VACCINATION EFFECT OF INACTIVATED H9N2 VACCINE ON TRANSMISSION IN CHICKENS

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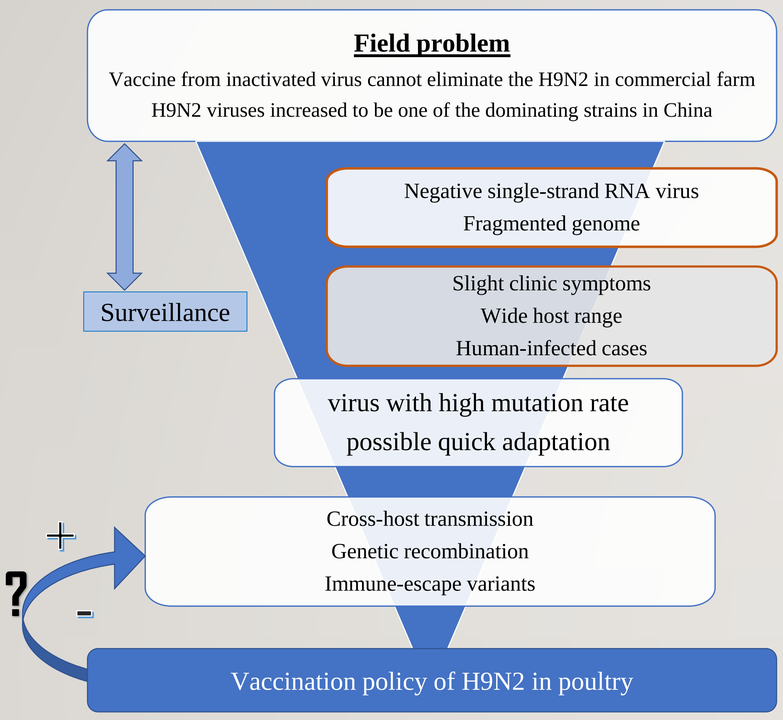
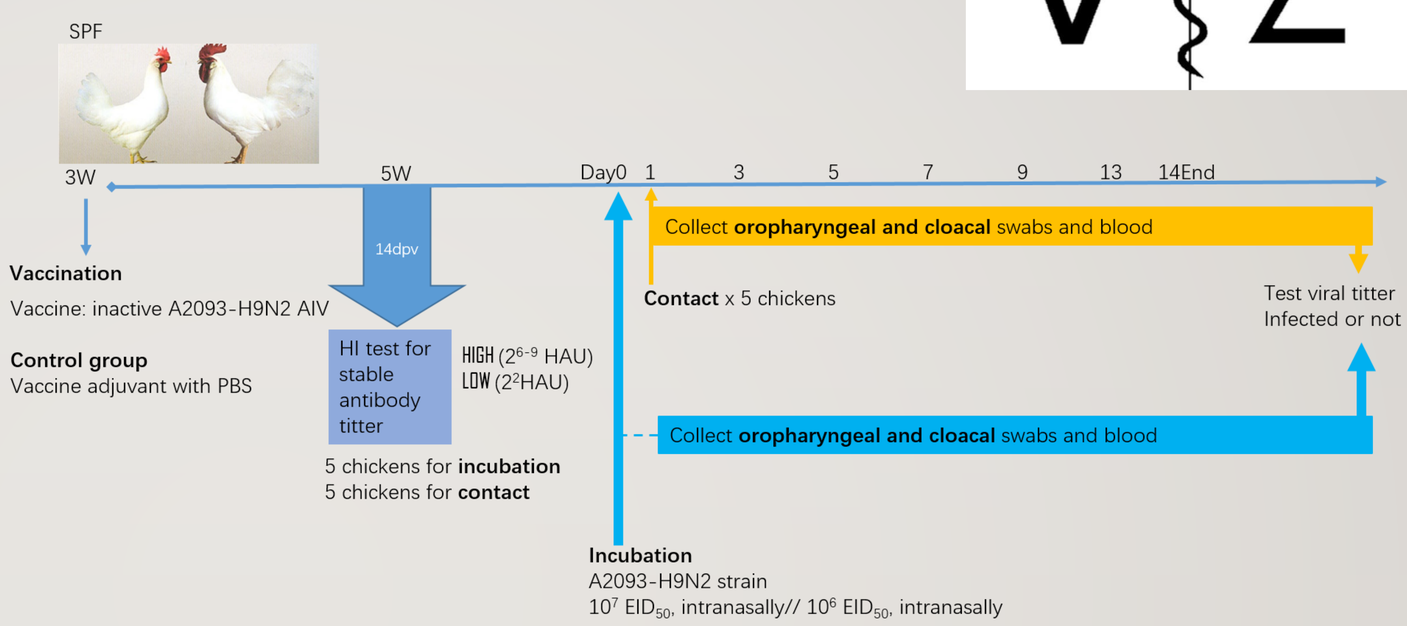
Abstract

