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ASSessment of Mycoplasma Hyopneumoniae Aerosol Movement
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Introduction: Recent changes in swine production have been designed in an attempt to eliminate pathogens in the system. However, diseases are still present and routes of reinfection are the subject of intense debate. Aerosol transmission has been postulated as an important pathway of disease spread between farms. Experimentally, M. hyopneumoniae aerosol infection has been successfully performed to reproduce the disease1. Under field conditions, aerosol transmission of the disease has been suggested within distances up to 3.2 km², but these results have been based on retrospective epidemiological data from farm outbreaks2 and not on direct observation. The problem has partly been that M. hyopneumoniae is a very fastidious organism, characterized by high requirements and special conditions to grow3 and therefore its direct detection in the field has been difficult. PCR has allowed the detection of the organism from air samplings in an infected pig barn4 suggesting the possibility of aerosol transmission. This transmission is a crucial risk factor in eradication programs.

Materials and methods: The model used on this study was based on a previously developed model to evaluate aerosol transmission of porcine reproductive and respiratory syndrome virus5. Three ml of a suspension containing 10⁷ CCU of M. hyopneumoniae strain 232 were mechanically aerosolized into the open end of a dissemination tube (PVC 4 inch diameter pipe). A Dayton split capacitor blower was used to pull the air into an air centrifuge (Spin Con 450, Camber Corp, Arlington, VA) to collect 450 liters of air per minute. The study consisted of two replicates over distances of 1 m, 75 m and 150 m. Temperature, relative humidity, and velocity of air in the pipe were measured over distances of up to 150 meters using a Kestrel weather meter (Nielsen-Kellerman, Chester, PA).

All samples from the air centrifuge including the aerated M. hyopneumoniae and sanitation controls were tested by Nested PCR (NPCR). The DNA extraction and N-PCR have been described previously6. M. hyopneumoniae isolation was attempted as previously described3.

Results and Discussion: In all replicates, M. hyopneumoniae DNA was detected at 1 m, 75m, and 150 m, but was not recovered by isolation. All samples from sham negative controls were negative by both NPCR and isolation. Changes in the air parameters measured across the 150-meter distance were observed. Air temperature increased on average from 8.3 °C to 10.7 °C. Percentage humidity increased from 40 to 56 percent. Mean velocity over distance traveled was 11.75 meters per second (42 km per hour). These airflow parameters were within the hypothetical ranges of climatic conditions associated with possible airborne transmission of M. hyopneumoniae7. The low RH and temperature conditions probably enhanced the detection of M. hyopneumoniae in this study. At this time, however it is not certain what is the maximum potential dissemination distance, or if the organism is capable of infecting pigs after being aerosolized.

Although the isolation of the organism proved negative, this may only reflect the fact that the final concentration may have been below the detection limits of the culture system, but not of the NPCR and that the samples were heavily contaminated with other bacteria. This raises the question if such presumably low concentrations of Mycoplasma can actually infect a pig and progress to clinical disease or not, since most respiratory bacterial pathogens show a clear dose response under experimental challenge conditions. While this study produced interesting preliminary results, further studies are necessary to establish if aerosol transmission of M. hyopneumoniae occurs between farms at infectious levels and which climatic conditions are needed for such transmission to take place.

References
3. Friis, N. S. (1975) Nor Vet 27, 337