

ORIGINAL ARTICLE

Perceptions and attitudes of swine exhibitors towards recommendations for reducing zoonotic transmission of influenza A viruses

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Abstract

Since 2011, there have been 468 cases of variant influenza A virus (IAV) reported in the United States, many of which were associated with youth swine exhibition. In an effort to mitigate risk associated with exposure to IAV in swine, the “Measures to Minimize Influenza Transmission at Swine Exhibitions” (MtM) was developed for show organizers, volunteers and exhibitors. These recommendations are updated annually; however, it is not clear if youth swine exhibitors are aware of the recommendations; support the recommendations; and would be willing to practise recommended behaviours. Therefore, a cross-sectional survey method was used to assess swine exhibitor perceptions and their adoption of swine production practices aimed at reducing the transmission of IAV at the human–animal interface. In addition, the survey asked participants their state of residence and the number of shows they would attend in 2017. In all, 155 participants who showed swine on a regular basis ($\bar{x}$ = 11 shows per year), from at least 18 states within the US, completed the survey. At least, 67% of participants believed each statement was a good recommendation, with 6 of 11 recommendations being supported by >90% of participants. When asked if recommendations could be implemented, 65%–94% of respondents agreed, and 21%–89% of participants had already implemented each recommendation, respectively. Although significant efforts have been made to increase signage at swine exhibitions (warning of risks associated with eating/drinking in animal areas), a majority of respondents report eating/drinking in the barn and are unwilling to change their behaviours. This study provides evidence that developing and disseminating static recommendations to reduce zoonotic disease transmission is not enough to change human behaviour to prevent future variant IAV infections associated with swine exhibitions.

KEYWORDS

4-H youth development, attitude, influenza A virus, mitigation strategies, public health, surveys and questionnaires, swine, zoonoses

1 | BACKGROUND

Educating youth regarding the risk of zoonotic disease is an important animal and public health concern as nearly 3 out of 5 new human illnesses are zoonotic (CDC, 2017). One important programme for educating youth is 4-H; a youth development organisation, sponsored by cooperative extension at over 100 public universities, with over 6 million members in the United States. 4-H programming consists of hands-on projects in the areas of health, science, agriculture, and citizenship; however, disease prevention was determined to be the life skill least represented in 4-H youth development programming (Maass, Wilken, Jordan, Cullen, & Place, 2006). Justification for increased diligence in this area is highlighted by the continual cases of H3N2v reported in youth swine exhibitors associated with agricultural fairs (Epperson et al., 2013; Jhung et al., 2013; Schicker et al., 2016). While the majority of youth exhibiting swine are enrolled in 4-H programmes and show at local agricultural fairs, there is a select population of these youth who show on a regular basis throughout the year in jackpot shows, as part of the swine show circuit. These shows are independent events held frequently throughout the year, where participants pay an entry fee to show their animals and winners are awarded cash prizes. These individuals are not only exposed to swine pathogens on a regular basis (A. S. Bowman, unpublished data), but serve as leaders within local level swine exhibitions; therefore, efforts must be focused towards leading transition directly within this group. Several suggestions presented in "Managing Transitions" (Bridges, 1991) can be used to lead youth to adopt healthy habits associated with disease prevention. Starting the transition with these youth can be beneficial as they are exposed to swine and their diseases on a regular basis and also because they are often leaders of the swine departments at the local level because of their vast experience.

Animal and public health experts must work alongside extension educators to create and implement programming that is effective and engaging. Building a repertoire of mitigation strategies based on scientific evidence is a key component to the development of sustainable educational programming. Many of the concepts highlighted in the "Becoming a Swine Scientist" educational programme to increase the knowledge of youth swine exhibitors in the area of zoonotic disease risk and prevention, were based upon recommendations presented in the "Measures to Minimize Influenza Transmission at Swine Exhibitions" (MtM) document released each year by a committee of animal and public health officials. It is not clear how many youth swine exhibitors were aware of the recommendations; support the recommendations; and would be willing to practise behaviours recommended. Therefore, a cross-sectional survey method was used to understand swine exhibitor perceptions and their adoption of swine production practices aimed at reducing the transmission of influenza A viruses at the human-animal interface.

