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SDEC Partners Research Update

Project Update: Transmission of influenza in piglets via a nurse sow model

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Funding: SDEC

Background

- Influenza A virus (IAV) transmission occurs mainly by direct contact between pigs and indirectly through contaminated materials, droplets and aerosols.
- Piglets in breeding herds become infected around the second week of age and by weaning age, infection can be prevalent.
- Recently, viable IAV was isolated from udder skin of lactating sows suggesting that contaminated skin can be a source of IAV.
- Use of nurse sows is a standard management practice in swine farms. If the underline of these sows is contaminated with IAV, there is a high probability that they transmit influenza to their newly adopted piglets.

Objective

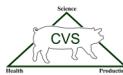
- To evaluate the transmission of influenza A virus to piglets in a nurse sow model under experimental conditions.

Materials and methods

- Two IAV-negative pregnant sows gave birth in separate farrowing rooms in a research facility.
- A nurse sow transmission model was created by infecting 6 piglets from a sow at 10 days after farrowing. Piglets and one sow were inoculated intranasally with 10^5 TCID₅₀/ml of A/swine/lowa/MT_12_07_1920/2012 H1N1 IAV. Infection was confirmed in the sow (Sow 1) and her piglets by nasal swabs (NS), nasal wipes (NW), oropharyngeal swabs (OP) and udder skin wipes (UW) by rRT-PCR testing. Four days after the first inoculation, four additional piglets were added to the litter and inoculated with IAV. These piglets became the source of contamination of the sow's underline.
- In a separate room, a second sow (Sow 2) reared IAV negative piglets and became a donor of IAV negative piglets to Sow 1.
- In order to evaluate transmission via nurse sows, Sow 1 (which was non-shedding but IAV positive in the udder skin) was moved into a clean room and adopted 8 IAV negative piglets. Piglets were tested daily after that and until the termination of the study.
- In order to evaluate transmission via cross-fostering, Sow 2 (IAV negative) and 4 of its piglets (also negative) adopted 8 positive piglets from sow 1.



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Results:

- A nurse sow transmission model was developed. At the time of piglet adoption by Sow 1, the sow's udder underline was IAV RT-PCR positive.
- All adopted piglets became IAV positive after nursing Sow 1. One piglet became positive at 1 day post adoption, and by 4 days post adoption all piglets tested IAV positive (Fig 1).
- All cross-fostered piglets from Sow 2 became IAV positive after being commingled with piglets from Sow 1 (IAV positive) one day post cross-fostering and by day two, Sow 2 also became positive (Fig 2).

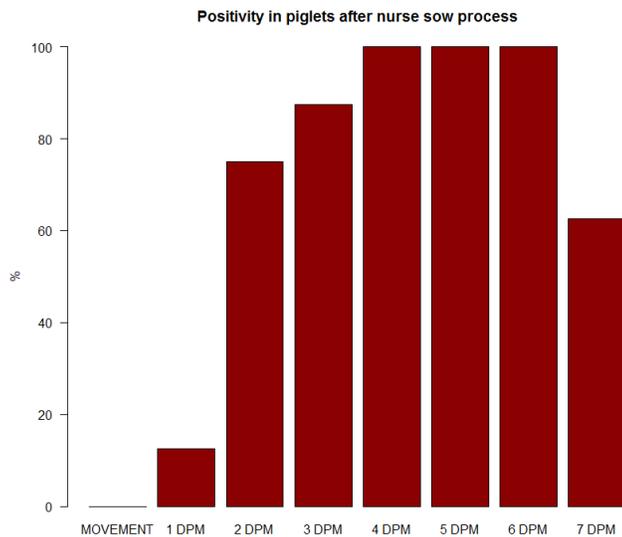


Figure 1. Percentage of piglets that became influenza positive after being adopted by Sow 1 in an experimental nurse sow model.

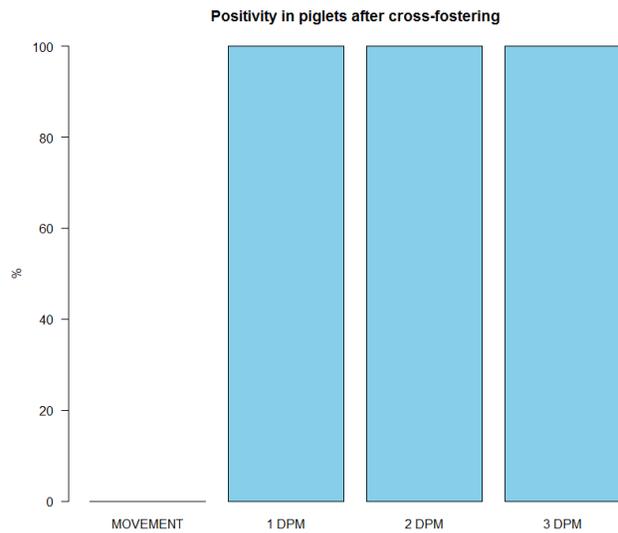


Figure 2. Percentage of piglets that became influenza positive after being cross-fostered with piglets from an influenza positive litter.

Conclusions and Implications:

- Under the conditions of this study, piglets became infected in a nurse sow model through the exposure to IAV contaminated udder skin.
- Cross-fostered piglets also became IAV positive after being commingled with IAV positive piglets.
- A sow also became influenza positive after having adopted influenza positive piglets in a cross-fostering model.
- Results highlight the potential role of nurse sow and cross-fostering practices in the transmission of IAV in swine breeding farms.
- The role of nurse sows at transmitting influenza needs to be further investigated under field conditions.