- H9N2 subtype avian influenza spread into vast regions of China ever since its first report in Guangdong at the early 90th. It has currently become an endemic problem threating both poultry industry and public health. Different from the HPAIV, which are H5 and H7 subtype viruses, it seems from field data that the widely used H9N2 vaccine cannot provide effective control of the transmission of this subtype virus in poultry. Two main reasons were suspected: an insufficient immune response triggered by the vaccination with inactivated virus; the immune-escape mutants selected by the perennial immune pressure from vaccine. Current research focused on epidemiological dynamics and molecular phylogeny analysed basing on the genomic databases to reveal the rapid evolution drove by improperly used vaccine. However, no study was carried out to proof the effectivity of the vaccine to sufficiently reduce transmission. In our study, we mimic the natural infection and transmission process of the LPAI H9N2 in vaccinated and non-vaccinated groups of poultry. A statistical model was used to estimate the transmission parameters among vaccinated chickens with different serum HI titters and non-vaccinated chickens. Here, it is shown for the first time that the transmission is not sufficiently reduced by inactivated H9N2 vaccine even when the vaccinated chicken have a high-enough IgG titer (HIT>23) in serum. Our study does, therefore, casts a new light on viral transmission and immune-escape. Hence, new mitigation strategies against LPAI viruses are needed.

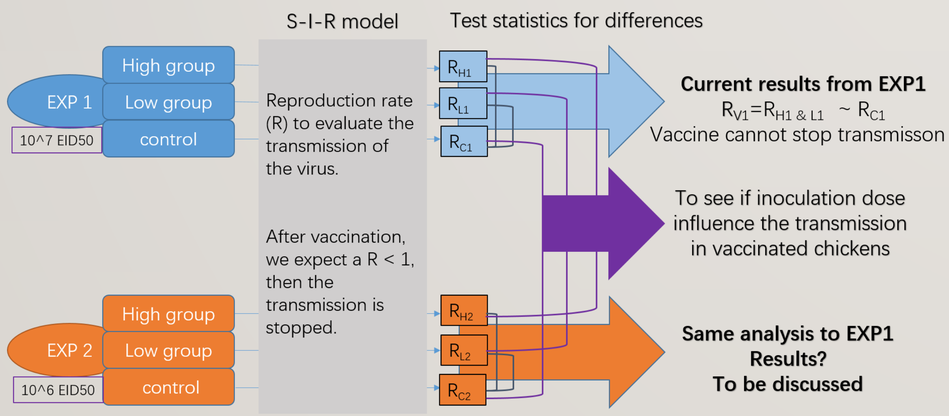
Background



Transmission experiment



Statistical Analysis



Results

Table1. Three Transmission Rate Parameters of Three Groups

	Constant	β	T	R
High HIT Group	-0.2091	0.81135	7.6	6.16622
Low HIT Group	0.00734	1.00737	7.8	7.85745
Control Group	-0.4492	0.63815	6.5	4.14798

