Infection of differentiated porcine airway epithelial cells by influenza viruses; comparison of porcine and avian strains

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Introduction

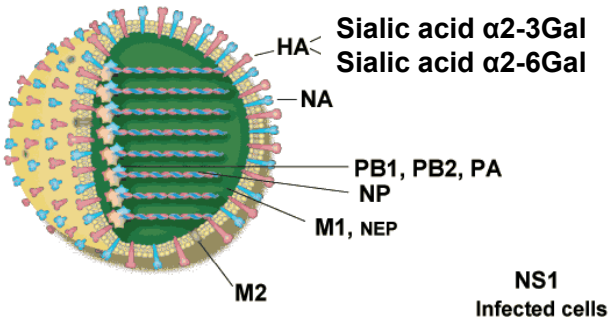
Influenza virus Classification

Family: *Orthomyxoviridae*

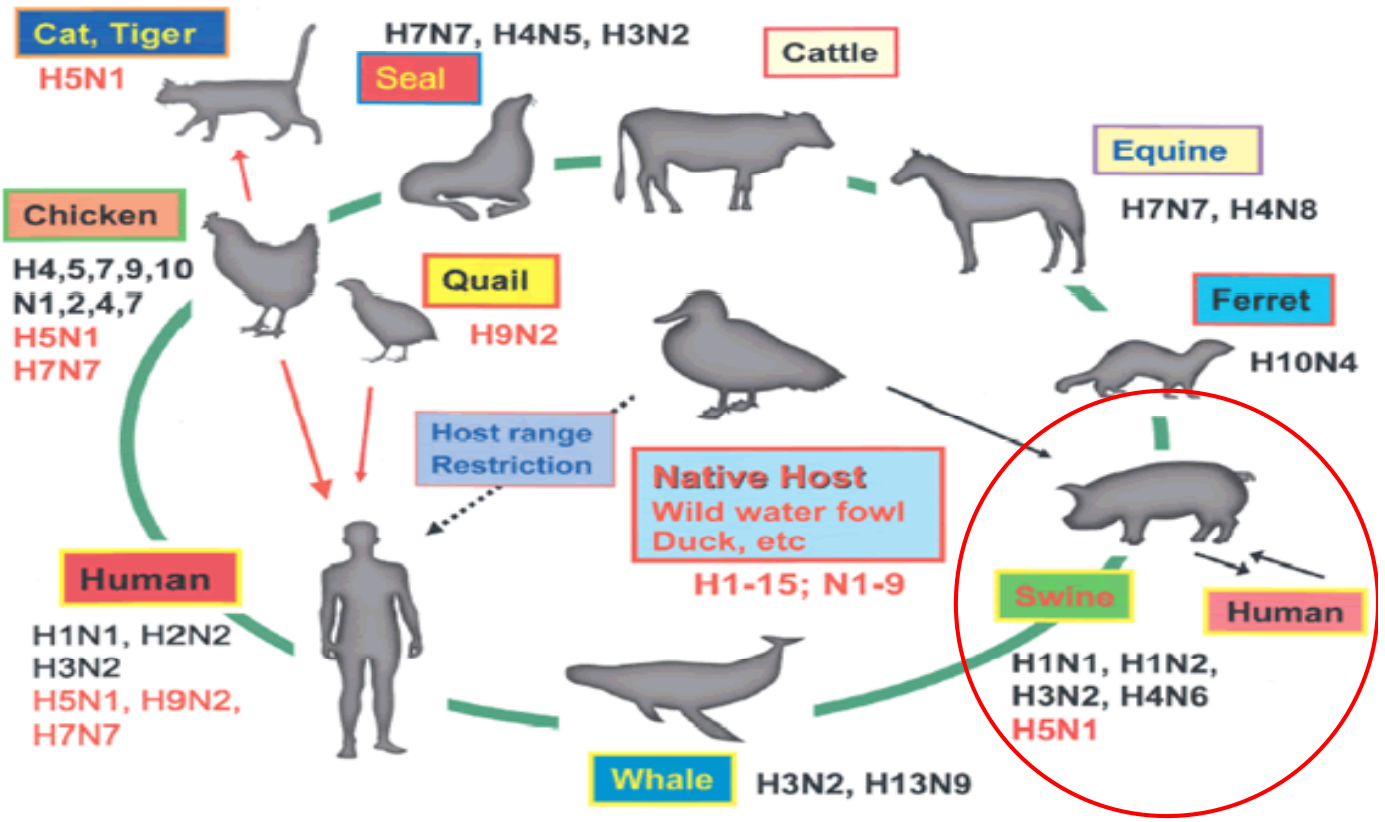
Genus: *Influenzavirus A*; *Influenza virus B*; *Influenza virus C*; *Thogoto virus*; *Isavirus*

