A Novel and Cost-effective Protein-based Vaccine Against Pneumococcal Invasive Disease

A tripartite pneumococcal vaccine that provides universal coverage through antibody- and cell-mediated responses

Reference: Opp Ref: 1091

Source: https://stock.adobe.com/uk/215843357

IP Status
Patent application submitted

Seeking
Commercial partner, Development partner

About University of Liverpool
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Background

*Streptococcus pneumoniae* (or the pneumococcus) is one of the primary causes of life-threatening diseases such as pneumonia, meningitis and sepsis, accounting for over 1.9 million deaths worldwide. The bacterium exists in 100 distinct variants (known as serotypes) which vary in their biological properties and distribution around the globe. The bacterium spreads through contact with people who carry the bacteria in their nose and throat e.g. via respiratory droplets. People, especially children, can be carriers without showing any signs of disease, and can then spread the bacterium to others. As such, vaccines are the best way to prevent pneumococcal disease.

Currently licensed pneumococcal vaccines, such as Prevnar13®, have significantly contributed to reducing the incidence of invasive disease globally. They do not however offer protection against circulating non-vaccine covered serotypes, which have led to the sustained prevalence of pneumococcal invasive diseases globally. This important limitation, along with the alarming rise of antimicrobial drug resistance, is driving the need for the development of a pneumococcal vaccine with a broader, universal, cross-serotype coverage.

Tech Overview

Liverpool's research efforts have been focused on the preclinical development of a novel protein-based pneumococcal vaccine formulation (coined PrPV). The researchers assessed the protective efficacy and immunogenicity of PrPV in murine models of invasive pneumococcal disease (IPD) using both adult and infant mice, testing various formulations including human licensed adjuvants, protein combinations and doses, in challenge experiments with vaccine and non-vaccine covered serotypes. Prevnar13® (Pfizer) was used as the benchmark vaccine throughout the investigations. While the researchers confirmed that Prevnar13® is a robust vaccine, their results showed that PrPV offered cross-serotype protection that Prevnar13® failed to provide. The team determined that this effect was largely due to protein-specific cell-mediated immune responses.

The stratagem is primarily based on the principle of reverse vaccinology. To date, the reverse vaccinology approach has led to the construction of a subunit vaccine against *Neisseria meningitidis* serogroup B (Bexsero®, GSK), now registered in several industrialised countries around the globe. Liverpool researchers have now shown that this approach will also work for a pneumococcal vaccine.

Applications

PrPV is a potent vaccine formulation, which may be used in combination with Prevnar13®, or in settings where serotype replacement is a significant issue. Furthermore, our formulation offers the potential for co-formulation in any future vaccine with higher valency.
Opportunity

In February 2020, Allied Market Research reported that the global pneumococcal vaccine market was expected to reach $10,215 million by 2025, registering a compound annual growth rate (CAGR) of 5% from 2018 to 2025.

The growth of the global pneumococcal vaccine market is driven by a sustained prevalence of pneumococcal invasive diseases across the globe and particular in poor-resource settings, a heightened governmental focus on routine immunisation programs in children, and the introduction of novel pneumococcal vaccines such as Pneumosil® (Serum Institute of India Pvt., Ltd. (SIIPL) - WHO-prequalified in January 2020. However, the costs associated with development of such vaccines restrain the market growth. Hence the development of protein-based pneumococcal vaccines is expected to offer lucrative opportunities.

The University is seeking a commercial partner to help develop the technology and bring it to the market.

Patents

- A patent titled “A novel and potent yet cheaper vaccine against pneumococcal disease” was filed in 2020