Modelling spread of MRSA within a pig herd

Sørensen, Anna Irene Vedel; Toft, Nils; Espinosa-Gongora, Carmen; Græsbøll, Kaare; Boklund, Anette; Larsen, Jesper; Hisham Beshara Halasa, Tariq

Publication date: 2017

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.
Modelling spread of MRSA within a pig herd

Anna Irene Vedel Sørensen¹, Nils Toft¹, Carmen Espinosa-Gongora¹, Kaare Græsbøll¹, Anette Boklund¹, Jesper Larsen² & Tariq Halasa¹

¹Division of Diagnostics and Scientific Advice, National Veterinary Institute, Technical University of Denmark,
²Microbiology and Infection Control, Statens Serum Institute

Objectives
• Study the spread and persistence of MRSA (methicillin-resistant Staphylococcus aureus) within a pig herd
• Examine short and long term consequences and cost-effectiveness of different potential control strategies

Material and methods
• A mechanistic individual-based simulation model was built in R
• Herd model: A medium-sized Danish farrow-to-finish herd
• Infection model: SIS model with two different 'infectious stages': Intermittent or persistent MRSA shedder
• Due to uncertainty, all scenarios were modelled with three different sets of transmission rates ('low', 'medium', 'high'), estimated based on Broens et al. (2012)

Key observations
• Development over time after introduction (Fig. 1): Spread of MRSA was mainly following the movement of pigs between stable units
• Following introduction of lower numbers of intermittent shedders, MRSA would frequently fade out (Fig.1.a + Fig. 2.a)
• After spread of MRSA has reached an equilibrium, the prevalence of MRSA shedders would be highest in the farrowing unit (Fig. 2), independent of how MRSA was introduced

Fig.1: Median simulated proportion of MRSA shedders after introduction of one intermittent (a-c) or persistent shedder (d-f) in the mating unit under low*, medium* and high* transmission of MRSA

Fig. 2: Simulated proportion of MRSA shedders in the five stable units, six years after introduction of one intermittently (left) or persistently (right) shedding gilt, using medium transmission rates and 500 iterations

References

Acknowledgements
This study was supported by a grant from the Danish Ministry of Environment and Food through The Danish Agrifish Agency (J. no. 33010-NIFA-14-612)