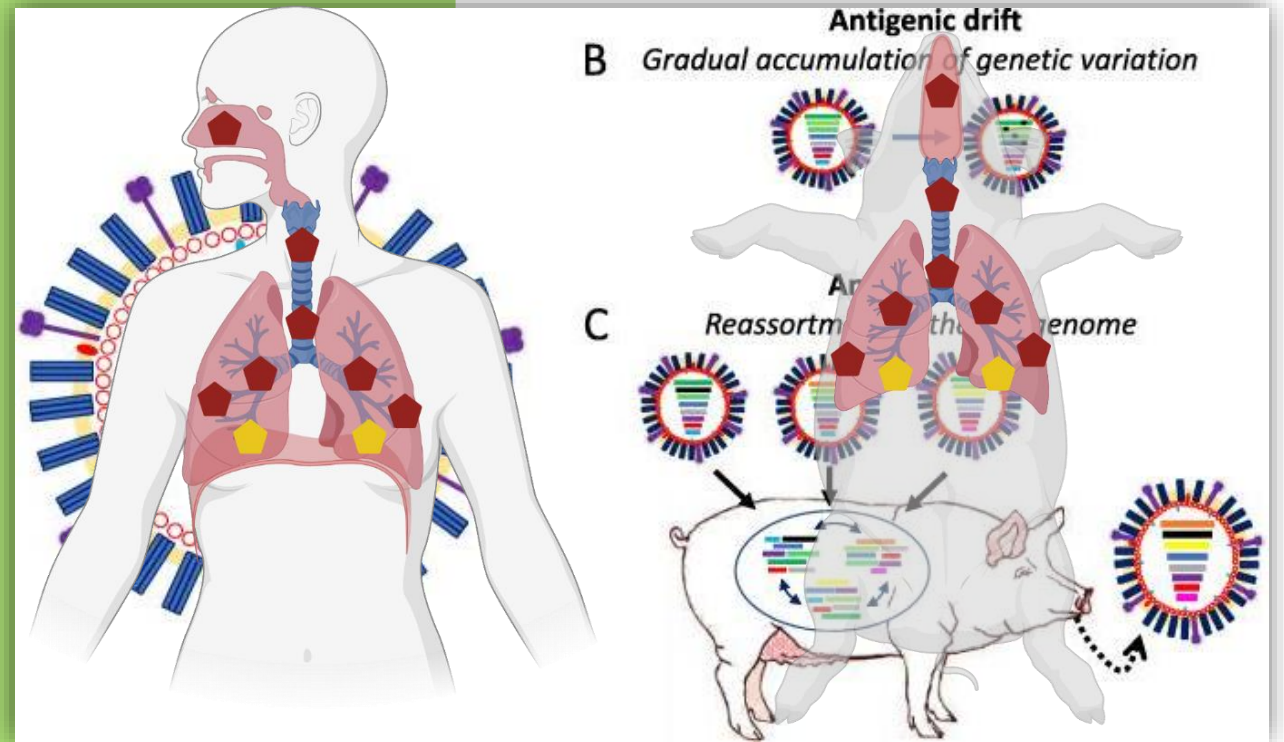


# Comparative Pathology of Pigs Infected with Different Variants of Pandemic (H1N1pdm09) Influenza A Viruses

Charlotte Kristensen  
CPH pig seminar 2022

# What is Influenza A Virus?

- Segmented negative single stranded RNA virus
- Continuing evolving pathogen
- “Mixing vessels”



Created in Biorender



# Why is IAV important?

- Fever, depression, anorexia, sneezing, abdominal breathing and increased respiratory rate
- Economic losses
- Cause for 290.000-650.000 human deaths per. Year worldwide
- Increasing evidence of human-to-swine transmissions
- DK: >30 million pigs per year → potential hotspot for new Influenza A viruses



# FluZooMark

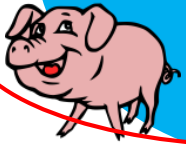
Ongoing PhD study  
-Preliminary results

