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Siderophore-Based Immunization Against Gram-Negative Bacteria

Tech ID: 27269 / UC Case 2014-676-0

BRIEF DESCRIPTION

Bacterial pathogens such as E. coli and Salmonella hijack the host’s iron to cause infection. This invention describes an immunization strategy for triggering an immune response against the iron-sequestering agent secreted by the pathogen, thus turning the bacterial virulence mechanism against itself, and thereby resulting in host immunity.

FULL DESCRIPTION

In the US alone, there are typically ~ 1 million food-borne cases of Salmonellosis, accompanied by ~ 19K hospitalizations and > 400 deaths – costing ~ USD 15 billion, excluding costs to the food industry. These numbers jump much higher when other enteric bacterial pathogens are included. Common to these pathogens is the strategy of secreting iron chelating small molecules, known as siderophores, that sequester iron from the host for the purpose of gainful bacterial infection. There is no known host immunity against siderophore-mediated bacterial mechanism.

Researchers at UC-Irvine have devised and optimized a novel vaccine that triggers the host immune response against siderophores. This vaccination has been shown to effectively protect against Salmonella infections in animal studies.

ADVANTAGES

- § No other reports exist of a vaccine composed of siderophore conjugated to carrier protein, as a strategy against Salmonella and other enteropathogenic bacteria.
- § The vaccine will work against all ~ 2,500 diverse Salmonella variants, as well as other pathogens including E. coli and Klebsiella pneumoniae, and any Gram Negative bacterial species that utilize siderophore-based iron acquisition from the host for infection. Since siderophores are more-or-less invariant, these strains are very unlikely to evolve and render the vaccine ineffective.
- § The vaccine will not indiscriminately target all gut microbiota unlike a broad-spectrum antibiotic. In fact, vaccination has been shown to increase fraction of beneficial species such as Lactobacillus spp. in animals challenged with Salmonella.
- § Vaccine may also be effective against Inflammatory Bowel Disease patients that are E. coli strain LF82 positive – this pathogen also uses a siderophore for infection.
- § Assays to detect antibodies and antibody producing immune cells against the enteropathogenic siderophores have been developed and optimized, allowing antibody development as a therapeutic.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,039,002	08/07/2018	2014-676

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OTHER INFORMATION

CATEGORIZED AS

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- » **Research Tools**
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RELATED CASES

2014-676-0

STATE OF DEVELOPMENT

*In vivo animal studies have shown efficacy of the immunization strategy against Salmonella inoculation challenges. Experiments with more animal subjects are planned for replicating these results.

*Antibodies against the siderophores continue to be developed.

RELATED MATERIALS

- » Behnsen J, Perez-Lopez A, Nuccio SP, Raffatellu M. Exploiting host immunity: The Salmonella paradigm. Trends Immunol 2015, Feb;36(2):112-20. - 01/09/2015
- » Kortman GA, Raffatellu M, Swinkels DW, Tjalsma H. Nutritional iron turned inside out: Intestinal stress from a gut microbial perspective. FEMS Microbiol Rev 2014, Nov;38(6):1202-34. - 09/20/2014

