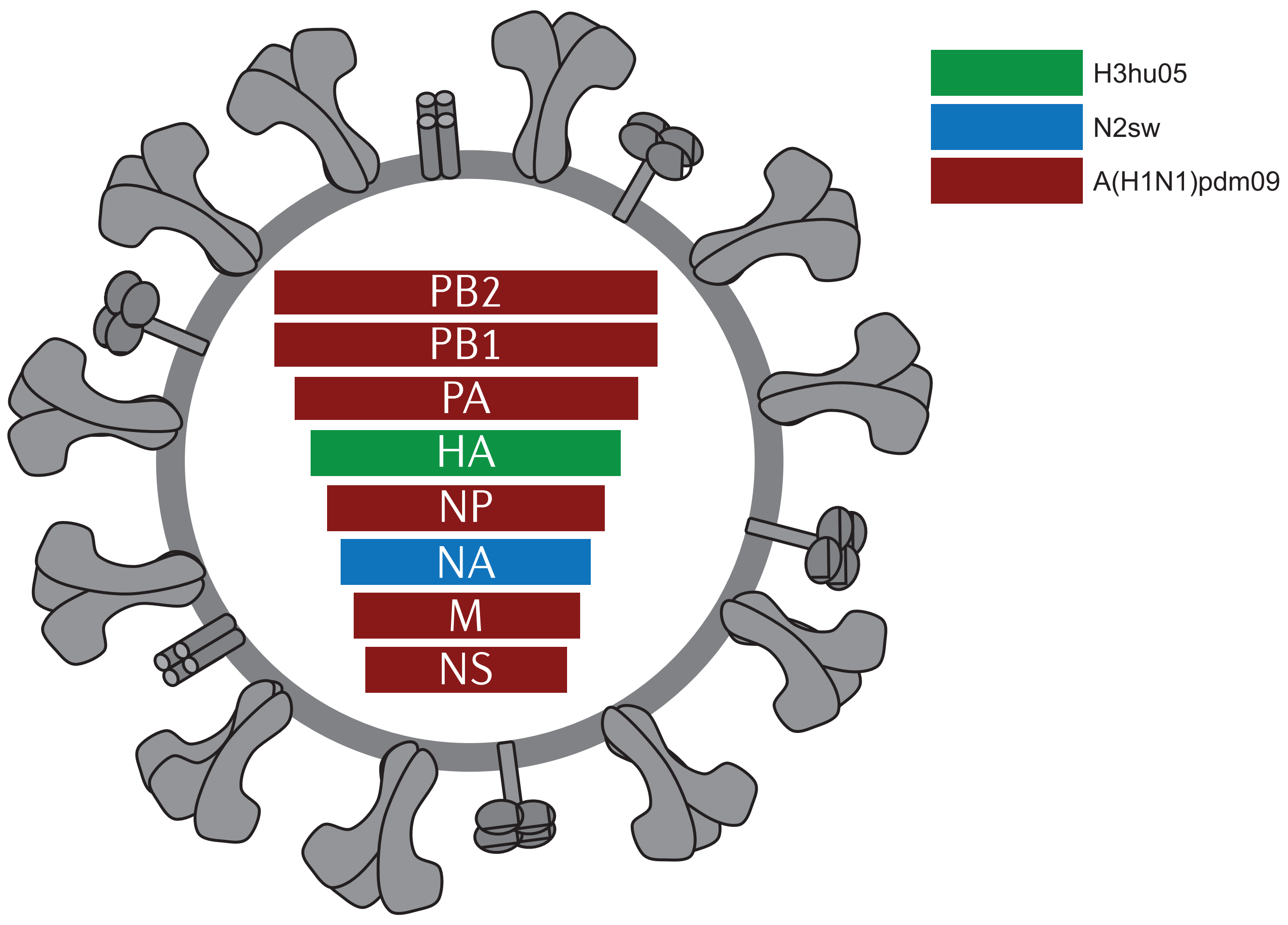
Evaluation of the zoonotic potential of a novel triple-reassortant H3N2 virus circulating in Danish pigs

Malene Rask Andersen[1], John Franks[2], Jesper S. Krog[1], Charlotte K. Hjulsager[1], Lise K. Kvisgaard[1], Richard Webby[2], Lars E. Larsen[1]

1. National Veterinary Institute, Technical University of Denmark, Denmark. 2. Division of Virology, St. Jude Children's Research Hospital, Memphis, TN, USA.

