Modeling and stability analysis of the African swine fever epidemic model

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In this paper, a mathematical model for the transmission dynamics and control of African swine fever with recruitment of susceptible, exposed and infective domestic pigs into the population is studied using a system of ordinary differential equations. The basic reproduction number Ro for the model was obtained and its dependence on model parameters discussed. Without the inflow of exposed and infective pigs into the population, the model exhibits the disease-free equilibrium Eo and the endemic equilibrium El. The disease-free equilibrium Eo is globally stable if the basic reproduction number Ro < 1 and the disease will be wiped out of the population. If Ro > 1, the endemic equilibrium El is asyrnptotically globally stable and the disease persists in the population. With the influx of exposed and infective domestic pigs, the model has only a unique endemic equilibrium Ee that is globally asymptotically stable and the disease persists. Numerical simulation is carried out to verify the analytical results. It is revealed that with the influx of the exposed and infected pigs, the disease is maintained at endemic equilibrium.

Keywords: African swine fever; Endemic equilibrium; Global stability; Lyapunov function; Reproduction number.