Impact of swine influenza A virus on porcine reproductive and respiratory syndrome virus infection in alveolar macrophages

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Article

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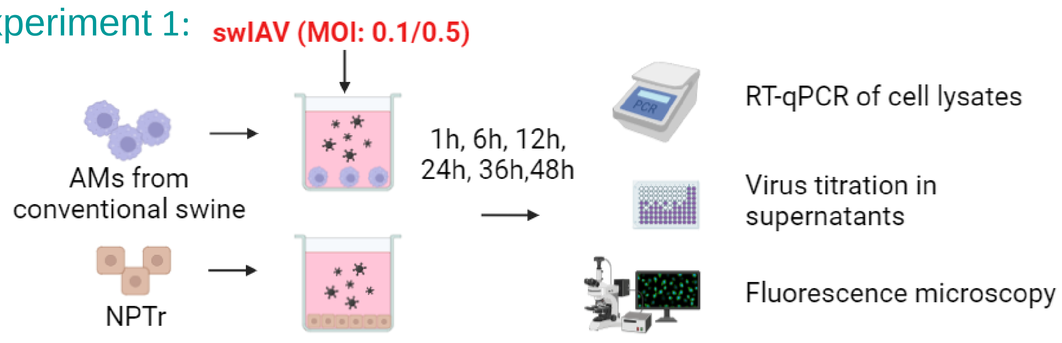
1. INTRODUCTION

Alveolar macrophages (AMs) are important for defending the lungs against respiratory infections, such as influenza. In pigs, the interaction between AMs and **swine influenza A virus (swIAV)** requires further investigation, particularly due to its association with other pathogens within the **porcine respiratory disease complex (PRDC)**. Among these pathogens, **porcine reproductive and respiratory syndrome virus (PRRSV)** infects and depletes AMs, whereas swIAV primarily targets epithelial cells in the respiratory tract.

In this study, we explored the effects of swIAV on AMs, as well as the impact of swIAV/PRRSV co-infection on AMs and within a porcine epithelial cell line/ AMs co-culture system using AMs from swine with different health statuses.

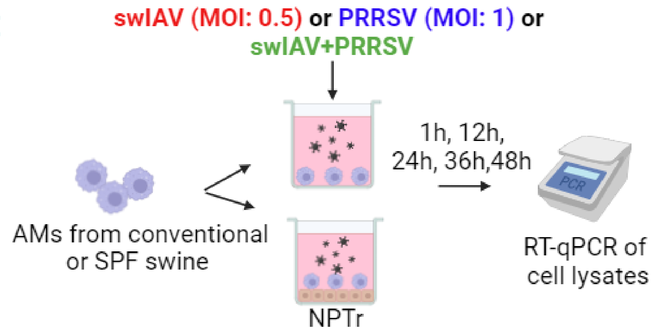
2. METHODS

Experiment 1:



MOI: Multiplicity of infection; NPTr: Newborn pig tracheal epithelial cell line (Ferrari et al., 2003)

Experiment 2:

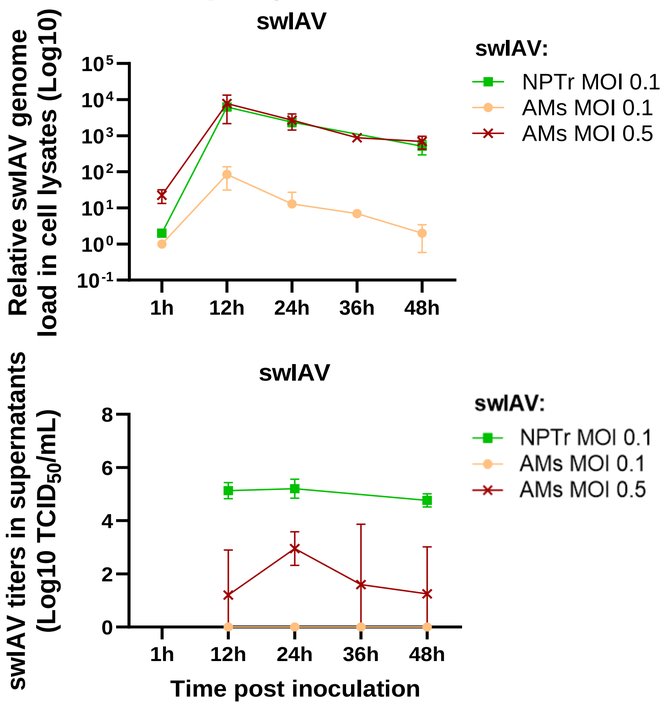


SPF: Specific pathogen-free (free from swIAV, PRRSV, Porcine Circovirus type 2, *Mycoplasma hyopneumoniae,* among others)