**KU**

- Sequencing pig samples

- Swine experimental studies

- Pathology



**SSI**

- Sequencing

**DTU:**

- Host factors

- Innate immune response

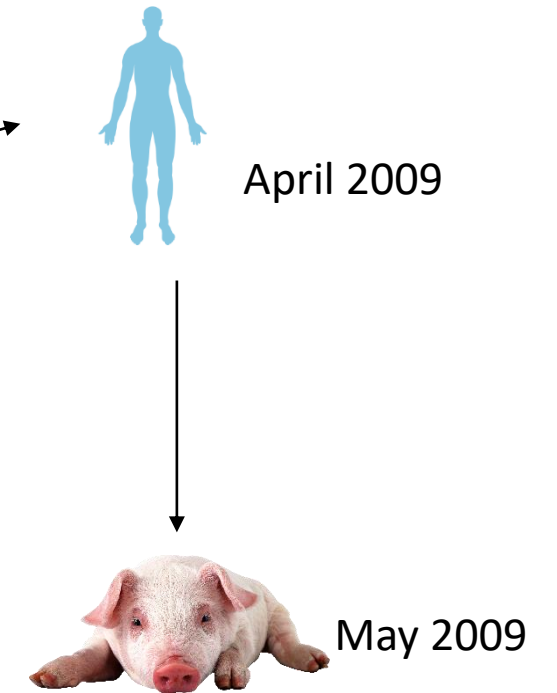
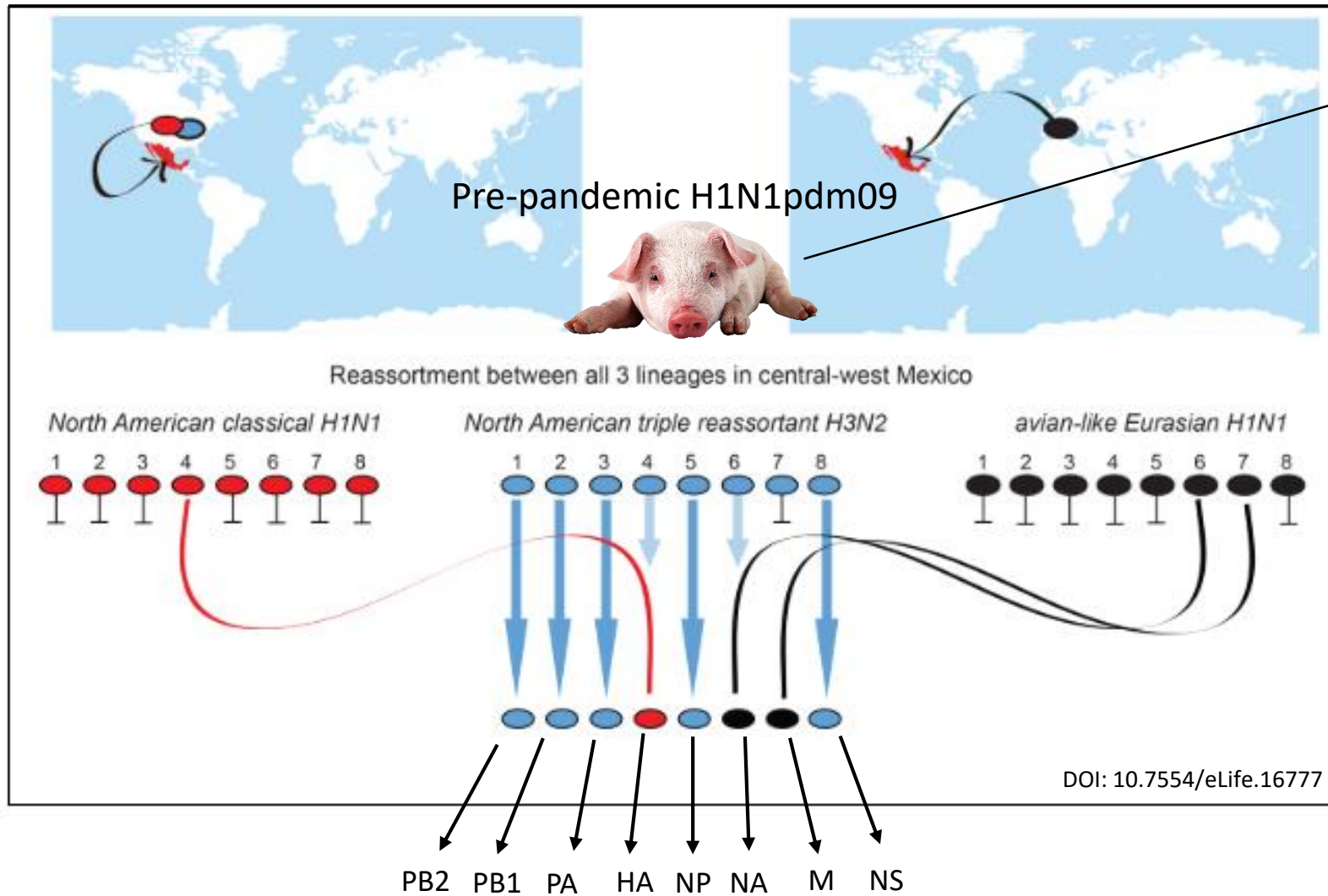
**St. Judes Children Research hospital**

- Ferret experimental studies

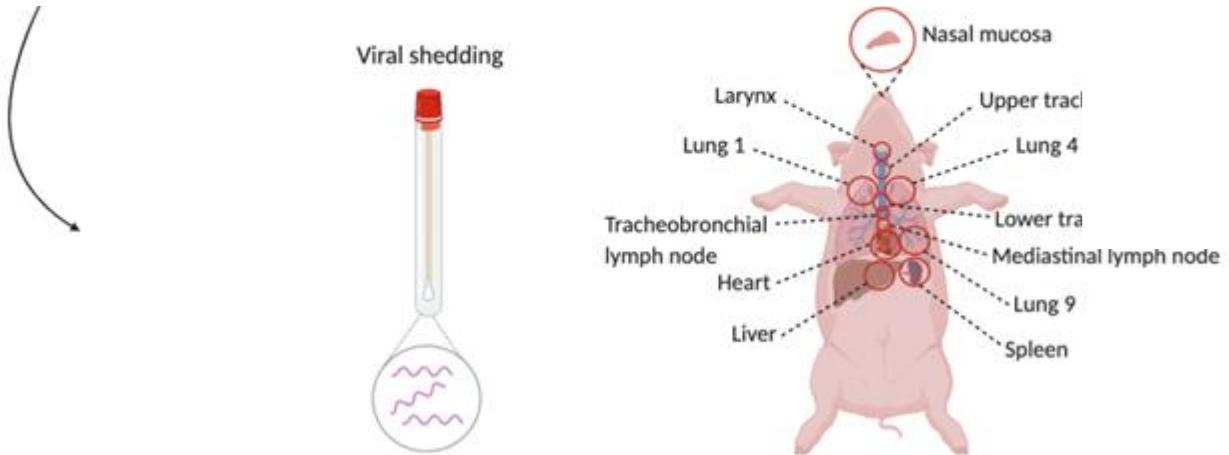
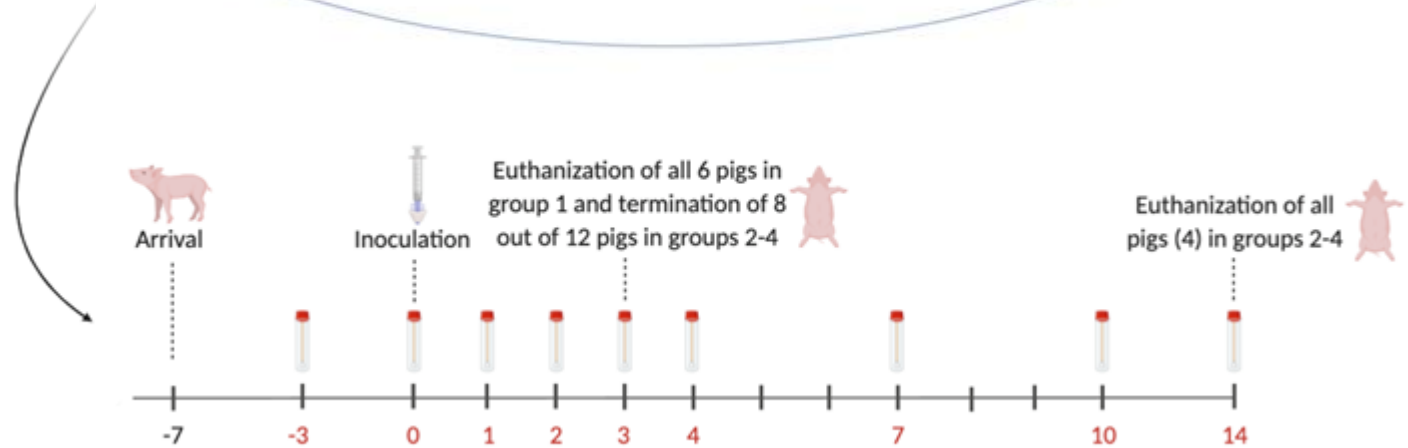
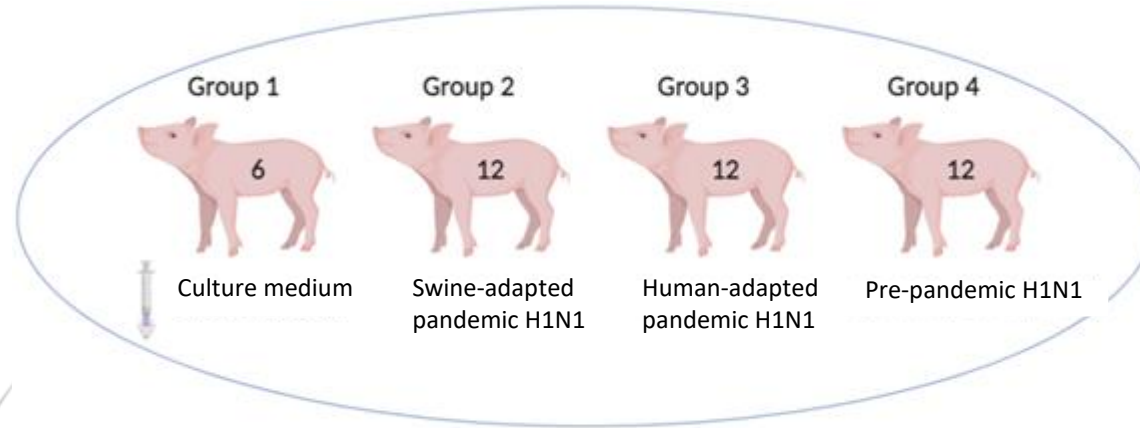




