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Selenium may slow march of AIDS

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Increasing the production of naturally occurring proteins that contain selenium in human blood cells slows down multiplication of the AIDS virus, according to biochemists.

"We have found that increasing the expression of proteins that contain selenium negatively affects the replication of HIV," said K. Sandeep Prabhu, Penn State assistant professor of immunology and molecular toxicology. "Our results suggest a reduction in viral replication by at least 10-fold."

Selenium is a micronutrient that the body needs to maintain normal metabolism. Unlike other nutrients, which bind to certain proteins and modulate the protein's activity, selenium gets incorporated into proteins in the form of an amino acid called selenocysteine.

These proteins – selenoproteins – are especially important in reducing the stress caused by an infection, thereby slowing its spread.

Upon infecting a person, the virus quickly degrades selenoproteins so that it can replicate efficiently. It is unclear just how the virus is able to silence these proteins but Prabhu and his colleagues believe that stress inflicted on cells by the rapidly dividing virus, which produces a key protein known as Tat, is the likely culprit.

Tat is one of about 14 odd proteins produced by HIV during the first stage of infection. The job of these proteins is to trigger the expression of all the other genes that the virus needs to sustain itself. In addition,

Tat also plays a key role in helping the virus replicate.

One of the proteins that targets Tat is a selenoprotein known as TR1.

"Since HIV targets the selenoproteins, we thought that the logical way to deal with the virus is to increase the expression of such proteins in the body," explained Prabhu, whose team's findings are outlined this week (Nov. 28) in the Journal of Biological Chemistry.

Researchers first isolated blood cells from healthy human volunteers who did not have HIV, and infected those cells with the virus. Next, they added tiny amounts of a selenium compound – sodium selenite – into the cell culture to see the effect on viral replication.

Results from the tests indicate that the addition of selenium inhibits the replication of HIV at least 10-fold, compared to cell cultures in which no selenium is added. When the researchers selectively reduced production of the selenium containing TR1 protein, they observed a 3.5-fold increase in viral replication.

"This confirms that while increasing the expression of TR1 has a negative impact on the replication of HIV, reducing it helps the virus replicate more efficiently," explained Prabhu. He believes that TR1 works by upsetting the chemical structure of Tat, which in turn reduces the virus' ability to replicate.

"Once we fully understand the function of these selenium proteins, it will give us a handle to come up with more effective drugs," said Prabhu, whose work is partly funded by the National Institutes of Health.

Source: Penn State