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Source: <http://sci.tech-archive.net/Archive/sci.med.diseases.lyme/2005-03/0972.html>

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Date: 03/26/05

Date: 26 Mar 2005 08:47:00 -0800

Origins of HIV?AIDS – Aids: Where are we now? – ABC Science Online
<http://www.abc.net.au/health/aids2001/origins.htm>

Details of HIV crossing the species barrier remain unclear. All evidence suggests that HIV is a recent disease of humanity. Most scientists now agree that HIV evolved from SIV (Simian Immunodeficiency Virus), a related virus of apes and monkeys, and that the first cases of human infection occurred somewhere in Africa. But crucial details of when, how and where the virus first crossed the species barrier from apes to humans are still hotly debated.

A sailor from Manchester called David Carr was thought to have been the first person to die from AIDS. He succumbed to an exotic AIDS-like illness in Britain in 1959 after spending time in West Africa and a posthumous analysis of his tissue revealed traces of HIV. However the results of this study were overturned in 1995 by a US medical team that concluded that David Carr had actually not been HIV-positive. One of the original researchers subsequently admitted that his samples had probably been contaminated. This means the first definite identification of HIV comes from a blood sample taken in 1959 from a patient in Kinshasa, then the capital of the Belgian Congo.

The investigations continue

The date is important because it gives a clue as to what might have prompted HIV to emerge. Conventional scientific wisdom has been that HIV emerged when native hunters became infected with SIV, probably by killing and eating chimpanzees – a traditional and bloody practice that could easily spread viruses. However, there are flaws with this theory: Humans have hunted and killed chimps for thousands of years but HIV emerged only in the second half of the 20th Century. SIV is also not infectious to humans and the amount of mutation needed for SIV to reshape itself into a new human virus would almost certainly require repeated infections between people.

Most significantly, though, DNA analyses of modern-day strains of HIV show that the virus crossed the species barrier to humans not once but at least three times, forming the three main strains of HIV that infect

people today. The probability that SIV coexisted in apes for thousands, perhaps millions, of years and then suddenly jumped to humans three times in a decade seems remote, unless something happened in Africa during that time that helped the natural evolutionary process along.

The Origin of AIDS & HIV, and the First Cases of AIDS

<http://www.avert.org/origins.htm>

Debate around the origin of AIDS has sparked considerable interest and controversy since the beginning of the epidemic. However, in trying to identify where AIDS originated, there is a danger that people may try and use the debate to attribute blame for the disease to particular groups of individuals or certain lifestyles.

The first cases of AIDS occurred in the USA in 1981, but they provide little information about the source of the disease. There is now clear evidence that the disease AIDS is caused by the virus HIV. So to find the source of AIDS we need to look for the origin of HIV.

The issue of the origin of HIV could go beyond one of purely academic interest, as an understanding of where the virus originated and how it evolved could be crucial in developing a vaccine against HIV and more effective treatments in the future. Also, a knowledge of how the AIDS epidemic emerged could be important in both mapping the future course of the epidemic and developing effective education and prevention programme.

What type of virus is HIV?

HIV is part of a family or group of viruses called lentiviruses. Lentiviruses other than HIV have been found in a wide range of nonhuman primates. These other lentiviruses are known collectively as simian (monkey) viruses (SIV) where a subscript is used to denote their species of origin.

So where did HIV come from? Did HIV come from an SIV?

It is now generally accepted that HIV is a descendant of simian (monkey) immunodeficiency virus (SIV). Certain simian immunodeficiency viruses bear a very close resemblance to HIV-1 and HIV-2, the two types of HIV.

For example, HIV-2 corresponds to a simian immunodeficiency virus found in the sooty mangabey monkey (SIV_{sm}), sometimes known as the green monkey, which is indigenous to western Africa.

The more virulent strain of HIV, namely HIV-1, was until very recently more difficult to place. Until 1999 the closest counterpart that had been identified was the simian (monkey) immunodeficiency virus that was known to infect chimpanzees (SIV_{cpz}), but this virus had significant differences between it and HIV

So what happened in 1999?

Are chimpanzees now known to be the source of HIV?

In February 1999 it was announced¹ that a group of researchers from the University of Alabama had studied frozen tissue from a chimpanzee and found that the simian virus it carried (SIVcpz) was almost identical to HIV-1. The chimpanzee came from a sub-group of chimpanzees known as Pan troglodytes troglodytes, which were once common in west-central Africa.

It is claimed by the researchers that this shows that these chimpanzees were the source of HIV-1, and that the virus at some point crossed species from chimpanzees to human. However, it was not necessarily clear that chimpanzees were the original reservoir for HIV-1 because chimpanzees are only rarely infected with SIVcpz.

The findings of this 10-year long research into the origin and evolution of HIV by Paul Sharp of Nottingham University and Beatrice Hahn of the University of Alabama were published in 2003². They concluded that wild chimps became infected simultaneously with two simian immunodeficiency viruses (SIVs) which had "viral sex" to form a third virus capable of infecting humans and causing AIDS.