Introduction

Recently, a novel triple-reassortant H3N2 influenza A virus was detected in Danish swine. The genetic makeup of this virus is distinct from previously known European swine H3N2 viruses. The reassortment events remain speculative, as neither human nor animal surveillance has reported occurrences of this H3 gene during the period from 2004/2005 – 2013 (1).

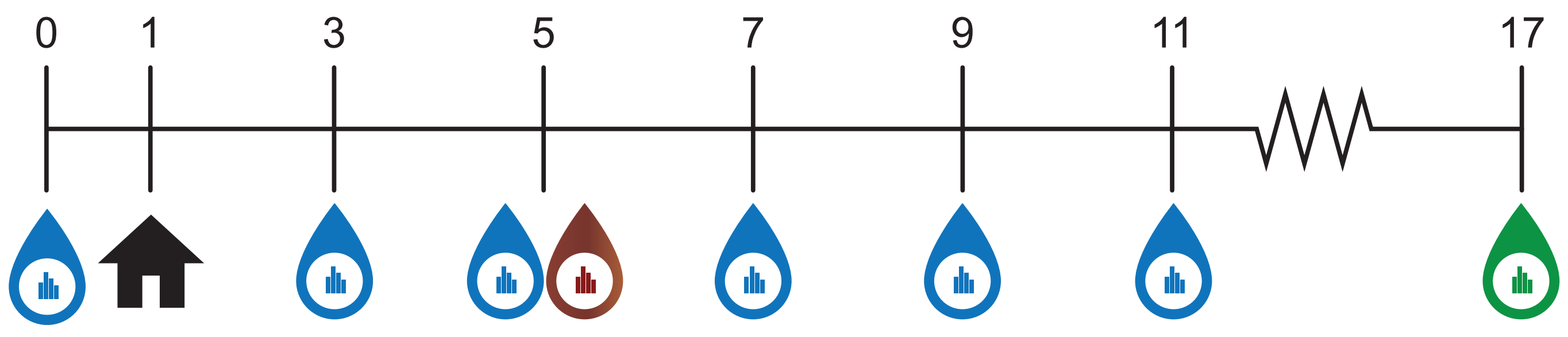


An influenza virus in which seven of the eight genes are of human origin, raises concerns to which impact the virus may impose on human health.

In this study, we assessed the zoonotic potential of this novel triple-reassortant H3N2 virus circulating in Danish pigs, using a well-established ferret model.

Methods

Days post inocculation (dpi)



Six ferrets were inoculated intranasally with 1ml (3,6x10^4 PFU/ml) A/swine/Denmark/15164/2014 (H3hu05N2sw).

Three inocculated ferrets were move into separate cages each containing one naïve ferret (direct transmission). These cages was placed adjacent to three cages containing an additional ferret (aerosol transmission).

