Introduction: Trypanosomes are parasitic protozoa that will typically exploit a bloodsucking insect and the blood and/or tissues of a vertebrate as a host. Natural mixed infections of different species and genotypes of trypanosomes occur frequently in a variety of hosts. Their interaction may affect or modify parasite infection dynamics through co-operation or competition, either by reducing or enhancing parasitemia, virulence and pathogenicity in the host.

Results: Our studies have revealed the presence of three different species of trypanosomes naturally occurring within nine species of West Australian marsupials [1]. However, the woylie, *Bettongia penicillata*, which has undergone a massive population decline (~90% over 10 years) and has been listed as a critically endangered species since 2006 [2, 3], is the only marsupial that has been found to be highly infected with trypanosomes and also to harbour mixed infections.

In woylies only single-species infections were found in the blood, however, co-infections with two or three trypanosome species were found in individual tissues such as heart, skeletal muscle, lung and oesophagus. Infected tissues displayed significant levels of inflammation and damage. Interestingly, significant differences in *Trypanosoma* species and prevalence rates of mixed infections were found when comparing animals from a stable population at Karakamia Sanctuary, to an unstable, declining population in the Upper Warren region.

While *T. copemani* is known to naturally infect other native Australian marsupials, the species found to be dominant in declining woylie populations appears to be pathogenic. *T. copemani* is shown to have similar biological behaviour in the host to the pathogenic *T. cruzi*, which is responsible for Chagas disease in humans. Both species are capable of invading cells and colonising different tissues in the host, and are able to produce an inflammatory process that can result in significant damage to vital organs including the heart and liver. Parallel in vitro studies have further confirmed the capacity of *T. copemani* to invade cells.

Conclusion: Our results show that the marsupial *B. penicillata* is highly susceptible to co-infections within it’s tissues by trypanosomes, which is atypical for Australian marsupials. We suggest that interactions between these different trypanosome species is playing an important role in the rapid population decline of the woylie.


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