



The pig barn – a playground for pathogens

Cattle, pigs and poultry can all carry bacteria that are resistant to antibiotics. The spread of these bacteria is considered to be a major problem, as it complicates the use of antibiotics in humans and animals – and sometimes renders antibiotics ineffective. It's essential to treat pathogens in livestock facilities as early as possible. But how do these bacteria spread within herds in the first place?

Herds of pigs naturally develop a social structure; they like to interact with herd members and are curious. Pigs live in groups both in nature and in modern livestock barns. In a unique experiment, the BfR has investigated the contact structure of these animals inside their barns in order to gain insights into the potential spread of disease pathogens.

Due to a lack of suitable data, scientists normally model the infection dynamics in livestock on the assumption that microorganisms are spread through random contacts between the animals. Within the framework of the MedVetStaph research network, the BfR for the first time was able to record position data of animals from which the contact structure between individuals could be elucidated under realistic conditions. In addition, the animals were tested for colonisation with MRSA bacteria (methicillin-resistant *Staphylococcus aureus*) when joining and leaving the farming unit.

Movement data reveals social behaviour

In cooperation with the University of Kiel, the research team at the BfR recorded the positions of each individ-

ual animal in the gestation facility/barn at the Training and Research Centre Futterkamp in Schleswig-Holstein – second by second and around the clock. For this purpose, the sows were equipped with ear tags containing a battery-operated transmitter. The location of each individual animal was recorded by triangulation. Every week, some sows left the barn before giving birth to their piglets, with new, pregnant sows joining the group in their place. Roughly 1.1 billion positional data from a total of 330 different animals were recorded over a period of six months. Scientists at the BfR used this data set to develop algorithms for the analysis of the contact dynamics between the sows.

Loners and socialisers

Evaluations to date show that the sows became calmer the longer they stayed in the group. In addition to a day-night rhythm of contact frequency in all animals, the evaluation of movement patterns showed that some sows may have preferred contact with only a few others, but then regularly and for longer times/durations. Contact with most other animals, on the other hand, was short and irregular (see figure). Parallel to this, there were

some very sociable sows that stayed in different areas of the barn and had contact with numerous animals. As carriers of antibiotic-resistant bacteria or disease-causing microorganisms, these sows may be more likely to pass those pathogens on to many other animals. On the other hand, bacteria that are hardly communicable may have a higher chance of spreading if the contact time between the animals is extended.

Promoting systematic disease prevention

The investigations on the contact structures show that MRSA bacteria do not necessarily have to spread to the entire herd. Individual MRSA-populated sows did not carry the bacteria permanently; MRSA bacteria were not detected consecutively in any of the repeatedly tested sows. It could therefore be discussed whether, depending on the pathogen, it would be more target-oriented, cost-effective and less invasive for the herd to test or treat only animals with frequent contacts.

Further studies should be conducted in other livestock farms / facilities in order to determine if it is possible to generalise the findings of this study. ■

More information:

Will et al. 2017. Accuracy of a real-time location system in static positions under practical conditions: Prospects to track group-housed sows. *Comput Electron Agric.* 142 (A): 473–484

MedVetStaph

The MedVetStaph research network investigated the relevance of methicillin-resistant *Staphylococcus aureus* bacteria (livestock-associated MRSA) in animals for infections in humans. This interdisciplinary project was funded by the Federal Ministry of Education and Research (BMBF) from 2010 to 2018. The studies conducted at the BfR show that carryover of MRSA can occur between animals and humans on livestock farms and that the pathogen can also be transferred to kitchen utensils, work surfaces and other foods during the preparation of foods of animal origin.

Pregnant sows like to spend time with their preferred fellow animals

Contacts of a pig in the barn over a period of 7 days