Clinical signs: Weight and temperature
Virus detection: Nasal washes

Virus detection: Tissues from inocculated ferrets

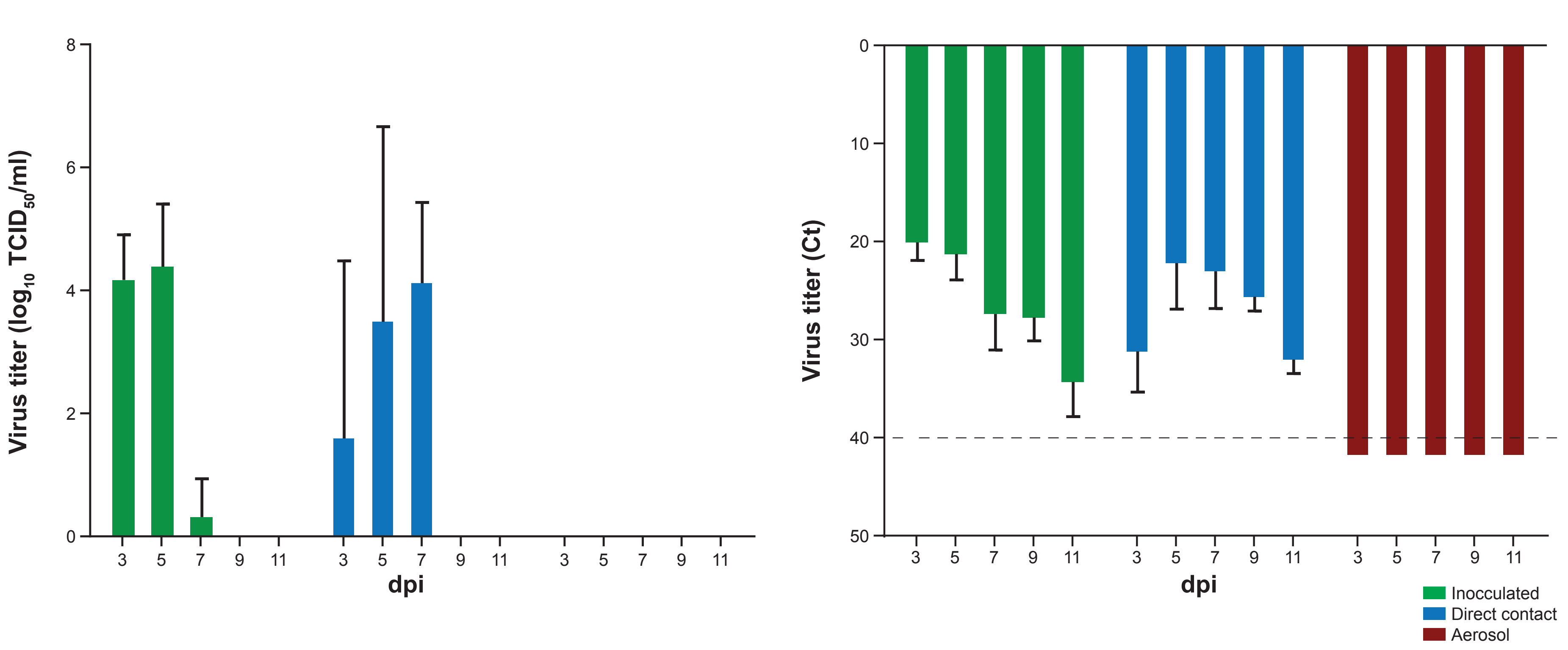
Serum collection

Virus was detected by real time RT-PCR targeting the M gene and by a hemagglutination assay (HA) using turkey red blood cells.
Serum conversion of nine ferrets were tested with a hemagglutionation inhibition assay.

