

# VACCINES AND ANTIBODIES AGAINST MALARIA AND OTHER PARASITIC DISEASES IN HUMANS AND ANIMALS

[Jimah, John, Tolia, Niraj](#)

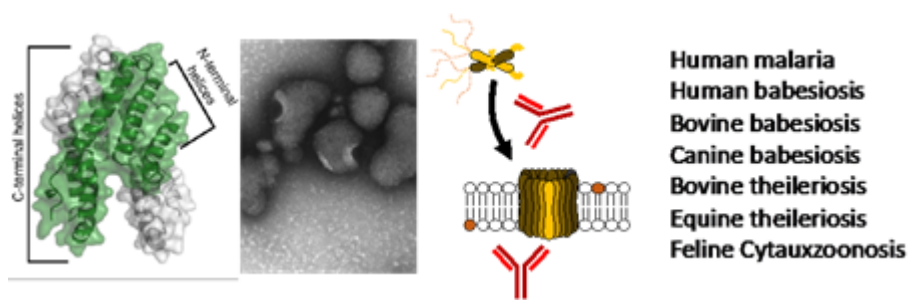
[Hardin, Clyde "Frank"](#)

T-016150

## Technology Description

Researchers in Prof. Niraj Tolia's laboratory have exploited structure-based vaccine design to develop immunogenic compositions and neutralizing antibodies that could protect against malaria and a range of other parasitic diseases that affect humans, livestock and companion animals. These compositions and antibodies were devised based on critical epitopes identified in the crystal structure of CelTOS (cell traversal of ookinetics and sporozoites), a protein that is highly conserved across apicomplexan parasites - all *Plasmodium*, *Babesia*, *Theileria* and *Cytauzoon* species.

CelTOS is essential for malaria transmission and diseases pathogenesis. However, previous malaria vaccines directed at CelTOS did not provide complete protection. Using information from the crystal structure, more potent next generation vaccines could be developed by focusing on regions of CelTOS with protective epitopes that are necessary for immune recognition. In addition, antibodies against these epitopes could potentially be used as therapeutics against malaria and other global and emerging infectious diseases.



Stage of research

Structural analysis: The inventors discovered the structure of CelTOS and showed that it has a conserved critical function in both *Plasmodium falciparum* and *Plasmodium vivax* as well as *Babesia*, *Theileria* and *Cytauzoon* species.

Antibody and immunogen development: The inventors used this structural information to develop a neutralizing antibody that targets CelTOS and prevents malaria transmission. The have designed additional immunogens using other neutralizing epitopes

## Applications

- **Vaccine for parasitic diseases** – CelTOS-based immunization against diseases such as:
  - malaria
  - babesiosis – a disease that infects cattle, horses and domesticated animals and is an

- emerging infectious disease in humans
- theileriosis - a disease that infects cattle, horses and domesticated animals
- cytauzoonosis - an emerging infectious disease in cats
- **Antibody therapeutic** – CelTOS-targeting antibodies to protect against malaria or other diseases caused by apicomplexans
- **Antibody diagnostic** – CelTOS-targeting antibodies to detect parasites in humans, livestock or companion animals

### Key Advantages

- **Broad indications** - the CelTOS protein is a broadly conserved target across range of apicomplexan parasites (all *Plasmodium*, *Babesia*, *Theileria* and *Cytauzoon* species), suggesting that immunization with CelTOS epitopes could protect against a range of diseases
- **Rational design** – structural analysis of CelTOS identified epitopes that impact immune recognition and could result in more potent vaccines than those previously developed

### Publications

- Jimah, J. R., Salinas, N. D., Sala-Rabanal, M., Jones, N. G., Sibley, L. D., Nichols, C. G., ... & Tolia, N. H. (2016). [Malaria parasite CelTOS targets the inner leaflet of cell membranes for pore-dependent disruption](#). *Elife*, 5, e20621.

### Patents

- [COMPOSITIONS COMPRISING CelTOS IMMUNOGENS AND ANTIBODIES AND METHOD OF USE THEREOF](#) (U.S. Patent Application, Publication No. US20190276506)