Aversion to the inhalation of nitrogen and carbon dioxide mixtures compared to high concentrations of carbon dioxide for stunning rabbits

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Abstract

Stunning by inhalation of nitrogen (N₂) and carbon dioxide (CO₂) mixtures reduces aversion compared to high concentrations of CO₂ in pigs and poultry. The objective of the study was to assess the aversion to 90% of CO₂ (90C) and an alternative gas mixture of 80% N₂ and 20% CO₂ (80N20C) in commercial rabbits (Oryctolagus cuniculus). Sixty animals, divided into two groups, were used. During the first day, the rabbits of both groups were lowered in pairs into the pit with atmospheric air and their behaviour was recorded as control. During the second day, one group was exposed, again in pairs, to 90C and the other to 80N20C for 1 min. Exploratory behaviour and general activity were assessed 2 min before the exposure, during the exposure and for 2 min subsequently. During the exposure, signs of respiratory distress, loss of balance, muscle twitching and recovery of balance were also assessed. In the control sessions (atmospheric air), animals did not show respiratory distress or muscle twitching and were less active while the crate was descending than when gas treatments were applied. The percentage of animals with respiratory distress was higher in 90C (97%) than 80N20C (40%). Muscle twitching occurred earlier in 80N20C (97%; 23.9 s) than in 90C (17%; 37.4 s). A second phase of muscle twitching occurred only in 90C at 93.0 s. Mean latency of lost of balance and recovery were lower in 80N20C (24.2 and 98.6 s, respectively) than in 90C (28.2 and 110.2 s, respectively). It is concluded that rabbits showed less signs of respiratory distress to inhalation of 80N20C than 90C but more signs of aversion than when they were exposed to atmospheric air.

Keywords: animal welfare, aversion, carbon dioxide, nitrogen, rabbits, stunning

Introduction

Domestic rabbits (Oryctolagus cuniculus) kept for meat production represent 1.2% of the meat produced in Europe. However, they are in fact the second species, after poultry, in terms of the number of animals slaughtered per year in the European Union, with 321,334 × 1,000 rabbits in 2009 (FAOSTAT). Due probably to the local consumption of this meat (mainly restricted to the Mediterranean countries), this is by far the least studied meat production species in terms of animal welfare (EFSA 2005), especially when compared to pigs, poultry, cattle, sheep and goats. Eurogroup for Animals stated that further research is needed on rabbits to improve handling during transport and slaughter (Eurogroup for Animals 2010). Stunning before slaughter is a statutory requirement in Europe (Council Regulation [EC] No 1099/2009) and is performed to induce unconsciousness and insensibility in animals in order that the slaughter can be performed without causing the animals any avoidable anxiety, pain, suffering or distress. Under commercial conditions, two main methods are used to stun rabbits for meat production, electrical and mechanical stunning. In both systems animals have to be handled and restrained before stunning. According to the EFSA (2005), rabbits should be lifted by grasping the loose skin at the back of the neck and supported by placing the hand beneath the hindquarters. However, due to possible fur damage, most abattoir personnel avoid catching the animals by the skin on the neck and use the legs or ears instead. This latter method is painful and is not allowed by the Regulation 1099/2009 (EFSA 2005). Alternatively, carbon dioxide stunning is used in pigs and birds, and allows the exposure of animals in groups, and avoids the need for shackling of live animals. This reduces human contact during handling and decreases pre-slaughter stress (Velarde et al 2000). In this stunning system, animals contained in cages, cradles, crates or conveyor belts, are exposed to high concentration of CO₂ or a predetermined gas mixture contained within a well or tunnel. However, carbon dioxide is not allowed for the stunning of rabbits for meat consumption (Regulation 1099/2009) because of its aversiveness at high concentrations (Conlee et al 2005). Furthermore, loss of consciousness is not immediate and other species, such as pigs, mice or rats, also react adversely on its exposure (Smith & Harrap 1997; Leach et al 2002) especially when the concentration of CO₂ is above 30% (Raj & Gregory 1995; Velarde et al 2007; Dalmau et al 2010b). Raj and Gregory (1995)