Incidence and risk factors of Highly Pathogenic Avian Influenza (HPAI) infection in smallholder, village-based duck flocks in Indonesia

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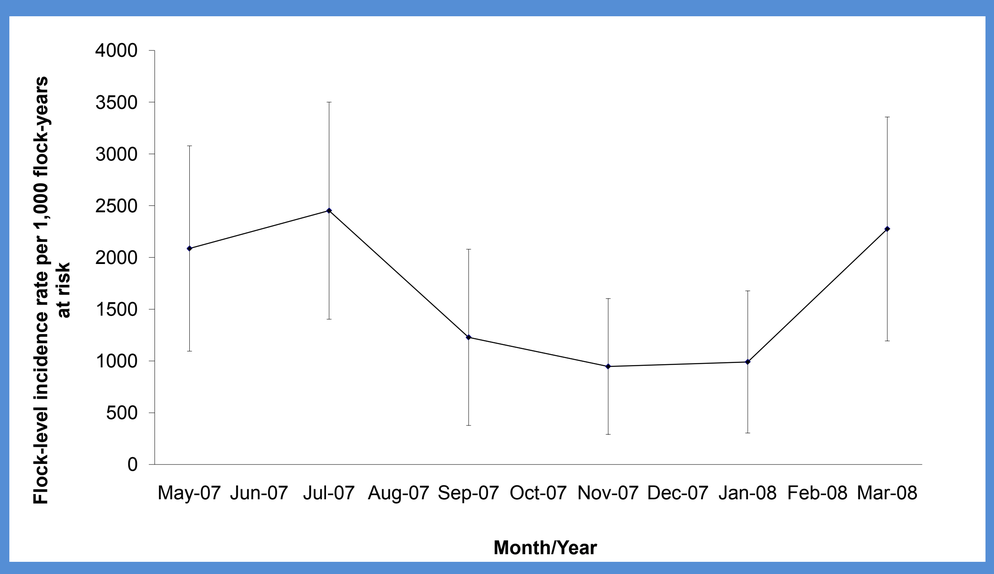
Background: All published risk factor studies from countries where H5N1 HPAI is widespread are based on disease outbreak occurrence rather than on incidence of infection, because the latter requires undoubtedly a more intense and costly monitoring of poultry populations for their infection status. However, as not all infections of ducks result in apparent signs of disease, risks associated with the management of ducks that result in infection of flocks might differ from those risks resulting in outbreaks. Therefore we investigated HPAI incidence of duck flocks and identified risk factors for new H5 HPAI virus introductions into "stationary", village-based duck flocks.

Methods: Ducks on 96 small-holder duck farms in 4 districts (Sleman, Magelang, Bantul, Kulon Progo) of central Java, Indonesia, were surveyed once every two months over 12 months in 2007/2008. Sera were tested for H5 antibodies using the haemagglutination inhibition test. Questionnaire surveys were conducted to record information on the management of flocks in-between visits (i.e. the risk factors). We used in a logistic GEE model with an exchangeable correlation structure to identify risk factors associated with incidence of H5 antibody positivity of flocks.

Results:



Explanatory varibale	Category	Farm status		OR (95%CI)	P
		H5 negative (%)	H5 postive (%)		
Carcasses of dead birds eaten	No	233 (76.6)	2 (33.3)	10.2 (1.2-85.9)	0.03
	Yes	71 (23.4)	4 (66.7)		
Ducks roaming throughout the village	No	219 (77.1)	16 (61.5)	2.8 (1.2-6.9)	0.02
	Yes	65 (22.9)	10 (38.5)		
Duck confinement over night on the farm	No	36 (65.5)	199 (78.0)	0.4 (0.2-0.9)	0.04
	Yes	19 (34.5)	56 (22.0)		
Sudden deaths of birds	No	212 (74.4)	23 (92.0)	0.2 (0.1-0.8)	0.02
	Yes	73 (25.6)	2 (8.0)		

Flock-level incidence rate was high at the first flock-sampling and peaked in July 2007 and then decreased and remained low until January 2008, before it rose again in February 2008. The scavenging and roaming of ducks through the village increased the risk of duck flocks developing H5 antibodies, but also the consumption by the farmer of carcasses of dead or sick birds increased the risk (although this was only conducted on six out of 310 farm-samplings over the study period). If ducks were housed overnight on the farm, the risk of flocks developing H5 antibodies was reduced and surprisingly, if dead birds were found on the farm in the preceding two months before the flock-sampling, the risk of flocks developing H5 antibodies was also reduced.

Discussion: The carcasses of sick birds potentially contain a high titre of virus. Through the process of slaughtering sick birds for consumption or the disposal of the remains, the virus could be spread and might result in the infection of ducks on the farm. The roaming of ducks through the village allowed contact with various other birds, people and other possible sources of infection. If birds were confined overnight on the farm, the risk of infection was reduced, most likely because less contact could be made with potentially infected animals. It seems that sudden deaths made farmers aware of the bio-security risk these carcasses pose, hence farmers responded quickly to stop the spread of infection from these carcasses by immediately removing and disposing of the bodies.

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