Species: *Influenza-A-Virus*

- Surface proteins
  - Haemagglutinin (H1-H16)
  - Neuraminidase (N1-N9)



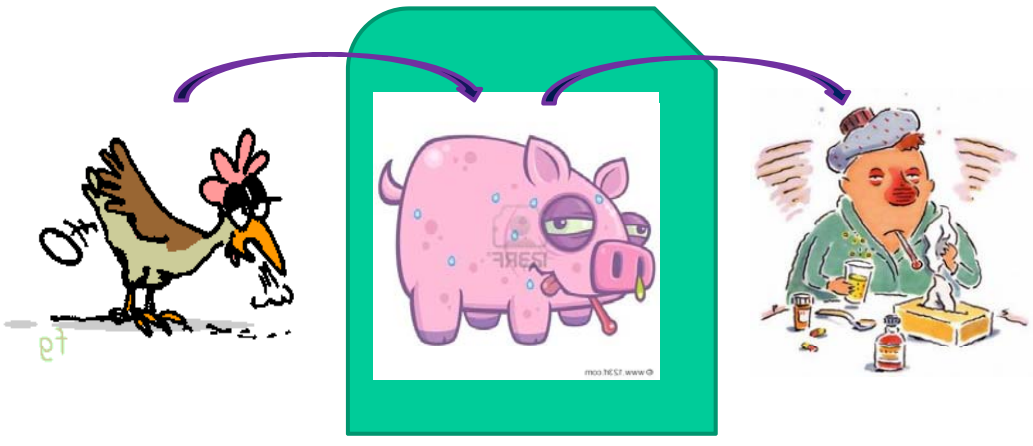
Summary of the ecology of influenza viruses



Source:http://www.medicalecology.org/diseases/influenza/print_influenza.htm

Project title

Adaptation of influenza viruses to the respiratory epithelium of new hosts

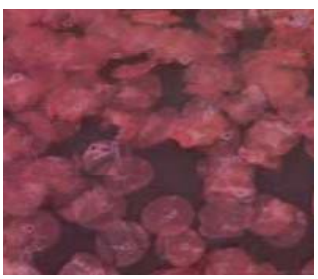


Aim of study

Comparative analysis of the infection
of differentiated porcine respiratory epithelial cells
by swine influenza virus (H3N2 strain) and
avian influenza viruses (H7N7 and H9N2 strains)

Preparation

Precision cut lung slice



Lungs of 3 months old pigs

↓

The cranial lobe, middle lobe,
and intermediate lobe were filled
with warm low-melting agarose

↓

After solidification on ice,
250 µm thick slices were prepared
using the Krumdieck tissue slicer

