Title: Developing best management practices for on-farm euthanasia of young pigs using carbon dioxide gas – NPB #08-145 revised

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Scientific Abstract:
The use of carbon dioxide has the potential to be a practical method of on-farm euthanasia for young pigs in farrowing as an alternative to blunt force trauma, where the pigs’ small size makes the use of a captive bolt dangerous and impractical. For carbon dioxide to become a practical on-farm alternative to blunt force trauma it is necessary to develop best management practices for the use of carbon dioxide on commercial swine farms taking into consideration animal welfare and worker safety. The objectives of this study were to develop best management practices for euthanasia of young pigs using carbon dioxide. In experiment 1, five pigs of six different ages (1, 2, 3, 4, 5, and 6 weeks of age) were euthanized in an euthanasia chamber. The euthanasia chamber measured 76.6 cm X 42.6 cm X 50.0 cm. The pig was placed in the chamber and then the carbon dioxide was gradually released at a flow rate of 20% per min. The concentration of the carbon dioxide gas in the chamber was measured over time during euthanasia to calculate the ‘wash-in and wash-out’ effect of the carbon dioxide. Blood samples were collected prior to euthanasia and immediately after death to measure cortisol and catecholamine concentrations. Heart rate and brain activity were used to assess time of death. Pig behavior and vocalizations were recorded using a camcorder. Behavior and postures recorded included breathing intensity (heavy, gasping), escape attempts, loss of consciousness, padding.

In experiment 2, five pigs were euthanatized by prefilling the chamber with CO₂ prior to placing the pig in the chamber so as to compare the physiological and behavioral response to CO₂ euthanasia using the gradual fill (experiment 1) and prefill methods. Carbon dioxide was allowed to flow into the chamber until the concentration in the chamber reached 90% CO₂. Once the chamber reached a concentration of 90% CO₂, the pig was placed in the chamber. The same physiological and behavioral measures were recorded as in experiment 1. Data were analyzed using analysis of variance using the mixed model procedure of SAS.

Cortisol concentrations were elevated (P < 0.001) in pigs after euthanasia with CO₂ gas compared with baseline values, regardless of age. Age of pig influenced (P < 0.05) the time to onset of heavy breathing, gasping, loss of balance, escape behaviors and death. Cortisol concentrations were elevated (P < 0.001) in pigs after euthanasia with CO₂ gas compared with baseline values, regardless of method of gas administration. The time to onset of heavy breathing, gasping, loss of balance, performance of escape behaviors, loss of posture, paddling and the last gasp was quicker (P < 0.05) in pigs euthanized using the prefill compared with the gradual fill method. Furthermore, the time to death was shorter (P < 0.05) in pigs euthanized using the prefill compared with the gradual fill method as measured by EEG (Gradual: 461.6 s; Prefill: 248.2 s) and heart rate (Gradual: 464.7 ± 22.9 s; Prefill: 313.4 ± 56.1 s). Based on these results, the prefill method of euthanasia appears more humane than the gradual fill method, therefore best management practices were written based on the prefill method rather than the gradual fill method.