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CO_2 stunning may compromise swine welfare compared with electrical stunning

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ABSTRACT

The effects of two different stunning methods on critical blood values in fattening pigs at a federal inspection slaughtering plant were monitored. A total of 658 pigs from the same genetic line and origin, were randomly assigned to 3 treatments: reference baseline levels (resting pigs; T1), stunning with CO_2 (T2) and stunned electrically (T3). Energetic profile, acid imbalance and blood gas levels, were monitored. Significant differences ($p \leqslant 0.05$) between treatments for all variables were found, CO_2 stunned pigs showed hypercapnia, hypercalcemia, hyperglucemia, lactic acidemia, and an increase in haematocrit, coupled with reduced pH, P_{O_2}, and Na; electrically stunned pigs had reduced blood pH, P_{CO_2} and P_{O_2}. The remaining indicators were increased in relation to the resting swine. Thus CO_2 stunning leads to a major imbalance because of mineral and acid base gaseous interchange, compared to electric stunning, thus possibly compromising animal welfare.

1. Introduction

Maintaining high standards of animal welfare during transportation and slaughter requires the appropriate equipment and supervision of employees. Besides, animals should be unconscious at the time of slaughter in order to avoid pain and stress during the procedure (Gracey, 1989; Grandin, 2003). Most developed countries and many developing countries have laws that require stunning before sacrifice (FAO, 2001). Stunning is based on producing insensibility by striking the animal or other means.

Sacrifice of swine is carried out by bleeding the arteries and veins of the brachiocephalic trunk that interrupts the nutrient and oxygen supply to the brain, causing death of the animal. Therefore acceptable stunning systems must guarantee quick action rendering the animal unconscious without pain, and the unconscious state must be prolonged till the animal's death (Quiroga & García, 1994).

A stunning system can be reversible or irreversible. In the first case, animals can recover consciousness before death; therefore, the time between stunning and bleeding is a determining factor with regard to stunning efficiency. On the contrary, irreversible stunning systems "stun" and cause death of the animal simultaneously. In this case, the objective of the sacrifice is to drain the blood from the carcass, for which time would not be critical from the animal welfare point of view (Quiroga & García, 1994; Velarde, Faucitano, Manteca, & Diestre, 2000a).

Currently, the most frequently used methods for stunning swine are electric stunning and exposure to carbon dioxide. The aim of this study was to compare the effect of these stunning methods on the energetic profile, acid imbalances, as well as gaseous interchange, as means to determine animal welfare.

2. Material and methods

2.1. Location

This study was carried out in a federal inspection plant in Central Mexico.

2.2. Experimental handling

A total of 658 Mexican swine from a cross of Yorkshire–Landrace mother and a Pietrain sire, were monitored. The day before they left the farm for transportation to the slaughterhouse, random blood samples were taken from 159 pigs approximately 155 days old. This sample was taken as both baseline and reference sample. The next day the animals were transported for 7.5 h from the farm to the slaughterhouse and records were kept until they were sacrificed.

Transportation was done according to the animal care regulations in Mexico (official Mexican regulation NOM-024-ZOO-1995).

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