over to the island by humans in the last few centuries. But each was close to the strain infecting members of the same four genres on the mainland, meaning they must have existed before Bioko was cut off.

Knowing that all four strains were at least 10,000 years old, scientists recalculated the virus's "molecular clock," measuring how fast it mutates. They now believe that all the S.I.V. strains infecting monkeys and apes across Africa diverged from a common ancestor be-

tween 32,000 and 78,000 years ago.

"When we only had 25 years of data, we were dating from the tip at the end of a branch of the evolutionary tree," said Preston A. Marx, a virologist at the Tulane primate center and an author of the paper in *Science*. "I knew that what we had before couldn't be right, because the virus had spread from the Atlantic to the Indian Ocean to the southern end of the continent, and it couldn't have done that in a couple of hundred years."

Beatrice H. Hahn, a virologist from the University of Alabama at Birmingham and a discoverer of the simian virus, called the study "a very nice pa-

Scientists recalculated the virus's "molecular clock."

per," adding, "This is what people like us have been looking for."

Previous methods of dating the virus had concluded it was a few hundred to 2,000 years old, "and that just didn't seem right," Dr. Hahn said.

H.I.V., which is almost universally fatal to humans, is obviously very new to humans. As Dr. Marx pointed out, if it had been in humans before the 20th century, it would have arrived in the Americas in some of the 12 million Africans kidnapped for the slave trade.

Its immediate ancestor is probably also relatively new to chimpanzees. Last year, Dr. Hahn showed that it can sicken and kill chimps, although not as

quickly, meaning they have probably been adapting to it for generations.

The virus has probably crossed over from simians into humans at least five times. There are two human immunodeficiency viruses, H.I.V.-1, by far the most common, and H.I.V.-2, which is milder and rarely seen outside West Africa, and which jumped to humans from sooty mangabeys, a monkey that West Africans hunt and eat.

H.I.V.-1, in turn, has four subtypes, designated M, N, O and P. The first, which has spread around the world, clearly came from chimpanzees, as did N and O. But P appears to have crossed over from a gorilla; it was discovered only last year, and in only one woman, who was from Cameroon, where lowland gorillas are hunted for meat.

It is very likely, scientists said, that a little infected monkey or ape blood got into human veins many times in history as hunters cut themselves while butchering carcasses. But even if it sickened those hunters, it probably died out with them or their immediate contacts.

The earliest confirmed H.I.V. case in humans was found in blood drawn in 1959 from a man in Kinshasa, in what was then called the Belgian Congo.

Sometime between the 1800s and 1959, something presumably allowed a human infection with a chimpanzee virus to spread widely enough to evolve into modern H.I.V.-1, which could spread easily among humans.