

Biosecure strategies to prevent indirect transmission of viruses

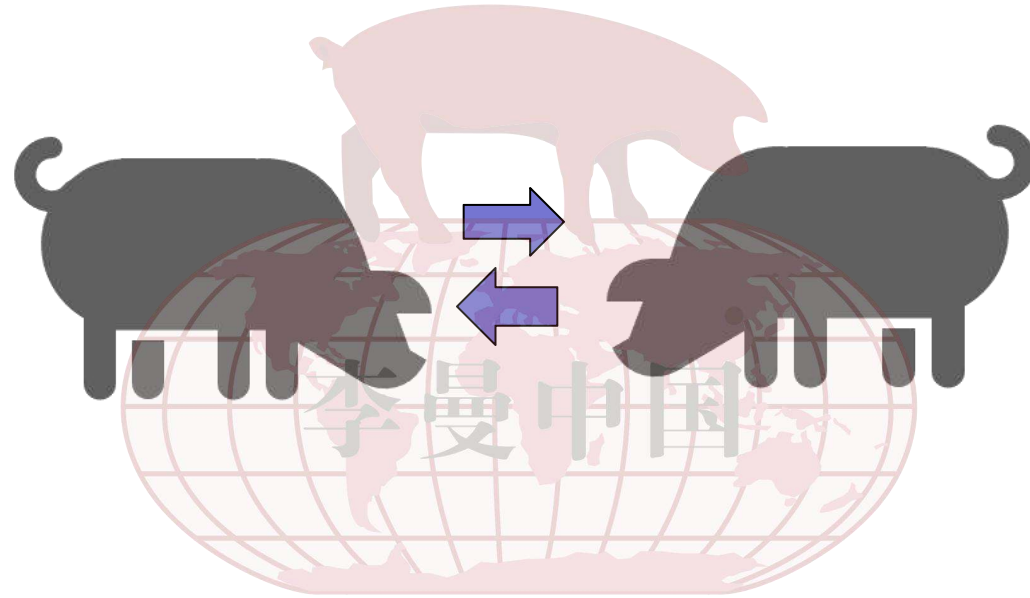
Montse Torremorell, DVM, PhD
Professor & Department Chair

University of Minnesota
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Direct transmission

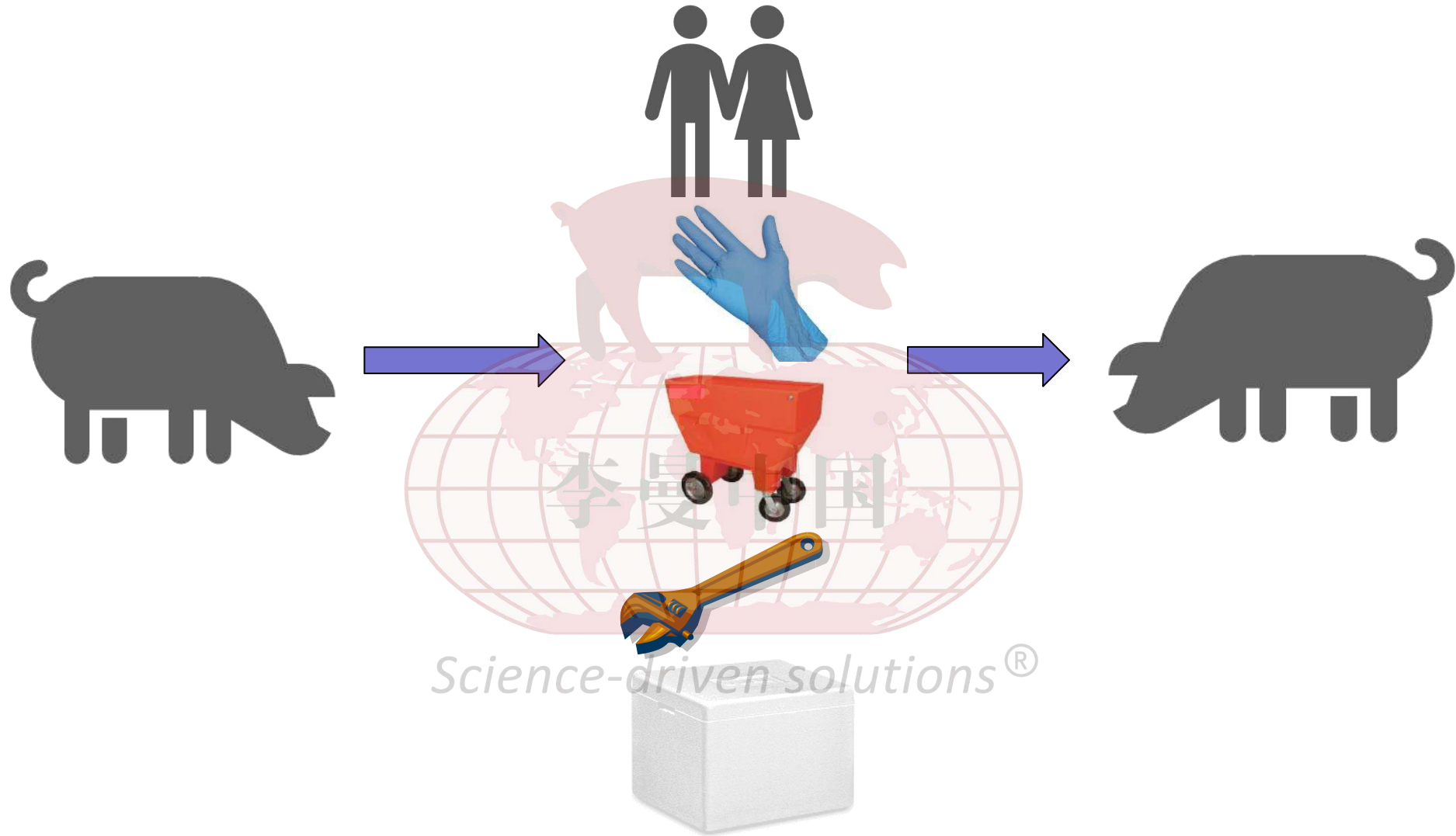


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Indirect transmission



We can find viruses in many places

Influenza virus in positive farms

Proportion of positive wipes of carts, tools and farm worker hands by RT-PCR.

| Farm | Cart/Tools | Hands |
|-------|---------------|---------------|
| A | Not collected | 19/35 (54.3) |
| B | 5/15 (33.3) | 19/37 (51.4) |
| C | 8/13 (61.5) | 27/39 (69.2) |
| Total | 13/28 (46.4) | 65/111 (58.6) |