SOURCE:http://www.alspi.com/slicer.htm

RESULTS

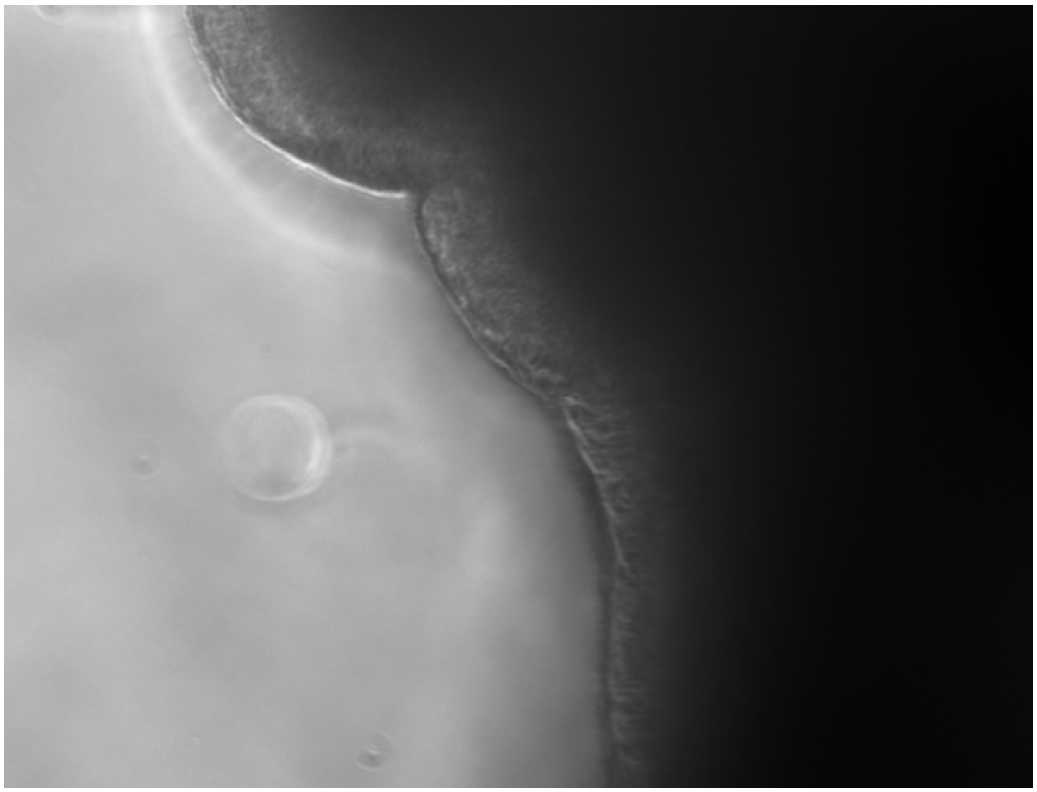
- Chracterization of PCLS
- Infection of PCLS by porcine and avian influenza viruses

Characterization of PCLS

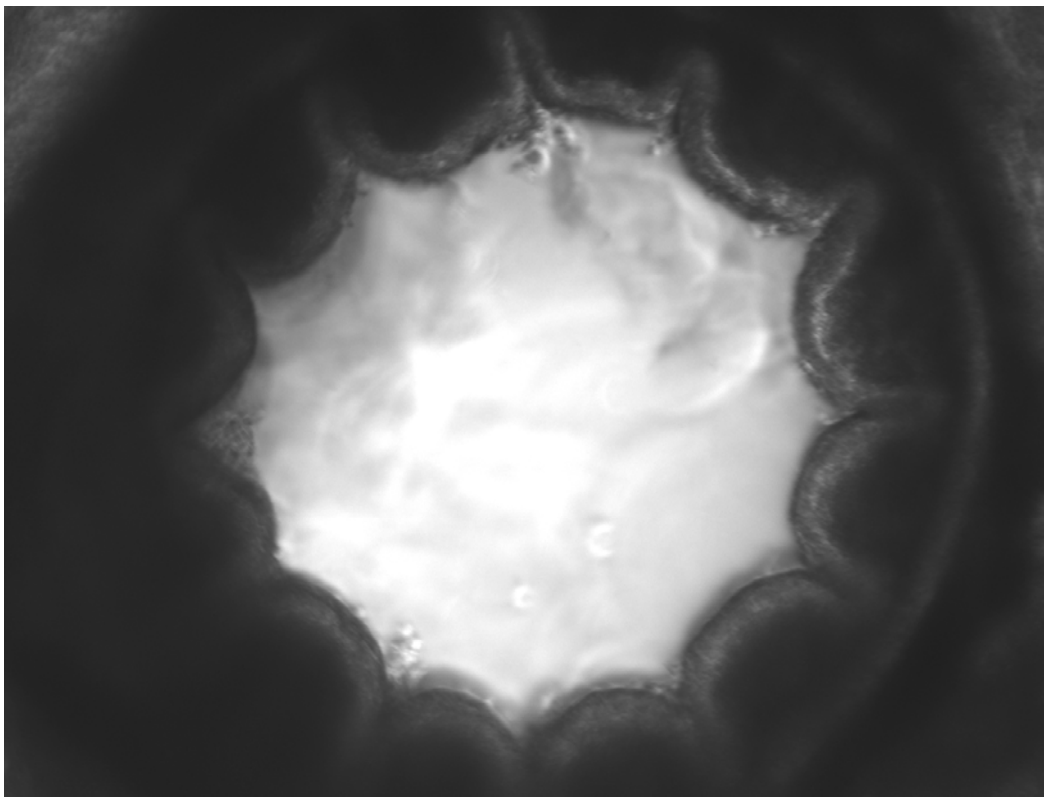
- Ciliary activity
- Bronchoconstriction
- Live/dead staining