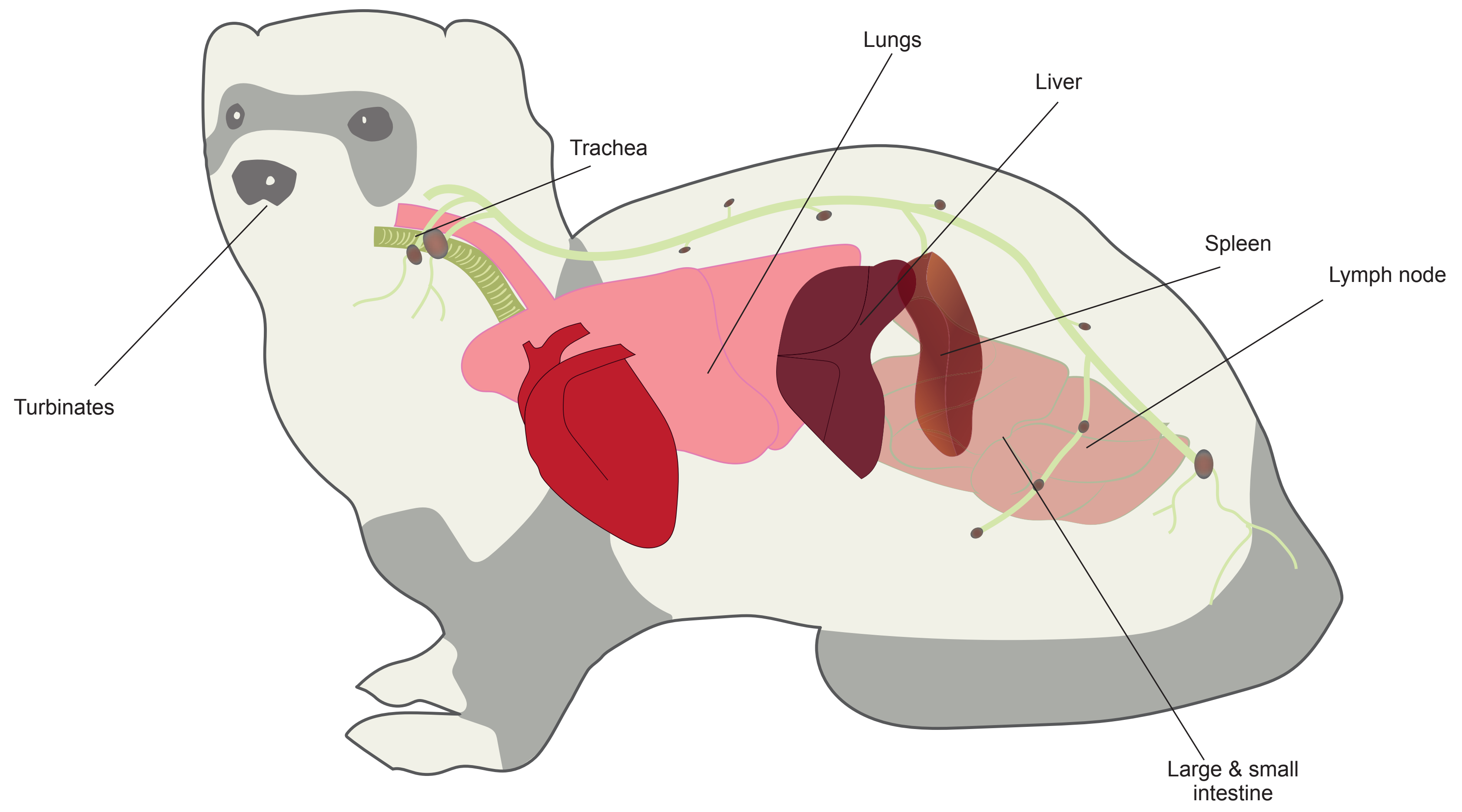
Results

No significant changes in body temperature or difference in weight gain between groups was detected during the experiment.