# H1N1 pandemic 2009 (H1N1pdm09)



# Study design

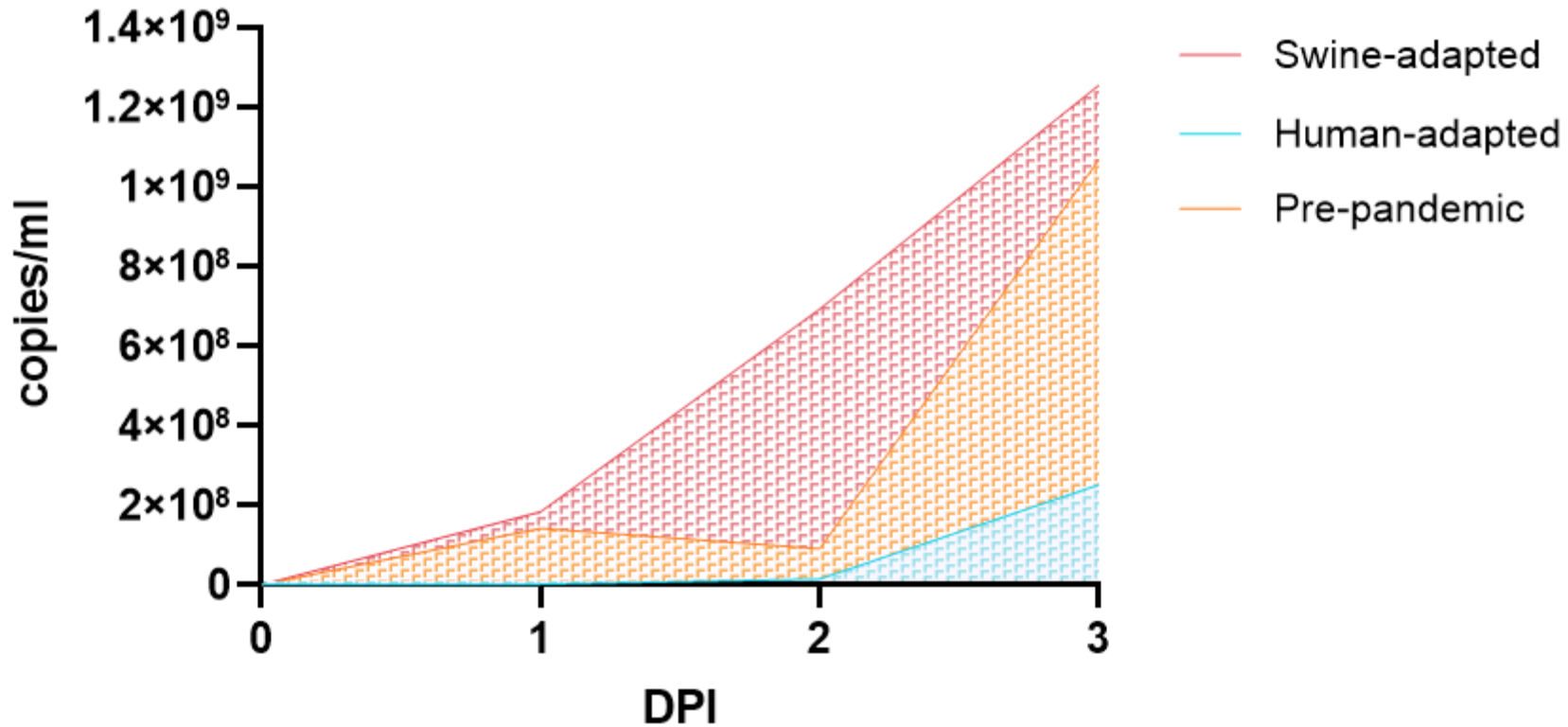


Made by: Helena Aagaard Glud in Biorender.