3 VI +

5 VI +

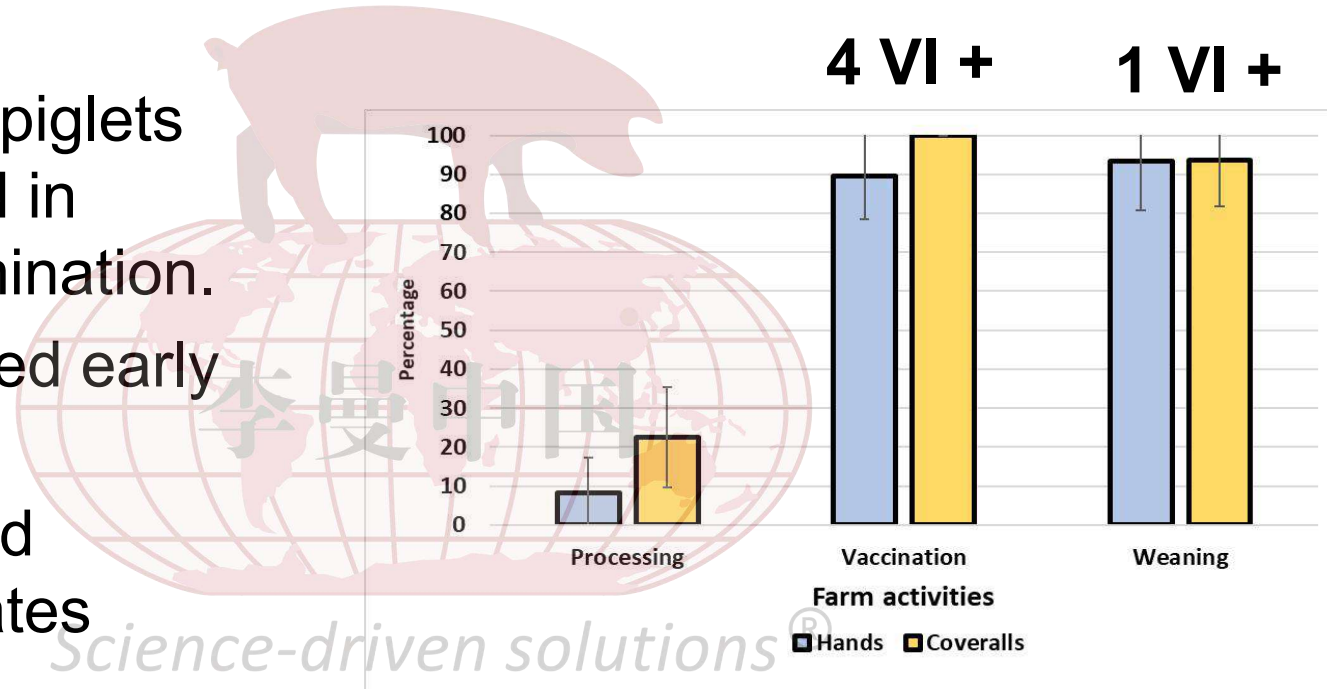


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There are farm management practices that are more likely to result in contamination of hands and clothes of farm workers

- Activities performed on piglets of weaning age resulted in higher influenza contamination.
- Influenza can be detected early in lactation.
- Hands and coveralls had similar contamination rates



Contaminated fomites can be a source of influenza infection to other pigs

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PLOS ONE

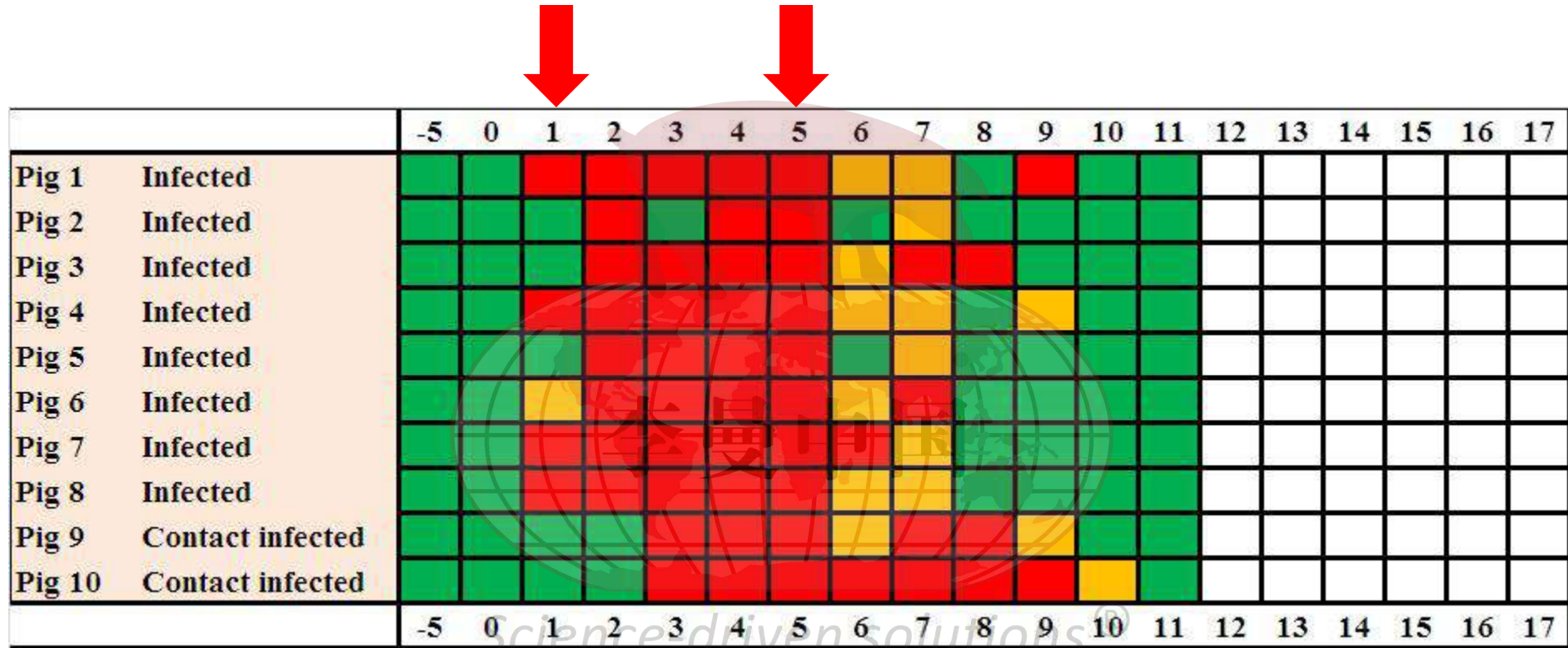
Indirect Transmission of Influenza A Virus between Pig Populations under Two Different Biosecurity Settings

