

## Effects of high airline pressures on stunning cattle with pneumatically powered captive bolt guns

Steffan Edward Octávio Oliveira<sup>\*1,2</sup>, Neville George Gregory<sup>3</sup>, Filipe Antonio Dalla Costa<sup>1,2</sup>, Maria Camila Ceballos Betancourt<sup>1,2</sup>, Mateus José Rodrigues Paranhos da Costa<sup>1,2</sup>, and Osmar Antonio Dalla Costa<sup>4</sup>

<sup>1</sup>FCAV-UNESP, Jaboticabal, SP, Brazil, <sup>2</sup>ETCO, Jaboticabal, SP, Brazil, <sup>3</sup>Royal Veterinary College, London, UK, <sup>4</sup>EMBRAPA Swine and Poultry, Brazil

The objective of this study was to assess the efficiency of two methods of stunning cattle using pneumatically powered captive bolt guns operating with high airline pressures. A total of 535 animals (395 Zebu and 140 European cattle) were distributed into two stunning treatments: Penetrating (PCB, N=443) and non-penetrating captive bolt (NPCB, N=92) (Jarvis Products Corporation®). PCB gun was powered pneumatically with 190 psi, which is the highest level of air pressure recommended for this model (USSS-1), and NPCB gun within the range of 210-220 psi (USSS-2A). Number of shots, collapse at the first shot and signs of consciousness were assessed. The signs of brain function (rhythmic respiration, corneal and palpebral reflex, eyeball rotation, response to nostril stimulation, tonic and clonic convulsion, tremor, righting reflex, tongue protrusion and masseter relaxation) were recorded after the animal had rolled out of the stunning pen (GR), just after being hoisted (HA) and at the bleeding rail (BL). Data were subjected to the Fisher exact test (2015 Graphpad Software, Inc.) to compare the effects of the treatments on responses of cattle after stunning. Two or more shots was more frequently observed for NPCB than PCB (29 vs. 12%,  $P<0.001$ ), and cattle were more likely to collapse at first shot when using PCB than NPCB (99 vs. 91%,  $P<0.002$ ). NPCB showed more eyeball rotation (5 vs. 1%,  $P<0.046$ ) and righting reflex (7 vs. 1%,  $P<0.06$ ) than PCB at GR. Tremor was more frequently observed for PCB than NPCB at HA (6 vs. 1%,  $P<0.05$ ). Some of NPCB cattle (2%) presented response to nostril stimulation while PCB did not ( $P<0.04$ ). Tongue protrusion was more frequent for PCB than NPCB (61 vs. 36%,  $P<0.001$ ) on BL. Rhythmic respiration was more frequently observed for NPCB than PCB at GR, HA and BL. The relatively high airline pressure used with NPCB in this study appears to have reduced signs of effective stunning. Based on these results, the PCB method was more efficient than NPCB in stunning cattle.

**Key Words:** cattle slaughter, consciousness signals, penetrating gun, rhythmic respiration, shot