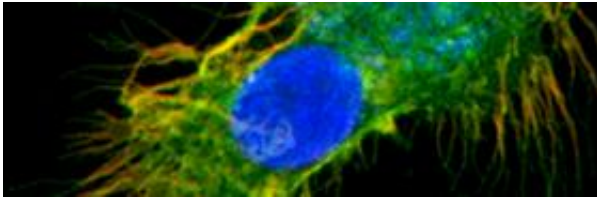


Good Bacteria Can Be 'EZ Pass' for Oral Vaccine Against Anthrax

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Dendritic cells are the first line of immune cells outside the small intestine. In a paper published in Proceedings of the National Academy of Sciences, Dr. Todd Klaenhammer and colleagues developed an oral vaccine that protected mice from anthrax exposure. The vaccine targeted dendritic cells to trigger the mucosal immune system to respond to and elicit protection against anthrax.

(PhysOrg.com) -- Researchers at North Carolina State University have discovered that the good bacteria found in dairy products and linked to positive health benefits in the human body might also be an effective vehicle for an oral vaccine that can provide immunity to anthrax exposure. The approach could possibly be used to deliver any number of specific vaccines that could block other types of viruses and pathogens.

The oral vaccine riding inside the good bacteria makes its way through the stomach and into the small intestine, an important immunological organ, where it easily and efficiently binds to cells that trigger an immune response - in this case, protection against anthrax in mice.

The finding, published the week of Feb. 16 in the online edition of *Proceedings of the National Academy of Sciences*, shows that an oral vaccine can be as effective as one given by needle, a potentially huge advance in drug delivery. Most vaccines are proteins, and as such normally won't maintain their effectiveness after being digested in the stomach.

The good bacteria - *Lactobacillus acidophilus*, a lactic acid bacteria - are naturally found in dairy products like milk and cheese, and are added by manufacturers to foods like yogurt. They are used in food fermentations, are safe for consumption and some are considered as probiotics that contribute to our general health and well-being.

In the paper, Dr. Todd Klaenhammer, Distinguished University Professor and William Neal Reynolds Professor in the Department of Food, Bioprocessing and Nutrition Sciences at NC State, Dr. Tri Duong from NC State's functional genomics program, and colleagues from the U.S. Army Medical Research Institute of Infectious Disease show that the acid tolerant lactic acid bacteria can act like an "EZ Pass," delivering the anthrax vaccine through the stomach and releasing it into the small intestine.

There, the vaccine targets the first line of immune cells - dendritic cells - that can trigger the mucosal immune system to respond to and elicit protection against anthrax. In the study, the oral vaccine worked about as well as a vaccine delivered by needle, the standard way of inoculating living things from viruses and pathogens.

"Normally, you can't eat vaccines because the digestive process in the stomach destroys them, so vaccines are traditionally administered by needle," Klaenhammer says. "But using 'food grade' lactic acid bacteria as a vehicle provides a safe way of getting the vaccine into the small intestine without losing any of the drug's efficacy in binding to the

dendritic cells, which can then trigger an immune response."

Klaenhammer and his colleagues are now attempting to use lactic acid bacteria to carry varying types of oral vaccines to provide immunity to important viruses and pathogens. They are also working to improve the efficiency of binding of *Lactobacillus acidophilus* and the vaccine to dendritic cells.

"Can we make these generally recognized as safe lactic acid bacteria into a premier delivery system for vaccines and biotherapeutics? That's the question we're now trying to answer," Klaenhammer says.

Provided by North Carolina State University

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