Matt W. Allerson¹, Carol J. Cardona², Montserrat Torremorell^{1*}

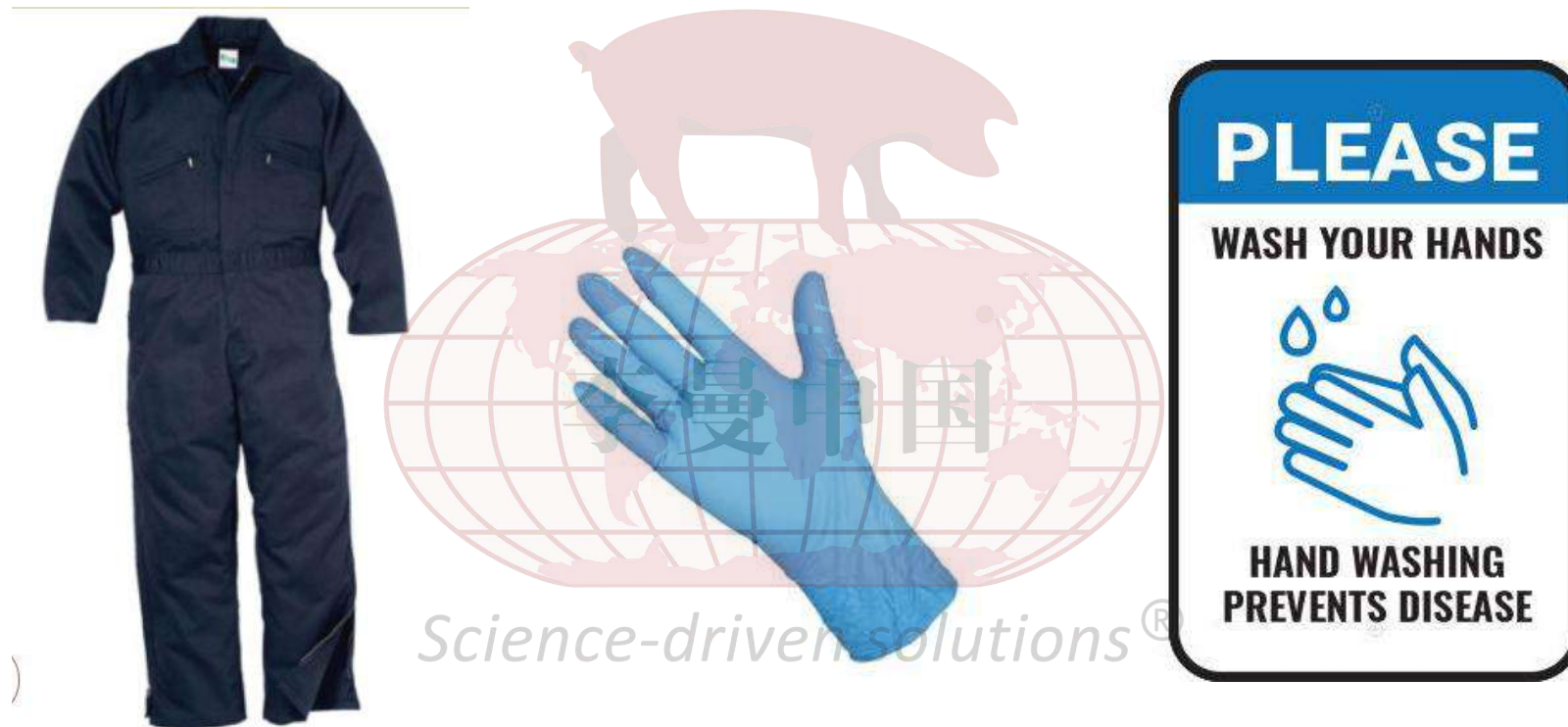
¹ Department of Veterinary Population Medicine, College of Veterinary Medicine, University of Minnesota, St. Paul, Minnesota, United States of America, ² Department of Veterinary and Biomedical Sciences, College of Veterinary Medicine, University of Minnesota, St. Paul, Minnesota, United States of America



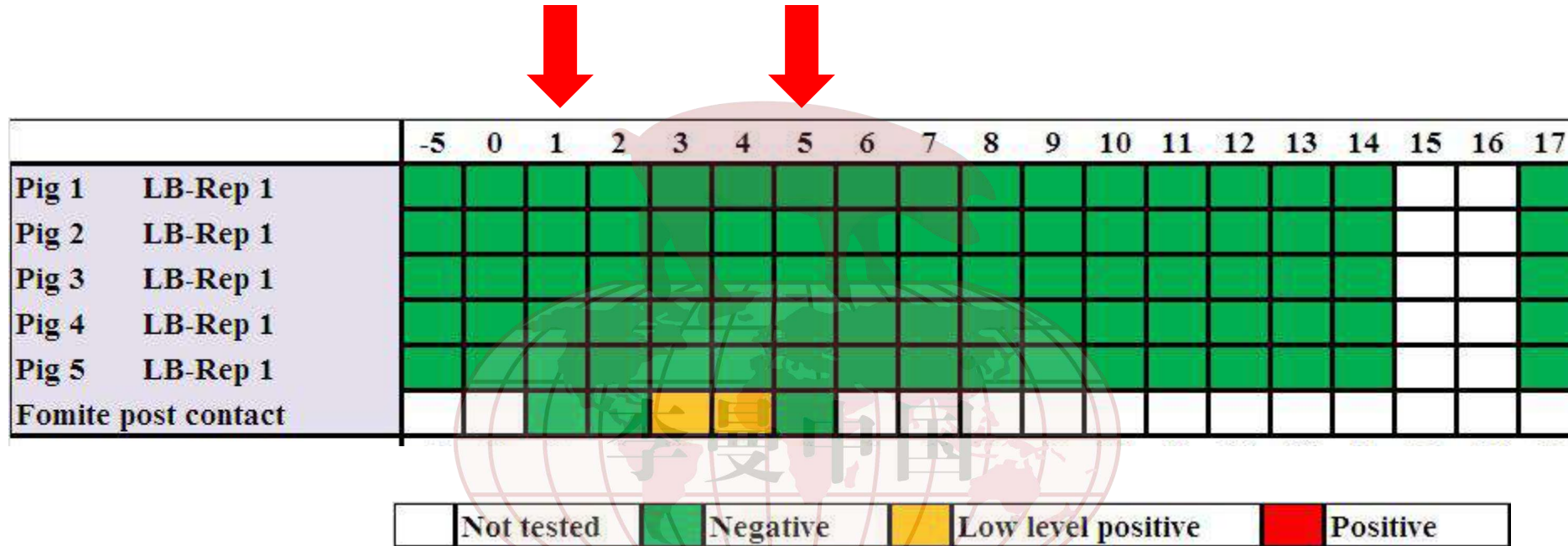
Pig to pig transmission – 1-2 days delay



What about if we change PPE or shower?



