



## TECHNOLOGY

# Salmonella Based Oral Vaccines for Anthrax

## OVERVIEW

Recent heightened awareness of the possibility of bioterrorism has raised concerns about the use of *Bacillus anthracis* or related strains as bio-weapons. Anthrax is an infection caused by the spore-forming bacterium *B. anthracis*, which can enter the body and cause infection by means of inhalation, ingestion, or subcutaneous exposure. There is a need to develop vaccines for widespread use in the event of a bioterrorist attack, in order to minimize the exposure of a population to the bacteria. UMB inventors have developed a potential method for the generation of live oral vaccines for the prevention of infection by anthrax, genetically modified *B. anthracis*, or anthrax-like strains. Using the success of the already FDA approved and licensed typhoid vaccine *Salmonella* strain, *S. enterica* serovar Typhi Ty21a, the anthrax oral vaccine would comprise of nucleotide sequences encoding nonlethal, mutated forms of anthrax protective antigen (PA) and anthrax lethal factor (LF) encapsulated into human approved strains of *Salmonella*.

## APPLICATIONS

The only FDA approved anthrax vaccine, BioThrax, is produced by Emergent BioDefense Corporation and consists of a sterile product made from an avirulent, nonencapsulated strain of *B. anthracis*. This vaccine requires six vaccinations over eighteen months (at 0, 2 and 4 weeks and at 6, 12 and 18 months), followed by annual boosters. In the US, the primary purchasers of the anthrax vaccine are the Department of Defense, Department of Health and Human Services, and Centers for Disease Control and Prevention. Total revenues reported from BioThrax sales were \$120.7 million in 2011 and \$162 million in 2010. However, serious adverse effects (permanent disability, hospitalization, and death) have been reported showing the need for a vaccine that is not only effective but safer than the current available anthrax vaccine.

## ADVANTAGES

- This invention provides a cost-effective and safe vaccine that would produce immunity to anthrax with fewer doses than the standard method of vaccination.
- This invention specifically stimulates strong T cell memory responses in humans by enhancing the antibody response to both PA and LF.

## STAGE OF DEVELOPMENT

Preliminary in vivo mouse studies conducted on the oral delivery of anthrax vaccinations followed by a subsequent challenge

## R&D REQUIRED

Additional validation required in in vivo models to test formulation.

## LICENSING POTENTIAL

UM seeks to develop and commercialize by an exclusive or non-exclusive license agreement and/or sponsored research with a company active in the area.

## CONTACT INFO

Office of Technology Transfer  
620 W Lexington St., 4th Floor  
Baltimore, MD 21201  
Email: [ott@umaryland.edu](mailto:ott@umaryland.edu)  
Phone: (410) 706-2380

## Additional Information

### INSTITUTION

University of Maryland, Baltimore

### PATENT STATUS

US 7,947,268, Issued 5/24/2011

### CATEGORIES

- Vaccine

### INVESTIGATOR(S)

Leslie Baillie

### EXTERNAL RESOURCES

- [Towards a human oral vaccine for anthrax: the utility of a Salmonella Typhi Ty21a-based prime-boost immunization strategy.](#)
- [Oral administration of a Salmonella enterica-based vaccine expressing Bacillus anthracis protective antigen confers protection..](#)
- [Past, imminent and future human medical countermeasures for anthrax.](#)
- [Expression of the protective antigen of Bacillus anthracis by Lactobacillus casei: towards the development...](#)

LB-2010-092