

# The Stunning Debate on Pigs: Welfare implications associated with Gas Stunning prior to Slaughter

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## Introduction

In many countries, pigs are stunned before being slaughtered in order to reduce their pain and suffering (FAO, 2001). A common method of stunning involves using CO<sub>2</sub> gas. This is often preferred over traditional methods, such as electrical stunning, as pigs can be stunned in groups without individual restraint, minimising human contact and hence minimising stress considerably. However, because of the aversive effects it has on pigs by not causing an immediate loss of consciousness (Atkinson *et al.*, 2012; Fries *et al.*, 2013; Llonch *et al.*, 2012), there are still welfare concerns with this method. This paper examines recent research on the effects of gas stunning on pigs and what should be done in order to improve their welfare.

## Discussion

Many abattoirs use a 90% concentration of CO<sub>2</sub> for stunning, as studies have shown that this results in less physical stress than lower concentrations, due to metabolic acidosis being less pronounced (Mota-Rojas *et al.*, 2012). The use of gases such as argon or nitrogen to stun pigs has been considered an alternative to high concentrations of CO<sub>2</sub>, since it reduces aversion (Llonch *et al.*, 2013). But, while pigs showed no signs of aversion when high argon concentrations were used, it is not a practical choice for use in commercial situations. Llonch *et al.* (2013) assessed unconsciousness in pigs during and after exposure to various mixtures of carbon dioxide and nitrogen gas via the index of consciousness (IoC), their behaviour and the lack of brain stem reflexes. Using mixtures of 70% N<sub>2</sub>/30% CO<sub>2</sub>, 80% N<sub>2</sub>/20% CO<sub>2</sub> and 85% N<sub>2</sub>/15% CO<sub>2</sub>, they compared this with using 90% CO<sub>2</sub>. Three trials were conducted, each with female pigs (n=24) of mean weight 93kg. These were divided into four treatment groups each comprising six pigs, with each pig receiving one of the treatments. Within each of the four groups, half the pigs were exposed to the gas for a shorter period than the other half (3 or 5 minutes for the N<sub>2</sub>/CO<sub>2</sub> mixtures and 2 or 3 minutes for the CO<sub>2</sub> mixture). Brain activity decreased sooner in the 90% CO<sub>2</sub> mixture compared with the N<sub>2</sub>/CO<sub>2</sub> mixtures. In addition, 90% CO<sub>2</sub> also caused a higher aversive reaction but faster loss of consciousness than the N<sub>2</sub>/CO<sub>2</sub> mixtures.

Another notable observation was that all pigs exposed to CO<sub>2</sub> for the longer period died, while approximately three quarters survived when exposed for the shorter period. No pigs died, during the short exposure to N<sub>2</sub>/CO<sub>2</sub>, while approximately 70% died from the long exposure, though no differences were found across the different mixtures. The authors concluded that 85% N<sub>2</sub> should not be used for stunning as brain stem activity restarted much sooner than with the other mixtures. Also, if other N<sub>2</sub> mixtures are to be used, then the pigs should be exposed to them for at least 5 minutes to guarantee that they remained unconscious.

In a similar study, Llonch *et al.* (2012) investigated the meat quality of pigs stunned using the same gas mixtures as in the 2013 study. Parameters for meat quality included pH at 45 minutes (pH<sub>45</sub>) and 24 hours post mortem, electrical conductivity, drip loss and colour. Pigs treated with N<sub>2</sub>/CO<sub>2</sub> had a lower pH<sub>45</sub> than those exposed to 90% carbon dioxide. As CO<sub>2</sub> concentration decreased, the meat also became more exudative (i.e., it oozed fluid and other materials). The key findings were that while adding N<sub>2</sub> to CO<sub>2</sub> caused less aversion than 90% CO<sub>2</sub>, the time taken to reach unconsciousness was longer and the meat and carcass quality were impaired. Thus, there is a dilemma between better animal welfare and better quality meat for consumers when deciding between an N<sub>2</sub>/CO<sub>2</sub> mixture and CO<sub>2</sub> for stunning pigs.

It is also important to make sure the stunning process is properly managed and monitored because, if it is not, pigs may regain consciousness and this will cause unnecessary distress. Atkinson *et al.* (2012) attempted to create a standardised assessment for stun quality to be used in abattoirs. Eight Swedish abattoirs were monitored with a total of 9520 female pigs (offspring of Hampshire sire and Landrace/Yorkshire sows) investigated. A stun-quality protocol was created to classify pigs based on symptoms that could signify that they were regaining consciousness. Regular gasping was identified as a valid indicator of inadequate stunning. In two of the abattoirs, a second assessment was conducted due to a large number of inadequately stunned pigs. In these two abattoirs, after the stun machines had been serviced, CO<sub>2</sub> concentrations and exposure times were increased and all pigs were successfully stunned.

A limitation of the above studies was that only female pigs were tested and hence research should also be conducted on male pigs to see if similar results are obtained. One difficulty encountered was objectively assessing unconsciousness, since some symptoms (such as corneal reflexes) are only indicative of brain stem activity and do not necessarily indicate the recovery of cortical function and hence consciousness (Atkinson *et al.*, 2012; Llonch *et al.*, 2013). Llonch *et al.* (2013) also noted that assessing brain activity was difficult due to pigs performing muscular excitations after inhaling gas, causing a delay in the calculation of the IoC and with 16 of the pigs not having their data recorded during the study.

## Conclusion

It is clear that the issue of pig stunning is complex and that further research is required if the welfare of pigs at slaughter is to be improved, without severely compromising profit for producers or meat quality and price for consumers. For now, 90% CO<sub>2</sub> still appears to be the best method for stunning since the pigs lose consciousness faster and meat quality is better, despite the greater aversive effects compared to N<sub>2</sub>/CO<sub>2</sub> mixtures. In addition, making sure stress is minimised as much as possible and that stunning is carried out properly and monitored regularly for any problems that arise will ensure that pigs suffer as little as possible prior to slaughter.

## References

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