

Assessing biosecurity solutions using within-farm models

Experiments concerning disease transmission are both expensive and time-consuming. When conducted in a farm setting, they present additional challenges and obstacles since it may not be feasible due to logistical, or ethical constraints. To tackle this, mathematical models and computer simulations offer a viable alternative. With sufficient data, these models can construct relatively accurate representations of disease transmission within a farm. Moreover, simulations are used to explore diverse outbreak scenarios amidst inherent uncertainties. They enable assessment of the efficacy of different interventions to the scale and range of disease outbreaks.

Within the BIOSECURE project, we are developing farm-specific models for swine and poultry to simulate disease spread within a farm environment. These models will serve to evaluate the effectiveness of different biosecurity practices by comparing scenarios with and without them. The biosecurity measures that can be assessed are movement of personnel, changes in number of animals per unit, and the segregation of feeding and drinking areas, among others.

A functional prototype of a farrow-to-finish swine farm model divides the farm into groups of animals based on age and purpose: non-gestating, gestating, farrowing, nursery, and fattening. Disease transmission can occur within and between these groups via animal transfers and farmer movements. An initial assessment of the model's accuracy was tested using available hepatitis E virus (HEV) data from a swine farm in the Netherlands, successfully replicating the number of HEV-infected pens among fattening pigs over a 36-week period, with two batches of fatteners in 12 pens, allotted 18 weeks each.

Lastly, it is essential to recognize that models serve as simplifications of reality and are based on assumptions that require empirical investigation. Nevertheless, these models provide valuable insights and aid in making informed decisions regarding biosecurity measures.



- A disease model is a cost-effective method for analyzing disease transmission within a farm under varying conditions
- Despite being simplifications of reality, models offer valuable insights for **informed decision-making** in biosecurity

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