# Total viral load 1-3 DPI

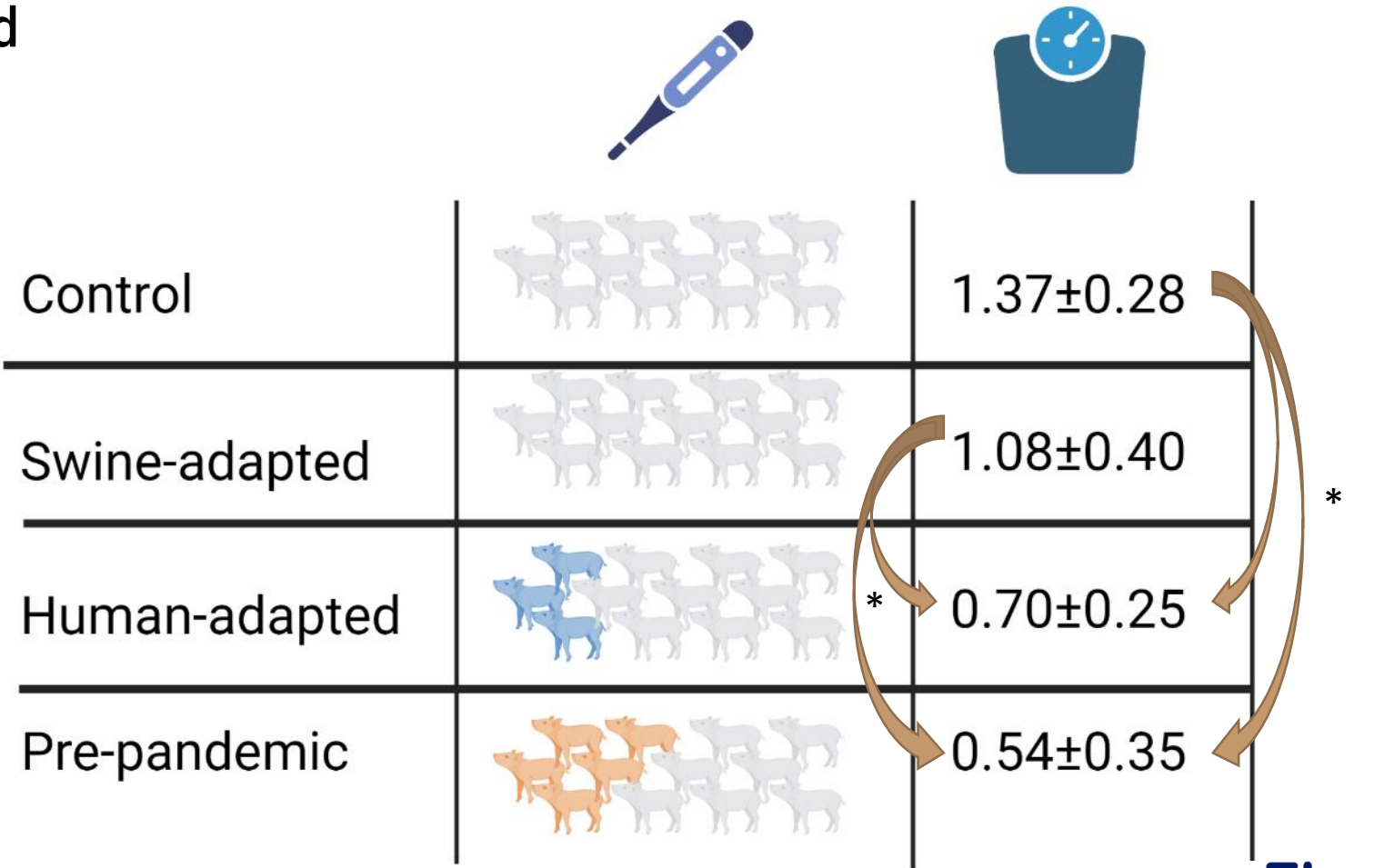
Swine-adapted > Pre-pandemic > Human-adapted