- Histological characterisation of PCLS

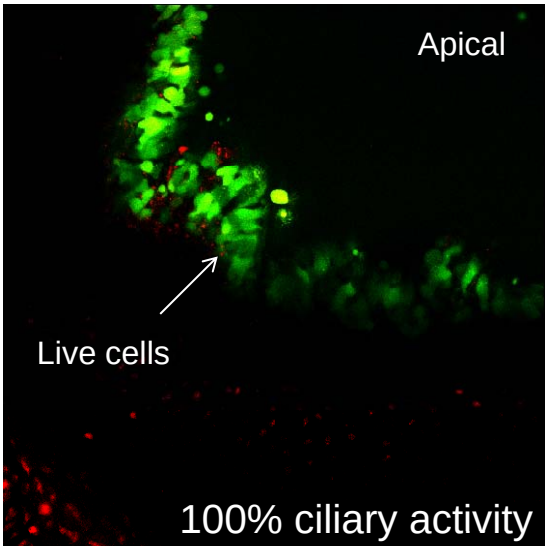
Ciliary activity

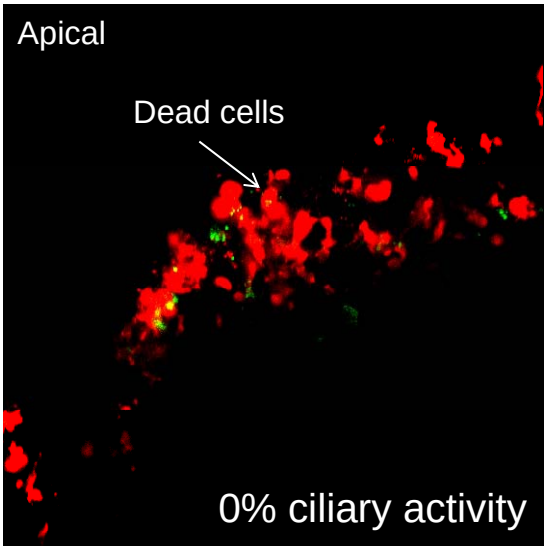


Bronchoconstriction

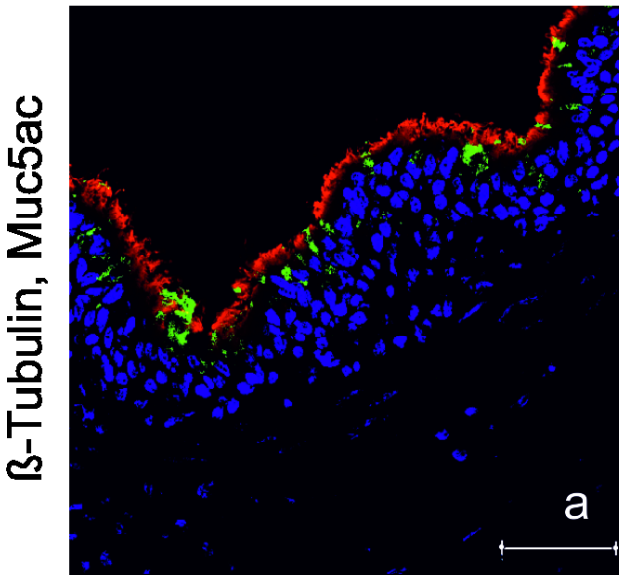


