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Commentary

Current Strategies on *Toxoplasma gondii* Vaccines

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DESCRIPTION

Toxoplasmosis, caused by the phylum Apicomplexa parasite *Toxoplasma*, is one of the most destructive zoonotic diseases of the world. It is estimated that about one-third of the world's population is infected with *T. gondii*, but effective vaccines for human use are not yet available. Global efforts to develop a *T. gondii* vaccine have been ongoing for decades, and new and innovative approaches are being introduced to support the process. To date, various vaccine strategies have been implemented, including nucleic acids, protein subunits, attenuated vaccines, and nanoparticles, which have been studied in rodents with promising results. However, converting these *in vivo* results into clinical trials remains a major obstacle that needs to be overcome. It aims to summarize the current advances in the *gondii* vaccine strategy and address the challenges that impede vaccine development.

Toxoplasma gondii has become a global concern, with an estimated 2 billion people infected with this phylum Apicomplexa parasite. In humans, transmission of this parasite by ingestion of poorly cooked or contaminated food can have serious consequences, depending on the state of the host's immune system. In a healthy person with immunity, *T. gondii* infections tend to be mild non-specific symptoms or generally asymptomatic, but in people with immunodeficiency or pregnancy, the infection causes congenital toxoplasmosis, leading to premature abortion and ocular toxoplasmosis. gondii infection involves the use of pyrimetamine and sulfadiidine. However, *T. gondii* pharmaceutical resistance is increased and the severity of the disease is deteriorated and a treatment failure is given. Pharmaceutical treatment has been proved to be effective against *T. gondii* Tachyzites, but they were almost invalid for Doorell Bradyzites and T deferred stages. In 2015, the financial scandal of pyrimethamine caused a large-scale eradication. At the cost of pyrimethamine increasing at 13.50% of 13.50% per 1 tablet is required to be this general thing, up to what is required as this general. Vaccines are widely considered as a method of preventing the most cost-effective disease and have a major impact on socio-economic levels. Taking into account such circumstances, effective vaccines that prevent toxoplasmosis provide great medical advances and global around the world.

DNA and vectored vaccines

Toxoplasma gondii has become a global concern, with an estimated 2 billion people infected with this phylum Apicomplexa parasite. For humans, transmission of this parasite *via* DNA vaccines is probably one of the most efficient vaccine platforms ever reported. Some of the key features that continue to drive their research derive from low manufacturing costs, ease of manufacture, and the ability to induce both humoral and cell-mediated immune responses. To date, numerous *T. gondii* DNA vaccine studies were conducted. Nevertheless, the results were more and less contradictory. In particular, most of the vaccine induced antibody responses, and the preparation of cytokine IFN-γ for mouse protected vaccines was changed as shown by survival and brain cyst. *T. gondii* most of the DNA vaccine studies were performed using multiple fully characterized *T. gondii* virulence factors such as Rhoptry Proteins (ROP), Dense Granule Proteins (GRA), Microneme Proteins (MIC), and Surface Antigens (SAG). Immunization of mice with a vaccine expressing ROP1 induces a strong Th1 immune response, T. Partial protection against lethal attacks by the *gondii* RH strain was provided.

Protein and recombinant subunit vaccines

Protein vaccines contain highly purified antigens as vaccine components. For this reason, protein and subunit vaccines are very safe and are less likely to cause side effects to the recipient. However, like DNA vaccines, their immunogenicity is inferior to that of live attenuated vaccines, and the use of this platform requires the identification of specific antigens involved in the etiology of the diseases. Similar to the *T. gondii* DNA vaccine, a wide range of antigens were screened for potential vaccine candidates derived from well-characterized *T. gondii* gene for crude extraction of lysate antigens, as well as other proteins involved in the biosynthetic pathway.

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