Results from Karen Martiny

# Clinical signs

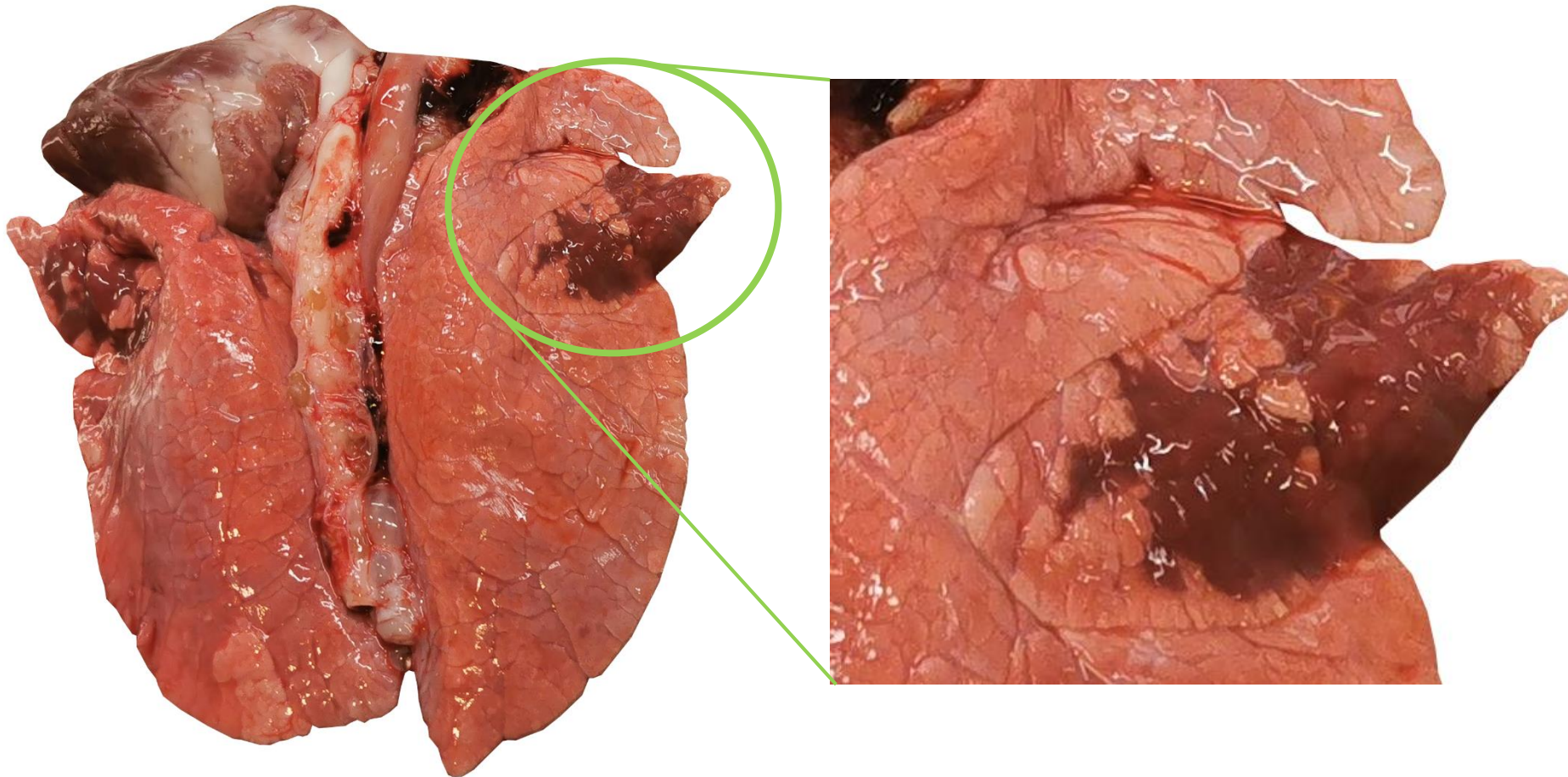
- Few clinical signs observed



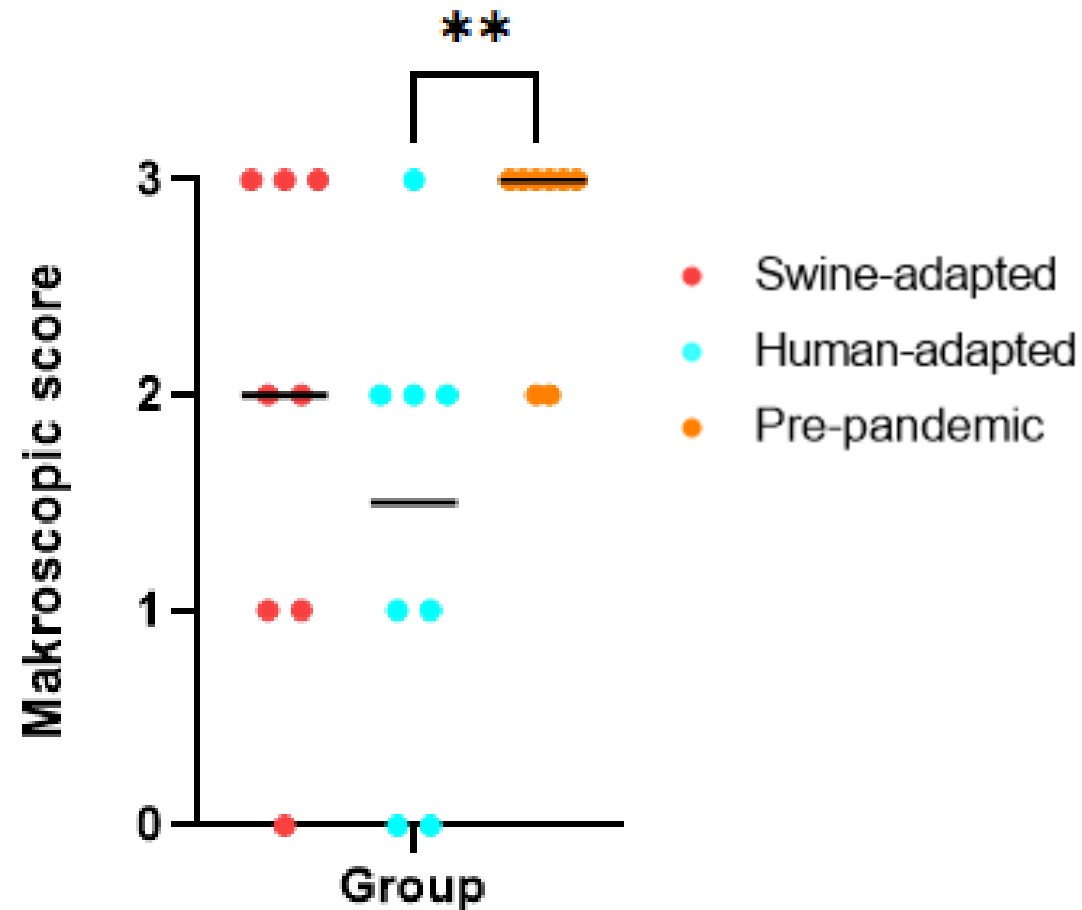


