

Validation of a penetrating captive bolt device with air-channel pithing as a single-step method for euthanasia of cattle in mass depopulation situations

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Introduction

The objective of this study was to evaluate the use of a penetrating captive bolt device with a built-in low pressure air-channel pithing as a single-step method for humane euthanasia of cattle in a mass depopulation scenario. Currently, the only single step methods of euthanasia approved for use in cattle are gunshot or barbiturate overdose both of which are impractical for mass depopulation situations.

Materials and Methods

Sixty-six feedlot steers and heifers ranging from 500 to 1100 pounds were euthanized using a Jarvis USSS-3 pneumatic captive bolt device with low pressure air-channel pithing delivered as the bolt retracted. The following clinical information was collected: corneal reflex, palpebral reflex, righting reflex, vocalization, respiration, involuntary movement, heart rate, auscultable heartbeat, and electrocardiography. Upon confirmation of death, the head was disarticulated at the atlanto-occipital joint and the following information collected: head weight, brain weight, skull thickness, diameter of the bolt entry hole, distance of the bolt entry site from the poll, depth of bolt penetration, brain tissue disruption and hemorrhage. Sagittal sections of skulls were made with a band saw to assess and score brain trauma induced by the air-channel pithing captive bolt device.

Results

One hundred percent (66/66) of animals had an immediate loss of consciousness when the bolt entered the calvarium and damaged the cerebrum of the brain; however 3 animals required a second (2) or third shot (1) because animal movement caused failure of the bolt to enter the calvarium. Heartbeat as determined by auscultation continued for approximately 7.3 minutes (440 seconds) following disruption of the brain by the penetrating captive bolt. Electrical activity of the heart was detectable for an average of 501 seconds (8.3 minutes) post shot. Regions of the brain observed to have significant damage included cerebrum 100%, cerebellum 21%, midbrain 53%, pons 27%, medulla oblongata 17% and thalamus/hypothalamus 76%. None of the animals in this study required an adjunctive step to cause death.

Significance

Results of the study indicate that the penetrating captive bolt equipped with an air-channel pithing mechanism is an effective single-step method for humane euthanasia of cattle. When accurately placed over the correct anatomical site this device is capable of lethal brain trauma preventing any possibility of a return to consciousness.