Mechanistic modelling of interventions against spread of livestock-associated methicillin-resistant Staphylococcus aureus (LA-MRSA) within a Danish farrow-to-finish pig herd - DTU Orbit (23/12/2018)

Mechanistic modelling of interventions against spread of livestock-associated methicillin-resistant Staphylococcus aureus (LA-MRSA) within a Danish farrow-to-finish pig herd

Knowledge on successful interventions against livestock-associated methicillin-resistant Staphylococcus aureus (LA-MRSA) within pig herds is sparse. In situations like this, a mechanistic simulation model can be a valuable tool for assessing the effect of potential intervention strategies, and prioritising which should be tested in the field. We have simulated on-farm interventions in a farrow-to-finish pig herd, with a previously published LA-MRSA spread model, within four different areas: 1) Reduced antimicrobial consumption, 2) Reduced number of pigs within each section, 3) Reduced mixing of pigs, and 4) Improved internal biosecurity. To model a decrease in the selective pressure, the transmission rates were reduced after LA-MRSA had become fully established within a herd, which resulted in a marked decrease in the prevalence within all stable units. However, LA-MRSA rarely disappeared completely from the herd; this was only observed in scenarios where the transmission rates were reduced to ≤ 30% of the original level. While changes in antimicrobial consumption patterns might be a very important step towards reducing the spread of LA-MRSA, the simulation results indicate that it may need to be paired with other preventive or intervention measures. Reducing the number of pigs within each section, reducing mixing of pigs, or improving internal biosecurity after LA-MRSA had become established within the herd only resulted in marginal changes in the median prevalence within the herd. However, these factors might be important in relation to being able to achieve or maintain a low level of antimicrobial consumption, and thus still indirectly influence the LA-MRSA prevalence within the herd. The results of a sensitivity analysis indicated the assumptions regarding the existence of pigs persistently shedding MRSA have a noticeable influence on the model results. The assumptions regarding transmission from sow to offspring at the day of birth also had a considerable influence on the MRSA prevalence within the farrowing unit but did not cause any marked changes in the simulated effect of interventions. Effects might differ between different farm types contaminated in different levels and this simulation study highlights a strong need for more knowledge from on-farm trials.

General information
State: Published
Organisations: National Veterinary Institute, Epidemiology, National Veterinary Institute
Contributors: Sørensen, A. I. V., Rosendal, T., Widgren, S., Hisham Beshara Halasa, T.
Number of pages: 14
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: P L o S One
Volume: 13
Issue number: 7
Article number: e0200563
ISSN (Print): 1932-6203
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.01 SJR 1.164 SNIP 1.111
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.11 SJR 1.236 SNIP 1.101
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 3.32 SJR 1.427 SNIP 1.136
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 3.54 SJR 1.559 SNIP 1.148
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 3.94 SJR 1.772 SNIP 1.153
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1