# Lesions 3 DPI

- Red, lobular to confluent areas with atelectasis

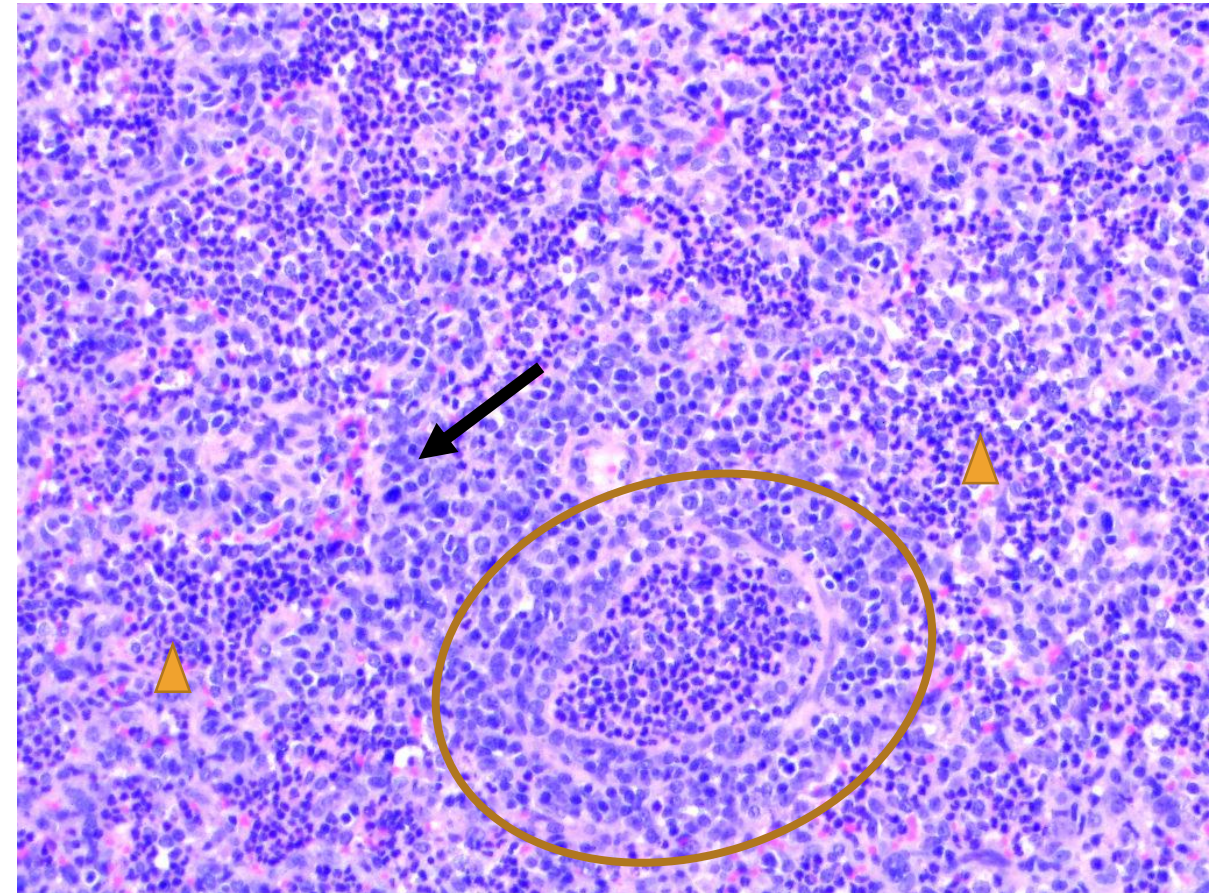
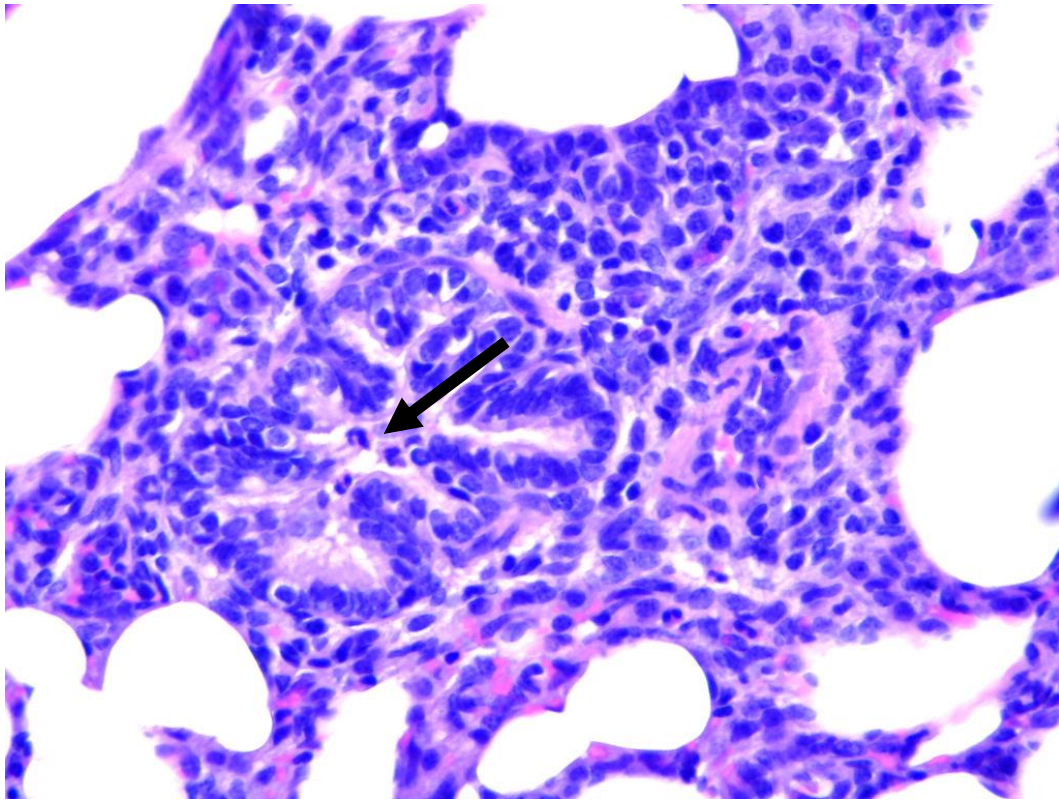