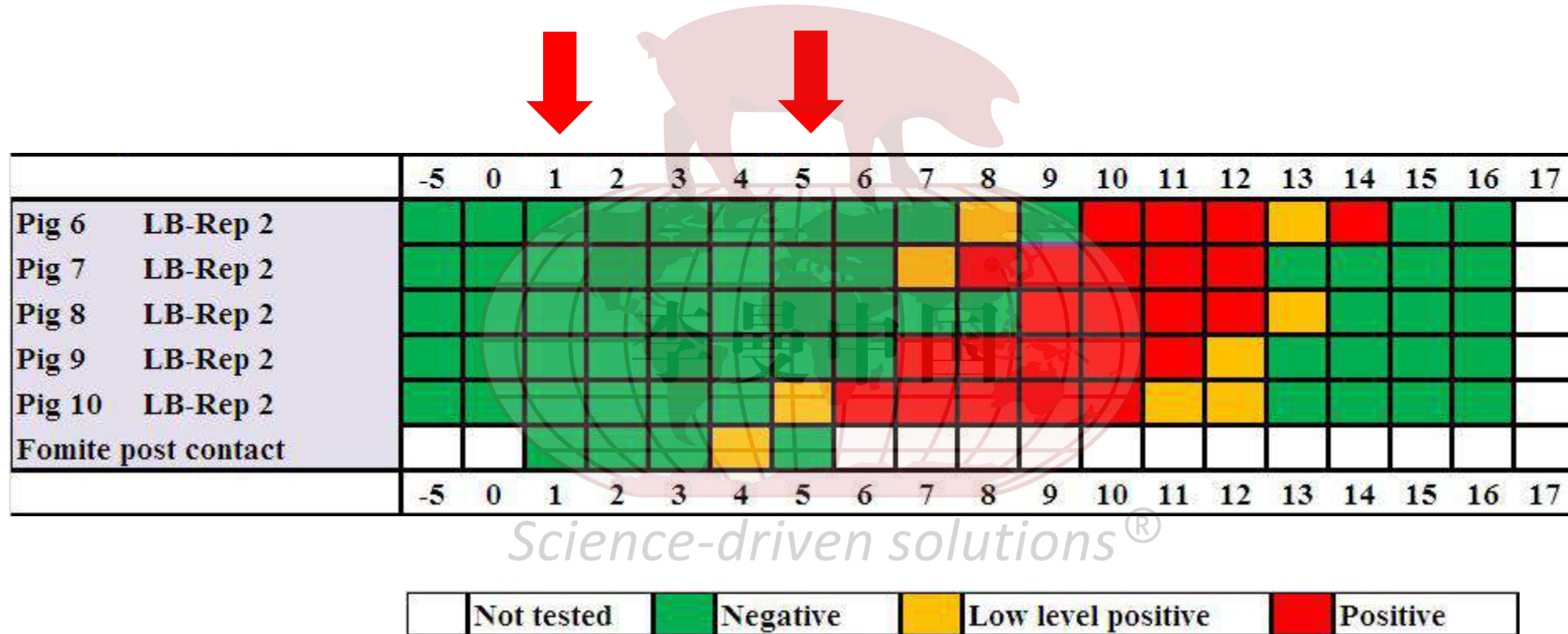
If PPE change is effective = No transmission



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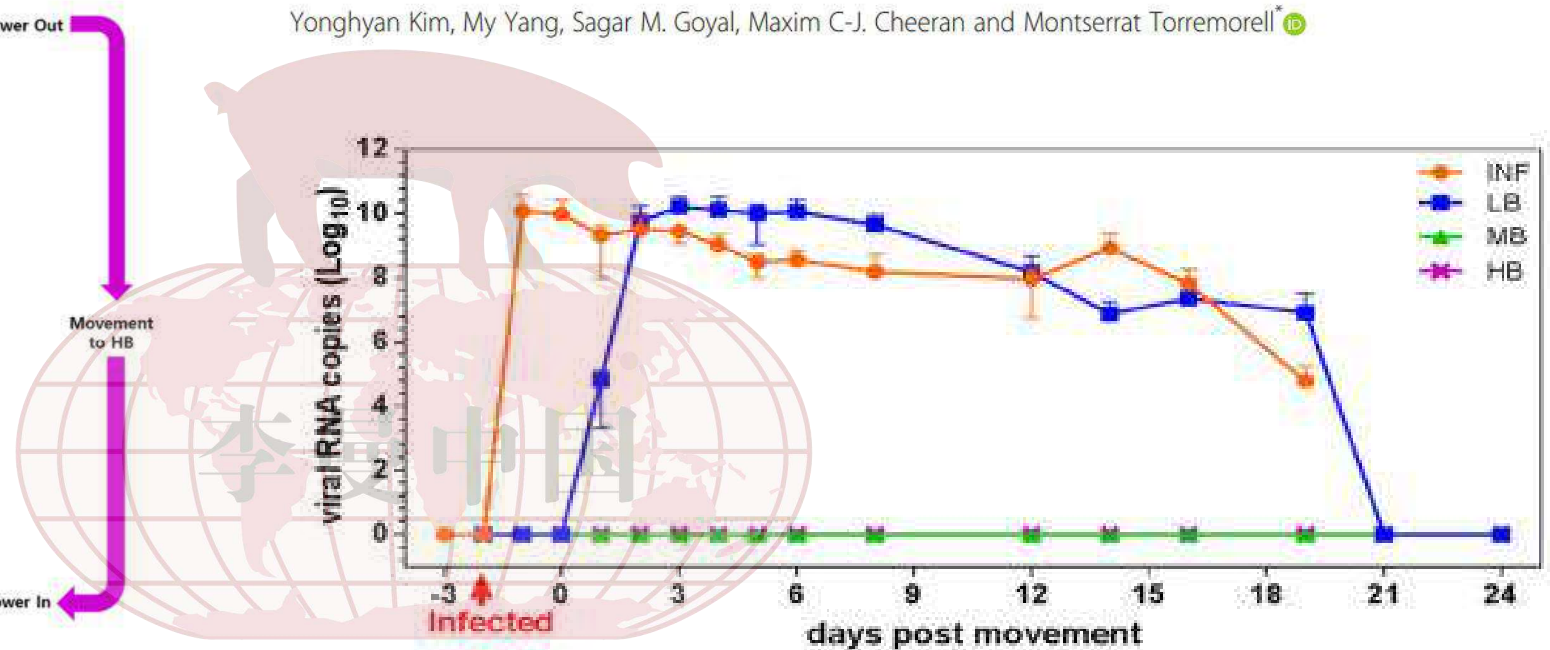
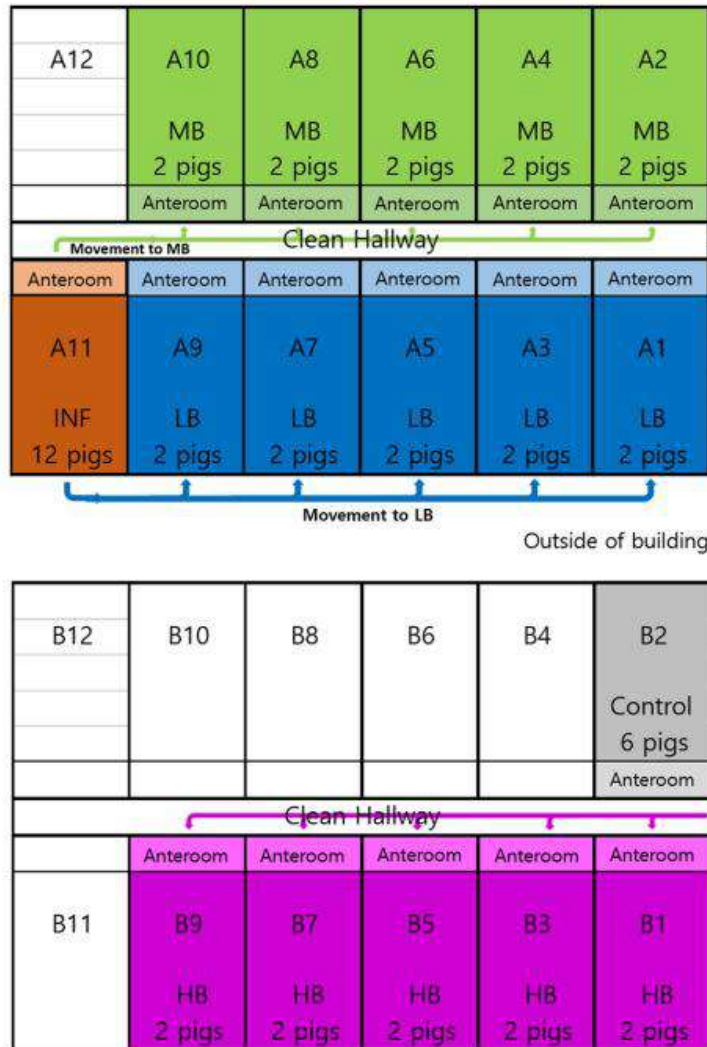
If PPE change is NOT effective = Transmission