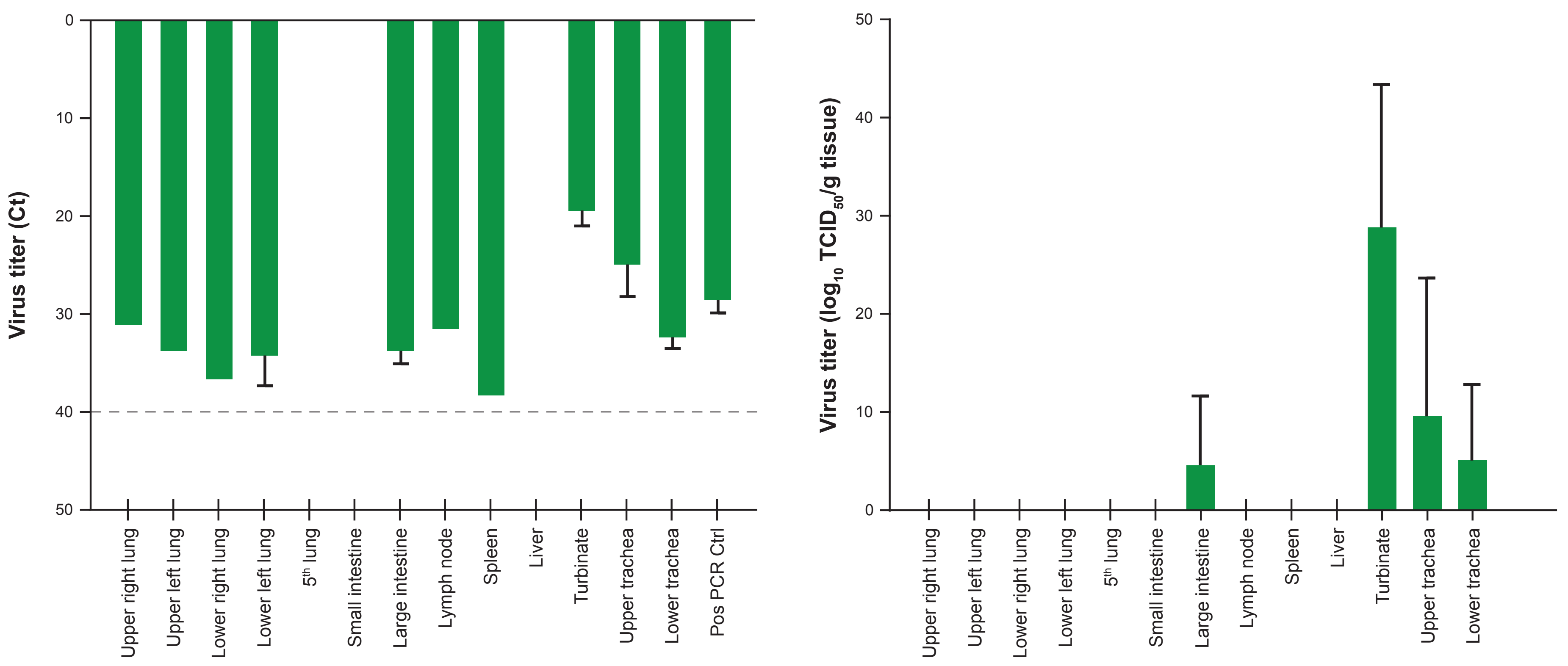
Nasal Wash titers



Virus was detected in both inoculated ferrets and ferrets with direct contact to these. No virus was detected, at any point, in ferrets with restricted access to the inocculated ferrets neither by real-time RT-PCR nor by HA test. Nasal washes from inocculated and contact ferrets were virus positive by HA test until 7 dpi and until 11 dpi by real-time RT-PCR. Contact ferrets showed a characteristic delayed virus peak compared to inocculated ferrets, in accodance with known transmission patterns.



Tissue titers



10 of 13 tissues were virus positive by real-time RT-PCR. It was possible to determine virus titer by HA test in only four of the collected tissues, with the nasal turbinates showing the highest viral titer.

All inocculated and contact ferrets sero-converted 17 dpi opposed to the ferrets with aerosol contact, which remain antibody negative.

Conclusion

The H3hu05N2sw influenza virus was found capable of infecting ferrets. The virus was transmitted to ferrets in direct contact with inoculated ferrets, but no aerosol transmission of the virus was observed. Despite a genetic arrangement with seven of eight genes of human origin, the results do not indicate that the H3hu05N2sw influenza virus pose pandemic potential in humans.

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DTU Vet
National Veterinary Institute

Contact infomation
Malene Rask Andersen
malra@vet.dtu.dk