Airborne transmission of A. PLEUROPNEUMONIAE and prrs virus between pig units

Kristensen, Charlotte S.; Bøtner, A.; Angen, Ø; Sørensen, V.; Jorsal, S.E.; Takai, H.; Barfod, K.; Nielsen, Jens Peter

PAPER 102

AIRBORNE TRANSMISSION OF *A. PLEUROPNEUMONIAE* AND PRRS VIRUS BETWEEN PIG UNITS

CS Kristensen[1], A Bøtner[2], Ø Angen[2], V Sørensen[2], SE Jorsal[2], H Takai[3], K Barfod[4], JP Nielsen[1]
[1]The Royal Veterinary- and Agricultural University, Frederiksberg, Denmark; [2] Danish Veterinary Institute, Copenhagen/Lindholm, Denmark; [3]The Danish Institute of Agricultural Science, Horsens, Denmark; [4]Federation of Danish Pig Producers and Slaughterhouses, Roskilde, Denmark

Introduction and Objectives

Airborne transmission of respiratory diseases can be a risk to herds that are free from specific pathogens. For Porcine reproductive and respiratory syndrome virus (PRRSV) and *Actinobacillus pleuropneumoniae* (AP), airborne transmission has previously been demonstrated (1), but the air volume and concentration of the pathogens necessary for transmission of infection has yet to be clarified.
The objective of the present study was to study airborne transmission of AP and PRRSV between 2 "container pig units", with a controlled amount of air transmitted between the 2 units.

Materials and Methods

The experiment was carried out in 2 containers reconstructed as pig units and placed with a distance of 1 meter and connected by pipes. By manipulation of the air pressure in the 2 containers, the amount of ventilation air transmitted from pig unit A to pig unit B was controlled and measured. Transmission by personnel was prohibited by quarantine procedures.
For PRRSV, 3 experiments were conducted, according to table 1.

Table 1. Experiments (exp.) conducted with PRRSV

Exp.	Pigs in A	Pigs in B	Weeks[a]	Air[b]	Trans[c]
1-PRRSV	25[1]/25[2]	50[2]	5	70%	+
2-PRRSV	26[1]/17[2]	43[2]	6	10%	+
3-PRRSV	25[1]/25[2]	50[2]	5	1%	+

[a] Weeks of experiment. [b]Amount of ventilation air transmitted from A to B. [c]Transmission of infection. [1]Pigs positive for PRRSV. [2]Pigs negative for PRRSV.

The pigs positive for PRRSV were delivered from a herd infected with European type PRRSV and free from American type PRRSV. The pigs had recently been infected and had high antibody titers when analysed in IPMA using a European strain of PRRSV (IPMA-EU) (2). The pigs negative for PRRSV originated from an SPF herd, demonstrated by serologic analysis to be free from both European and American type PRRSV. Blood samples from all pigs in both units were taken the day of arrival and once every week. The samples were analysed for antibodies against PRRSV in IPMA-EU (2).
For the AP experiments, 25 SPF pigs were placed in each container. Pigs were inoculated with AP serotype 2 strain 4226 (Danish field isolate) in each experiment, according to table 2. Blood samples from all pigs in both units were taken at arrival and once every week thereafter. The samples were analysed for antibodies against AP serotype 2 with a blocking ELISA (3).

Table 2. Experiments (exp.) conducted with AP.

Exp.	Pigs inoculated	Weeks[a]	Air[b]	Trans[c]
1-AP	5	6	10%	-
2-AP	8	4	70%	+
3-AP	8	4	10%	-

[a]Weeks of experiment. [b]Amount of ventilation air transmitted from A to B. [c]Transmission of infection

Results and Discussion

The serology results of the first and last week for the PRRSV and AP experiments are shown in table 3.

Table 3. Percent seropositive pigs at the first and last week of the PRRSV and AP experiments for each pig unit

	%Seropositive pigs			
	First week		Last week	
Experiment	Pigs in A	Pigs in B	Pigs in A	Pigs in B
1-PRRSV[1]	14%	0%	96%	87%
2-PRRSV[1]	56%	0%	100%	100%
3-PRRSV[1]	8%	0%	100%	98%
1-AP[2]	0%	0%	39%	0%
2-AP[2]	0%	0%	100%	36%
3-AP[2]	0%	0%	100%	0%

[1] IPMA-EU [2] ELISA

From the results it can bee seen, that PRRSV was transferred between the pig units when the amount of ventilation air transmitted from container A to container B was 70%, 10% and 1%, respectively. AP was transferred when 70% of the ventilation air was transmitted from the infected pig unit A to the non-infected pig unit B. In both AP-trials with 10% of the ventilation air in pig unit A transmitted to pig unit B, no transmission of AP was observed. In ordinary pig herds less than 2% (most often far below 2%) of the air inlet will originate from the air outlet of neighbouring pig units (4.) Hence, the results from the present experiment indicates that airborne transmission of PRRSV between pig units located at close range may readily occur, whereas airborne transmission of AP seems less likely as a frequent event.

References

1. Torremorell, M. et al. 1997. AJVR, 58. 8:828-832
2. Sørensen et al. 1998. Vet. Microbiol., 60: 169-177
3. Nielsen et a.l. 1991. Can. J. of Vet. Res, 54: 68-72
4. Bjerg, B., 2000. Paper R2207 Proceedings of The XIV Memorial CIGR World Congress 2000. Tsukuba, Japan: 58.

PROCEEDINGS

Invited and Oral Presentations

The 17th Congress of the International Pig Veterinary Society

June 2 - 5, 2002

Iowa State University
Ames, Iowa
USA

1