Evaluation of biosecurity measures to prevent indirect transmission of porcine epidemic diarrhea virus

Yonghyan Kim, My Yang, Sagar M. Goyal, Maxim C-J. Cheeran and Montserrat Torremorell*



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Transmission only observed in lower biosecurity group

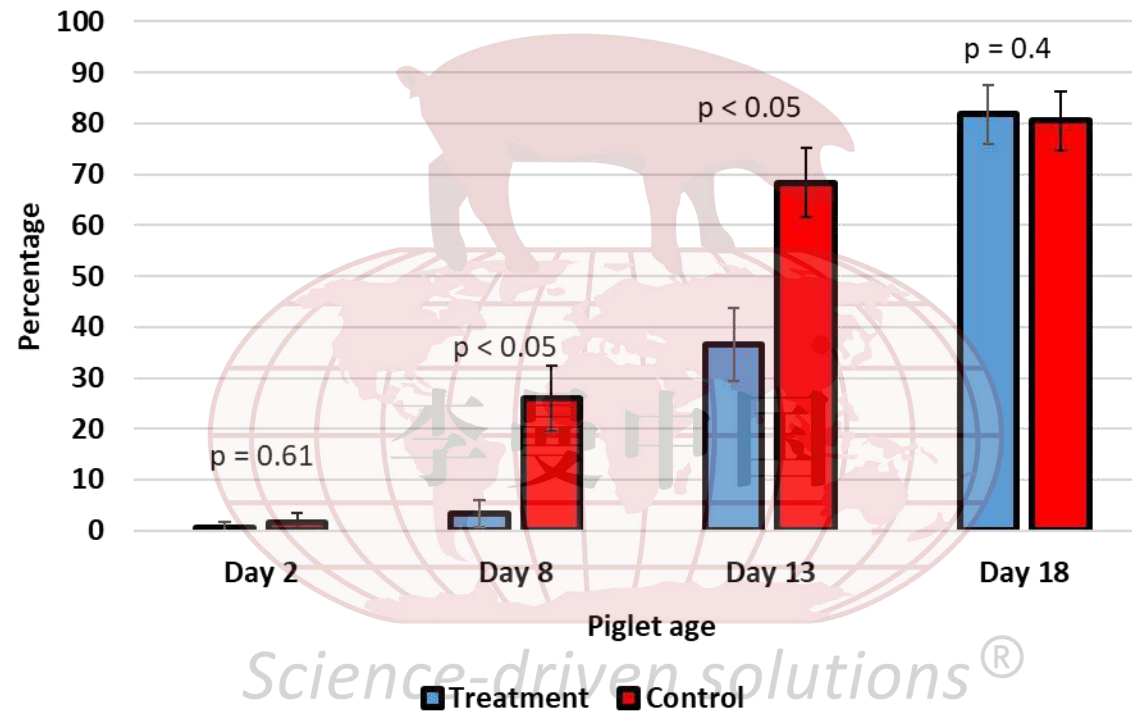


Recommendations



There are instances where change of PPE delays infections but not fully prevent them

RT-PCR proportion of positive litters by treatment and day of sample collection



Internal biosecurity practices without vaccination delayed influenza infections but did not affect status at weaning

In some instances, both vaccination and biosecurity practices are needed to mitigate the effect of indirect transmission

Effect on IAV prevalence at weaning

Table 5. Number (percentage) of influenza A virus rRT-PCR positive litters before and after intervention measured by udder skin wipes by farm. Statistical significance was measured between pre-intervention and post-intervention positive proportions.

| Experimental group | Farm | Pre-intervention prevalence (%) | Post-intervention prevalence (%) | P value [^] |
|------------------------------------|------|---------------------------------|----------------------------------|----------------------|
| Control | F | 73/90* (81) | 71/90 (79) | 0.7 |
| Treatment | A | 62/90 (69) | 56/90 (62) | 0.34 |
| Treatment | B | 31/90 (34) | 12/90 (13) | 0.001 |
| Treatment | C | 7/90 (8) | 0/90 (0) | 0.01 |
| Treatment | D | 13/90 (14) | 0/90 (0) | <0.001 |
| Treatment | E | 12/90 (13) | 0/90 (0) | 0.001 |
| Total treatment⁺ | - | 125/450 (27.8) | 68/450 (15.1) | <0.0001 |

*Number of positive samples / total number of samples tested (percentage).

