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Bacterium-membrane derived nanoparticles as a vaccine for prevention of Pseudomonas aeruginosa infection

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Abstract

Pseudomonas aeruginosa is a pathogen that impairs the host defense resulting in the severe infection, particularly in cystic fibrosis patients. However, no effective drugs are available to treat this infection due to increasing drug resistance. A vaccination could offer a means to prevent a pseudomonas aeruginosa infection through the utilization of dead bacteria, their antigens, or their secreted outer membrane vesicles. Here, we show the development of a novel method to generate bacterium membrane-formed nanovesicles (BMFNVs) using mechanic force (nitrogen cavitation) to quickly disrupt pseudomonas aeruginosa bacteria. We studied the size and surface charges of the BMFNVs using dynamic light scattering and cryo-TEM, and their biological characteristics using PAGE and protein assays. The results showed that we have successfully made 300nm-sized nanovesicles containing bacterial membrane antigens and possessing an intact double-layer of bacterial membrane. Using this approach, we can quickly generate vaccines from all kinds of bacterial pathogens to prevent an array of infections. At the end of my talk, I will discuss the future directions to test this new platform of vaccine in vitro and in vivo mouse models.