

# Determining the frequency and associated risk factors of influenza A virus infections in swine upon arrival at agriculture exhibitions

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## Introduction

Swine play a key role in the evolution and ecology of influenza A virus (IAV) infecting humans because pigs are considered to be a major “mixing vessel” in which reassortment of the IAV segmented genome can occur. Exhibition swine, due to the distinctive management practices in which they are shown and raised, provide a critical human-swine interface allowing for the bidirectional zoonotic transmission of IAV. Uniquely, these exhibition pigs come into contact with not only their handlers/owners but also large numbers of other swine and the general public at agricultural fairs throughout the United States.

## Materials and methods

Snout wipes were collected from every pig upon arrival at nine agriculture exhibitions in Ohio and Indiana during 2013 and 2014. A modified sampling occurred at one additional exhibition in 2014 where samples were only collected from a subpopulation of the pigs on arrival. In 2013, all 2,194 samples were collected upon entrance to one exhibition. In 2014, an additional 3,656 samples were collected at the beginning of nine exhibitions. These samples were screened via rRT-PCR for the presence of IAV and inoculated onto monolayers of Madin-Darby canine kidney (MDCK) cells for virus isolation. In addition, a survey was administered to the families of exhibitors to determine the on-farm management history of the exhibition swine. Snout wipes and surveys will be linked to asses if there is a correlation between IAV incidence and certain management practices, such as vaccination and on-farm biosecurity.

## Results and discussion

As summarized in Table 1, viable IAV was recovered from the pigs at the beginning of six of ten sampled exhibitions. Forty-eight IAV isolates were recovered from the 2,194 (2.18%) samples collected during 2013. This one time prevalence may not be typical of most agricultural fairs since qualification at a prior swine show was required for attendance at this regional exhibition. To obtain a more accurate estimate of IAV prevalence, the

project was continued in 2014 and expanded to include nine fairs in Ohio and Indiana. During 2014, 52 IAV isolates were obtained from the 3,656 samples resulting in an IAV prevalence of 1.4%. As recovered via MDCK cell culture: exhibition A had five IAV isolates 5/383(1.30%), exhibition F one IAV isolate 1/525(0.19%), exhibition G had one IAV isolate 1/360(0.28%), exhibition H had 43 IAV isolates 43/419(10.26%), and exhibition I had two IAV isolates 2/445(0.45%). IAV was not detected with rRT-PCR in the samples collected at exhibitions B, C, D and E. The overall prevalence of IAV in exhibition swine upon entrance to fairs during the two year study was 1.71% (100/5850). From nine of the exhibitions a total of 480 surveys were completed. Analysis of the risk factor data is currently undergoing. It is important to note the decrease in sampling size at exhibition A between 2013 and 2014, which was done at the request of the exhibitions administration and did not allow for every pig to be sampled upon arrival. Additionally at exhibition H, the large number of isolates recovered is hypothesized to be the result of sampling the pigs as they moved through the chute at weigh-in. Due to the nature of snout wipes, external contamination of a pig's snout via contact with communal objects (i.e. gates, panels, scales) may result in artificial elevation of the prevalence estimate. While viable IAV was recovered from the snouts of 43 pigs during the time of sampling, we assume all pigs were not actively shedding IAV upon arrival. These data indicate that many of the pigs at agricultural fairs are exposed to IAV within hours after arrival at the exhibition, a situation that likely accelerates the spread of virus between pigs. Ultimately, slowing the spread of IAV between pigs will reduce the risk of zoonotic influenza A virus transmission and improve public health.

## References

1. Ma W, Kahn RE, Richt JA. The pig as a mixing vessel for influenza viruses: Human and veterinary implications. *Journal of molecular and genetic medicine* 2008, 3(1):158–166.
2. Bowman AS, Nolting JM, Nelson SW, Slemons RD. Subclinical influenza virus A infections in pigs exhibited at agricultural fairs, Ohio, USA, 2009–2011. *Emerging Infectious Diseases* 2012, 18(12):1945–1950.

**Table 1:** Virus isolation results

Year	Exhibition	Number samples collected	RRT-PCR positive (ct ≤ 35)	VI
2013	A	2194	107	48
	A	383	21	5
	B	367	0	-
	C	274	0	-
2014	D	597	0	-
	E	286	0	-
	F	525	1	1
	G	360	16	1
	H	419	144	43
	I	445	6	2
<b>Total</b>		<b>5850</b>	<b>295</b>	<b>100</b>