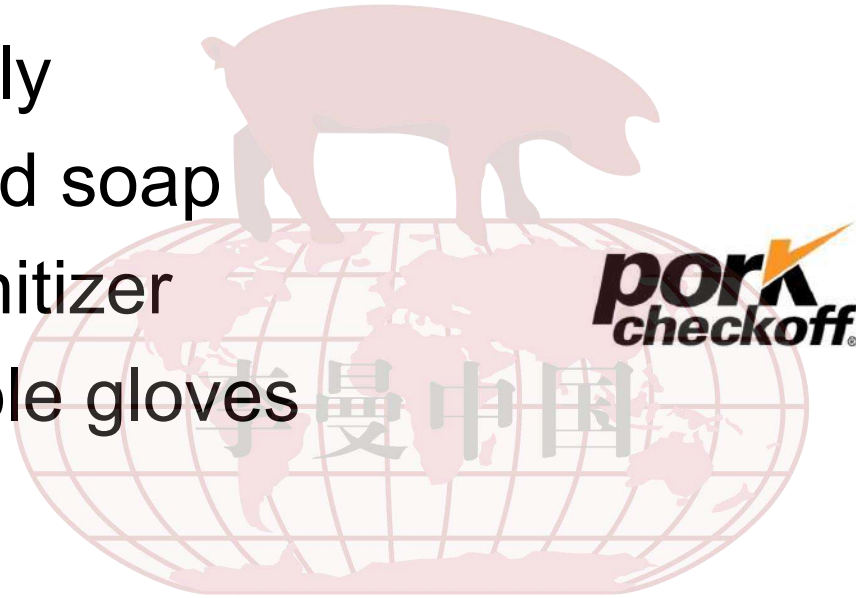
[^]P values were obtained using a Pearson's Chi-squared test.

⁺Total values were summarized using farms assigned to the treatment group.

4 farms had significant reductions in IAV prevalence

How should we wash hands?

- Water only
- Water and soap
- Hand sanitizer
- Disposable gloves



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Soap and water: rinse 5s, soap 10s, rinse 10s, wipe dry

Water only: rinse 10s, wipe dry

Alcohol-based sanitizer (70% ethyl alcohol): sanitizer 10s, air dry

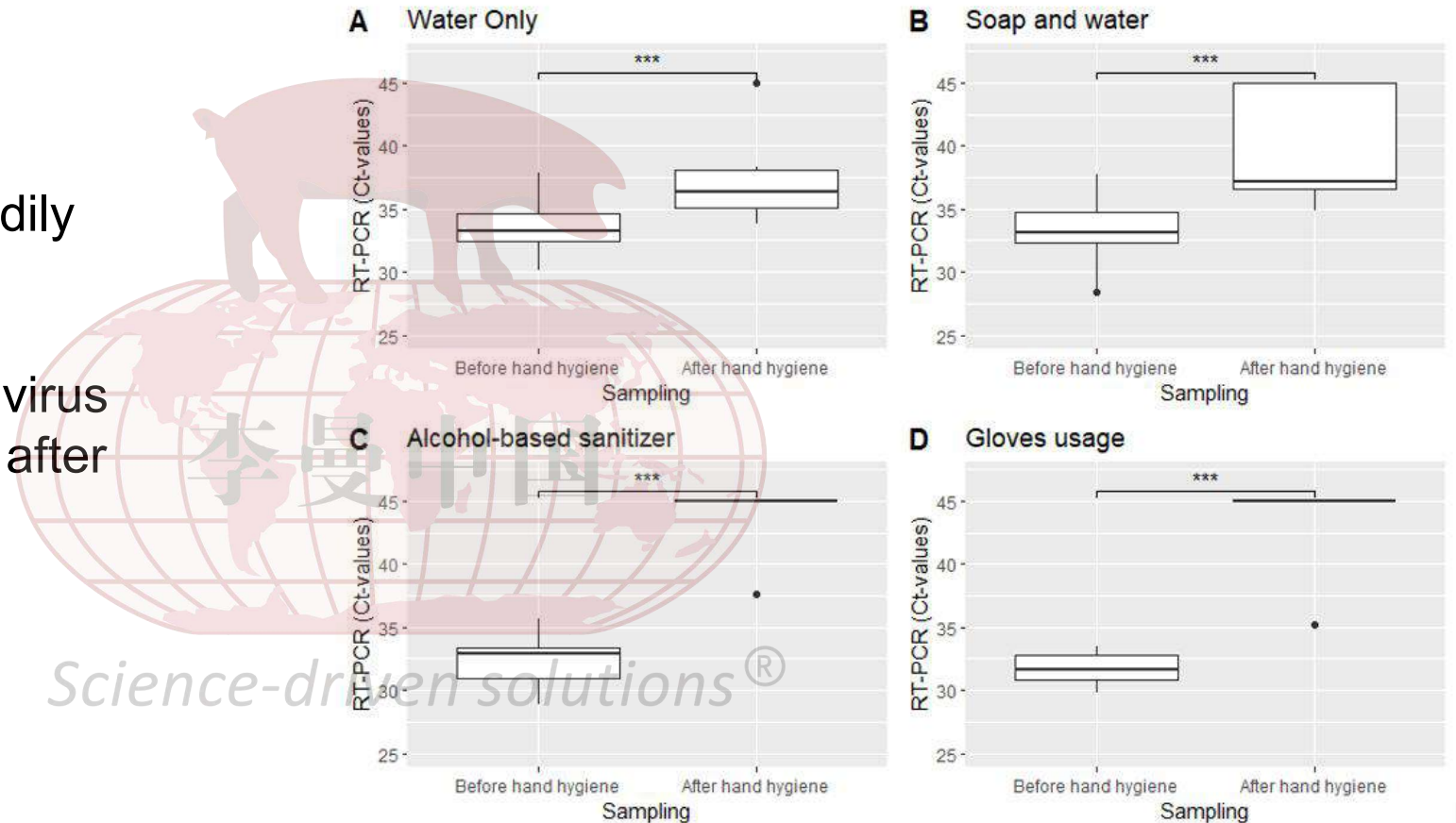
Wearing disposable gloves: remove gloves

