A pilot study investigating the air velocity inside a transport vehicle for pigs during transport

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Introduction: Pigs' thermal comfort zone lies between 15 and 20°C (Brown-Brandl et al., 2001). However, in Denmark, during the year, fluctuations between -8 and 32°C can occur. Most commercial pig transports are open, which means that the temperature inside the transport vehicle, where the pigs are located, depends on the outside temperature. The thermal comfort of pigs during transport is maintained by adjusting the air flow surrounding the pigs through regulation of among others ventilation openings along sides of the vehicle. This mechanism is defined as the chill factor and expresses how air velocity can affect the experienced temperature. However, there is no published data on the level of air velocity inside a transport vehicle during transport of pigs. The aim of this pilot study was to measure the air velocity inside a pig transport vehicle during transport under different climate settings.

Material and methods: The study was conducted in Denmark for two days in 2020. An anemometer (1590-PK-020/W Wind Master, Gill Instruments Limited, 60140-Hampshire, UK) was mounted on the lower deck of an empty pig transport vehicle, which measured air velocity and wind direction once every second. An app (TracksLoggerPro) registered GPS coordinates and the speed of the transport vehicle, and outside air velocity was retrieved from the Danish Meteorological Institute. The following model was used to analyse the effect of climate setting on air velocity inside the transport vehicle in RStudio:

Air velocity = mean + climate setting + beta * direction of the vehicle + gamma * speed of the vehicle + delta * outside air velocity.

Climate setting was a factor with 9 levels consisting of combinations of the degree of opening (0, 25, 50, 100%), use of mechanical ventilation (MC) (Yes/No) and placement on the deck (Front, Middle, Back): 0-Middle, 25-Middle, 50-Middle, 100-Middle, 100-Front, 100-Middle, 100-Back, 0-Middle-MC and 100- Middle-MC.

Results: Results showed that air velocity inside the vehicle was significantly affected by the climate setting. The larger the ventilation opening, the higher the air velocity ranging from mean 0.51 ± 0.02 m/s (0% open) to mean 1.46 ± 0.02 m/s (100% open) ($P < 0.05$). Surprisingly, the addition of mechanical ventilation when the ventilation openings were 100% open reduced the air velocity (mean 1.41 ± 0.02 m/s vs. mean 1.53 ± 0.01 m/s; $P < 0.05$). Results also showed that a placement in the middle of the vehicle generated a higher air velocity (mean 1.53 ± 0.01 m/s) compared to in the front (mean 0.76 ± 0.02 m/s) and back (mean 1.02 ± 0.01 m/s) of the vehicle ($P < 0.05$).

Conclusion: In conclusion, the air velocity inside a commercial transport vehicle for pigs ranges between 0.5 and 1.5 m/s depending on the climate setting. This is useful knowledge when formulating a standardized management protocol for optimal climate setting during transport of pigs across the year. However, to make a firm conclusion on optimal climate setting during transport, the effects of heat production from pigs during transport on air velocity must be included in future studies.

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Literature:

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