

Citrobacter freundii WR7011 as a Vaccine Strain or Source of Vi Capsular Antigen for Protection Against Typhoid Fever

Technology Summary

According to the WHO, typhoid fever remains a serious public health problem throughout the world, with an estimated 16-33 million cases and 500,000 to 600,000 deaths annually. The Vi capsule of *S. typhi*, the causative agent of typhoid fever, is a surface-bound carbohydrate polymer targeted by antibodies to protect against typhoid fever. Purification of this polymer from virulent *S. typhi* strains poses a danger to those handling the live organism.

Available to license through FDA, a unique strain of *Citrobacter freundii*, WR7004, was mutated by FDA inventors to create the strain (WR7011) that expresses Vi polysaccharide on its surface. *C. freundii* WR7011 expresses several times as much Vi polysaccharide as native strains of *S. typhi*, is nonpathogenic, and is much safer to work with for Vi production or as a vaccine strain. The strain specifically was mutated using nitrosoguanidine. This strain of *C. freundii* can reduce the cost of purifying the Vi polysaccharide and provide a safe method of manufacturing the polysaccharide.

Potential Commercial Applications

- Synthesis of *S. typhi* Vi polysaccharide

Competitive Advantages

- WR7011 is a safe, non-toxic strain of *Citrobacter freundii*
- Efficient, low cost, production of *S. Typhi* vaccine polysaccharide (Vi)

Inventors: Dennis Kopecko, De Qi Xu

Publications:

- Snellings, N.J. et al. Genetic regulation of variable Vi antigen expression in a strain of *Citrobacter freundii*. J Bacteriol. 1981 Feb;145(2):1010-1017. PMID: [6161917](#)
- Houg, H.S., et al. Expression of Vi antigen in *Escherichia coli* K-12: characterization of ViaB from *Citrobacter freundii* and identity of ViaA with RcsB. J Bacteriol. 1992 Sep;174(18):5910-5915. PMID: [1522067](#)
- Ou, J.T., et al. Specific insertion and deletion of insertion sequence 1-like DNA element causes the reversible expression of the virulent capsular antigen Vi of *Citrobacter freundii* in *Escherichia coli*. Proc Natl Sci USA. 1988 June;85(12):4402-4405. PMID: [2837765](#)
- Szu, S.C., et al. Vi capsular polysaccharide-protein conjugates for prevention of typhoid fever. J Exp Med. 1987 Nov 1;166(5):1510-24. PMID: [3681191](#)

Intellectual Property:

- Research Tool – no patent protection was pursued for this technology

Product Area: typhoid fever, vaccine, conjugated vaccine, polysaccharide

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