2 | METHODS AND MATERIALS

2.1 | Instrumentation

The instrument created consists of 11 recommendations put forth in the MtM document. Example statements include the following:

Impacts

- Despite efforts to increase healthy behaviours among individuals involved in swine exhibition, many exhibitors have not adopted the recommended behaviours.
- Nearly 20% of respondents report showing sick pigs and 34% report attending shows when they are ill themselves.
- A majority of participants (74%) report eating/drinking in animal areas.
- Respondents report participating in an average of 11 swine shows per year, indicating frequent swine movement.

Clean and disinfect all tack, feeders, waterers and show supplies between shows; Wash your hands with soap and water when you leave the barn; and No food or drink in animal areas. Each statement is followed by three to six statements regarding the participant's perception of the recommendation, their opinion of their ability to implement the recommendation, and their current behaviour related to the recommendation. In addition, the survey asks participants which state they reside, and the number of shows they will attend in 2017. The research design and instrumentation was approved by The Ohio State University Institutional Review Board protocol number 2017B0132.

2.2 | Validity of instrument

Face and content validity were established by a review of a panel of virology experts and young adults involved in public health and agricultural education. Panel members with expertise in virology and agricultural education reviewed the instrumentation to ensure the content measured characteristics it was intended to measure; content validity. All panel experts reviewed for face validity, or the overall appearance of the instrument. Panel of experts included:

1. Dr. Andrew Bowman—Virology and veterinary medicine expert to assess scientific background
2. Ms. Sarah Lauterbach—Virology and veterinary medicine expert to assess scientific background
3. Dr. Josh Lorbach—Virology and veterinary medicine expert to assess scientific background
4. Ms. Elena Mircoff—Masters of Public Health Student to assess public health relatedness
5. Ms. Sarah Nelson—Virology and veterinary medicine expert to assess scientific background
6. Ms. Hannah Cochran—Young adult involved in agricultural education to determine age level appropriateness
7. Ms. Rachel Patton—Young adult involved in agricultural education to determine age level appropriateness

2.3 | Study sample

Surveys were collected from jackpot swine exhibitors (ages 3–21) and their parents, regarding their perceptions and behaviours related to recommendations in the “Measures to Minimize Influenza Transmission at Swine Exhibitions” document, because of their level of participation in swine exhibition. Paper copies of the survey were available for completion at educational booths at swine jackpot shows. Individuals competing at the shows chose to complete the survey as they visited the booth to engage in other educational activities.

2.4 | data analysis

Deductive reasoning was used to determine if themes of support in accordance with recommendations exist among swine jackpot exhibitors. Content analysis was used to gain insight in the perceptions and behaviours of jackpot swine exhibitors. Frequencies were calculated using SPSS and used to compare the number of shows attended and the state distributions of respondents.

3 | RESULTS

In all, 155 jackpot show participants who showed swine on a regular basis ($\bar{x}$ =11 shows per year), from at least 18 states within the US, completed the survey (Table 1). At least 58.7% of participants believed each statement was a good recommendation, with 5 of 11 recommendations being supported by >85% of participants. When asked if recommendations could be implemented, 54%–82% of respondents agreed, and 36%–93% of participants had already implemented each recommendation, respectively. Recommendations that have been widely adopted by respondents include; avoidance of sick pigs or people attending shows (90%) and disinfecting equipment between shows (88%). The recommendations not being implemented most commonly by respondents include; not eating and drinking in animal areas (19%), reporting sick pigs to show organisers (36%), and isolating animals when they are taken home after a show (45%). All reported behaviours are based on individual self-reporting, with no observations being completed by the study team. Details for the responses to each survey item are listed in Table 2.