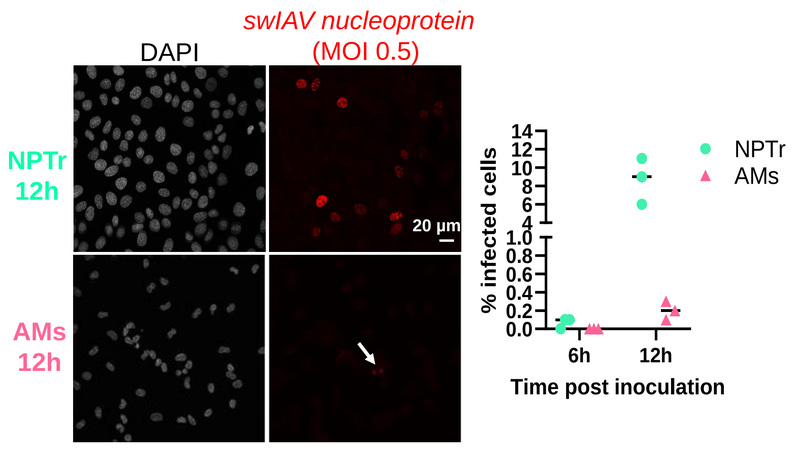
3. RESULTS

Experiment 1:

❖ **Abortive replication of swine IAV in alveolar macrophages**



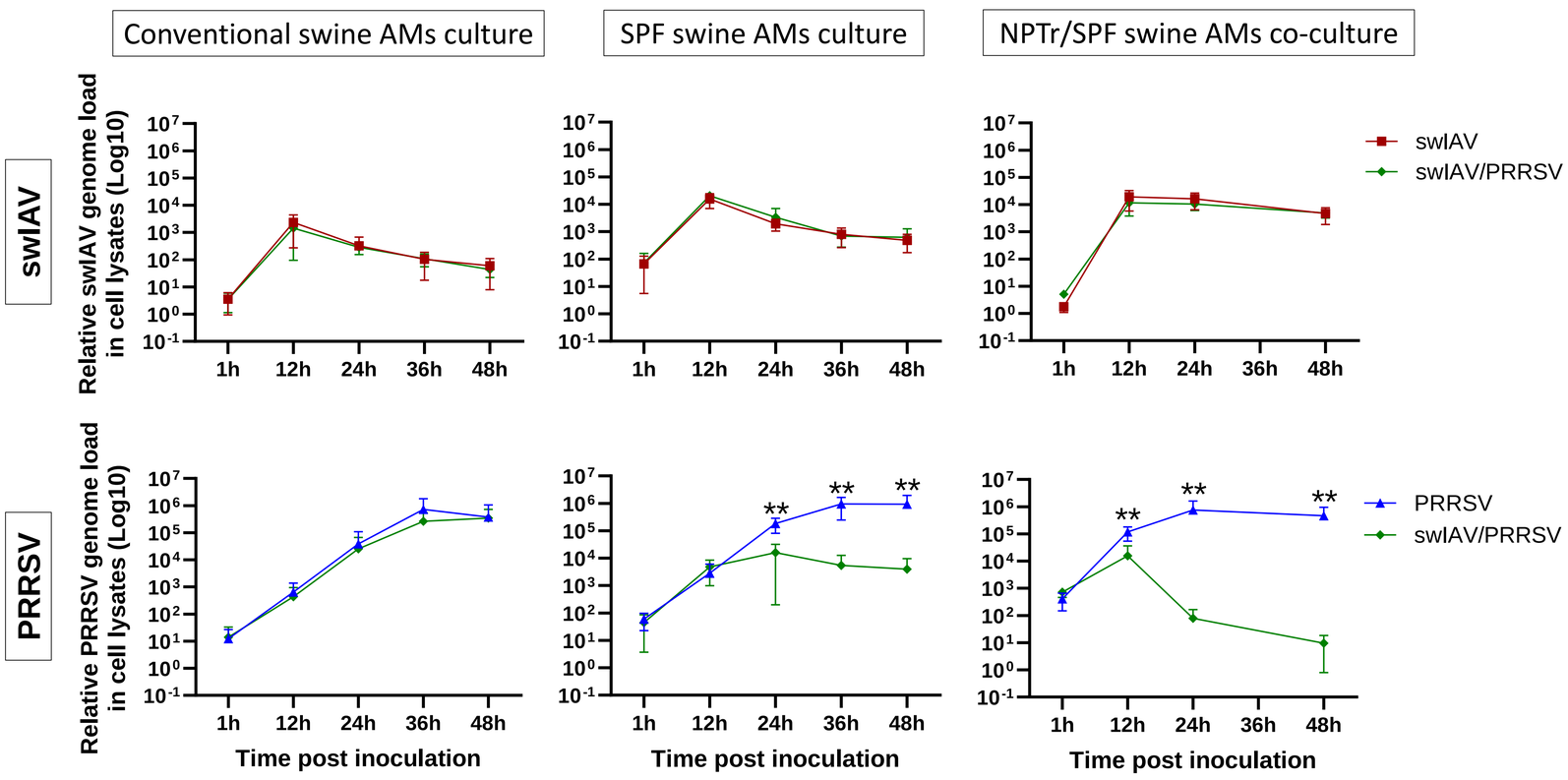
(mean ± SD; *n* = 2)



(mean; *n* = 3, technical replicate).