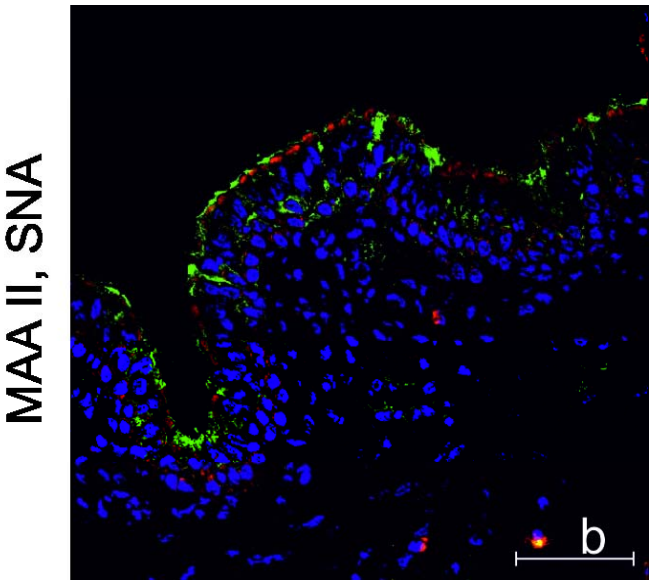
Live/dead staining





Histological characterisation of PCLS





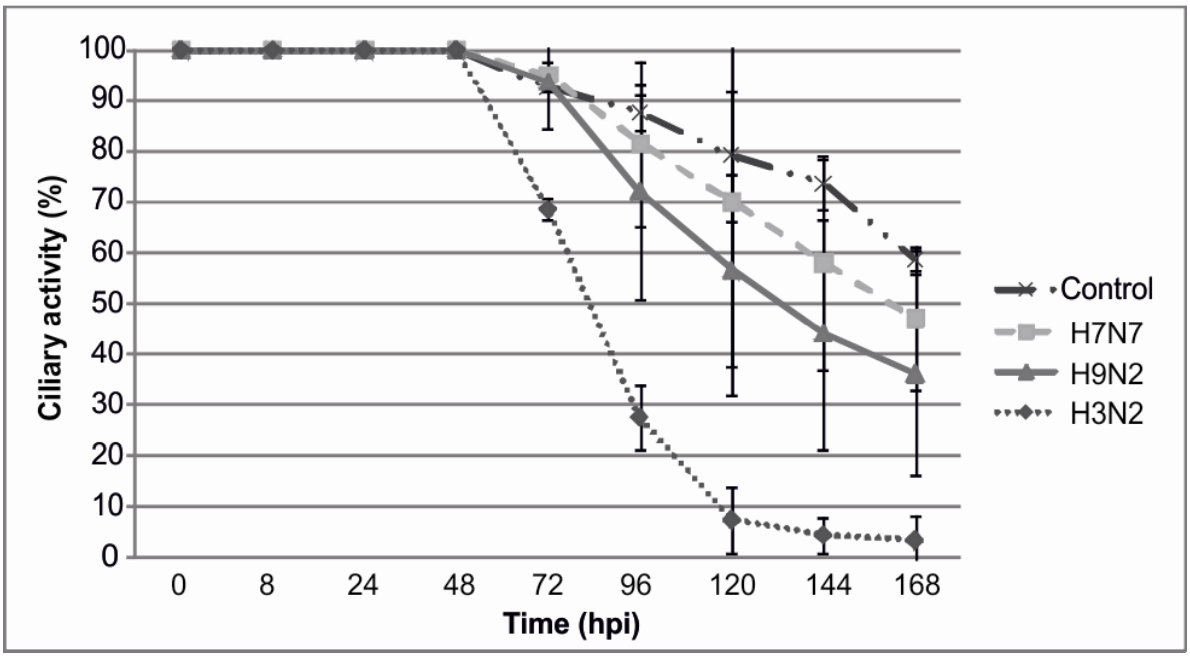
Ciliated epithelial cells
Mucus producing cells

