INVESTIGATIONS INTO THE CAUSES OF TRANSPORT AND LAIRAGE MORTALITY IN DANISH SLAUGHTER PIGS

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Background

Transport and lairage mortality in pigs causes a significant economic loss in many countries and in addition, the welfare of the animals dying, as well as those surviving, is compromised. More pigs die during transport than in the lairage and it is generally thought that pigs dying in the lairage do so because of the effects of the previous transport. However, improving conditions in the lairage by keeping pigs in small groups of 15 corresponding to transport vehicle compartment sizes, i.e., no further mixing, optimising ventilation and watering etc. reduced lairage mortality at a factory considerably (Christensen, 1992, unpublished material). The main factors affecting transport and lairage mortality are genotype and environmental conditions on the transport vehicle. Many studies have shown that mortality is closely related to the halothane gene and pigs that are sensitive to halothane have a much higher mortality than pigs resistant to halothane (Barton Gade and Baltzer, 1991, Eikelenboom et al., 1978, 1980, McPhee et al., 1994, Murray and Johnson, 1998) and that high temperatures in combination with high humidity lead to higher mortality. Thus, critical combinations of temperature and humidity are used in the US Livestock Weather Safety Index (Grandin, 1992) to decide when transport is dangerous for pigs. Danish research has shown that transport mortality only occurred in the front lower compartment of a double-decker vehicle used for commercial transports (Christensen and Barton Gade, 1996) Temperature was always higher in the front lower compartment compared to other vehicle compartments, so that poorer ventilation is implicated. Nielsen, (1981) showed that an optimised forced ventilation system halved transport mortality in slaughter pigs.

The Danish pig industry has followed transport and lairage mortality in slaughter pigs annually since 1975 and all cooperative abattoirs, which slaughter minimum 95 % of all slaughter pigs in Denmark, send their figures to the Danish Meat Research Institute every year. These figures are then compiled to show how the individual factories lie in relation to each other and the information has been used to improve conditions for pigs during transport and lairage. These efforts together with removal of the halothane gene in the Danish breeding herd have meant that mortality figures in Denmark are very low compared to other countries. However, transport and lairage mortality has not changed over the past three years and the industry would like to establish the reasons for this lack of change, so that conditions can be further improved.

Objectives

The aim of this work was to establish factors affecting mortality in Danish pigs that could be used as guidelines to further reduce transport and lairage mortality.

Methods

The experimental material consisted of 20,928,546 pigs slaughtered on 17 cooperative abattoirs in 2002. Pig supply to these abattoirs varied from a minimum of 396,722 to 2,949,625 pigs. Average warm slaughter weight was 78.1 kg and average meat content in the carcass 60.0 %, as measured using the classification centre. Most Danish pigs are 3 and 4 breed crosses with Duroc and Hampshire as boar breed. The figures were used to establish possible factors leading to higher mortality with special emphasis on variation over the year and transport distance. For the latter, figures from 16 of the 17 abattoirs were divided into three transport distances: <100 km, 100-200 km and > 200 km and the transport mortality calculated for each. The results were investigated using a ^{2}-test. It should be noted that Denmark has interpreted the EC Directive regarding stocking density during transport such that transports over 4 hours use the recommended value of 0.42 m^2 per 100 kg pig, whereas transports below 4 hours use a stocking density of 0.35 m^2 per 100 kg pig. The rationale for this is that shorter transports are over smaller, rougher roads and a tighter stocking density improves pig welfare under these conditions (Barton Gade, 1998, 2000). Most transports under 100 km will be shorter than 4 hours and hence be carried out using a stocking density of 0.35 m^2 per 100 kg pig, most transports over 200 km will be longer than 4 hours and use a stocking density of 0.42 m^2 per 100 kg pig. The intermediate distance group will be a mixture of both stocking densities.

Results and discussion

In 2002, average transport mortality was 0.012 %, average lairage mortality 0.005 %, giving a total average mortality of 0.016 %. This mortality is very low compared to other published figures for European countries (Warriss, 1995). There was a clear effect of time of year on mortality figures (Figure 1). Lairage mortality was relatively independent of time of year but transport mortality, and hence total mortality, increased during the summer months. In July and August transport mortality was almost doubled compared to winter months. Maximum recorded temperatures in July and August were 31.7 and 32.1 ^{o}C respectively. Average relative humidity did not vary between July and August in 2002, being 87-88 % at 7-8 am in the morning and 66-70 % in the middle of the day.

Most Danish transports are below 100 km and relatively few pigs are transported over 200 km (Table 1). Transport mortality increased with transport distance and was significantly higher with longer transport ($p<0.001$). Previously, it was generally accepted that transport mortality was not related to transport distance, as removal of a sensitive pig from its familiar environment, loading it onto a vehicle and mixing it with unfamiliar animals was sufficient to trigger the mechanism leading to hyperthermia and death. Older Swedish figures (Cedervall, 1966) confirm that most pigs die during transport and that pigs dying in the lairage are already affected on arrival at the factory. Lairage mortality was zero for transport distances longer than 50 km in this work.. The present Danish pig population is essentially free of the halothane gene and it seems that under these conditions transport mortality is affected by transport distance. A plausible reason could be that mortality will increase with time if the internal environment in the vehicle is less than optimal, as pigs would be subjected to sub-optimal conditions for a longer period during longer transports. The higher mortality during the summer months compared to winter would support this explanation, as sub-optimal conditions within the vehicle would have greater effect in warmer weather.

Conclusions

• In a pig population essentially free of the halothane gene and with a low overall mortality, transport mortality increases during warmer weather and with longer journeys.

• Improving the internal environment of vehicles especially in summer months can be expected to lower transport mortality.

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Table 1. Effect of transport distance on transport mortality in Danish slaughter pigs in 2002

Transport distance km	Total no. of pigs	% of pigs transported	Pigs dead on arrival	Transport mortality %	Significance
< 100	16,189,889	90.5	1.880	0.0116	p<0.001
100-200	1,441,793	8.1	243	0.0169	
> 200	250,940	1.4	56	0.0223	
Total	17,882,622	100.0	2.179	0.0122	

Figure 1. Monthly transport and lairage mortality for 2002 in relation to environmental temperature