Anthrax capsule vaccine protects monkeys from lethal infection

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a naturally occurring component of the bacterium that causes the disease-protected monkeys from lethal anthrax infection, according to U.S. Army scientists. The study, which appears in the Jan. 20th print edition of the journal *Vaccine*, represents the first successful use of a non-toxin vaccine to protect monkeys from the disease.

Bacillus anthracis, the bacterium that causes anthrax, is recognized as one of the most serious bioterrorism threats. It produces three main components that allow it to do harm-lethal toxin, edema toxin, and the 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, or PA, 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 PA alone confers protection in animal challenge studies with both rabbits and monkeys.

However, according to senior author Arthur M. Friedlander 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 mouse studies, that the anthrax capsule plays a role in conferring protection. In their current work, the team describes testing the capsule vaccine in both rabbits and monkeys against an aerosol challenge with anthrax spores. The vaccine induced anti-capsule antibody responses in both species. While rabbits were not protected against a high aerosol challenge dose, a significant number of the monkeys who received the capsule vaccine survived.

"This is the first non-toxin anthrax vaccine shown to be protective in monkeys," Friedlander said. "In addition, this new capsule vaccine is expected to work against possible vaccine-resistant strains of anthrax, as well as in recipients whose immune systems may not respond to protective antigen alone."

The results suggest that addition of capsule to protective antigen to create a multi-component vaccine may broaden and enhance the protection afforded by protective antigen-based vaccines. Friedlander said the next step would be to do a larger study in monkeys looking at varying doses of the capsule vaccine.

More information: *Vaccine* 30: 2012-846-852

Provided by US Army Medical Research Institute of Infectious Diseases

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