Identification of super cattle, resistant to cattle ticks

Cattle ticks cause approximately AUD $175 million losses per year to the Australian beef industry. The control of cattle ticks is compromised due to the increased resistance to anti-tick drugs and lack of an effective anti-tick vaccine which has led to interest in breeding more resistant cattle as a sustainable method of tick control.

Breeding for tick resistance requires quick and easy identification of more resistant cattle. The current method of phenotyping cattle includes single or repeated counts of the number of engorging ticks (ticks between 4.5 and 8 mm in diameter) on one or both sides of each animal following artificial or field infestation. Natural infestation depends on the season and artificial tick infestations require tick-breeding facilities and skilled laboratory technicians. Tick counts are time-consuming and require skilled personnel as well as suitable infrastructure to constrain animals. Therefore, an easy and cost-effective method for identifying tick resistant cattle, preferably at an early age and without the need for tick exposure, is required.

At the Queensland Alliance for Agriculture and Food Innovations, the University of Queensland, our research group focuses on utilizing the advanced 'Omics' technologies to identify tick host resistance biomarkers My research project aims to develop a fast and cost-effective method to identify tick resistant animals in the field. The initial field/ laboratory work has been completed in which the Santa Gertrudis and Brangus cattle were artificially infested with cattle ticks to identify tick-resistant and susceptible cattle based on their tick scores. Blood and skin samples were obtained before and after tick infestation to study the variation in protein levels associated with host protection using high-throughput 'Proteomics' techniques.

Research Findings

- The cattle which had lower number of ticks (tick-resistant cattle) carry higher levels of some proteins in their blood before any tick exposure. These proteins are responsible for developing an earlier immune response in the resistant cattle.
- The genetically resistant cattle may produce a quicker protective response than in susceptible cattle, potentially impairing tick attachment and feeding success.
- Similar differences in protein levels were also observed after tick exposure.

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QAAFI is a research institute at The University of Queensland supported by the Queensland Government via the Queensland Department of Agriculture and Fisheries.

What's next?

A rapid diagnostic test, ELISA, will be developed for the candidate proteins which could be used as potential biomarkers for differentiating tick-resistant and -susceptible cattle with or without any tick exposure in the field.

How you can help

Once we develop an ELISA test, this would need to be validated in the field across multiple breeds of cattle, so if you are a farmer who has been keeping a record of the tick numbers on the cattle and has divided your herd into cattle with low and high tick numbers, you can contact us to provide permission for us to collect blood samples from the phenotyped cattle to test our ELISA under field conditions for validation. Your support could help us in developing a rapid and cost-effective test for identifying tick-resistant cattle which will ultimately provide a sustainable tick-control method.

Acknowledgment

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Cattle tick, nymph and tick larvae feeding on cattle

Cattle tick attached with skin biopsy

Researcher Profile

Dr Raza completed his PhD at CSIRO and University of Queensland in 2017 and joined Queensland Alliance for Agriculture and Food Innovation as a Postdoctoral Research Scientist in 2018.

Before being appointed at the Centre for Animal Science, QAAFI, Dr. Raza was a lecturer at the Faculty of Veterinary Science, University of Agriculture, Faisalabad, Pakistan for four years. His major areas of interest are investigating means of controlling parasites, development of diagnostic tests for anthelmintic resistance, drug discovery, and discovery of biomarkers for host resistance to pathogens. Currently, he is working on developing more efficient and practically feasible methods for assessing cattle tick and buffalo fly numbers to facilitate rapid and accurate phenotyping for susceptibility. This project aims to develop a set of standards for commercial scoring of these ectoparasites and identifying new biomarkers and/or genomic breeding tools that facilitate selection of cattle resistant to ticks and buffalo flies.

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