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Harnessing the Power of Single-dose Immunogenic DNA Vaccines for Live-attenuated Alpha- and Flavivirus Protection

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Abstract

In the global battle against infectious diseases, vaccines have proven to be one of the most effective tools for prevention. Traditional vaccines have typically relied on weakened or inactivated forms of pathogens to stimulate an immune response without causing illness. However, recent advances in biotechnology have paved the way for the development of novel vaccine platforms, including DNA vaccines, which hold great promise for their versatility, stability, and potential for single-dose immunization.

Keywords: Immunogenic DNA • Vaccines • Flavivirus protection

Introduction

Alpha- and flaviviruses represent a significant public health threat worldwide, causing diseases such as dengue fever, Zika virus infection, yellow fever, and Japanese encephalitis. Live-attenuated vaccines have been successful in preventing these diseases, but they come with certain limitations such as safety concerns and the need for multiple doses. In this article, we explore the potential of single-dose immunogenic DNA vaccines as a promising alternative for combating alpha- and flavivirus infections.

Literature Review

Live-attenuated vaccines contain weakened forms of the pathogen that are still capable of replicating within the host but are attenuated to reduce virulence. These vaccines mimic natural infection, eliciting robust and long-lasting immune responses. However, safety concerns arise due to the risk of reversion to virulence, particularly in immunocompromised individuals. Safety Concerns: Live-attenuated vaccines may cause adverse reactions, particularly in individuals with weakened immune systems [1].

Cold Chain Requirements: Many live vaccines require stringent cold chain storage and transportation, posing logistical challenges in resource-limited settings. Need for Multiple Doses: Some live vaccines require multiple doses to achieve optimal protection, leading to compliance issues and increased costs [2].

Discussion

Safety: DNA vaccines do not contain infectious agents, eliminating the risk of causing disease.

Stability: DNA vaccines are more stable than live vaccines and can be stored at room temperature, simplifying storage and distribution.

Single-dose immunization: DNA vaccines have the potential for single-dose immunization, offering convenience and improving compliance.

Induction of cellular and humoral immune responses: DNA vaccines can elicit both cellular and humoral immune responses, providing comprehensive protection against pathogens [3].

Researchers have been exploring the use of DNA vaccines targeting alpha- and flaviviruses

Vector design: DNA vaccine constructs are designed to express specific antigens of the target virus, triggering an immune response.

Optimization strategies: Various optimization strategies, such as codon optimization and the inclusion of adjuvants, are employed to enhance vaccine immunogenicity.

Preclinical studies: Preclinical studies have demonstrated the efficacy and safety of DNA vaccines against alpha- and flaviviruses in animal models.

Clinical trials and beyond: Several DNA vaccine candidates targeting alpha- and flaviviruses have advanced to clinical trials:

Dengue fever: DNA vaccines targeting dengue virus have shown promising results in early-phase clinical trials, demonstrating safety and immunogenicity.

Zika virus: DNA vaccines against Zika virus have also progressed to clinical testing, with encouraging findings regarding safety and immune response.

Yellow fever and japanese encephalitis: Efforts are underway to develop DNA vaccines for other flaviviruses, including yellow fever and Japanese encephalitis [4].

Challenges and future directions

While single-dose immunogenic DNA vaccines hold great promise, several challenges remain:

Optimization of immunogenicity: Further optimization of DNA vaccine design and delivery methods is needed to enhance immunogenicity.

Regulatory hurdles: Regulatory approval for DNA vaccines may pose challenges due to the novelty of the platform and concerns regarding long-term safety.

Scalability and cost: The scalability and cost-effectiveness of DNA vaccine production need to be addressed to ensure widespread accessibility [5,6].

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Conclusion

Single-dose immunogenic DNA vaccines represent a promising approach for combating alpha- and flavivirus infections, offering safety, stability, and the potential for single-dose immunization. While challenges remain, ongoing research and clinical trials hold the key to realizing the full potential of this innovative vaccine platform. With continued investment and collaboration, DNA vaccines have the potential to revolutionize the field of vaccinology and contribute significantly to global health security.

Acknowledgement

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Conflict of Interest

None.

References

1. Chen, Keda, Ling Zhang, Zhongbiao Fang and Jiaxuan Li, et al. "Analysis of the protective efficacy of approved COVID-19 vaccines against Omicron variants and the prospects for universal vaccines." *Front Immunol* 14 (2023): 1294288.
2. Ferraro, Bernadette, Matthew P. Morrow, Natalie A. Hutnick and Thomas H. Shin, et al. "Clinical applications of DNA vaccines: current progress." *Clin Infect Dis* 53 (2011): 296-302.
3. Kutzler, Michele A. and David B. Weiner. "DNA vaccines: ready for prime time?." *Nat Rev Genet* 9 (2008): 776-788.
4. Liu, Margaret A. "DNA vaccines: an historical perspective and view to the future." *Immunol Rev* 239 (2011): 62-84.
5. Pagliari, Sthefany, Barbara Dema, Alexandra Sanchez-Martinez and Gerardo Montalvo Zurbia Flores, et al. "DNA vaccines: History, molecular mechanisms and future perspectives." *J Mol Biol* (2023): 168297.
6. Sällberg, Matti, Lars Frelin, Gustaf Ahlén and Margaret Sällberg-Chen. "Electroporation for therapeutic DNA vaccination in patients." *Med Microbiol Immunol* 204 (2015): 131-135.

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