Combination vaccine developed for smallpox and anthrax

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Image credit: Wikipedia.

(PhysOrg.com) -- A new combination vaccine against both smallpox and anthrax has been tested in animal studies and found to be more effective against anthrax than the Emergent BioSolutions Inc. vaccine currently available.

The experimental vaccine, developed by scientists from the US Food and Drug Administration (FDA) and the National Cancer Institute, was tested on rabbits and found to build up immunity to anthrax faster and more effectively than the anthrax-only vaccine, BioThrax, sold by Maryland company Emergent BioSolutions Inc., which is the version stockpiled by the US government.

The vaccine was developed from a version of Pfizer's smallpox vaccination that had earlier been demonstrated to be more effective in mice with compromised immune systems. This modified vaccine was developed by National Cancer Institute researcher Liyanage Perera and

colleagues by adding a gene to the vaccinia virus with a gene encoding for interleukin-15 (IL-15), which is a molecule that boosts the immune system and helps clear the smallpox virus from the system.

To this modified vaccine the researchers added a gene from the anthrax bacterium. The researchers say this may make the vaccine safer than the alternative because BioThrax contains small amounts of the anthrax toxin, the protein Protective Antigen A (PA), while the new vaccine contains only the protective antigen.

The vaccine was tested in a single dose in rabbits, with control rabbits being given BioThrax and a further group being given the Pfizer smallpox vaccination. The combination vaccine protected 33 percent of the rabbits, while only around 10 percent were protected by BioThrax. The vaccine has also been tested on mice and found to be faster-acting than the alternative.

Side effects to smallpox and anthrax vaccines do occur, including severe allergic reactions and brain and heart inflammation, and anthrax vaccines must be given in multiple doses and have a shelf life of only four years. The combination vaccine can be stockpiled in a freeze-dried state and rapidly deployed in the event of a biological attack involving anthrax or smallpox.

According to Perera, the next stage in the research is to test the vaccine against anthrax in monkeys, and if this is successful human tests will follow. If testing is successful, the vaccine is likely to be ready for distribution within two or three years.

Both anthrax and smallpox are deadly diseases that can be turned into biological weapons. Having a single vaccine to protect against both, especially one that appears at this stage to work better than either of the single disease vaccines, would be highly advantageous in the aftermath

of a bioterrorist attack.

The paper was published in the *Proceedings of the National Academy of Sciences* (*PNAS*) and the research was funded by the National Institutes of Health.

More information: Development of a highly efficacious vaccinia-based dual vaccine against smallpox and anthrax, two important bioterror entities, *Proceedings of the National Academy of Sciences*, Published online before print October 4, 2010, doi:10.1073/pnas.1013083107