A framework for surveillance of emerging pathogens at the human-animal interface: pigs and coronaviruses as a case study

Kim Pepin[1], Ryan Miller[2], and Mark Wilber[1]

[1]Affiliation not available
[2]USDA APHIS Veterinary Services

November 18, 2020

Abstract

Pigs (*Sus scrofa*) may be important surveillance targets for risk assessment and risk-based control planning against emerging zoonoses. Pigs have high-contact rates with humans and other animals, transmit similar pathogens as humans including CoVs, and serve as reservoirs and intermediate hosts for notable human pandemics.Wild and domestic pigs both interface with humans and each other but have unique ecologies that demand different surveillance strategies. Three fundamental questions shape any surveillance program: where, when, and how can surveillance be conducted to optimize the surveillance objective? Using theory of mechanisms of zoonotic spillover and data on risk factors, we propose a framework for determining where surveillance might begin initially to maximize a detection in each host species at their interface. We illustrate the utility of the framework using data from the United States. We then discuss variables to consider in refining when and how to conduct surveillance. Recent advances in accounting for opportunistic sampling designs and in translating serology samples into infection times provide promising directions for extracting spatio-temporal estimates of disease risk from typical surveillance data. Such robust estimates of population-level disease risk allow surveillance plans to be updated in space and time based on new information (adaptive surveillance) thus optimizing allocation of surveillance resources to maximize the quality of risk assessment insight.