PhD defence Marvelous Sungirai

Ixodid ticks parasitising cattle in Zimbabwe: Ecology and management

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Dit is de omschrijving

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Summary

Ixodid ticks are among the most important parasites affecting animal health in tropical and sub-tropical countries. One of the challenges hindering successful control of ticks is their high dispersal rate. The expansion in the geographic range of ixodid tick species might lead to variability amongst different populations as an adaptation strategy. This will subsequently affect pathogen transmission and resistance to chemical acaricides used to control the ticks. The aim of this study was to investigate the geographic expansion of ixodid ticks which parasitise cattle in Zimbabwe in light of spatial-temporal changes which have occurred over the past 20 years, explore how invasive tick species interact with local competitor tick species and whether they are undergoing genetic differentiation as an adaptation strategy to new environments. In addition the management of ticks and tick borne diseases by communal farmers and implications on acaricide resistance was investigated. A nationwide tick survey was carried out between September 2013 and May 2015 on cattle at 322 communal dipping tanks. Habitat suitability models were developed for R. microplus and R. decoloratus and the environmental requirements for the two tick species were compared. Microsatellite markers were used to investigate genetic differentiation among the R. microplus tick populations. Three hundred and thirteen communal farmers were interviewed using semi-structured questionnaires and screening for acaricide resistance was done using molecular markers. Results showed a notable expansion in the geographic range of the most economically important ticks namely Amblyomma variegatum, Amblyomma hebraeum and Rhipicephalus microplus. The habitat preferences of R. microplus will remain restricted to favourable climates with subsequent displacement of R. decoloratus in those areas. There was little genetic differentiation amongst tick populations with gene flow patterns showing continuous exchange of genetic material. Communal farmers do participate consistently in tick control programmes with frequent usage of one acaricide chemical, amitraz. However, the intensive use of acaricides will predispose tick populations to resistance. Subsequently these populations were genotyped using Single Nucleotide Polymorphisms (SNPs) associated with resistance to amitraz, pyrethroids and organophosphates (OPs) to investigate whether they are undergoing selection pressure.). The results showed selection pressure for amitraz only. Expansion in the geographic range of ticks will lead to unstable epidemiological situations. Continuous exchange of genetic material amongst different populations supports the hypothesis that cattle movements are responsible for the dispersal of R. microplus ticks. The high frequency of use of amitraz has led to selection for resistant alleles in R. microplus ticks while there is need to further elucidate resistance mechanisms for pyrethroids and organophosphates in these tick populations.