



Modified Pathogens for Vaccine Applications

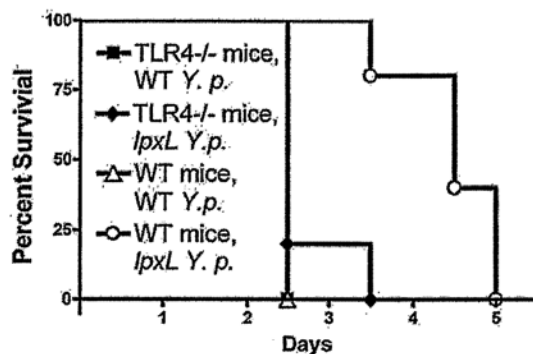
Keywords: LPS, Bacteria, Virus, *Yersinia pestis*, Vaccine, Heterologous, Cancer
WIPO# WO/2007/106073

Background

Gram negative bacteria are the causative agents of numerous human diseases. These include, pneumonic plague, a lethal and highly contagious disease caused by the Gram-negative bacterium *Yersinia pestis*. The CDC classifies Plague as a Category A agent, a designation given to diseases believed to pose the greatest threat to public health. Also, the heightened threat perception of bioterrorism has necessitated the need to develop and maintain vaccines stockpiles against Plague. Methods that can be applied to multiple diseases encompassing a wide spectrum of vaccine candidates would be extremely desirable.

Technology

UMass Medical School investigator Dr Egil Lien and colleagues have developed a novel method for engineering pathogens, especially gram negative bacteria, to produce potent immunostimulatory molecules for vaccine applications. Bacterial endotoxin, lipopolysaccharide (LPS) interacts with components of the innate immunity, leading to activation & stimulation of the immune system. In a well-designed study the investigators validated the methodology disclosed in the present invention by genetically engineering a *Yersinia pestis* strain to express an LPS biosynthesis enzyme, LpxL from *E.coli* (Motminy *et al* (2006).[Nat Immunol.](#) 10:1066-73). The engineered *Yersinia* strain produced a modified and highly stimulatory LPS. In sharp contrast to LPS produced by wild type *Y. pestis*, the modified LPS can stimulate mammalian toll-like receptors, thereby, generating a heightened immune response against the pathogen.



Application

Vaccines: bacterial, viral and or cancer.

Salient Features and Competitive Advantages

- ◆ **Heightened Innate Immune Response:** A poor immune response empowers pathogens with an escape mechanism to evade the immune system, multiply quickly to reach a high MOI and cause disease. UMass technology discloses methods for directing the innate immune response against the bacterium, thereby, increasing the chance of pathogen recognition & elimination.
- ◆ **Broad Applicability:** The technology can be easily adapted to other disease causing gram negative bacteria. These include *Yersinia pestis*, *Chlamydia trachomatis*, *Francisella tularensis*, *Legionella pneumophila*, *Brucella abortus* & *Chlamydia pneumoniae*.
- ◆ **Production Units for Heterologous Antigens:** The engineered bacterial strains can serve as host for heterologous antigens e.g. from bacteria other than gram negative, viruses and or mammalian cancer cells.
- ◆ **Adjuvant:** The technology can be used to modify a wide spectrum of immunostimulant to boost the innate immune response.
- ◆ **Ease of Manufacture.** The engineered bacteria can be cultured by existing fermentation technology methods.
- ◆ **Market Potential:** The global vaccine market is expected to reach \$10 billion in 2008 and ~\$24 billion by 2012.

Business Opportunity

UMass OTM is seeking statements of interest from parties interested in licensing and/or sponsoring collaborative research to further develop, evaluate, or commercialize this technology.

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