# Significant more severe lung lesions in pre-pandemic compared to human-adapted

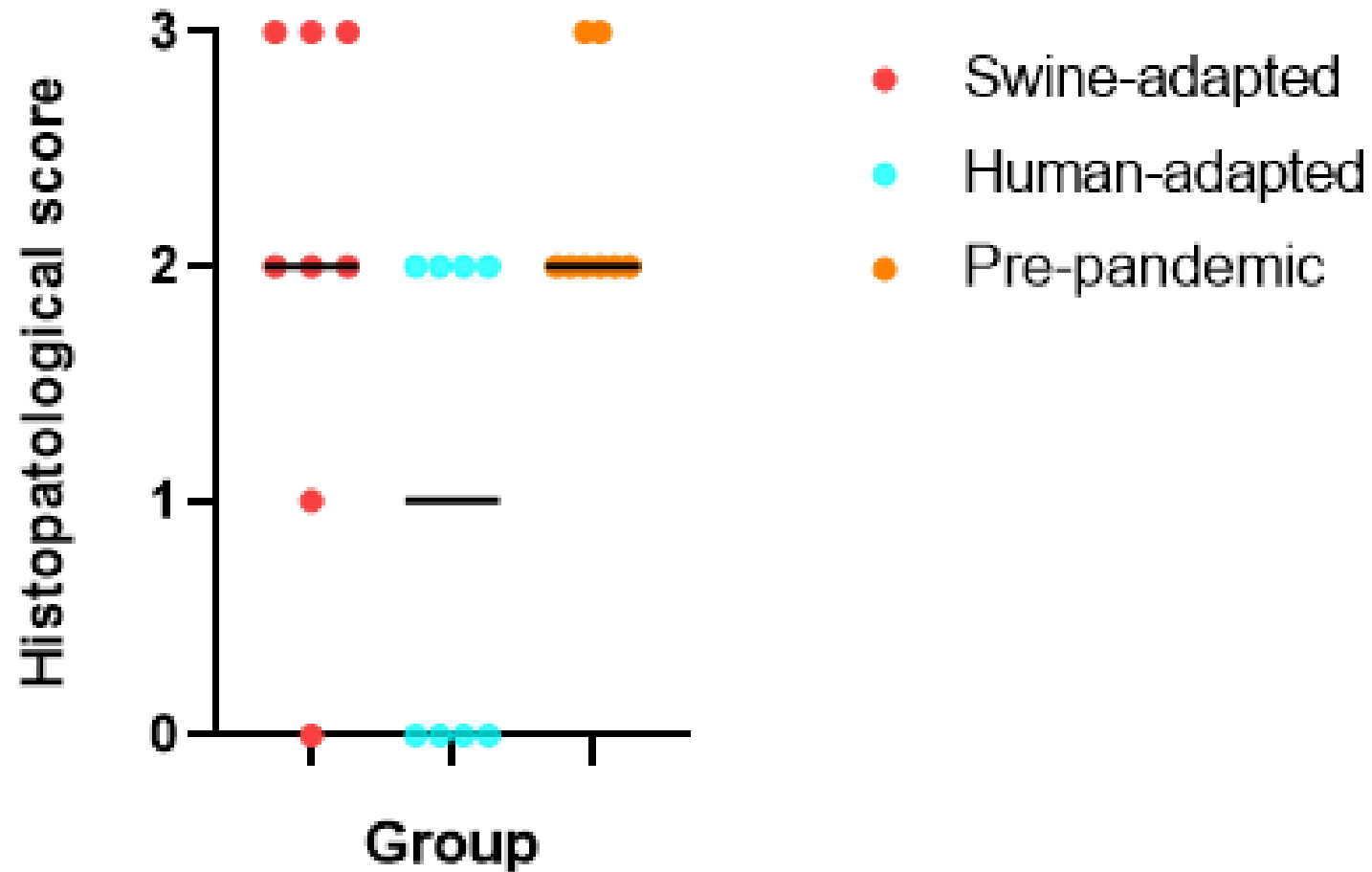




# Mild bronchiolitis to suppurative bronchointerstitial pneumonia



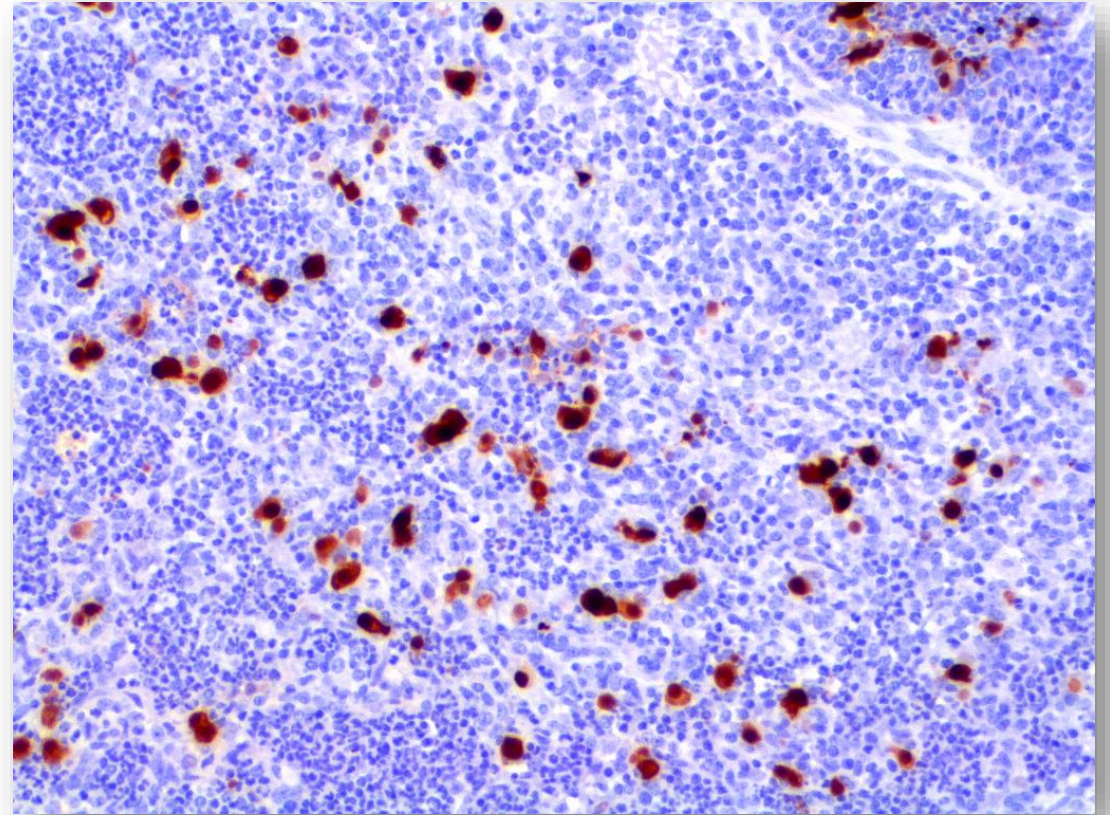
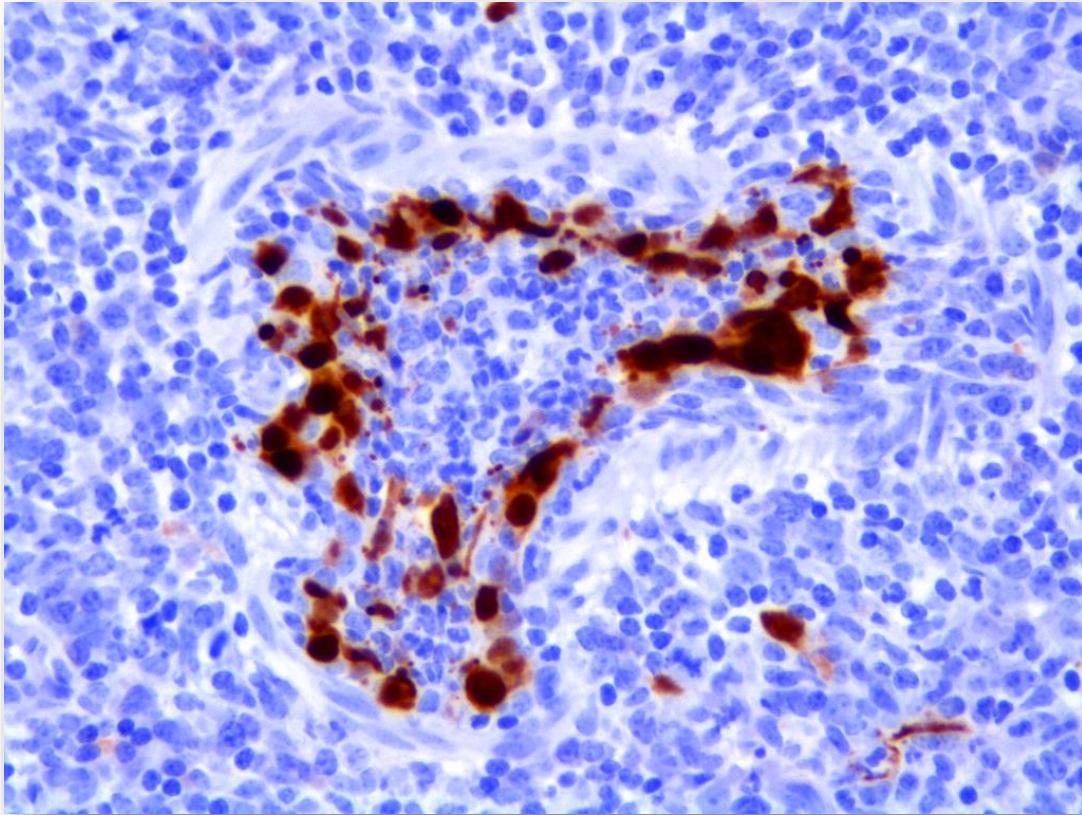
# Histopathological grading



