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DETECTION OF INFLUENZA VIRUS IN AIR FROM EXPERIMENTALLY INFECTED PIGS

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Introduction

Influenza A virus is a primary respiratory pathogen of pigs.[1] Infected pigs shed the virus through nasal secretions for a period of approximately five to seven days and transmit the pathogen through nose-to-nose contact.[2] In addition, influenza virus can also be transmitted through aerosols.[3] However, literature about detection of airborne influenza virus is scarce. Detection of influenza virus in air samples has been reported[4] but there is limited information on the dynamics of aerosol detection in influenza in pigs. The objective of the project reported here is to determine the relationship between the frequency of detection of influenza virus in air samples and the number of actively shedding pigs.

Materials and Methods

Two groups of 11, 7-week-old pigs were housed in two separate rooms at the University of Minnesota Animal Isolation facility. All pigs originated from an influenza negative pig farm in Minnesota.

One "seeder" pig from each group of 11 pigs was infected with H1N1 influenza A virus in a separate room and commingled with the other 10 pigs when shedding in this pig was confirmed through RRT-PCR.[5] Pigs were in contact for 8 days after commingling. Transmission was assessed by collecting individual nasal swabs from all pigs daily and tested for influenza RNA through RRT-PCR.

A cyclonic collector, capable of collecting 400L of air per minute, was used for air collection. The collector was located in the room, 74 cm from the wall and 89 cm from the floor (above the reach of the pigs). Ten milliliters of minimum essential media (MEM) supplemented with 4% bovine serum albumin was added to the cyclonic collector vessel and the collector was allowed to run for 30 minutes. Three air samples per day approximately every 8 hours were collected for 8 days after commingling. A sterile syringe was used to extract the MEM after the 30 minute period and the sample was then stored in a sterile plastic 10 ml tube for testing. Air sample fluid was tested for influenza A virus RNA through RRT-PCR. An attempt to quantify the amount of viral particles in the air was done though virus titration of RRT-PCR positive samples on MDCK cell culture.

Results and Discussion

Both seeder pigs and all in-contact pen-mates were confirmed to be shedding influenza virus for at least 4 days and a maximum of 6 days during the 8 day period.

A total of 43 air samples were collected. Out of those 43 samples, 25 (58%) were positive to influenza virus. In both groups, influenza virus was detected for the first time 2 days after commingling when 4 out of 11 pigs were shedding virus. All air samples were positive for influenza from day three after commingling until the first sample on day seven. During these days, all pigs in the room tested positive by individual RRT-PCR (e.g. influenza A virus RNA positive by nasal swab RRT-PCR).

Titration of RRT-PCR positive air samples yielded negative results.

Our results are novel and confirm that detecting influenza A virus in air from experimentally infected pigs is possible and a frequent event under the conditions of this study. Detection of influenza A virus in air samples was associated with the presence of active contact transmission. More studies are needed to further characterize aerosol generation from actively shedding pigs in order to understand the relevance of influenza airborne transmission under natural conditions.

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