

Superinfection

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The possibility of multiple infections with different strains of HIV has worried positive people and researchers for many years, but convincing proof of superinfection has been notoriously hard to come by. That proof now exists, but we still don't know just how great the risk is. Is it time to ring the alarm bells?

Several recent scientific reports of HIV superinfection (or reinfection) have sent shivers down the spines of many HIV-positive people. Infection with a second, possibly drug-[resistant](#) [1] HIV which has mutated and is less susceptible to the effects of one or more anti-HIV drugs is said to be resistant. or more aggressive, strain of HIV has been theorised for many years, and now there are a handful of proven cases.

With the long-held assumption that unprotected sex between two HIV-positive partners carries no HIV/AIDS-related risk, this news is disturbing indeed. Now that we know that superinfection can and does happen, we know that unprotected sex between positive partners is may not be entirely risk-free, leading many commentators to sound an alarm over rising rates of unprotected anal intercourse among gay men.

But what we still don't know is just how great the risk is. There has been just one proven case of superinfection reported to date in a scientific journal, with several more cases reported at AIDS conferences. Research is ongoing around the world to try to establish the degree of risk and the circumstances in which superinfection occurs.

This backgrounder looks at some of the facts and issues behind multiple HIV infections.

Different types of HIV

Firstly, it's important to note that there are two different Human Immunodeficiency [Viruses](#) [2] A small infective organism which is incapable of reproducing outside a host cell. —[HIV-1](#) [3] One of two distinct HIV species, HIV-1 is the predominant type in Australia and around the world. is the type found all around the world, including Australia, while [HIV-2](#) [4] A distinct and separate species of HIV, HIV-2 is rare outside West Africa and appears to be more difficult to transmit than HIV-1. is mostly confined to West Africa. Both viruses are transmitted via the same means, although HIV-2 seems to be a little harder to transmit, and both produce AIDS.

There have been many cases, especially in Africa, of people being infected with both HIV-1 and HIV-2. Luckily, HIV-2 remains very rare in this country.

Within HIV-1, there are two groups, labelled M and O — group M is overwhelmingly the most common.

Within group M, there are then nine [subtypes](#) [5] [HIV subtype or clade] A genetically distinct subtype of HIV within a defined HIV group. Group M has nine known subtypes -- A, B, C, D, F, G, H, J and K. or clades, labelled A to I.

In Australia, Europe, North and South America, Japan and the Caribbean, HIV-1, group M, subtype B is the most predominant. Subtypes A and D are predominant in sub-Saharan Africa, subtype C in South Africa and India, and subtype E in South-East Asia. The other subtypes are rare.

It has been suggested that different subtypes may replicate more efficiently, and may be associated with different forms of transmission. For example, subtype B is associated with homosexual contact and IV drug use, while subtypes C and E (common in Africa) seem to spread more easily via heterosexual sex.

As you can see, the different subtypes present significant challenges for development of an HIV vaccine. Furthermore, within subtypes it's possible for HIV to mutate, leading to different strains of the virus, some of which may be resistant to particular [antiretroviral](#) [6] A medication or other substance which is active against retroviruses such as HIV. drugs.

Different types of reinfection

It's possible for multiple infection with HIV to occur at any of three stages.

Simultaneous infection, or co-infection, occurs when an HIV-negative person is exposed to multiple HIV subtypes at the same time, during primary infection.

After primary infection but before seroconversion (the development of antibodies to HIV) there is a window period during which reinfection can occur. This is called serial infection.

The possibility of simultaneous or serial infection has never been in any doubt and has been demonstrated in both animal experiments and real life cases. It's the third type of reinfection that we're most interested in here.

Superinfection occurs when a second HIV infection takes place after the development of antibodies to HIV.

In many viral infections, the body's immune response to infection confers an immunity against further infections — this is why you can't get mumps, measles or Hepatitis A a second time. Until recently, the question of whether the same was true for HIV has been unclear. We now know it's possible.

The Swiss Case

In September last year, the New England Journal of Medicine carried the first published report, by a group of Swiss doctors, of HIV superinfection. (The Swiss case was originally the subject of a presentation at the Retrovirus conference in Seattle a year ago; several other cases have been reported at scientific conferences, but the Swiss case is important because publication in a scientific journal means that the report has been peer reviewed by an independent panel of experts.)

In November 1998, a 38-year-old gay man sought medical treatment in Switzerland with symptoms of seroconversion illness. He was diagnosed with HIV infection, and resistance testing showed that he was infected with HIV-1 subtype E, the type most common in South-East Asia. He also had acquired Hepatitis B at around the same time.

For the next couple of years, he was treated with antiretroviral drugs, had two treatment interruptions and was entered into a therapeutic vaccine study. In February 2001, he had a [viral load](#) [7] A measurement of the quantity of HIV RNA in the blood. Viral load blood test results are expressed as the number of copies (of HIV) per milliliter of blood plasma. of 21,000 copies.

In March 2001, the man had several unprotected sexual encounters in Brazil. A month later, his viral load rose suddenly, fluctuating between 200,000 and 400,000 copies, which decreased rapidly after restarting [HAART](#) [8] Highly Active AntiRetroviral Therapy ??? aggressive treatment of HIV infection using several different drugs together..

Genetic testing revealed that the man's HIV subtype had changed from E to B around April 2001, confirming that he had undergone superinfection.

In the Swiss case, superinfection could be proved because the second infection was a different subtype, however that does not mean that superinfection is only possible with a different subtype, only that it's easier to prove.

At the Barcelona AIDS Conference last year, an American researcher described a case of superinfection with two different strains of subtype B in a patient referred to as "AC-06". In this case the investigators found that the surface protein on the new virus was different from the original infection by only about 12 percent. Nonetheless, AC-06's immune system was unable to control the second infection.

In the Swiss Case, researchers were able to demonstrate in the laboratory that the subtype B virus with which the man had been superinfected reproduced more efficiently than his existing subtype E virus. In the man's body, the subtype B virus became dominant, and the numbers of CD8 cells specifically targeted at the subtype AE virus declined significantly, confirming that the second infection was with a fitter strain of HIV.

So what does it all mean?

In both the cases described above, the development of superinfection resulted in significant medical challenges for people whose infection had previously been under control.

At the Retrovirus Conference in Boston earlier this year, researchers from the University of Washington reported on four cases of dual HIV infection where the patients progressed very rapidly from HIV infection to AIDS or death, within two years. The researchers believe that in these four cases the dual infections had most likely been acquired simultaneously, but they didn't rule out superinfection.

This is important because it is the first evidence linking multiple infection to more rapid disease progression, but we don't know how applicable it is to superinfection because of the likelihood that the immune system is primed by initial infection to respond.

- [superinfection/reinfection](#)

Links:

[1] <http://www.napwa.org.au/glossary/term/109>

[2] <http://www.napwa.org.au/glossary/term/125>

[3] <http://www.napwa.org.au/glossary/term/191>

[4] <http://www.napwa.org.au/glossary/term/194>

[5] <http://www.napwa.org.au/glossary/term/193>

[6] <http://www.napwa.org.au/glossary/term/122>

[7] <http://www.napwa.org.au/glossary/term/416>

[8] <http://www.napwa.org.au/glossary/term/96>