4 | DISCUSSION

Understanding the opinions and perceptions of swine exhibitors towards recommendations to mitigate disease is essential in directing further mitigation. Stewart et al. (2018) completed a study with swine exhibitors who show at local county fairs and found that several households report high levels of behaviours that elevate their risks for zoonotic disease transmission. Swine jackpot participants and their parents were the target population for this study because they generally were more heavily involved in the show swine industry, and may have different opinions towards the recommendation because of their increased economic

TABLE 1 Number of survey respondents representing each state included in the study

State	No. Surveys
Arkansas	2
Arizona	5
California	1
Florida	4
Georgia	2
Iowa	1
Idaho	1
Illinois	2
Indiana	4
Kansas	1
Michigan	5
Minnesota	2
Missouri	6
Nebraska	1
Ohio	99
Oklahoma	9
Texas	5
West Virginia	1
Unknown	4
Grand Total	155

investments in show pigs. Individuals show pigs at the county fair level, likely have very few pigs and attend only 1–2 shows per year; however, the families included in this study reported attending an average of 11 shows per year, with a range of 2–37 shows (Bliss, Stull, Moeller, Rajala-Schultz, & Bowman, 2017). This increased level of show activity allows more opportunity for these individuals to adopt mitigation strategies recommended by animal and public health officials. It also increases their risk for exposure to zoonotic disease, potentially increasing their favouritism towards mitigation. Thus, the results found in this study may be skewed towards being a more positive view of the recommendations, as compared to individuals who only compete at local fairs.

Besides targeting this population based on the number of shows they attend, swine jackpot participants were also targeted because it has been observed that they are considered experts at the local level and their advice is sought after by local show pig enthusiasts. If the experts consider the recommendations favourable and adopt the practices, they are more likely to encourage local level showman to do the same. This trickle down approach to knowledge dissemination saves time and resources by spreading the information rapidly across large geographic areas. Individuals who show at the local level may be more willing to adopt practices that reduce disease transmission if they are recommended by other swine producers rather than regulatory or university personnel.

Variant influenza A virus cases have not been reported in swine jackpot participants, as they have been reported in county fair swine exhibitors (Epperson et al., 2013; Jhung et al., 2013; Schicker et al., 2016). This could be attributed to many factors

TABLE 2 Summary of swine jackpot exhibitor perceptions and opinions of the recommendations put forth in the Measures to Minimize Influenza Transmission at Swine Exhibitions document