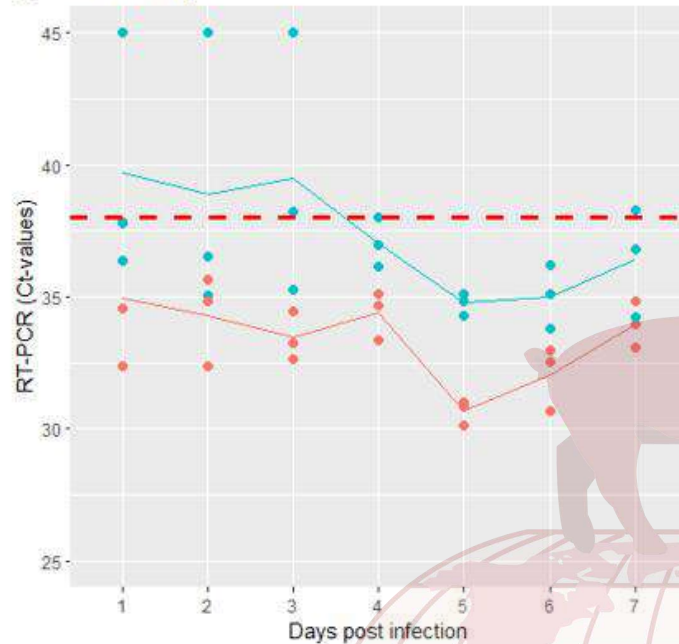
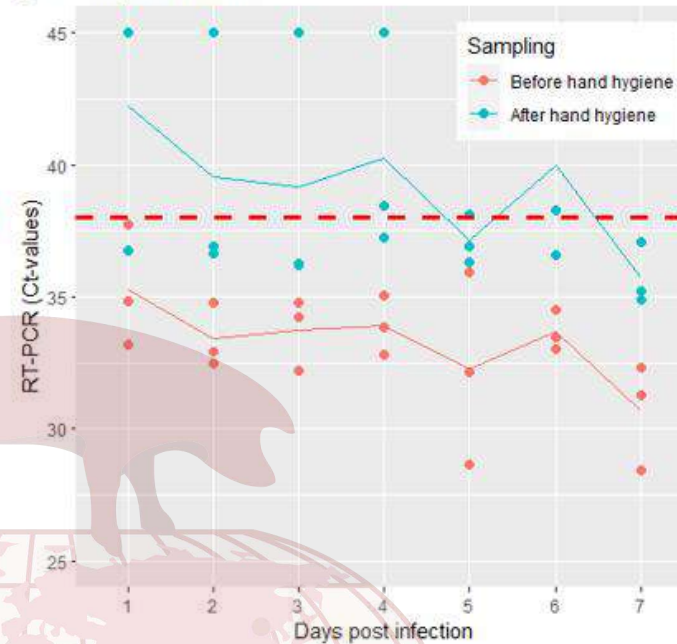
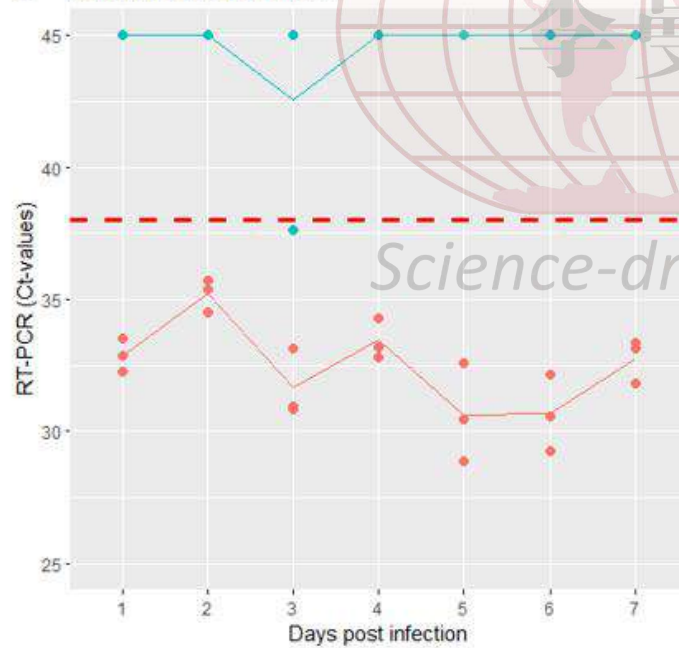
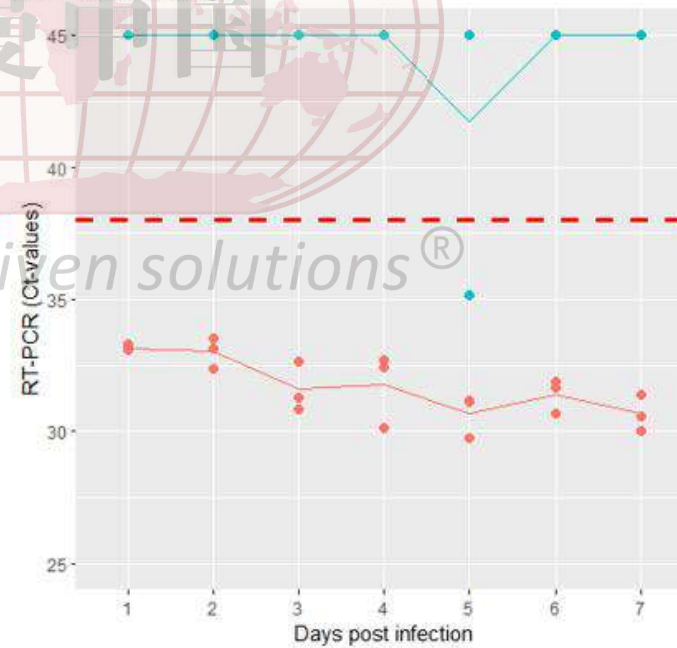


All treatments decreased the levels of influenza in the hands

Upon handling infected pigs all participant's hands became readily contaminated with IAV (100%).

