Mathematical Model for the Spread of African Swine Fever Virus in Wildlife Areas

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African Swine Fever Virus (ASFV) is a vector-borne viral disease that affects both domestic and wild pigs. The primary natural hosts of ASFV is the warthog (*Phacochoerus africanus*), while the primary vector is the soft tick (*Ornithodoros porcinus porcinus*) [2,3]. A warthog recovers from infection within two to three weeks, acquiring a lifelong immunity thereafter. Hence, the infective warthogs are typically the neonatals. Due to the short infective period of the warthogs, the virus persists mainly in the tick population. Warthogs inhabit burrows that are often infested with ticks during farrowing season. If the tick population is infected, the virus levels are amplified by the presence of the neonatals in the burrow. We propose a model consisting of two sets of PDE's: the first for the tick population (susceptible and infective) and the second for the warthog population (susceptible, infective, recovered). In order to capture the epidemiological dynamics correctly, the tick population is age-structured, while the warthog population is epidemiological state-structured. The beginning of interaction between the two populations modelled via impulses [1], where an impulse represents the event of a warthog family inhabiting a burrow. The model is investigation as dynamical system both theoretically and numerically.

References

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