TH1/TH2 Polarizing Vaccines

Unmet Need: Diseases with promiscuous T-cell epitopes like Malaria can be persistent threats to public health in much of the developing and developed world, and existing vaccines and treatments have limited or diminishing utility. For example, Malaria is caused by parasites in the *Plasmodium* genus and spread through the Anopheles mosquito, there were almost 250 million cases of malaria in 2022, causing an estimated 600,000 to 1M deaths per year world-wide. Although anti-malarial drugs exist, drug-resistant strains are becoming more prevalent, and the direct costs from malaria have been estimated to be about $12B per year. In addition, global climate change has expanded the habitat of the Anopheles mosquito; again, although treatments and vaccines exist, resistant strains are becoming more prevalent and current vaccines have been of limited utility against modern strains/pathogens which are tolerant of T-cell immune response.

Solution: The US Navy, through the Naval Medical Research Command (NMRC), has been at the forefront of developing vaccine technologies to protect its warfighters from malaria and other diseases with promiscuous T-cell epitopes. The innovative vaccine technology uses engineered chimeric proteins that offer novel vaccine platform that can provide antigenic as well as costimulatory signals to the immune system, overcoming T cell tolerance like that induced by Malaria parasites. Genetic construction of chimeric Ig -H and Ig-K genes encoding for the Th1/Th2 polarizing vaccines. Each vaccine, named PyBTh1 , PyTh1, PyBTh2 , and PyTh2 were developed and encoded by specific Ig-H and Ig-K genes.

Stage of Development: The technology is in the early stages of development.

IP or IP status: This research has produced an effective vaccine, bodied in US Patent 9,795,661 (US Patent 9,795,661) and its related foreign patents. These patents are available for licensing from the US Navy.

- **Command:** NMRC
- **Category:** Vaccines
- **License Status:** Available for exclusive or non-exclusive licensing and collaborations
- **Date Published:** March 15, 2024
- **Date Updated:** N/A
- **Invention No.**: 99154US02
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