Griffith UNIVERSITY
Institute for Glycomics
Queensland, Australia

Fighting diseases of global impact
griffith.edu.au/glycomics

A PARASITE VACCINE PLATFORM FOR BABESIOSIS

A novel vaccine approach for preventing babesiosis in humans, companion animals and cattle.

At the Institute for Glycomics, we have developed a novel, whole parasite vaccine platform technology, developed initially for malaria under the leadership of Professor Michael Good AO. Our malaria vaccine technology takes two forms: 1) a chemically attenuated whole parasite vaccine candidate; and 2) a novel adjuvanted whole parasite vaccine candidate.

Both approaches have demonstrated excellent efficacy in pre-clinical studies using rodent models of malaria and the chemically attenuated vaccine is currently being evaluated in human clinical trials at Griffith University. We have recently extended our whole parasite vaccine approach to tick-borne diseases, namely the development of vaccines for babesiosis.

We believe this vaccine platform has the potential to address the human, companion animal and livestock markets.

Babesiosis

Babesia spp. are tick-borne Apicomplexan parasites, first detected in cattle but now a well-known cause of malaria-like illness in both humans and animals.

Humans:

The incidence of human babesiosis has increased significantly in the last 50 years and is likely to continue as new species are discovered. Babesiosis can be a severe, life-threatening disease, particularly in people who are elderly or have existing health issues, such as weakened immune systems.

Dogs:

Canine babesiosis is a significant cause of multi-organ failure, with a risk of death. Both the large (*B. canis* and *B. vogeli*) and small (*B. gibsoni*, *B. conradae* and *B. microti-like*) species can infect dogs; and their geographical distribution, transmission, clinical signs, treatment, and prognosis vary for each species.

Cattle:

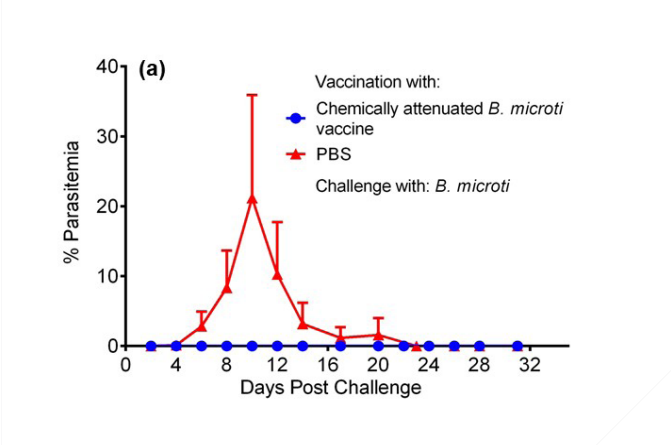
The direct effects of cattle tick fever include increased morbidity (both acute and chronic) and mortality. During the period of infection, milk production, cattle growth, manure production and capacity for animal draught power are significantly decreased. Additionally, it can cause production losses in cattle that recover from infection.

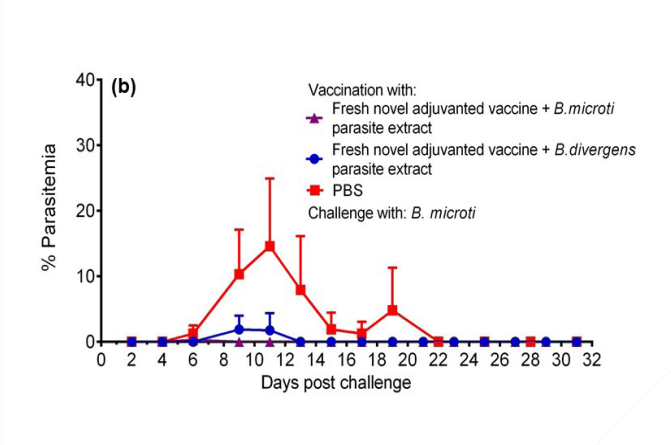
Competitive Advantage

There are several treatment options for humans and animals available, but their efficacy is limited due to the need for accurate *Babesia* spp. detection and identification. Our whole-parasite vaccine program eliminates these issues by providing cross-protection against many *Babesia* spp.

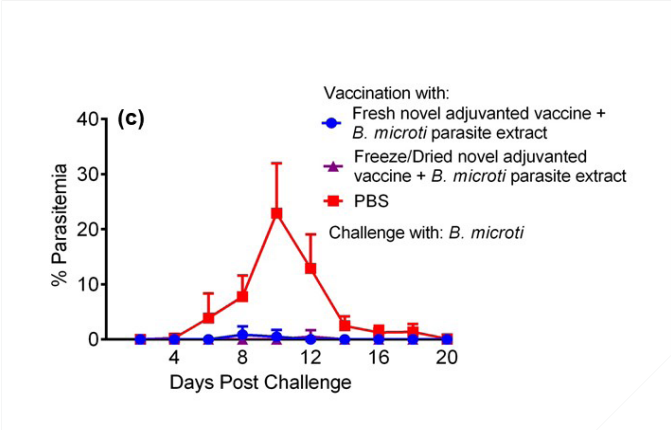
Humans: There are currently no vaccines available for the treatment of human babesiosis. Unwell people may be treated with antibiotics such as clindamycin, and/or antiparasitic drugs, to limited effect.

Companion animals: One vaccine is currently available for dogs, but requires annual re-vaccination and protects against limited *Babesia* spp. Canine babesiosis is currently managed by costly





(a) Chemically attenuated vaccine induces homologous protection (*B. microti*) (b) Novel adjuvanted vaccine induces homologous (*B. microti*) and heterologous (*B. divergens*) protection (c) Freeze-dried novel adjuvanted formulation provides equivalent protection to fresh formulation



antibiotics, however are not ideal as they frequently fail to resolve infection.

Cattle: The currently marketed live attenuated chilled vaccine has numerous drawbacks: production in live splenectomised animals, potential for reversion to virulence in the field, and its short shelf life. As this is a live vaccine, cattle can exhibit symptoms of mild disease and have to be carefully managed post vaccination.

Babesiosis Market

Humans: In 2014, babesiosis was a reportable condition in 31 American states and a total of 1,744 cases of babesiosis were reported. At that time, the incidence of babesiosis was 280 cases per 100,000 of the population, placing the burden of disease in the same category as gonorrhoea, a moderately common STI.

Dogs: The prevalence of *Babesia canis* infections in Europe alone is as high as 88% in some countries.

Cattle: 80% of the world's cattle population are affected by tick-borne pathogens; of these, *Babesia* spp. has become the most widespread.

Partnering Opportunity

We are seeking an industry partner with key insights in the vaccine manufacturing sector to co-develop and licence our Babesia vaccine platform.

Research Leaders

Professor Michael Good AO is an internationally recognised leader in the field of immunology and vaccine development. He is the author of over 300 publications and was awarded an Order of Australia for his services to medical research.

Dr Danielle Stanisic is an expert in parasitology and a recipient of the Queensland Premier's Award for Medical Research and a Centenary Medal for distinguished service to medical research.

About us

The Institute for Glycomics is a flagship biomedical research institute at Griffith University's Gold Coast campus in Queensland, Australia.

The Institute is one of only six of its kind in the world and has a strategic focus on translating basic drug and vaccine research into clinical outcomes.

We have a strong track record in commercialisation and industry engagement, and our research leaders have extensive experience in developing technologies for the commercial market.

With over 200 multidisciplinary researchers and support staff, the Institute for Glycomics is well positioned to deliver tangible clinical solutions for infectious diseases and cancer.

Contact us

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