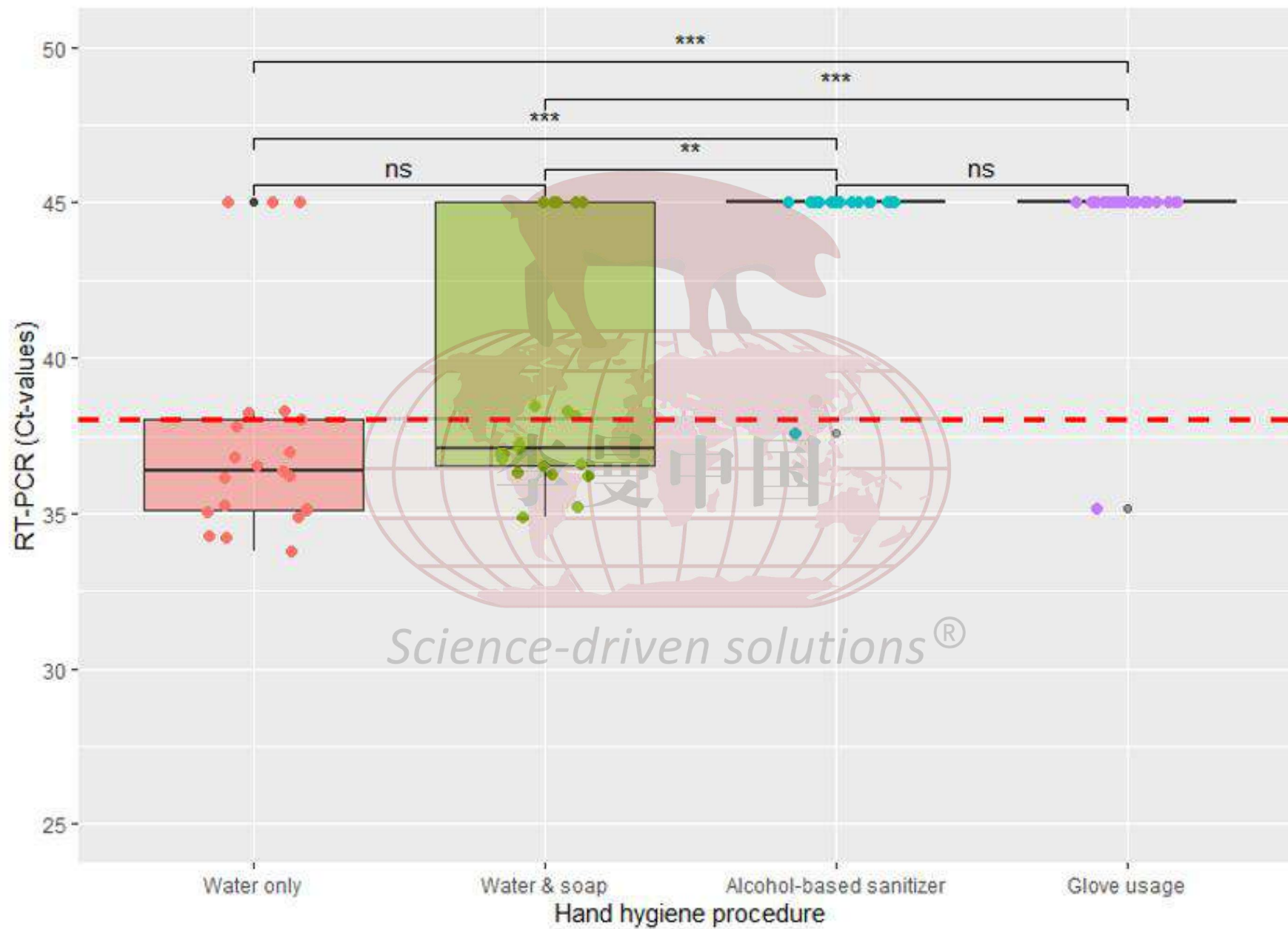
Viable virus was found through virus isolation in 7 out of 84 samples after handling pigs.



A Water Only**B Soap and water****C Alcohol-based sanitizer****D Gloves usage**

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Overall difference



- Influenza can be readily found in hands of swine workers handling influenza infected pigs
- Use of an alcohol-based hand sanitizer and wearing disposable gloves were the most effective hand hygiene treatments.
- However, soap & water should still be considered to facilitate the removal of organic matter and pig secretions from the hands.



N95 Respirator

Surgical mask



Dust mask



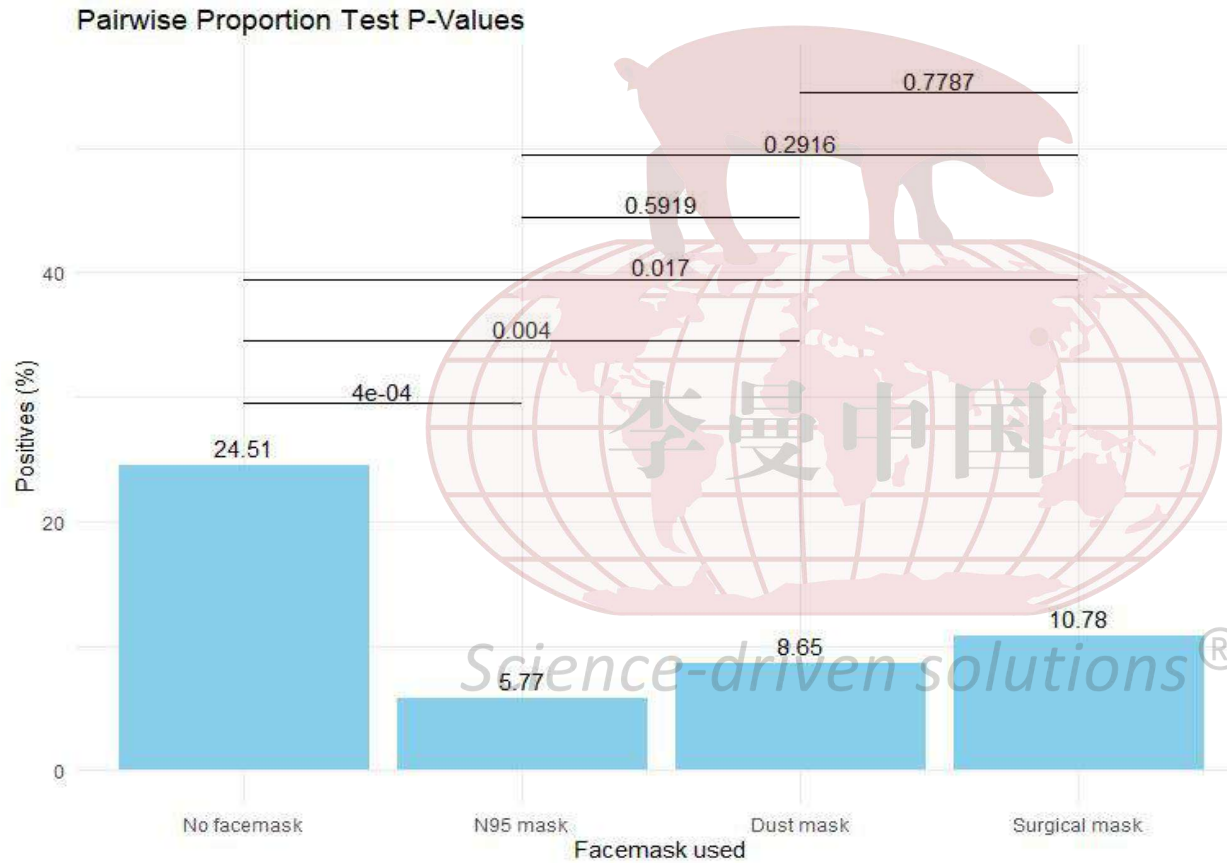
No mask

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Use of face masks can decrease influenza detection in the nares of farm workers



Decrease risk of interspecies transmission of influenza



Summary

- Transmission through indirect routes is important.
- Workers clothing, hands and tools are effective ways to transmit diseases.
- Biosecurity practices that prevent transmission between groups of animals and farms should be considered.
- Consider showers, changes in clothing, washing hands and not sharing materials.





Thank you

Questions?

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