α2,3-linked sialic acids
α2,6-linked sialic acids

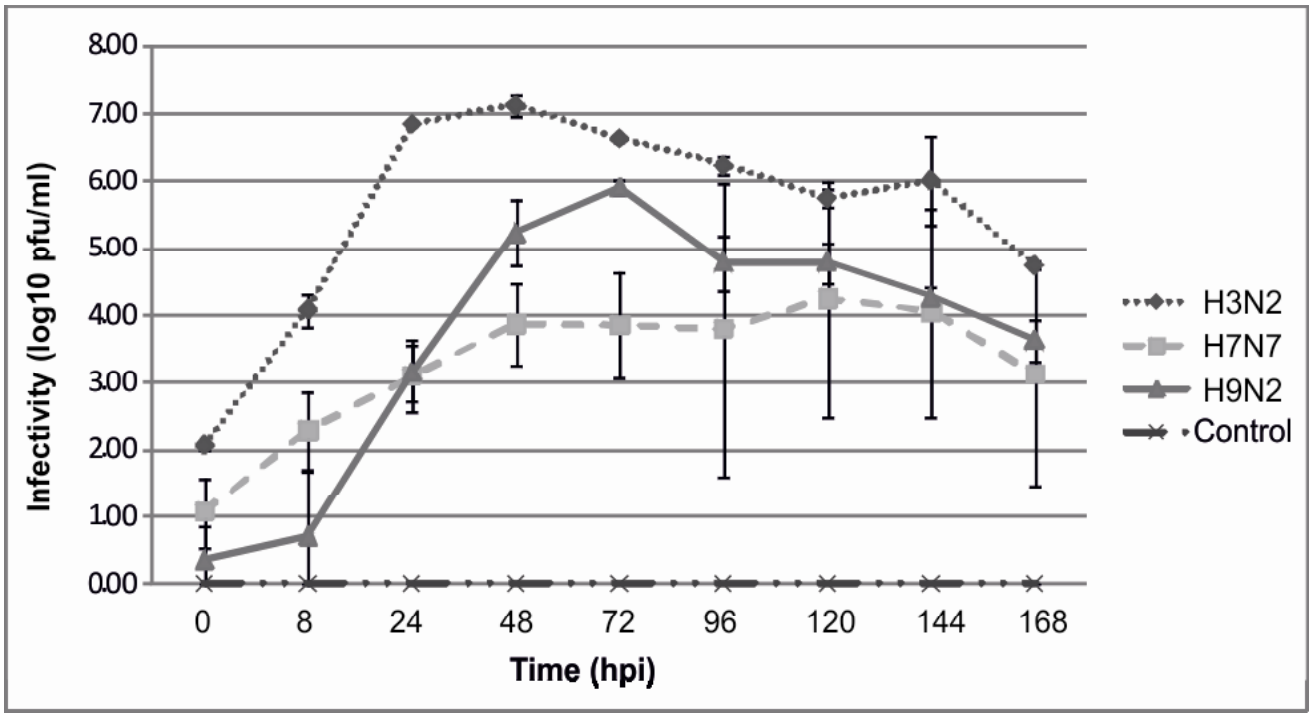
Infection of PCLS by porcine and avian influenza viruses

- Swine influenza virus H3N2
- Avian influenza virus H7N7
- Avian influenza virus H9N2

