

Within herd transmission and reproductive number of African swine fever in pig herds in southwestern Nigeria

Emmanuel J. Awosanya¹, Zhao Lu², Babasola Olugasa¹, Yrjo Grohn², ¹University of Ibadan, Ibadan, Nigeria; ²Cornell University, Ithaca, NY, Contact: emmafisayo@yahoo.com

Purpose: African swine fever (ASF) is a trans-boundary fatal viral disease of both domestic and wild pigs. The disease has become enzootic in southwestern Nigeria and poses threat to farmers' livelihood. The aim of this study was to investigate within herd transmission of ASF and estimate its basic reproductive number in pig herds within southwestern Nigeria.

Methods: We constructed a modified deterministic Susceptible-Exposed-Infectious-and-Recovered pig (SEIR) model, using parameters derived from a cross sectional survey and the literature. Basic (R_0) and effective (R_e) reproductive numbers were computed using next generation matrix approach. We performed global uncertainty analysis (UA) and sensitivity analysis (SA) using Simlab(R) version 2.2 Software. The ordinary differential equations of the SEIR model were solved using Runge-Katta (rk4) algorithm.

Results: The within herd ASF transmission model gave a predicted prevalence of 7%, which was close to the survey data prevalence of 11% (95% CI 9 - 14). R_0 and R_e values were estimated as 6 and 1 respectively. There was a seasonal effect on ASF prevalence; however, there was no significant difference in the average value of R_0 between the dry (7) and wet (6) seasons. Model parameters such as rate of infectiousness before onset of clinical signs (σ), transmission rate (β) and rate of infectiousness with clinical signs (δ) were positively correlated with ASF prevalence, while culling rate (μ) and recovery rate (r) were negatively correlated with ASF prevalence.

Conclusions: ASF transmission in southwestern Nigeria appears to mimic more of a subacute than chronic course and that clinically healthy recovered pigs contribute little to the prevalence of ASF. Aside from transmission rate, rate of infectiousness before onset of clinical signs is critical to ASF prevalence.

Relevance: Culling of infected pigs and elimination of chronic carriers should reduce ASF prevalence in southwestern Nigeria