TECHNOLOGY OFFER

OMVs AS HETEROLOGOUS ANTIGEN DISPLAY SYSTEM FOR VACCINE DEVELOPMENT

Recent events highlight the desperate need of alternative vaccine platforms, which are safe, effective, stable, simple to administer, and can be modified to carry antigens of emerging pathogens. We have developed a vaccine platform technology based on bacterial outer membrane vesicles (OMVs) derived from detoxified *Vibrio cholerae* and enterotoxigenic *Escherichia coli* (ETEC) bacterial donor strains. Our technology allows efficient decoration of OMVs with heterologous antigens, which can be isolated via filtration and centrifugation. The OMVs are stable, highly immunogenic and induce a long-lasting immune response upon non-invasive intranasal immunization. Proof of concept was demonstrated by decorating OMVs with a SARS-CoV-2 Spike protein domain followed by an immunization study in mice, which resulted in a protective immune response.

BACKGROUND

Several vaccine types have been established, including whole pathogen vaccines, vector vaccines, nucleic acid vaccines and subunit vaccines. Among the later we herein introduce a vaccine platform based on bacterial OMVs, which has distinct advantages over the existing technologies. OMVs are naturally released from the surface of Gram-negative bacteria and consequently represent non-living facsimiles of the donor cell that present antigens in their natural conformation. Especially, pathogenic species secrete OMVs, which are highly immunogenic and have self-adjuvant properties. We have studied OMVs and their role as vaccine candidates against human mucosal pathogens of the intestinal and respiratory tracts for many years[1] and demonstrated that non-invasive intranasal immunization induces a specific, high-titer, protective antibody response in the murine model that is long-lasting.

TECHNOLOGY

Using our acquired knowledge, we not only constructed strains producing detoxified OMVs in high amounts, but also successfully established a protein fusion technology enabling the decoration of OMVs with heterologous antigens. Our protein fusion technology allows the decoration of OMVs with any proteinaceous antigen of interest. The antigen-decorated OMVs can be isolated by filtration and centrifugation techniques from bacterial cultures and directly used for immunization without any further manipulation. Mixtures of diverse OMVs expressing the same or various antigens are applicable.

ADVANTAGES

- Simple production process
- Substantial yield (1 liter bacterial culture sufficient to vaccinate 100 animals)
- Flexible platform, which can be modified to display various antigens of interest
- Highly immunogenic and stable, cold chain requirement can be avoided
- Non-invasive administration (e.g. nasal spray)

APPLICATIONS

- Platform vaccine technology for development of new potent vaccines
- Versatile non-living antigen display system for diagnostic and research use (e.g. ELISA coating material)

[1] Schild et al., 2008; Schild et al., 2009; Bishop et al., 2010; Roier et al., 2012; Leitner et al., 2013; Roier et al., 2013; Leitner et al., 2015

WISSENS/ TRANSFER/ SÜD/

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KEYWORDS:
Outer Membrane Vesicles
Omv
Heterologous Antigens
Vaccine Development
Platform Technology
Vaccine Platform
SARS-CoV-2

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COOPERATION OPTIONS:
Licensing Agreement
Research cooperation agreement

DEVELOPMENT STATUS:
Proof of Concept in Animal Model

STATUS OF PATENTS:
US Patent Filed (63/261,027)
Priority Date: 09/09/2021

REFERENCE NUMBER
2021 13

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