Professor Sharp and his colleagues discovered that the chimp virus was an amalgam of the SIV infecting red-capped mangabeys and the virus found in greater spot-nosed monkeys. They believe that the hybridisation took place inside chimps that had become infected with both strains of SIV after hunting and killing the two smaller species of monkey.

How could HIV have crossed species?

It has been known for a long time that certain viruses can pass from animals to humans, and this process is referred to as zoonosis.

The researchers concluded that HIV could have crossed over from chimpanzees as a result of a human killing a chimp and eating it for food.

Some other rather controversial theories have contended that HIV was transferred iatrogenically i.e. via medical experiments. One particularly well publicised theory is that polio vaccines played a role in the transfer.

The journalist Edward Hooper has suggested that HIV could be traced to the testing of an oral polio vaccine called Chat as batches of the Chat vaccine may have been grown in chimp kidney cells in the Congo, the Wistar Institute and Belgium. That could have resulted in the contamination of the vaccine with chimp SIV, the simian version of HIV-1. This vaccine was then given to about a million people in the Belgian Congo, Ruanda and Urundi in the late 1950s.

However, in February 2000 the Wistar Institute in Philadelphia announced that it had discovered in its stores a phial of polio vaccine

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that had been used as part of this polio vaccination program. The vaccine was subsequently analysed and in April 2001 it was announced³ that no trace had been found of either HIV or chimpanzee. A second analysis⁴ confirmed that only macaque monkey kidney cells, which cannot be infected with SIV or HIV, were used to make Chat.

What is crucial in regard to the credibility of any theory is the question of when the transfer took place.

Is there any evidence of when the transfer took place?

During the last few years it has become possible not only to determine whether HIV is present in a blood or plasma sample, but also to determine the particular subtype of the virus. Studying the subtype of virus of some of the earliest known instances of HIV infection can help to provide clues about the time of origin and the subsequent evolution of HIV in humans.

Three of the earliest known instances of HIV infection are as follows:

A plasma sample taken in 1959 from an adult male living in what is now the Democratic Republic of Congo

HIV found in tissue samples from an American teenager who died in St. Louis in 1969.

HIV found in tissue samples from a Norwegian sailor who died around 1976.

Analysis in 1998 of the plasma sample from 1959 was interpreted⁵ as suggesting that HIV-1 was introduced into humans around the 1940s or the early 1950s, which was earlier than had previously been suggested. Other scientists have suggested that it could have been even longer, perhaps around 100 years or more ago.

In January 2000, the results of a new study presented at the 7th Conference on Retroviruses and Opportunistic Infections, suggested that the first case of HIV infection occurred around 1930 in West Africa. The study was carried out by Dr Bette Korber of the Los Alamos National Laboratory. The estimate of 1930 (which does have a 20 year margin of error), is based on a complicated computer model of HIV's evolution.

Is it known where the emergence of HIV in humans took place?

Many people now assume that because HIV has apparently developed from a form of SIV found in a type of chimpanzee in West Africa, that is was actually in West Africa that HIV first emerged in humans. It is then presumed that HIV spread from there around the world.

However, as discussed above, chimpanzees are not necessarily the original source of HIV and it is likely that the virus crossed over to humans on more than one occasion.² So it is quite possible that HIV emerged at the same time in say both South America and Africa, or that it even emerged in the Americas before it emerged in Africa.

We will probably never know exactly when and where the virus first emerged, but what is clear is that sometime in the middle of the 20th century, HIV infection in humans developed into the epidemic of disease around the world that we now refer to as AIDS.

What caused the epidemic to spread so suddenly?

There are a number of factors that may have contributed to the sudden spread including international travel, the blood industry, and widespread drug use.

International Travel

The role of international travel in the spread of HIV was highlighted by the case of 'Patient Zero'. Patient Zero was a Canadian flight attendant called Gaetan Dugas who travelled extensively worldwide. Analysis of several of the early cases of AIDS showed that the infected individuals were either direct or indirect sexual contacts of the flight attendant. These cases could be traced to several different American cities demonstrating the role of international travel in spreading the virus. It also suggested that the disease was probably the consequence of a single transmissible agent.

The Blood Industry

As blood transfusions became a routine part of medical practice, this led to a growth of an industry around meeting this increased demand for blood. In some countries such as the USA paid donors were used, including intravenous drug users. This blood was then sent worldwide. Also, in the late 1960's haemophiliacs began to benefit from the blood clotting properties of a product called Factor VIII. However, to produce the coagulant, blood from thousands of individual donors had to be pooled. Factor VIII was then distributed worldwide making it likely that haemophiliacs could become exposed to new infections.

Drug Use

The 1970s saw an increase in the availability of heroin following the Vietnam War and other conflicts in the Middle East, which helped stimulate a growth in intravenous drug use. This increased availability together with the development of disposable plastic syringes and the establishment of 'shooting galleries' where people could buy drugs and rent equipment provided another route through which the virus could be passed on.

What other theories have there been about the origin of HIV?

Other theories put forward about the origin of HIV include a number of conspiracy theories. Some people have suggested that HIV was manufactured by the CIA whilst others believe that HIV was genetically engineered.

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