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Animal Welfare 2010, 19: 515-522
ISSN 0962-7286

Relationship between the response to the corneal reflex (depth of narcosis) and specific parameters in the slaughter blood of pigs narcotised with CO_2

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Abstract

There has been insufficient research into CO_2 stunning with regard to its effect on pigs being slaughtered. This lack of knowledge may be at least partly responsible for the partial rejection of CO_2-stunning methods. During routine slaughter work, 598 pigs (average carcase weight: 94 kg) were evaluated. The stunning procedure was carried out in industrial stunning chambers with 90% CO_2 by volume and an exposure time of either 120 or 90 s. The corneal reflex response was evaluated immediately prior to bleeding in order to determine the depth of narcosis. Blood was taken at slaughter (slaughter blood) to determine the partial pressure of breathing gases and the acid-base status. We found that CO_2 stunning mainly produced hypoxaemia, but also normo- and hyperoxaemia, in arteriovenous slaughter blood. No further positive reflex responses occurred at a pO_2 threshold of $\leq$ 1.6 kPa. PCO_2 increased to values of 40 kPa and above. This extreme hypercapnia resulted in a decrease of the slaughter blood pH with values of less than 7.00 (ie, strong respiratory acidosis). Starting with threshold values from $pCO_2 \geq$ 23 kPa and pH $\leq$ 6.85, stunned pigs revealed only a few or no positive reflex responses, respectively. The non-respiratory Stewart-variable serum [SID_3] was elevated to alkaline values of 65 mmol L^{-1} and above, in comparison to the normal values of 45 (± 2) mmol L^{-1}. We conclude that the use of cut-off points such as the pH and/or pO_2 in routine sampling of slaughter animals (eg by application of ion-sensitive electrodes) would establish the depth of narcosis in pigs destined for slaughter. The efficiency of monitoring could thereby be improved during slaughter, in line with the demands of animal welfare.

Keywords: *acid-base parameter, animal welfare, blood-gas tension, CO_2 stunning, corneal reflex response, pigs*