DETECTION OF SWINE INFLUENZA A VIRUS IN ORAL FLUIDS AND UDDER SKIN WIPES

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Introduction

- Monitoring Influenza A virus (IAV) in swine is relevant from three perspectives: animal health, economic impact and public health [1]
- Detection using individual samples is challenging
  - Collection of group samples is gaining popularity
    - Oral fluids (OF) in weaned pigs [2]
    - Sow udder skin wipes (UW) in suckling piglets [3]

Objectives

- Compare IAV detection rates at the herd and pen level
  - Between Nasal swabs (NS) and UW in suckling piglets
  - Between NS and OF in weaned piglets
- By quantitative reverse transcription PCR (RT-qPCR)
- In endemically infected farms with low disease prevalence

Materials and Methods

A. Cross-sectional study

B. Longitudinal study: during 8 weeks in two a) positive IAV swine herds b) no current respiratory outbreak and c) no vaccination for IAV.

C. Laboratory analysis: RNA extraction → RT-qPCR

Figure 1. Swine farm

1   3   5   8

NS and UW   NS and OF

Weaning

Figure 2. Wiping the udder skin of a lactating sow

Figure 3. A group of weaned piglets chewing a pen-based cotton rope

Results

- Influenza RT-qPCR

Table 1. RT-qPCR detection of IAV by sample type, age of pigs and herd.

| Herd | Age of pigs (weeks) | IAV detection by RT-qPCR | | |
| | | Pigs | | Sows |
		NS (%)	OF (%)	UW (%)
A1	1	2/10 (20)	NC	2/10 (20)
	3	11/20 (55)	NC	5/20 (25)
	5	5/20 (25)	5/20 (25)	NC
	8	1/10 (10)	1/10 (10)	NC
Total A		19/60 (32)	6/30 (20)	7/30 (23)
B	1	0/10 (0)	NC	1/10 (10)
	3	8/9 (90)	NC	4/9 (44)
	5	4/12 (33)	4/12 (33)	NC
	8	3/12 (25)	2/12 (17)	NC
Total B		15/43 (35)	6/24 (25)	5/19 (26)
Total A		34/103 (33)	12/54 (22)	12/49 (24)

NC: Not collected

- Agreement between tests

Table 2. Cohen's Kappa coefficient of paired NS and UW, and paired NS and OF. In both cases the level of agreement is slight

