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HIV-like viruses in non-human primates have existed much longer than previously thought

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Viruses similar to those that cause AIDS in humans were present in non-human primates in Africa at least 5 million years ago and perhaps up to 12 million years ago, according to study published January 24 in the Open Access journal *PLOS Pathogens* by scientists at Fred Hutchinson Cancer Research Center. Until now, researchers have hypothesized that such viruses originated much more recently.

HIV-1, the virus responsible for AIDS, infiltrated the human population in the early 20th century following multiple transmissions of a similar chimpanzee virus known as SIVcpz. Previous work to determine the age of HIV-like viruses, called lentiviruses, by comparing their genetic blueprints has calculated their origin to be tens of thousands of years ago.

However, other researchers have suspected this time frame to be much too recent. Michael Emerman, Ph.D., a virologist and member of the Human Biology Division at Fred Hutchinson Cancer Research Center, and Alex Compton, a graduate student in the Emerman Lab, describe the use of a technique to estimate the extent to which primates and lentiviruses have coexisted by tracking the changes in a host immunity gene called APOBEC3G that were induced by ancient viral challenges.

They report that this host immunity factor is evolving in tandem with a viral gene that defends the virus against APOBEC3G, which allowed

them to determine the minimum age for the association between primates and lentiviruses to be around 5 or 6 million years ago, and possibly up to 12 million years ago.

These findings suggest that HIV-like infections in primates are much older than previously thought, and they have driven selective changes in antiviral genes that have incited an evolutionary arms race that continues to this day. The study also confirms that viruses similar to HIV that are present in various monkey species today are the descendants of ancient pathogens in primates that have shaped how the immune system fights infections.

"More than 40 non-human primate species in sub-Saharan Africa are infected with strains of HIV-related viruses," Emerman said. "Since some of these viruses may have the potential to infect humans as well, it is important to know their origins."

More information: Compton AA, Emerman M (2013) Convergence and Divergence in the Evolution of the APOBEC3G-Vif Interaction Reveal Ancient Origins of Simian Immunodeficiency Viruses. PLoS Pathog 9(1): e1003135. doi:10.1371/journal.ppat.1003135