Scientists find a key chink in HIV's armour

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In a finding that could have profound implications for HIV vaccine research, US scientists say they have found a site on HIV's outer coating which is vulnerable to antibodies that could effectively neutralise the virus [1]A small infective organism which is incapable of reproducing outside a host cell. and prevent it from infecting human cells.

Using high-powered X-ray microscopy, researchers from the National Institutes of Health (NIH) captured an image of the precise moment when the virus gains entry to human cells. The discovery, reported in the journal Nature, has been hailed as a major breakthrough in understanding the process by which HIV gains entry to cells. It could lead to the development of an effective preventative or therapeutic vaccine against HIV.

"Creating an HIV vaccine is one of the great scientific challenges of our time," said NIH Director Elias Zerhouni. " NIH researchers and their colleagues have revealed a gap in HIV's armour and have thereby opened a new avenue to meeting that challenge."

Developing an anti-HIV vaccine has so far proved impossible because of HIV's unique ability to change shape rapidly: the surface proteins which would be targeted by vaccine-produced antibodies vary too much from one virus to the next. Scientists have known for some time that the gp120 surface protein, a critical part of the process by which the virus binds to human cells, presents the most likely target for a vaccine, however attempts to create antibodies to block this molecule have failed.

"The more we learned about HIV, the more we realised just how many levels of defence the virus has against attacks by the immune system," said Dr Peter Kwong, the leader of the NIH research team. Not only does HIV mutate rapidly and continuously, it also produces tough sugary molecules that form an almost impenetrable cloak to prevent antibodies from slipping in and blocking the proteins the virus uses to latch onto a cell and infect it.

The gp120 molecule presents the best hope for vaccine research because it it the point at which the virus makes its first contact with CD4 cells. Once the spike-shaped molecule of gp120 has latched onto the cell, the virus quickly invades. "The first contact is like a cautious handshake, which then becomes a hearty bear hug," according to Gary Nabel, a member of the research team.

The NIH team was able to capture an image of the precise moment this first handshake happens, and identify that an antibody, called b12, is able to bind with gp120 before it latches onto the host cell. The b12 antibody has previously been shown to be part of the process by which some 'long-term nonprogressors' avoid progressing from HIV to AIDS without treatment.

While there is much more work to be done before the discovery translates into a possible vaccine or treatment, the announcement has generated considerable excitement in the scientific community. According to Dr Nabel, "This is certainly one of the best leads to come along in recent years."

- basic science

Links:
[1] http://www.napwa.org.au/glossary/term/125