	NS
UW	K= 0.164, CI −0.096-0.423; SE= 0.132
OF	K= 0.116; CI −0.169-0.4

- Distribution of RT-qPCR positive Cycle threshold (Ct) values

Figure 3. Boxplots of IAV RT-qPCR cycle threshold (Ct) values of NS and UW from suckling piglets. The median Ct value of NS (33.19) is lower than the median Ct value of UW (37.80).
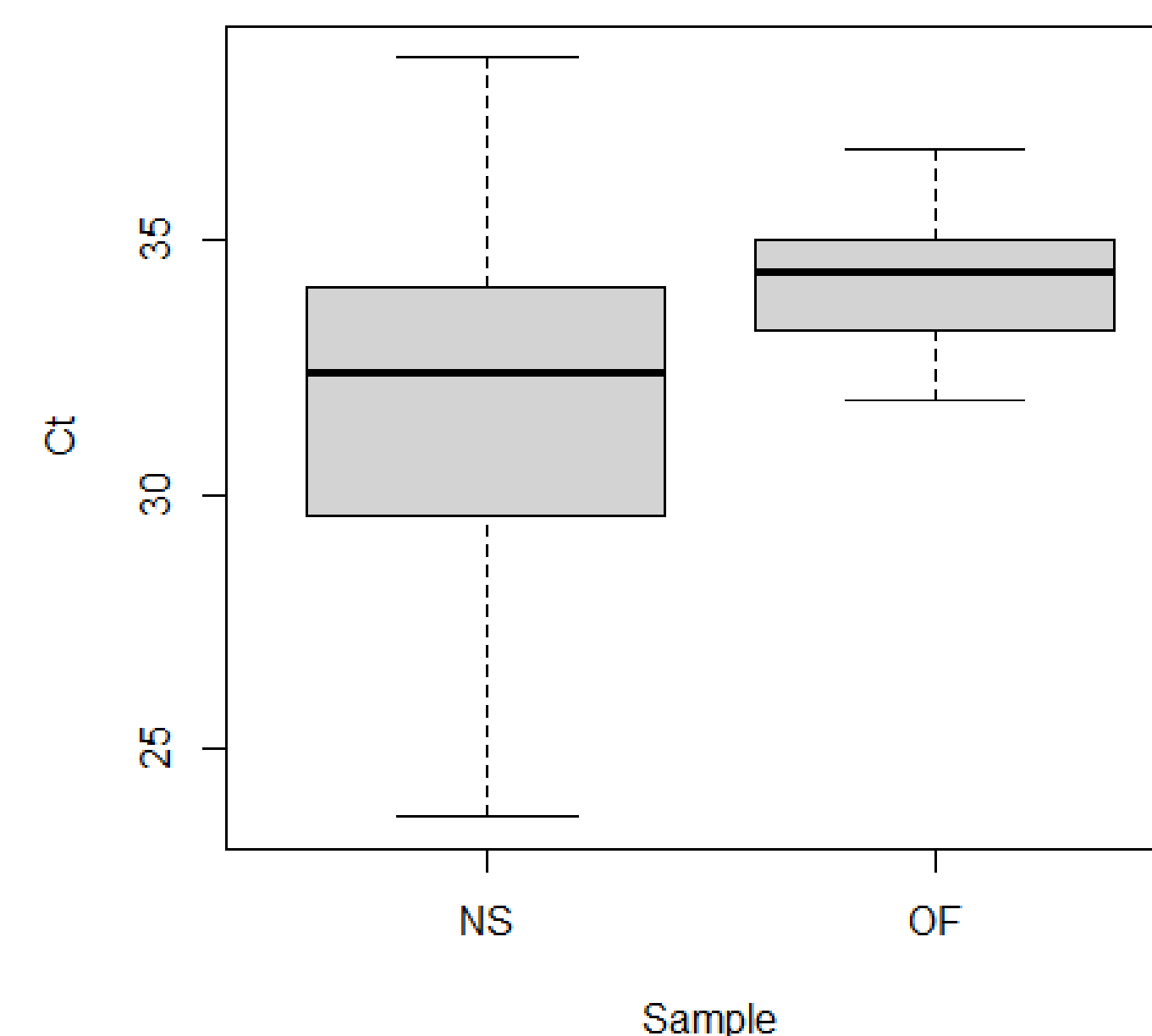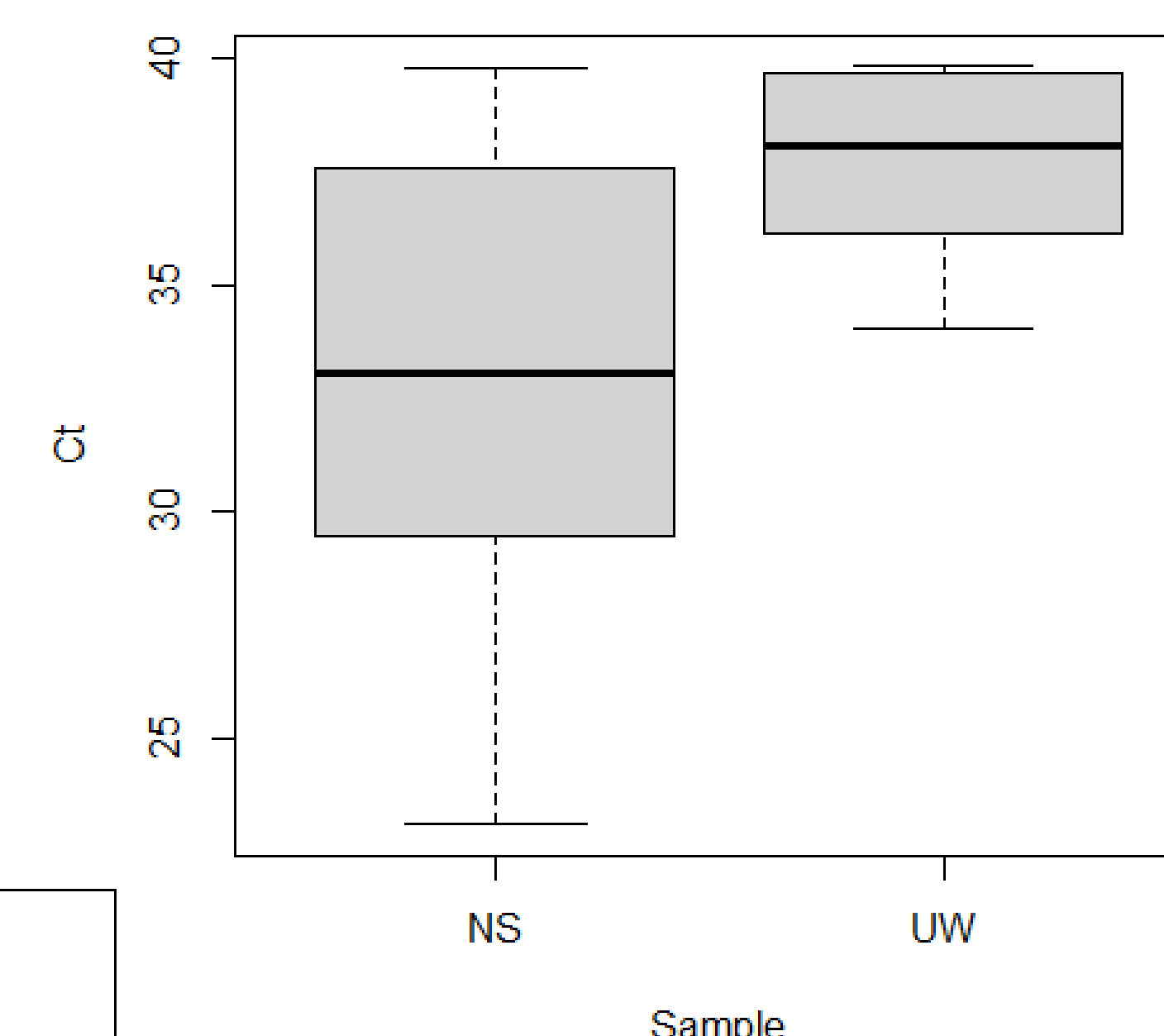
Figure 4. Boxplots of RT-qPCR Ct values of NS and OF. The median Ct value of NS (31.56) is lower than the median Ct value of OF (34.24).

Conclusions

1) UW in suckling piglets and OF in weaned pigs can be a feasible alternatives for IAV screening
   - Similar IAV detection rates at the herd level with NS
   - Collection is easy, timesaving, less stressful and non-invasive
2) Detection of IAV is a key tool to help designing strategic and risk-based preventive and control measures

References

1) Taubenberger, J. K., & Kash, J. C. (2010). Influenza Virus Evolution, Host Adaptation, and Pandemic Formation. *Cell Host & Microbe*, 7(6), 440–451. https://doi.org/10.1016/j.chom.2010.05.009
2) Gerber, P. F., Dawson, L., Strugnell, B., Burgess, R., Brown, H., & Opriessnig, T. (2016). Using oral fluids samples for indirect influenza A virus surveillance in farmed UK pigs. *Veterinary Medicine and Science*, 3(1), 3–12. https://doi.org/10.1002/vms3.51
3) Garrido-Mantilla, J., Alvarez, J., Culhane, M., Nirmala, J., Cano, J. P., & Torremorell, M. (2019). Comparison of individual, group and environmental sampling strategies to conduct influenza surveillance in pigs. *BMC Veterinary Research*, 15(1). https://doi.org/10.1186/s12917-019-1805-0