

PUBLIC HEALTHWORKER SAFETY

Title: Determining viral load and persistence of influenza A in aerosols and on surfaces of swine production facilities - *NPB # 12-073*

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Scientific Abstract

Little is known of the mechanisms of transmission of influenza A viruses in swine production facilities, including the levels of exposure for both humans and swine from aerosols and on surfaces. We performed longitudinal field sampling of swine facilities for the presence and persistence of influenza A virus in aerosols and on surfaces.

Methods: Farms were identified by veterinarians as having suspected influenza outbreaks in the swine herd. Site visits were conducted to sample influenza virus in aerosols using high volume samplers, and on surfaces using wipe sampling, as well as in swine oral fluids using cotton ropes. Observations were also made of swine worker use of personal protective equipment during site visits.

Results: Influenza A virus was detected in indoor aerosols and on surfaces. Estimates of viral load in aerosols ranged from 0 to 1.25×10^6 RNA copies/ m^3 while on surfaces estimates ranged from 0 to 6.65×10^5 RNA copies/ml. Viable virus was cultured from aerosols but not surfaces. Virus levels peaked in the first week of an outbreak and declined over the next 10-14 days. Our model predicted IAV could be found for 21 days in the air from infected environments during an acute outbreak. Swine workers used certain types of personal protective equipment such as boots, heavy rubber gloves and protective clothing, but use of N-95 or equivalent respirators was not routinely reported. Our model of worker risk estimated that there could be a real and non-zero risk of

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human infection with swine influenza during a swine outbreak, even though factors of environmental degradation of viruses, host immunity and species barrier considerations for zoonotic infection could reduce this risk. Furthermore, we estimated that this risk could be reduced with the use of an N-95 respirator that was correctly fitted.

Conclusion: During outbreaks of influenza A infection in swine, aerosols in barns contain detectable levels of virus particles representing an exposure hazard to both swine and swine workers. Future studies should explore further the viability of viruses in barn aerosols, confirm the impact of personal protective equipment on exposure risk, the role of acquired immunity to infection in workers, as well as explore other strategies to prevent bidirectional transmission of influenza virus between humans and swine.