

# Paralysis Tick Vaccine

## Greater protection for dogs, cats and cattle



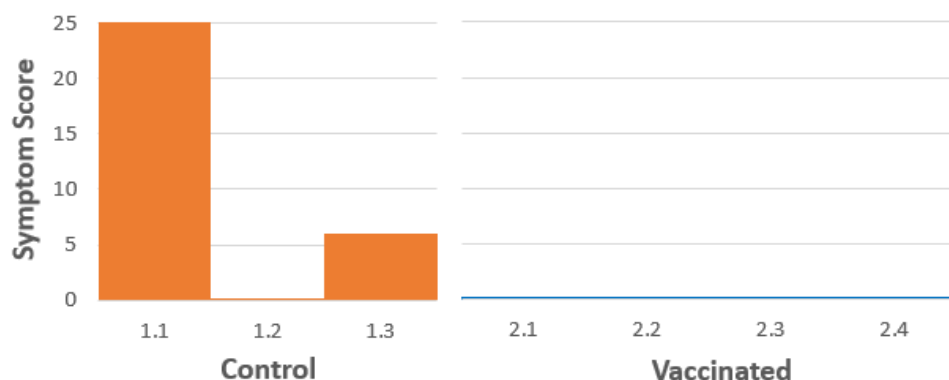
### The Technology

The Australian paralysis tick, *Ixodes holocyclus*, is one of the most virulent ticks in the world, with a single tick capable of killing a large dog. The tick is indigenous to the Australian marsupial bandicoot and incidentally infests companion animals (cats and dogs), livestock and humans during the course of its life cycle. Each year approximately 100,000 domestic animals are affected with up to 10,000 companion animals treated at veterinary surgeries for symptoms of paralysis. All dogs and cats are currently recommended to have monthly and fortnightly preventative medication, respectively.

During feeding, the adult female tick injects neurotoxins into the host which can progress to paralysis and death if not treated. Currently only crude dog anti-sera are available as treatments which are successful only if administered during early stages of the paralysis, meaning that prevention is extremely important. Preventative options currently include pesticides which prevent tick attachment and are also not fully effective or safe. Furthermore, most preventative and treatment approaches are available only to dogs as the formulations are toxic to cats.

Professor Tabor and her team at the University of Queensland have developed a novel peptide cocktail that can successfully prevent paralysis tick symptoms. The researchers identified the primary holocyclotoxins (HTs) in tick saliva that cause disease in dogs. Recombinant analogues of those HTs were subsequently generated, eight of which are included in the optimized vaccine cocktail and have undergone a successful vaccination trial in dogs.

The pilot study showed that administration of the vaccine cocktail prevented the development of paralysis symptoms in dogs after 7 days of tick attachment. In unvaccinated animals who had a tick attachment of at least 6 days, two of three dogs developed moderate to severe paralysis symptoms, demonstrating the efficacy of the vaccine in a small trial.



**Figure 1:** Severity of paralysis symptoms in dogs following attachment of tick for up to 4 days with (N=4) or without (N=3) prior vaccination. Toxicity developed at symptom score >12.

### Competitive Advantages

Current preventative treatments for paralysis tick infection require at least monthly oral administration for dogs and fortnightly topical application for cats, with an attenuation of efficacy during that period. An injectable vaccine will provide enhanced and prolonged protection and greater adherence, due to the ease of treatment in line with existing annual vaccination strategies for other .

### Applications

The vaccine will be suitable for preventing paralysis tick symptoms in dogs, cats and cattle.

### Commercialisation opportunities

UniQuest Pty Limited, the main commercialisation company of The University of Queensland is seeking to engage with animal health companies to license and co-develop this technology.

# People and Publications



## Prof. Ala Tabor

Professorial Research Fellow

Prof Ala Tabor joined QAAFI in October 2010, after 18 years of conducting research with the Queensland Government. She is a research focussed academic with a strong background in industry engagement associated with animal health.

Her research interests are related to the application of genomic sequence data to improve animal disease management through: 1) the development of molecular diagnostic and genotyping methods to better identify pathogens; and 2) the study of gene function in relation to virulence and host pathogenicity of infectious diseases, to develop new effective vaccines.

Areas studied to date include bovine reproductive diseases (in particular bovine genital campylobacteriosis), Australian paralysis tick (*Ixodes holocyclus*), cattle tick (*Rhipicephalus microplus* species complex), and tick-borne diseases (babesiosis and anaplasmosis). Some key outputs of her work include the application of reverse vaccinology for the development of a novel cattle tick vaccine and commercialized diagnostic tools for bovine reproductive diseases.



## Dr Manuel Rodriguez-Valle

Honorary QAAFI Professor

Dr Rodriguez-Valle joined QAAFI's Centre for Animal Science from 2010-2016 after more than 25 years of conducting and leading researchers in animal science at Centre of Engineering Genetic and Biotechnology, Havana, Cuba. Prior to QAAFI, he worked as a Senior Molecular Parasitology for DPIF in Brisbane. Rodriguez-Valle is Editor in Chief of Reports in Parasitology, member of Australian Society of Parasitology and International Society for Pest Information (ISPI).

His research interests are associated with the application of biotechnology, genomic and proteomic technologies to study the host-pathogen interaction in order to develop vaccines for the control of vector and pathogens. The application of these studies resulted in the developed of a recombinant vaccine against the tick cattle tick (*Rhipicephalus microplus*), expression of human Tissue plasminogen Activator (TPA), Bovine Interferon omega, Bm86, protease Inhibitors (serpins), VP60 (rabbit haemorrhagic viral protein) and development of gene display library system in yeast.

## Relevant Publications

de la Fuente, J., Kopacek, P., **Lew-Tabor, A.** and Maritz-Olivier, C. (2016) Strategies for new and improved vaccines against ticks and tick-borne diseases. *Parasite Immunology*, 38 12: 754-769.

Chand, Kirat K., Lee, Kah Meng, Lavidis, Nickolas A., **Rodriguez-Valle, Manuel**, Ijaz, Hina, Koehbach, Johannes, Clark, Richard J., **Lew-Tabor, Ala** and Noakes, Peter G. (2016) Tick holocyclotoxins trigger host paralysis by presynaptic inhibition. *Scientific Reports*, 6:29466.

**Lew-Tabor, A. E.** and **Rodriguez Valle, M.** (2016) A review of reverse vaccinology approaches for the development of vaccines against ticks and tick borne diseases. *Ticks and Tick-borne Diseases*, 7: 573-585.

Ong, C. T., **Rodriguez-Valle, M.**, Moolhuijzen, P. M., Barrero, R. A., Hunter, A., Szabo, T., Bellgard, M. I. and **Lew-Tabor, A. E.** (2016) Exploring the transcriptomic data of the Australian paralysis tick, *Ixodes holocyclus*. *GSTF Journal of Veterinary Science (JVet)*, 3:1.

**Rodriguez-Valle, M.**, Moolhuijzen P., Busch, G., Broady, K., Rothwell, J. and **Lew-Tabor, A.** (2011). Next generation sequence analysis of unfed adults and fed female sialome from the Australian paralysis tick, *Ixodes holocyclus*. In: Proceedings from the Australian Society for Parasitology Annual Meeting. *Australian Society for Parasitology*, Cairns, Qld, Australia. 10-13th July, 2011.