DEFINING THE GENETIC AND SEMIOCHEMICAL BASIS OF TICK RESISTANCE IN CATTLE

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Ticks have major impacts on animals and humans by transmitting disease and causing weight loss and anaemia. Acaricides are used for tick control, but this is problematic due to resistance and chemical residues. Bovines differ substantially in tick load, and this is genetically controlled. We hypothesize that the primary means by which host cattle differ in tick resistance is via their semiochemicals profiles, i.e., attractant/repellent volatile chemicals on the skin surface, with 6-methyl-5-hepten-2-one being our primary candidate. We will perform a GWAS for tick resistance, characterize the semiochemicals which differ between cattle resistant or susceptible ticks, identify genes differentially expressed between resistant and susceptible animals, integrate the results to obtain insights into the genetic and biochemical basis of tick resistance, and devise control options. The GWAS will be performed on >1000 Girolando cattle in Brazil, which will have been intensively phenotyped for tick burden, with detailed epidemiological data collected (to identify risk factors). GWAS will be performed using data from the high density bovine SNP chip, giving >750,000 genotypes per animal, and analysed with state-of-the-art techniques. From skin rubbings from animals with extreme tick counts, semiochemical profiles will be characterised using high resolution chromatography (GC, HPLC) and spectroscopic analysis. Gene expression will be performed using RNAseq on skin biopsies from extreme animals, before and after infestation, and pathways co-expressed with resistance determined. These data will inform on the true extent of genetic control, the underlying mechanisms and indicate actual loci contribution to variation. Validated SNPs for resistance will be identified, as will potential semiochemicals to be used as repellents.