

POSTER PRESENTATIONS

BLOOD GASES, METABOLIC PROFILE AND DEHYDRATION OF FEMALE AND BARROW PIGS TRANSPORTED FOR A PERIOD OF 7.5 HOURS IN MEXICO

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ABSTRACT

The aim of the study was to evaluate the effect of gender on a series of blood gases, and dehydration in pigs transported for 7.5 hours. A total of 250 pigs (120 females and 130 barrows) were monitored and a blood sample was taken on arrival to the abattoir. Significant differences ($P < 0.05$; Kruskal-Wallis) were observed for ear temperature, $p\text{CO}_2$, $p\text{O}_2$, K^+ , Ca^{++} , lactate and haematocrit between genders. Females had greater values ($P < 0.01$) than males for Ca^{++} (mmol/L): 1.48 ± 0.02 vs. 1.42 ± 0.01 ; lactate (mg/dL): 61.79 ± 1.89 vs. 56.03 ± 1.23 , and ear temperature ($^{\circ}\text{C}$): 39.51 ± 0.07 vs. 39.12 ± 0.07 , respectively. Haematocrit was higher ($P < 0.0001$) in males ($41.43 \pm 0.38\%$ vs. $37.63 \pm 0.50\%$). Results show that males were more tolerant to transport stress than females.

Keywords: pigs, transportation, haematocrit, carcass pH, blood gases, lactate, abattoir

INTRODUCTION

Transportation is one of the most important stages in pigs handling before slaughter, since it influences meat quality and quantity (Gallo *et al.*, 2000); transport duration affects the welfare of transported pigs (Wajda & Denaburski, 2003) compromising physiological stress and/or physical fatigue. The aim of the study was to evaluate the effect of gender on blood gases, energetic profile, acid-base imbalance and dehydration in pigs transported over a 7.5 hours period.

MATERIALS AND METHODS

Animals

The study was carried out in a federal inspection plant from August to October, 2006. A total of 250 pigs (130 barrows and 120 females) Pietrain x (Yorkshire x Landrace) were studied. Transportation was done in livestock trailers with straw bedding, according to the animal care regulations in Mexico (Official Mexican Regulation, NOM-024-Z00, 1995). Pigs were transported for 7.5 hours without stops and were not fed, nor provided with water.

Rectal temperature at arrival

Rectal temperature was measured with a digital rectal thermometer immediately after unloading; each of the transported pigs was marked with a marker on the cervical region in order to identify them before slaughter.

Sacrifice and carcass traits

Pigs were sacrificed through electrical stunning. After stunning, 45 min post sacrifice, pH was measured in the hot carcass and after fast cooling in the cold carcass.

Blood sampling

Animals were monitored from slaughter to sale as cold carcass. A blood sample was taken from jugular vein within 15 seconds of restraining, and mixed with lithium heparin to impede blood gas alteration. In our experience, the blood sampling takes approximately 20 to 30 sec. In order to evaluate acid-base imbalance, energetic profile and dehydration, haematocrite (%), glucose (mg/dL), serum electrolytes [Na⁺, K⁺ and Ca²⁺ (mmol/L)] and blood lactate (mg/dL) levels, oxygen saturation [SaO₂ (%)], and partial pressure of carbon dioxide [PaCO₂ (mm Hg)] and oxygen [PaO₂ (mm Hg)], were obtained by means of an automatic blood gas and electrolyte analyzer (GEM Premier 3000, Instrumentation Laboratory Diagnostics S.A. de C.V. México).

Statistical analysis

Results were analysed through a Kruskal-Wallis test.

RESULTS & DISCUSSION

Mean and standard error of the mean for traits monitored at arrival at the abattoir are shown in Table 1.

Significant differences were observed between genders ($P < 0.05$) for ear temperature (°C), pCO₂, pO₂, K⁺, Ca⁺⁺, lactate and haematocrit, with regard to the transport effect and tolerance of gender to stress. Females presented a great level ($P < 0.01$) of plasmatic Ca⁺⁺ (mmol/L) and lactate (mg/dL), and higher ear temperature (°C) than males on arrival to the slaughterhouse.

Higher lactate concentration found in pigs transported over a short period (7.5 h), might be an indicator of physical stress and might be one of the reasons for the lower pH values obtained in both genders (Pérez *et al.*, 2002).

There was a dramatic increase ($P < 0.0001$) in the haematocrit levels for the males (females 37.63 ± 0.50 , vs. males $41.43 \pm 0.38\%$), this may be due to a greater loss of body fluids since males deposit more fat and there is an inverse relationship between fat deposition and amount of liquids. There was a higher pH ($P < 0.01$) in both hot and cold carcass for the castrated males compared with the females (Table 2). Gilts showed values in the normal pH range (5.8–6.2).

Table 1. Mean and standard error of the mean of the energetic metabolism, acid-base imbalance, and blood gases on arrival at the abattoir according to the gender of transported pigs for 7.5 hours

Traits	Normal values*	Females n = 120	Barrows n = 130	Kruskal- Wallis test
		Mean \pm SEM	Mean \pm SEM	P (α)
Restraining time (sec)	–	21.55 \pm 0.47	22.03 \pm 0.47	0.4720
Ear temperature ($^{\circ}$ C)	37.5–39	39.51 \pm 0.07	39.12 \pm 0.07	0.0003
Blood pH	7.33–7.45	7.37 \pm 0.01	7.36 \pm 0.01	0.7699
pCO ₂ (mmHg)	40 \pm 2.3**	39.22 \pm 0.44	42.04 \pm 0.30	0.0001
pO ₂ (mmHg)	71 \pm 3**	23.44 \pm 0.56	21.50 \pm 0.38	0.0051
Na ⁺ (mmol/L)	133–171	148.05 \pm 0.36	148.20 \pm 0.24	0.7206
K ⁺ (mmol/L)	4.5–6.5	4.93 \pm 0.04	5.51 \pm 0.05	0.0001
Ca ⁺⁺ (mmol/L)	2.4–3.0	1.48 \pm 0.02	1.42 \pm 0.01	0.0067
Glucose (mg/dL)	48–135	103.80 \pm 1.49	100.40 \pm 1.61	0.1241
Lactate (mg/dL)	0–10	61.79 \pm 1.89	56.03 \pm 1.23	0.0116
Haematocrit (%)	36–43	37.63 \pm 0.50	41.43 \pm 0.38	0.0001

*After Bollen *et al.* (2000), Plonait & Bickhardt (2001) and Tello (1991).

**From arterial blood.

Table 2. Mean and standard error of the mean for the carcass pH from transported females and barrows for 7.5 hours electrically stunned

Carcass traits	Females n = 120	Barrows n = 130	Kruskal-Wallis test
	Mean \pm SEM	Mean \pm SEM	P (α)
Hot carcass pH	6.45 \pm 0.01	6.52 \pm 0.01	0.0040*
Cold carcass pH	6.00 \pm 0.02	6.22 \pm 0.01	0.0001*

CONCLUSIONS

On the basis of the information derived from the present study, it can be concluded that contrary to expectations, males were more tolerant to transport stress than females, this is observed by the biophysical profile at arrival, but also in the hot and cold carcass' pH values, which were significantly more acid in the females compared with the males.

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