

AVIAN INFLUENZA VIRUS H9N2 SURVIVAL AT DIFFERENT TEMPERATURES AND pHs



Davidson, I*, S. Nagar, R. Haddas, M. Ben-Shabat, N. Golender, E. Lapin, A. Altory, L. Simanov, I. Ribshtein, A. Panshin, and S. Perk

Division of Avian and Fish Diseases, Kimron Veterinary Institute, P.O.Box 12 Bet Dagan, Israel, 50250

* IRITD@MOAG.GOV.IL

AIV presence in the environment depends on:

- The cumulative effects of physical & chemical factors:
 - Humidity/liquid/dry conditions,
 - Mixture with organic compounds,
 - pH,
 - Salinity
 - Temperature
- The AIV strain
- The virus load
- The time of AIV dissemination from infected birds.

AIV dependence on physical conditions.

- Stallknecht, D.E., M. T. Kearney, S.M. Shane and P.J. Zwank (1990). Effect of pH, temperature and salinity on persistence of AIV in water. Avian Dis. 34: 412-418.

AIV strains: H6N2, H4N6 and H10N7

Main findings:

Interactive effects of pH, temperature and salinity. Higher persistence at lower temperatures.

- Lu, H., A. E. Castro, K. Pennick, J. Liu, Q. Yang, P. Dunn, D. Weinstock and D. Henzler (2003). Avian Dis. 47: 1015-1021. Survival of Avian Influenza virus H7N2 in SPF chickens and their Environments.

AIV strain: H7N2

Main findings: AIV (10^{7-8} ELD₅₀) in CAF

100% loss in viability: 56°C for 40-60 min

No loss in viability: 4°C for 4 months

4°C for 1 month

-80°C for 8 months

-20°C for 3 months

- Brown, J., Goekjian, G., Poulson, R., Valeika, S. & Stallknecht, D.E. (2008). AIV in water: Infectivity is dependent on pH, salinity and temperature. Vet. Microbiol. XXXX.

12 LPAIV strains:

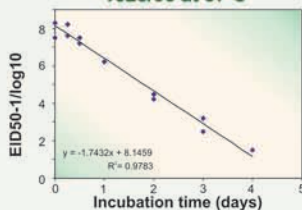
Main findings: Higher stabilities at higher pHs (7.4-8.2), low temperatures (<17°C) and lower salinities.

Aim of the study

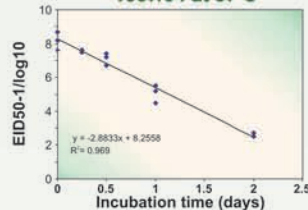
To study the heat stability of recent AIV isolates, strain H9N2, at temperatures that resemble actual climates (-37°C, 20°C, 4°C) over time.

AIV were incubated in AF and the AIV titers (EID50) were determined in embryonated eggs.

Viability of AI H9N2 isolate 1525/06 at 37°C



Viability of AI H9N2 isolate 1567/04 at 37°C

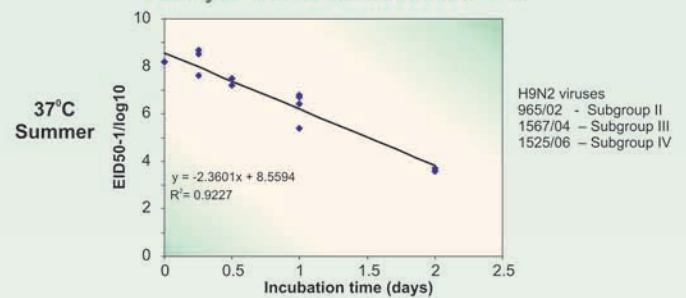


Viability (%) of AIV H9N2 strain 1525/06 at pH 5.0 & 7.0 at 4°C & 20°C

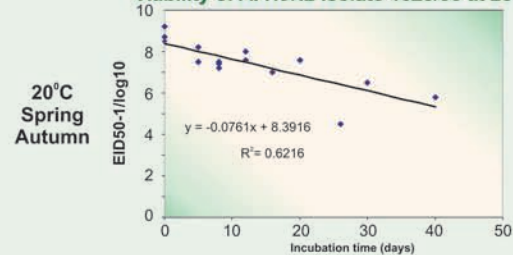
Incubation time (weeks)	pH 7.0		pH 5.0	
	4°C	20°C	4°C	20°C
0	100	100	100	100
1	100	100	100	0
2	60	100	80	0
3	100	100	0	0

AIV was incubated in AF at EID50 10⁷⁻⁶

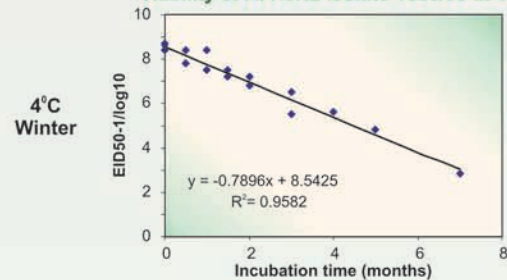
Viability of AI H9N2 isolate 965/02 at 37°C



Viability of AI H9N2 isolate 1525/06 at 20°C



Viability of AI H9N2 isolate 1525/06 at 4°C



Calculated viabilities

Incubation temp.	Virus	R ²	Decay time (days)*
37°C	965/02	0.9227	3.62
	1567/04	0.969	2.86
37°C	1525/06	0.9783	4.67
20°C	1525/06	0.6216	85.29
4°C	1525/06	0.9582	327.60

* EID50 = 0 = loss of AIV viability

Conclusions

- AIV resistance to the winter cold (4°C) is:
 - X10 greater than in the autumn & spring (20°C),
 - X100 greater than in summer (37°C).
- Elevated temperatures (20°C compared to 4°C) and lower pH (5.0 compared to 7.0) is critical for the AIV H9N2 (1525/06) viability.

Acknowledgment

The study was supported by the FLURESIST project SSPE-CT-2006- 044311 of EU-FP6.

Coordinator: Dr. Guus Koch
Israeli PI: Dr. Irit Davidson