

# Adaptation and Transmission of a Wild Duck Avian Influenza Isolate in Chickens

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## BACKGROUND & DESIGN

Experiment	transmission	challenge
animal	twenty-five 67-week-old Leghorn layers	twenty 3-week-old Pekin ducks
Pre-sample	Oropharyngeal & cloacal swabs & serum	Oropharyngeal & cloacal swabs & serum
route	intranasal	intranasal
Dose	ctrl	200 µl PBS
	exp	200 µl, 10 <sup>7.1</sup> TCID <sub>50</sub> per bird
Swabs	Oropharynx & cloaca daily	Oropharynx & cloaca daily
serum	3, 6, 10, 13, 17 and 20 P.I	5, 7, 11, 14, 18 and 21 P.I

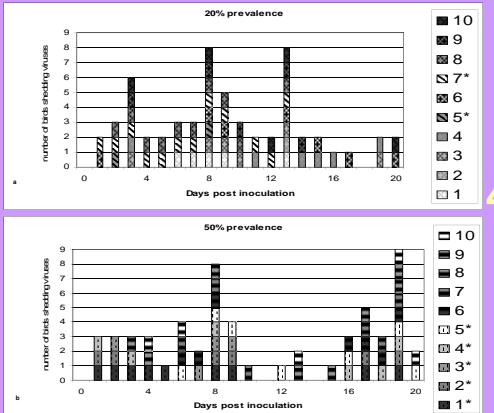
1 **A/duck/WA/663/1997, H11N9, LPAIV**  
Isolated from pooled tissues of a sick mandarin duck. Virus stock was collected from the second passage in SPF chicken embryos.  
**How does wild bird AIV behave in poultry?**

3 **Transmission experiment**  
Group 1: Five control birds  
Group 2: 20% prevalence, two of ten birds were inoculated with A/duck/WA/663/1997 (H11N9) virus.  
Group 3: 50% prevalence, five of ten birds were inoculated with A/duck/WA/663/1997 (H11N9) virus.

7 **Challenge experiment**  
Group 1: Ten control birds  
Group 2: experimental group, receiving NA stalk deletion mutant viruses

## RESULTS

The duck virus showed 100% transmission rate in chickens



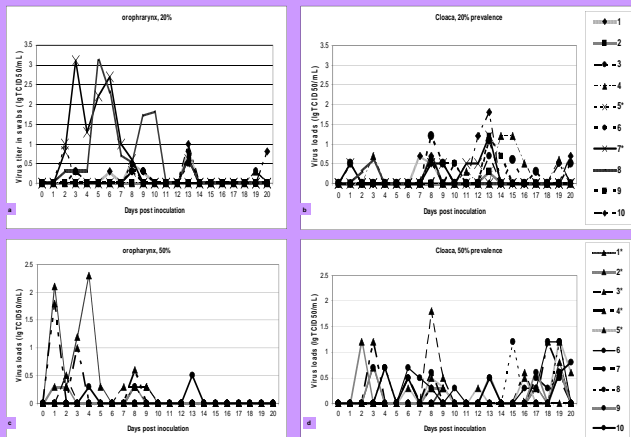
8 • No virus of any forms was recovered from inoculated ducks.  
• None of the ducks showed sero-conversion.

Table 1. Nucleotide/amino acid changes in HA and deletion mutation in NA from chicken isolates

Infection route	Prevalence (%)	Bird ID	Days PI	NA deletion	nucleotide position/amino acid position				
					332*/113*	463/144	625/198	721/230	853/274
inoculated	20	C-5	2	-	t/Y	g/G	c/A	g/S	c/S
			3	-	t/Y	g/G	t/V	g/S	t/F
		C-7	4	F	c/Y	g/G	t/V	g/S	t/F
			5	F	c/Y	g/G	t/V	g/S	t/F
			6	F	t/Y	g/G	t/V	g/S	t/F
			7	F	t/Y	g/G	t/V	g/S	t/F
			8	F	t/Y	a/D	t/V	a/N	t/F
			8	F	c/Y	g/G	c/A	g/S	c/S
	50	C-11	1	D*	c/Y	g/G	c/A	g/S	c/S
			2	-	c/Y	g/G	c/A	g/S	c/S
			3	D	c/Y	g/G	c/A	g/S	c/S
		C-12	4	D	-	g/G	c/A	g/S	c/S
			6	D	c/Y	g/G	c/A	g/S	c/S
			6	D	c/Y	g/G	c/A	g/S	c/S
C-14	1	F	c/Y	g/G	t/V	g/S	t/F		
	3	F	c/Y	g/G	t/V	g/S	t/F		
contact	20	C-3	3	F	t/Y	g/G	t/V	g/S	t/F
			5	F	c/Y	g/G	t/V	g/S	t/F
		C-8	6	F	c/Y	g/G	t/V	g/S	t/F
			7	-	c/Y	g/G	t/V	g/S	t/F
			9	F	c/Y	g/G	t/V	g/S	t/F
		C-10	10	-	c/Y	g/G	t/V	g/S	t/F
			3	F	c/Y	g/G	t/V	g/S	t/F
Input virus				F	t/Y	g/G	c/A	g/S	c/S

\*: nucleotide positions (changes may be non-synonymous)  
\*: amino acid positions

- The duck virus replicated at low titers for as long as 20 days.
- Tissue tropism shift from the respiratory tract to the digestive tract.
- Incomplete immune clearance.



## SUMMARY

A wild duck isolate of avian influenza virus developed mutations soon after inoculating chickens. The virus was able to transmit to naïve chickens in direct contact and sharing food and water. Two consistent amino acid substitutions in the hemagglutinin were identified and may be important in transmissibility. Mutants with a 30-amino acid deletion in the neuraminidase stalk region were recovered from inoculated chickens, but not from naïve chickens in contact. This mutant virus was not able to replicate well in Pekin ducks. *in vivo* viral replication was at low titers and a change in tropism from the respiratory to the digestive tract was observed. Our results indicated that there is a rapid adaptation of wild bird isolate in poultry species.