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SDEC Partners Research Update

Project Update: Novel approaches for influenza surveillance in swine breeding herds

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Background

- Surveillance for influenza A virus (IAV) is central to the control of influenza in pigs and the prevention of zoonotic infections.
- Routinely and readily detecting influenza infections can be challenging particularly in endemically infected herds.
- Control of IAV infections usually requires the successful recovery of virus isolates from collected samples with subsequent characterization and vaccine seedstock production.
- Optimal influenza surveillance should be a balance of cost, easiness to obtain sample and sensitivity of the sampling.

Objective

- To determine the most sensitive sampling method to detect and isolate influenza virus in piglets in breeding farms.

Material and methods

- Six breeding herds with prior history of IAV infection were sampled.
- Eight distinct sampling procedures were evaluated in piglets prior to wean: nasal swabs (NS), nasal wipes (NW), oro-pharyngeal swabs (OS), oral fluids (OF), surface wipes (SW), sow udder skin wipes (UW), airborne particle deposition (APD) and air.
- Three piglets from 10 litters were selected for individual sampling (NS, NW, OP). Oral fluids and wipes of surfaces accessible to pigs from the litters where pigs had been sampled individually were also collected. Air samples or samples from surfaces positioned to capture the settlement of airborne particles were collected simultaneously from the same air space where pigs were sampled. Lastly, a wipe from the udder skin from lactating sows was also collected on the same litters where the pigs were sampled.
- All samples were tested by rRT-PCR to detect the IAV matrix gene. A subset of positive samples (ct value < 35) were selected to culture for virus isolation in MDCK cells.
- Agreement between the test results for each sample type was measured using the kappa statistic, and the optimum

Results:

- IAV was detected in 4 out of 6 breeding herds.
- For influenza detection by RT-PCR (Figure 1):
  - Out of the individual samples oropharyngeal swabs were the best sample (p=0.012).
  - Out of the litter level samples, udder wipe was the best sample (p=0.035).
  - Out of the environment, both air samples and samples that represented airborne particle deposition were similar.
- In general, individual pig sampling strategies had lower cycle threshold values (Figure 2).
- Influenza virus was isolated from all sample types, but oropharyngeal swabs, nasal wipes, and udder skin had the best yield (Figure 3).
- Sample type agreement measured with the kappa coefficient ranged from moderate to substantial.

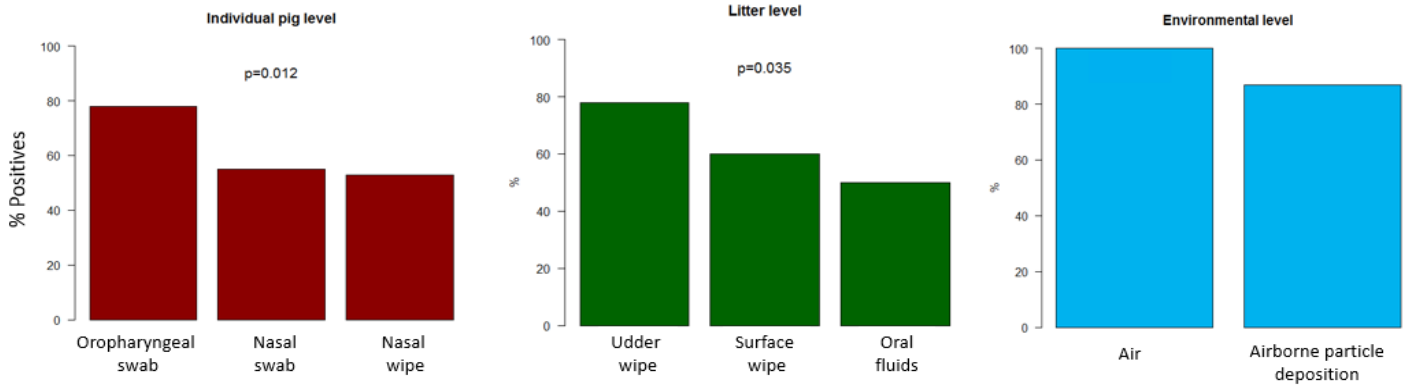

Figure 1. Detection rates (RT-PCR) by sampling procedure.

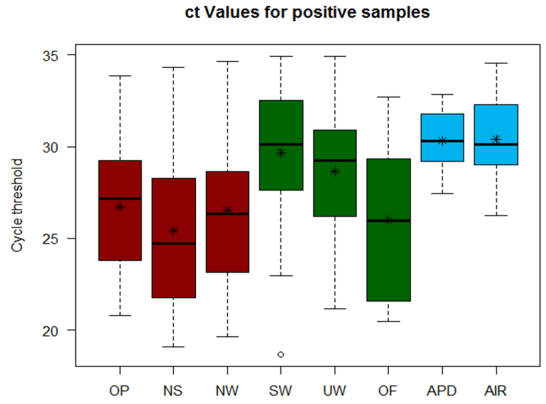

Figure 2. Distribution of cycle threshold values by sample type.

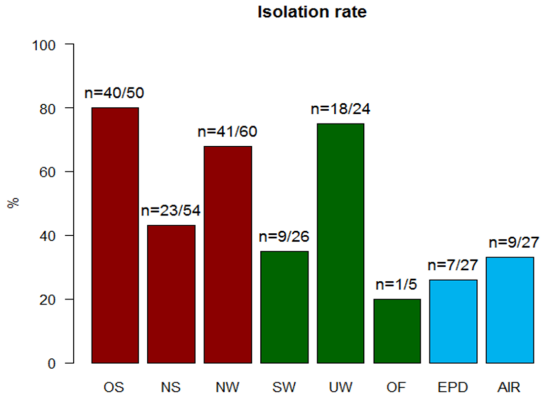

Figure 3. Influenza isolation rates by sample type

Conclusions and Implications:

- Group and environmental sampling strategies had similar sensitivity for detecting IAV than individual sampling.
- Among individual sampling strategies, oropharyngeal swab was the best sample.
- Udder skin wipes provided isolation rates as good as oropharyngeal swabs.
- There is significant detection of airborne influenza in farrowing rooms.
- Udder skin and environment could have an important role in transmission and maintenance of flu in piglets in breeding herds.