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Novel vaccine vector platform for safe and effective immunization using a replication-deficient murine cytomegalovirus (MCMV)

Keywords: Vaccine Vector, single cycle viral vector, MCMV, SARS-CoV-2, Corona, Infulenza, Herpes

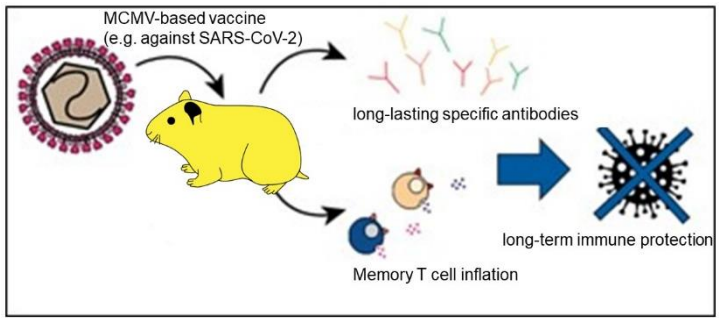
INVENTION NOVELTY

The invention provides a novel vaccine vector platform for safe and effective immunization against various viral pathogens using a replication-deficient murine cytomegalovirus (MCMV).

VALUE PROPOSITION

An ideal vaccine offers long-term protection, causes no undesirable side effects, is safe, triggers both a B-cell and a T-cell response, and only needs to be administered once. For this purpose, vaccine vectors can be used to transfer genetic material of a pathogen into cells to achieve immunity through the subsequent immune response. For example, the adenovirus was used by AstraZeneca as a vector for the development of the SARS-CoV-2 vaccine, with drawbacks such as undesirable side effects and the need for multiple vaccinations.

The proposed MCMV vaccine vector platform meets all the desired requirements. CMV belongs to the family of herpes viruses characterized by the maintenance of latency. Therefore, the use of a CMV vector for vaccination can provide long-term protection. Because the prevalence of human CMV (HCMV) in adults is approximately 70% and HCMV can cause severe infections (especially for the fetus in the womb), the use of HCVM as a vaccine vector is associated with safety concerns. Due to the lack of immunity to MCMV, adverse side effects are unlikely. In addition, the proposed MCMV vaccine vector is not replicable in human cells. Therefore, the new vaccine vector is expected to be safe. Initial studies in hamsters as non-mouse species have shown that immunization elicits a B cell response with long-lasting, specific antibodies, as well as memory T cell inflation. The number of antibodies actually increased over time, suggesting that a single vaccination is sufficient for adequate immunity.



Replication-deficient murine cytomegalovirus (MCMV) for long-term immune protection. Source HZI.

TECHNOLOGY DESCRIPTION

To create a viral vector platform with increased safety, the immendiate early 2 gene (IE2) of murine cytomegalovirus (MCMV) was deleted. Deletion of this gene resulted in a reproduction deficiency of the virus in non-murine species. In contrast, replication in mice is unaffected, paving the way for efficient production of the vaccine. Δ-IE2-MCMV viral vectors containing full-length viral proteins from SARS-CoV-2 and Influenza A, respectively, provide long-term humoral immune protection after a single vaccination, as demonstrated in studies in hamsters.

COMMERCIAL OPPORTUNITY

The technology is available for in-licensing and co-development.

DEVELOPMENT STATUS

In vivo test in hamsters using MCMV vaccines against SARS-CoV-2 and Influenza A, respectively, showed long-term humoral immune protection.

PATENT SITUATION

A European patent application was filed in January 2022. PCT-application was filed in January 2023.

FURTHER READING

Yeonsu Kim et al., MCMV-based vaccine vectors expressing full-length viral proteins provide long-term humoral immune protection upon a single-shot vaccination. Cell Mol Immunol. 2022;19 (2):234-244.

HZI HELMHOLTZ Zentrum für Infektionsforschung

Ascenion GmbH
Herzogstraße 64
D-80803 München
info@ascenion.de
www.ascenion.de

Licensing Contact
Dr. Petra Köhler
Technology Manager
T: +49 531 6181-2091
koehler@ascenion.de