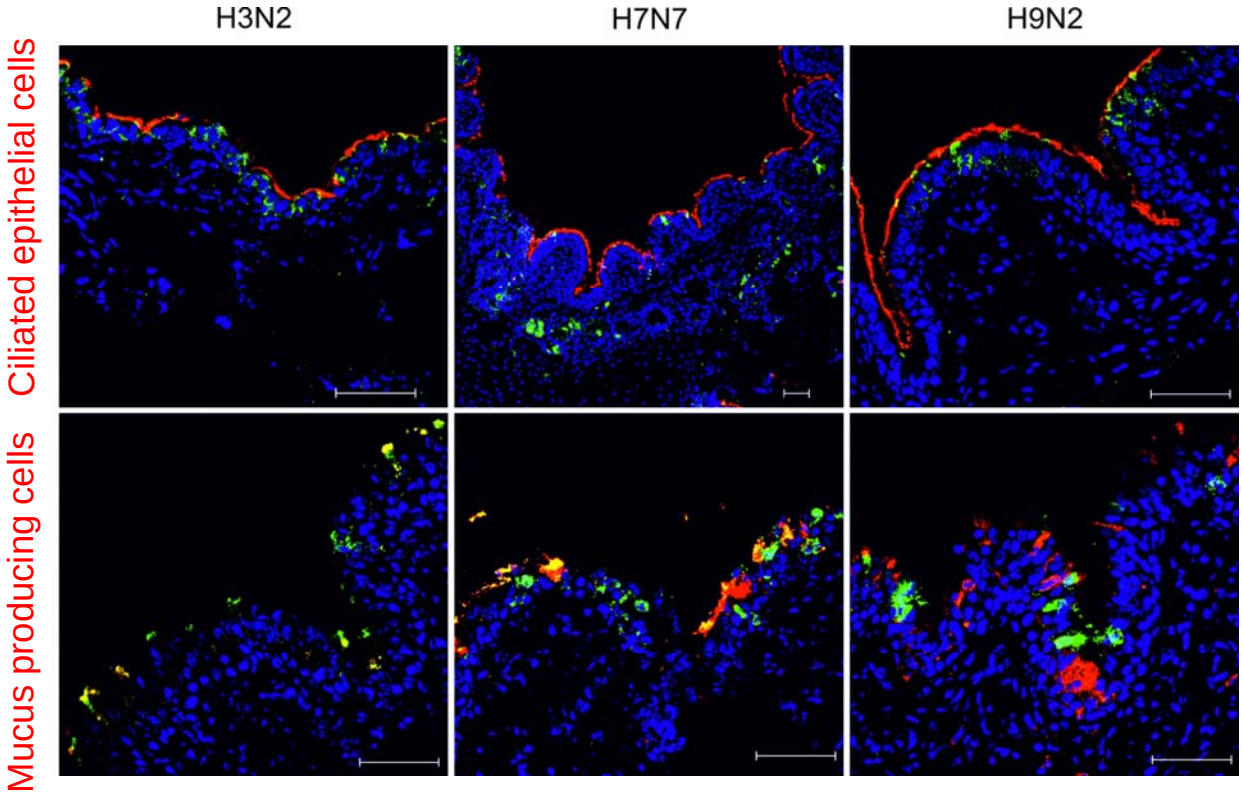
The ciliary activity of swine PCLS



Release of infectious virus from PCLS



Detection of infected epithelial cells



Summary

1. Establishment of porcine PCLS as a culture system for infection studies
2. Both swine influenza virus (H3N2 strain) and avian influenza viruses (H7N7, H9N2 strains) can infect the bronchial epithelium in swine PCLS.
3. Infection of PCLS by swine and avian influenza virus shows differences in
   - Ciliostatic effect H3N2 > H9N2, H7N7
   - Virus release H3N2 > H9N2 > H7N7
   - Type of infected cells (Ciliated cells, mucus producing cells and submucosa)

Outlook

Future attempts are directed to analyse of the adaptation process of avian influenza viruses to the porcine respiratory epithelium:

- Analysing whether there are changes during adaptation in the following parameters:
  - Ciliostatic effect
  - Virus released
  - Type of infected cells
- What mutations are responsible for these changes

Thanks to

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Thank you for your attention!

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Ciliary activity