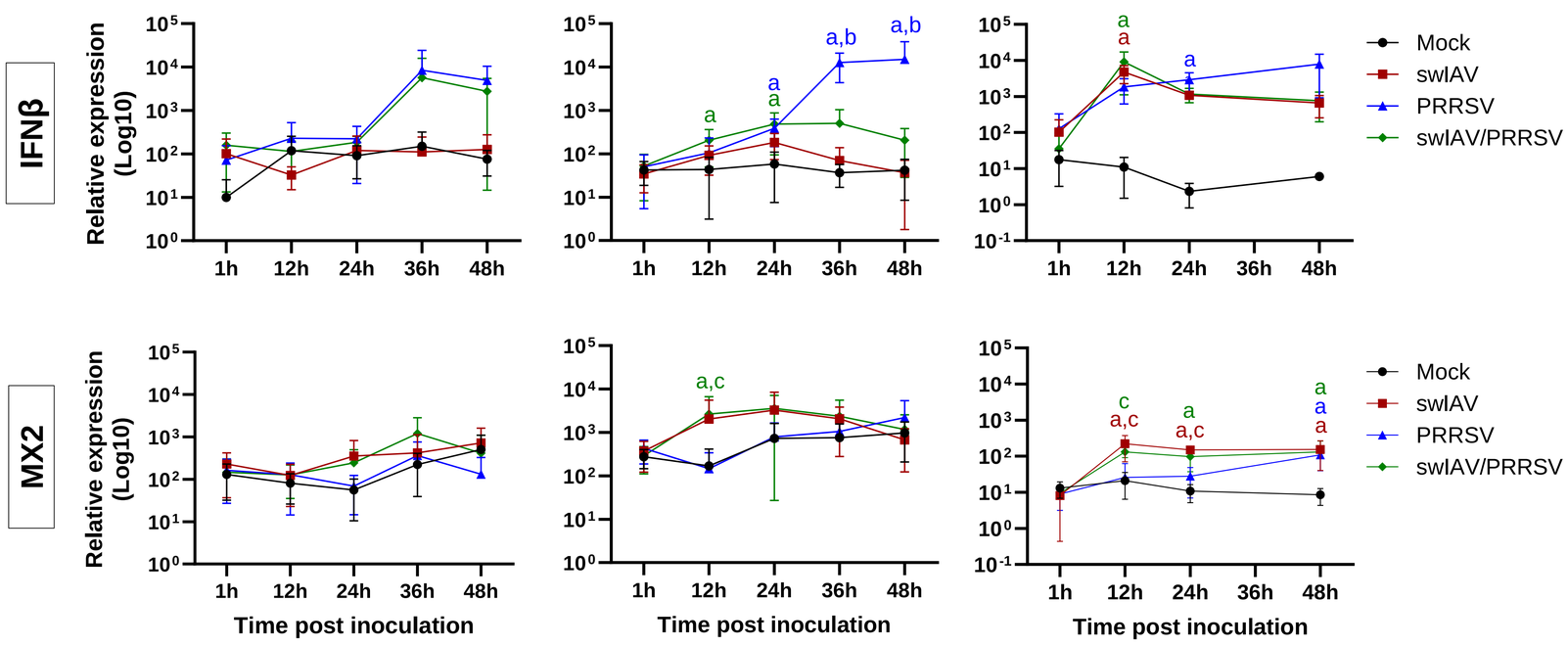
Experiment 2:

❖ **Simultaneous infection with swIAV and PRRSV inhibits PRRSV replication in AMs from SPF pigs but not in those from conventional pigs. In co-cultures, this inhibition is observed in AMs from both SPF and conventional pigs (data not shown).**



Mann-Whitney unpaired, non-parametric test, (*) $p < 0.05$ or (**) $p < 0.01$ (mean ± SD; *n* = 6 for SPF swine AMs; *n* = 4 for conventional swine AMs).

❖ **Early increase in antiviral gene expression coincides with swIAV inhibition of PRRSV replication**



Kruskal-Walis, non-parametric test. Different letters (a–d) indicate that the considered group (specified by its color) was significantly different from the Mock group (a), from the swIAV group (b), from the PRRSV group (c) or from the swIAV/PRRSV group (d) with $p < 0.05$ (mean ± SD; *n* = 6 for SPF swine AMs; *n* = 4 for conventional swine AMs).

4. CONCLUSION

This study showed that, despite limited replication in AMs, swIAV inhibited PRRSV replication in porcine AMs, likely through IFNβ modulation, with variations based on AMs origin. Co-culture with respiratory epithelial cells significantly enhanced swIAV-induced PRRSV inhibition, indicating a synergistic antiviral response. These findings revealed a plausible role of animal sanitary status on swIAV-PRRSV interactions, justifying further research into viral dynamics and respiratory immunity. The long lifespan and susceptibility of AMs to infections call for more studies on long-term effects in the swine respiratory disease complex.

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