Weighted kappa score: 0.87



# Influenza A **virus** immunohistochemistry



# Summarise

Viral load:

**Swine-adapted** > **Pre-pandemic** > **Human-adapted**

Clinical signs:

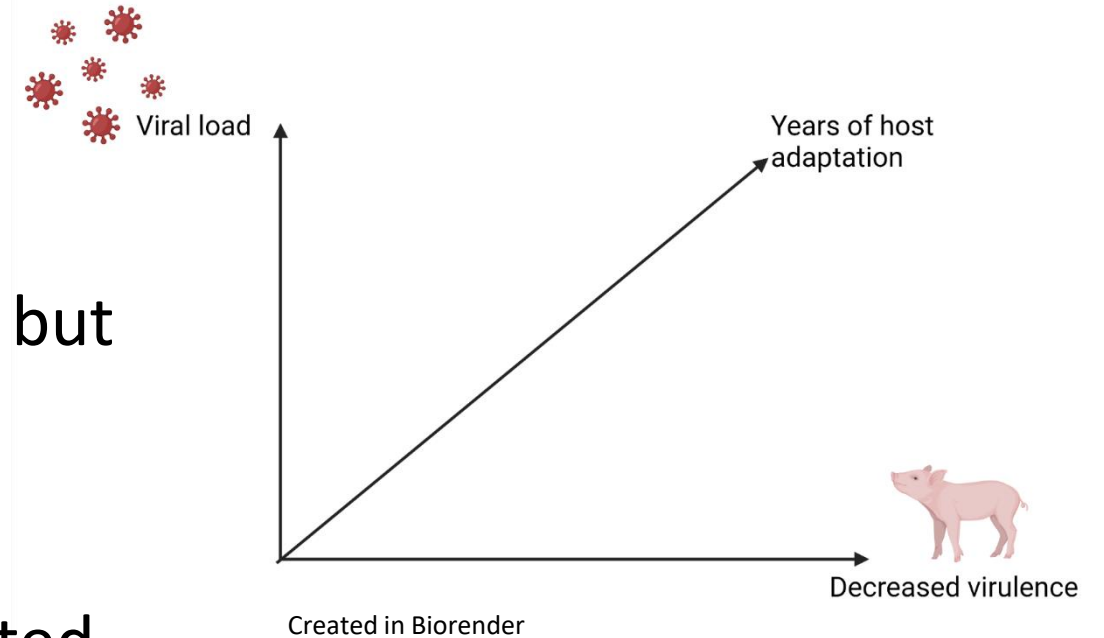
**Pre-pandemic** > **Human-adapted** > **Swine-adapted**

Pathology:

**Pre-pandemic** > **Swine-adapted** > **Human-adapted**

# Discussion

- Host adaptation
- Swine-adapted: increased viral fitness but reduced virulence
  - Amat et al, 2021
  - Covid-19: Delta vs. Omicron
- Both swine-adapted and human-adapted variants in Danish pig herds
  - Clinical presentations
  - 93% identical
    - Cross reactivity?
    - Sequencing?



# Thank you for listening!

## ACKNOWLEDGEMENTS

- Lars E. Larsen
- Henrik E. Jensen
- Ramona Trebbien
- Karen Martiny
- Nicole B. Goecke
- Lise Kvisgaard
- Nina Dam Grønnegaard
- Hue Thi Thanh Tran
- Elisabeth Wairimu Petersen
- Betina Gjedsted Andersen
- Frederik Andersen
- Yuan Liang
- Sophie George
- Pia Ryt-Hansen
- Simon Welner
- Kerstin Skovgaard
- Helena Aagaard Glud
- Kasper Pedersen
- Maja Rosendahl
- The animal caretakers