On the origins of HIV

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Dear Editor,

The article "Origins of HIV identified" by Barry Mason was an important contribution to understanding the worsening situation with the global AIDS pandemic. On the one hand, great strides are being made in the field of HIV research, and on the other, the epidemic has continued to flourish, in particular in poorest regions of the world--Sub-Saharan Africa and Asia.

I would like to add a few more points on the issues touched upon by the author, to further illustrate the significance of the latest finding on the origins of the HIV virus.

Just to reiterate, as reported in the science journal *Nature*, scientists found that HIV-1, the main strain responsible for the world epidemic, derived from a chimpanzee known as Pan troglodytes troglodytes, found in the central western African countries of Gabon, Equatorial Guinea and Cameroon. Scientists found that this particular chimpanzee species carried a primate-like HIV, known as a "Simian Immunodefiency Virus chimpanzee" or SIVcpz, which was transmitted as HIV-1 to humans.

It has long been suspected that HIV-1 came from chimpanzees, but scientists had been unable to identify the precise subspecies until now.

This latest research breakthrough is part of a string of findings in the past decade and a half aimed at unveiling the origins of HIV-1. Scientists have achieved this by piecing together the evolutionary path and origins of the virus--a crucial aspect of AIDS research. By understanding HIV's genetic make-up, scientists may be able to identify the organism's possible "weaknesses" as a means of developing an antidote to its attack. As the head of the research team, Dr. Beatrice Hahn of the University of Alabama, explained: "The chimpanzee, which has served as the source of HIV-1, also quite possibly holds the clues to its successful control."

Hahn's research team began studying HIV-1's origins in 1995 by investigating chimpanzee samples that had been tested in the US a decade earlier. The tests were carried out on 98 captive chimpanzees to see if they harboured HIV-1. Evidence showed that one of the chimps, known as Marilyn, had produced antibodies, that is, reacted against HIV-1, but the finding was put aside, and eventually picked up by the Hahn's team in 1995. The research team was able to analyse frozen tissue from Marilyn, using sophisticated genetic analyses that were unavailable at the time of her death in 1984.

Prior to the investigation of Marilyn, scientists had discovered similar HIV-like viruses in three other chimpanzees, two of which came from Gabon and the other from Zaire.The chimps tested positive to HIV antibodies, despite never been exposed to HIV of any form, thus demonstrating that a more fundamental relationship existed between the primate virus and HIV.

Scientists then analysed the genetic make-up of these three chimps to determine which subspecies of chimp they belonged to. Just like Marilyn, the two Gabonese animals belonged to the chimpanzee subspecies Pan troglodytes troglodytes, and the Zairian animal was another species. Using a genetic sequence analysis, Hahn's team found that the viruses from the chimp Marilyn and the two Gabonese chimps were all very closely related to the three HIV-1 strains M, N and O (showing more than 90 percent similarity). Furthermore, the African regions where the three chimps came from, are the same regions where HIV-1 is first recorded to have emerged.

These findings are considered to be conclusive. According to Hahn, the link between human and chimp would further strengthened if the chimp virus (SIVcpz) was found widely in wild populations.

The results are the culmination of more than a decade of research. At the end of the 1980s scientists began to link primate-like HIV to humans. By 1992, however, a

significant breakthrough emerged when scientists linked a specific type of SIV derived from the primate species--the sooty mangabey monkey--to the human virus--HIV type 2. This cross-transmission was considered to have taken place in West Africa, where the sooty mangabey was kept as a pet, as well as being widely prevalent in the wild.

The link was significant from a number of standpoints. Firstly, it demonstrated to scientists that primate species can harbour particular strains of HIV-like viruses, depending on which region of Africa they come from. Secondly, it enabled scientists to show that HIV became expressed in humans as a result of a cross-infection from the monkey--at some stage in the last few decades. This discovery also disclosed to scientists that HIV strains could be directly related to specific primate virus cross-transmissions. The task was, therefore, to find which particular primates caused the specific HIV forms.

The relationship between HIV-1 and HIV-2 was also more thoroughly understood. Scientists proved that HIV-2 is more closely related to the sooty mangabey monkey form of the virus than it is to HIV-1.

Barry Mason's article mentioned that HIV-2 is a "weaker" form to HIV-1. However, it is now understood that both strains cause AIDS in infected patients--the main difference is that in HIV-2, the disease can tend to take longer to emerge. In addition, both strains differ in terms of their distribution--HIV-2 is particularly found in West Africa, whilst HIV-1 is widely distributed throughout the world.

Scientists have revealed that differences in the two HIV strains are due to differences in their origins. That is, two genetically different primate SIV types crossed-over into humans at unknown points in time--as a result, both strains had time to evolve significant differences.

The latest discovery will enable scientists to further their research into the evolutionary relationships between chimps and human HIV infection. Moreover, scientists will also begin to explore why HIV destroys the immune system in humans whilst the primate form rarely harms the chimpanzees. The work will undoubtedly provide clues for the medical treatment of the disease.

How the virus jumped from chimpanzees to humans and why it emerged in recent years is not known. Hahn believes that the cross species transmission was due to high levels of chimpanzee poaching, a common practice in West Africa. Local people kill the chimps as "bushmeat" to survive. Hahn commented in an interview: "Subsistency hunting has always been part of African culture, but increasing logging activities in the past decade have provided unprecedented access to remote forest regions and have led to the commercialised killing of thousands of chimpanzees, gorillas and monkeys. It took us 20 years to find where HIV-1 came from, only to realise that the very animal species that habours it is at the brink of extinction."

Despite the unanswered questions, there is no doubt that the latest finding is a significant step forward.

Yours sincerely,

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