



Biodefense solutions to protect our nation

FOR IMMEDIATE RELEASE  
June 27, 2016  
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### **Anthrax Capsule Vaccine Completely Protects Monkeys from Lethal Inhalational Anthrax**

Vaccination with the anthrax capsule—a naturally occurring component of the bacterium that causes the disease—completely protected monkeys from lethal anthrax infection, according to a study published online this week in the journal *VACCINE*. These results indicate that anthrax capsule is a highly effective vaccine component that should be considered for incorporation in future generation anthrax vaccines.

*Bacillus anthracis*, the bacterium that causes anthrax, is recognized as one of the most significant bioterrorism threats. It produces three main components that allow it to cause disease—lethal toxin, edema toxin, and capsule. During anthrax infection, the bacterium invades and grows to high concentrations in the host. The capsule surrounds the bacterium and prevents it from being ingested and destroyed by the white blood cells, thus allowing anthrax infection to progress. The toxins are thought to act mainly by damaging the body's natural defense mechanisms.

Current human vaccines for anthrax are based on the protective antigen component of the anthrax toxins. Scientists at the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) have extensively studied protective antigen, demonstrating that protective antigen alone confers protection in animal challenge studies with both rabbits and monkeys.

However, according to senior author Arthur M. Friedlander, M.D., of USAMRIID, concerns about reliance on a single antigen—as well as the issue of protecting against anthrax strains that may be vaccine resistant—have prompted the search for additional vaccine components. Bacterial capsules are commonly used in licensed vaccines for other diseases, including certain types of pneumonia and meningitis.

Friedlander's group had already demonstrated in published studies that the anthrax capsule plays a role in conferring protection. In their current work, the team describes testing a higher dose of the capsule vaccine in monkeys against a lethal aerosol challenge with anthrax

spores. All the animals receiving the capsule vaccine survived while all non-vaccinated animals succumbed to the disease.

“In the 140-year history of research on anthrax there have been two previous types of vaccine, the last one licensed in 1970,” Friedlander said. “This new capsule vaccine is expected to work against possible vaccine-resistant strains of anthrax and to protect individuals who may not respond optimally to protective antigen alone. In addition, it could be combined with protective antigen to create a multi-component vaccine that may enhance the efficacy of protective antigen- based vaccines.”

USAMRIID’s mission is to provide leading edge medical capabilities to deter and defend against current and emerging biological threat agents. Research conducted at USAMRIID leads to medical solutions—vaccines, drugs, diagnostics, and information—that benefit both military personnel and civilians. The Institute plays a key role as the lead military medical research laboratory for the Defense Threat Reduction Agency’s Joint Science and Technology Office for Chemical and Biological Defense. USAMRIID is a subordinate laboratory of the U.S. Army Medical Research and Materiel Command. For more information about USAMRIID, visit [www.usamriid.army.mil](http://www.usamriid.army.mil).

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*Reference:* “Protection of rhesus macaques against inhalational anthrax with a Bacillus anthracis capsule conjugate vaccine.” Donald J. Chabot, Wilson J. Ribot, Joseph Joyce, James Cook, Robert Hepler, Debbie Nahas, Jennifer Chua, and Arthur M. Friedlander. DOI: <http://dx.doi.org/10.1016/j.vaccine.2016.06.031>.

*Funding:* This work was supported by the Medical Biological Defense Research Program, U.S. Army Medical Research and Materiel Command. Project No. 921175.

*About the journal:* VACCINE is the pre-eminent journal for those interested in vaccines and vaccination. It is the official journal of The Edward Jenner Society and The Japanese Society for Vaccinology and is published by Elsevier [www.elsevier.com/locate/vaccine](http://www.elsevier.com/locate/vaccine)

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