Table2. Comparison Analysis between Groups

Comparison	p	Co	Effect	$\beta_{control}$	β_{High}	β_{Low}	$\beta_{(C\&L)}$
Control vs.High Group	0.702	-0.449	0.240	0.638	0.811	*	*
Control vs. Low Group	0.451	-0.449	0.457	0.638	*	1.007	*
Low Group vs. High Group	0.735	-0.209	0.216	*	0.811	1.007	*
High Group vs. (C&L)	0.931	-0.251	0.042	*	0.811	*	0.778

Results

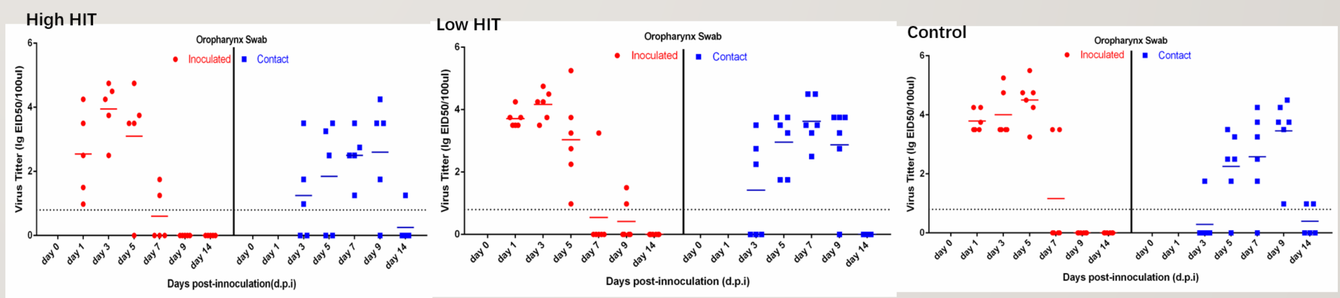


Fig1. Viral titers of oropharynx swabs. * 10^7 EID_{50} virus inoculation

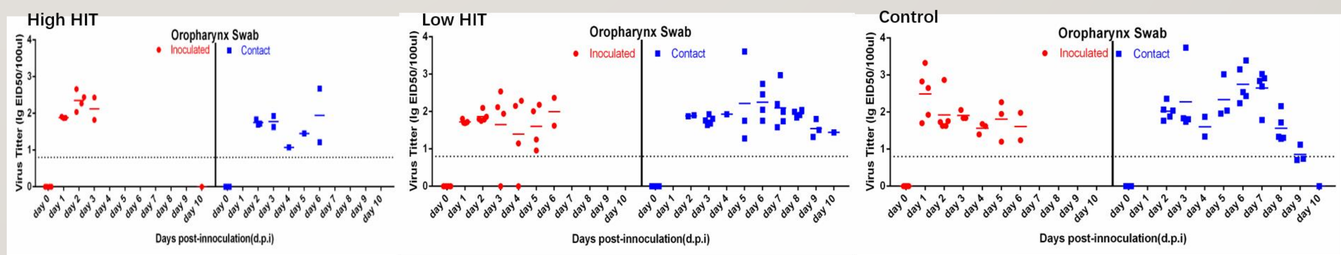


Fig2. Viral titers of oropharynx swabs. * 10^6 EID_{50} virus inoculation

Conclusions

- It is shown for the first time that the transmission is not sufficiently reduced by inactivated H9N2 vaccine even when the vaccinated chicken have a high-enough IgG titer (HIT>2^3) in serum.
- Transmission rate parameters in SIR model were estimated. Then, for control group, the R is 8.6, for high HI titer Group is 6.5 while for low HI titer group is 13.6.
- No significant differences were between Control and High HI titer group (p = 0.464), Control and Low HI titer group (p = 0.701).
- Our study does, therefore, cast a new light on viral transmission and immune-escape. Therefore, new mitigation strategies against LPAI viruses are needed.

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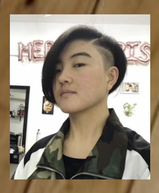

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