Survey Question	Yes/Total (%)	No/Total (%)
Clean and disinfect all tack, feeders, waterers and show supplies between shows		
I think this is a good recommendation	137/155 (88.4)	3/155 (1.9)
I can implement this recommendation	125/155 (80.6)	9/155 (5.8)
I disinfect all equipment between shows	74/155 (47.7)	70/155 (45.2)
Wash your hands with soap and water when you leave the barn		
I think this is a good recommendation	135/155 (87.1)	5/155 (3.2)
I can implement this recommendation	124/155 (80)	11/155 (7.1)
I wash my hands after I have contact with pigs	106/155 (92.3)	37/155 (23.9)
No food or drink in animal areas		
I think this is a good recommendation	91/155 (58.7)	45/155 (29)
I can implement this recommendation	89/155 (57.4)	45/155 (29)
I eat and/or drink in animal areas	115/155 (74.2)	30/155 (19.4)
Allow at least 7 days of "down time" (i.e., on-farm quarantine) after returning from a previous show before showing a pig or pen-mates, to reduce the risk of spreading influenza		
I think a 7 day down time is a good recommendation	110/155 (71)	26/155 (19.1)
I can implement a 7 day downtime	83/155 (53.5)	45/155 (29)
My pigs are at home for at least 7 days in between shows	76/155 (49)	55/155 (35.5)
I think it is a good day to isolate pigs returning home	112/155 (72.3)	20/155 (12.9)
I can implement isolation for pigs returning home	90/155 (58.1)	40/155 (25.8)
I do isolate pigs for at least 7 days when they return home	69/155 (44.5)	68/155 (43.9)
Discuss the use of swine influenza vaccines with a veterinarian and check the show rules for any requirements		
I think this is a good recommendation	130/155 (83.9)	7/155 (4.5)
I can implement this recommendation	121/155 (78.1)	11/155 (7.1)
My pig (s) were vaccinated for influenza	111/155 (71.6)	22/155 (14.2)
I have/will attend a show that requires influenza vaccination for pigs	94/155 (60.6)	29/155 (18.7)
Consult a veterinarian to help outline and implement applicable biosecurity and swine health practices at home		
I think this is a good recommendation	133/155 (85.8)	5/155 (3.2)
I can implement this recommendation	117/155 (75.5)	10/155 (6.5)
A veterinarian has visited my farm in the last 12 months	127/155 (81.9)	16/155 (10.3)
Sick pigs and sick people need to stay home so they do not risk infecting other pigs or people		
I think this is a good recommendation	139/155 (89.7)	3/155 (1.9)
I can implement this recommendation	127/155 (81.9)	11/155 (7.1)
I have taken a sick pigs to a show	29/155 (18.7)	101/155 (65.2)
I have gone to a show when I've been sick myself	52/155 (33.5)	79/155 (51)
Avoid sharing tack with other exhibitors, but if you must, clean and disinfect in-between uses		
I think this is a good recommendation	123/155 (79.4)	18/155 (11.6)
I can implement this recommendation	110/155 (71)	22/155 (14.2)
I have shared tack at shows	88/155 (56.8)	43/155 (27.7)
I disinfect shared tack	71/155 (45.8)	62/155 (40)
No sleeping in animal areas		
I think this is a good recommendation	103/155 (66.5)	35/155 (22.6)
I can implement this recommendation	87/155 (56.1)	44/155 (33.6)
I sleep in animal areas	71/155 (45.8)	64/155 (41.3)
Report sick pigs to exhibition organizers		
I think this is a good recommendation	129/155 (83.2)	16/155 (10.3)

(Continues)

TABLE 2 (Continued)

Survey Question	Yes/Total (%)	No/Total (%)
I can implement this recommendation	109/155 (70.3)	20/155 (12.9)
I have reported sick pigs to show organizers	56/155 (36.1)	74/155 (47.7)
Become familiar with the clinical signs of influenza and other illnesses in pigs		
I think this is a good recommendation	136/155 (87.7)	1/155 (0.6)
I can implement this recommendation	123/155 (79.4)	8/155 (5.2)
I can recognize influenza in pigs	100/155 (64.5)	40/155 (25.8)

including; increased biosecurity, increased knowledge, shortened length of show exposure, or differences in the viruses circulating within the swine populations. It has been shown in a fair setting, that the prevalence of swine shedding IAV is <30% at 72 hr post arrival whereas IAV prevalence can be over 90% by the seventh day of the fair (A. S. Bowman, unpublished data). Because jackpot shows typically last 1–3 days, the prevalence of IAV in the pigs stays relatively low during the show, thus decreasing the exposure jackpot participants may have to IAV. However, these individuals are also more likely to be raising swine full time, rather than purchasing only a few head to show at a local fair, and therefore may have exposures during animal husbandry away from show atmospheres. In addition, the strains of IAV circulating among swine at jackpot shows is genetically nearly identical to virus strains circulating among fair pigs, therefore the difference in variant cases is likely not due to viral strain (A. S. Bowman, unpublished data). The differences seen are then likely a result of increased biosecurity or knowledge of the risks associated with zoonotic diseases.

The MtM document has been disseminated across the country through extension and health officials; however, the breadth of impact it has made is currently unknown. Survey results indicate that 19%–92% of respondents have already implemented the respective recommendations included on the questionnaire. Whether they implemented these practices because they saw the specific recommendation in the MtM document or because they gained knowledge through some other venue is still unknown; however, it is important to document the practices currently being followed by the exhibition swine industry. This knowledge can be used to lead further investigation into behaviour changes that could prevent transmission of zoonotic diseases.

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CONFLICT OF INTEREST

Authors have no conflict of interest to declare.

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