National Cancer Institute at the National Institutes of Health

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Anti-HIV Protein from Blue-Green Algae Also Inhibits Ebola Infection

Researchers have discovered that a bacterial protein known to reduce the ability of the human immunodeficiency virus (HIV) to infect cells also inhibits infection by the Ebola virus. The antiviral protein, known as cyanovirin-N (CV-N), can extend the survival time of Ebola-infected mice, researchers from the National Cancer Institute's Molecular Targets Discovery Program report in a study published in *Antiviral Research*.

The study, done in collaboration with researchers from the U.S. Army Medical Research Institute of Infectious Diseases, the Centers for Disease Control and Prevention, and the National Institute of Diabetes and Digestive and Kidney Diseases, provides important insights into the process of Ebola infection. There is currently no treatment for Ebola infection, which causes severe and often fatal hemorrhagic fever.

CV-N comes from a type of bacterium known as cyanobacterium, or blue-green algae. Its antiviral properties were originally discovered through NCI's Laboratory of Drug Discovery Research and Development in a screening process designed to identify natural materials that act against HIV. CV-N effectively inhibits HIV infection of cells grown in the laboratory.

"CV-N is extremely effective against a broad range of HIV strains," said Barry O'Keefe, Ph.D., of NCI's Center for Cancer Research, one of the authors of the study. It is currently being investigated in the laboratory as a potential topical microbicide to prevent the sexual transmission of HIV.

CV-N inhibits HIV infection by binding to the outside of the virus and physically blocking it from entering cells. The protein is known to attach to a particular sugar molecule on the virus surface, and because similar sugar molecules coat the Ebola virus, researchers hoped CV-N might have the same effect on Ebola that it does on HIV.

Their hypothesis proved to be true when laboratory experiments revealed that CV-N does bind to the sugar molecules on the outside of the Ebola virus and inhibit its ability to infect cells, much as it does with HIV. Furthermore, when researchers injected CV-N into mice prior to infecting the animals with Ebola, then

continued to inject CV-N once a day, the onset of visible illness was delayed and the animals survived longer than those not treated with CV-N.

"CV-N is the first molecule known to inhibit Ebola infection by interfering with the virus's ability to enter cells," said O'Keefe. Although researchers believe it is unlikely that CV-N itself will be an effective treatment for Ebola infection, understanding the specific molecules involved in CV-N's interaction with the virus will help clarify the processes necessary for infection. Scientists are optimistic that this knowledge eventually may lead to useful therapies.

* Barrientos LG, O'Keefe BR, Bray M, Sanchez A, Gronenborn AM, Boyd MR. Cyanovirin-N binds to the viral surface glycoprotein GP1,2 and inhibits infectivity of Ebola virus. *Antiviral Res* 2003;58:47-56.

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