EFFECT OF *ANTE-MORTEM* TREATMENT IN TRANSPORT AND LAIRAGE MORTALITY IN COMMERCIAL PIG ABATOIRS

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BACKGROUND

There is no doubt that deaths occurring during transport or lairage clearly reflect the state of animal welfare. Also, high mortality rates are associated with inferior pigmeat quality, which means considerable economic losses for the pig meat sector. The environmental factors (management and weather) and the genetic sensitivity of stress of pig populations are the main causes of pre-slaughter mortality. In Spain, where the climatic conditions tend to induce heat stress in pigs, the total mortality was 0.22 % during 1992, 1993 and 1994 in 16 representative commercial abattoirs (Guardia **et al.**, 1996). It is considerable the importance of the economic losses due to deaths during and after the transport of pigs to be slaughtered, which in Spain are approximately 8 millions ECUs.

METHODS

The following pre-slaughter conditions were recorded in a total of 116 journeys (with 17.143 animals evaluated) from farms to 5 pig commercial abattoirs (A) (Oliver **et al.**, 1996) during 2 seasons: summer and winter (S). The following factors on-farm feed-withdrawal (FT), time required for transport (TT), density during transport (DT), time spent in lairage (LT) were recorded. Mortality during transport was calculated as percentage of number of dead pigs on arrival/number of pigs transported. Mortality during lairage was calculated as percentage of number of pigs deaths during lairage/number of pigs transported.
The statistical analysis was carried out with the procedure General Linear Model of the SAS. We applied a statistical model with A, S, FT, TT, DT and LT as main factors and their double interactions (Table 1).

RESULTS AND DISCUSSION

Mortality was significatively affected by several interactions between the main factors analyzed.
In table 2, least squares means of mortality during the transport of two transit loading densities (< 0.40 and > 0.40 m^2/pig) in the abattoirs studied are presented. When transports used stocking densities higher than 0.40 m^2 per pig, no significative differences between abattoirs were observed. However, when the surface available per pig of approximately 100 kg during transport was reduced to less than 0.40 m^2, abattoir B showed a higher transport mortality compared to the other abattoirs, which was significatively reduced using higher than 0.40 m^2 per animal loading densities. These results confirm the recommendation of Lambooij **et al.** (1985) and Lambooij and Engel (1991) that loading densities of approximately 235 kg/m^2 achieve an acceptable compromise between animal welfare, meat quality and the economics of transport. In fact, EU legislation states that pigs cannot be transported with stocking densities higher than 235 kg/m^2 (Directive 92/95CE).

Least squares means of transport, lairage and total mortality in three fasting periods prior to loading (< 12, 12 - 18, > 18 h) in the abattoirs visited are shown in Table 3. In the abattoir B, with the highest transport mortality during those journeys with on-farm feed-withdrawal periods of more than 18 hours, there was a significantly lower transport mortality when the pigs were fasted from 12 to 18 hours when fasting periods are compared. Abattoir A, which showed the highest lairage mortality when fasting periods were more than 18 hours, presented a lower mortality in lairage in the period from 12 to 18 hours of feed withdrawal prior to transport when comparing fasting times. The total mortality losses were significatively higher in abattoirs A and B in the transports studied with feed-withdrawal prior to loading of more than 18 hours, showing significatively lower total mortality with fasting periods before transport from 12 to 18 hours when fasting times are compared. These results agree with other studies where on-farm feed-withdrawal from 12 to 18 hours is recommended (Chevillon, 1994; Guise, 1990).

CONCLUSIONS

Mortality before slaughter is caused by the interactions of several factors: fasting duration, duration of loading and handling, conditions and duration of transport and lairage. On-farm fasting time of between 12 and 18 h decreases the percentage of mortality in abattoirs with a high level of mortality. Mortality during transport increases in some situations when the density in the lorry is below to 0.40 m^2/pig.

LITERATURE

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Table 1. Summary of the significative interactions of the analysis of variance

	SIGNIFICATIVE INTERACTIONS				
	S x A	A x FT	S x TT	A x TT	A x DT
Mortality in transport	*	***	*	***	*
Mortality in lairage	NS	*	NS	NS	NS
Total Mortality	NS	*	NS	*	NS

S: season; A: abattoir; FT: fasting time; TT: duration of transport; DT: density of transport; LT: duration of lairage.
*** ($p < 0.001$); * ($p < 0.05$); NS: No significative

Table 2. Least squares means (LSM) and standard errors (SE) of mortality during transport (%) in relation to the density of transport (< 0.40 and > 0.40 m^2/pig) in five abattoirs

Abattoirs	Density (m^2/pig)				
	< 0.40		> 0.40		Signification
	LSM	SE	LSM	SE	level
A	0.36 ^{b}	0.10	0.57	0.11	NS
B	0.77 ^{a}	0.09	0.04	0.26	**
C	0.15 ^{b}	0.13	0.13	0.16	NS
D	0.11 ^{b}	0.08	0.26	0.36	NS
E	0.01 ^{b}	0.15	0	0.14	NS

LSM with different superscripts indicate significant differences among abattoirs ($P < 0.05$).
Signification level: ** ($p < 0.01$); NS: No significative

Table 3. Least squares means (LSM) and standard errors (SE) of the mortality during transport (%), in lairage (%) and totalt mortality (%), in relation to the on-farm fasting time (< 12 h, 12 - 18 h, > 18 h) in five abattoir

	Abattoirs	Fasting time						
		< 12 h		12 - 18 h		> 18 h		Signification
		LSM	SE	LSM	SE	LSM	SE	level
Mortality in transport								
	A	1.13 ^{a}	0.22	0.85 ^{a}	0.11	0.95 ^{b}	0.12	NS
	B	0.82 ^{ab}	0.16	0 ^{c}	0.22	1.95 ^{a}	0.25	***
	C	0.58 ^{b}	0.11	0.74 ^{ab}	0.24	0.65 ^{b}	0.14	NS
	D	0.69 ^{ab}	0.16	0.56 ^{abc}	0.24	0.85 ^{b}	0.26	NS
	E	0.59 ^{ab}	0.14	0.49 ^{bc}	0.13	0.46 ^{b}	0.25	NS
Mortality in lairage								
	A	0.78 ^{a}	0.25	0.26	0.13	0.82 ^{a}	0.12	**
	B	0.41 ^{ab}	0.19	0.43	0.14	0 ^{b}	0.31	NS
	C	0.42 ^{ab}	0.11	0.81	0.30	0.11 ^{b}	0.16	NS
	D	0.28 ^{ab}	0.12	0.48	0.17	0.14 ^{b}	0.24	NS
	E	0.20 ^{b}	0.12	0.21	0.13	0.42 ^{b}	0.31	NS
Total Mortality								
	A	1.03 ^{a}	0.34	0.39	0.20	1.18 ^{a}	0.21	**
	B	0.75 ^{ab}	0.25	0	0.29	2.10 ^{a}	0.42	**
	C	0.56 ^{ab}	0.18	0.83	0.42	0.31 ^{b}	0.25	NS
	D	0.25 ^{b}	0.17	0.31	0.26	0.40 ^{b}	0.32	NS
	E	0.26 ^{ab}	0.23	0.15	0.24	0.11 ^{b}	0.45	NS

LSM with different superscripts indicate significant differences among abattoirs ($P < 0.05$).
*** ($p < 0.001$); ** ($p < 0.01$); NS: No significative