

Anatomical pathology and behavioural reflex responses induced by non-penetrating captive bolt devices for on farm euthanasia of layer chickens

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This study evaluated three types of non-penetrating captive bolt devices (Zephyr-E, Zephyr- EXL and TED) for loss of consciousness, cessation of heart beat and severity of brain damage in four different age groups of layer chickens (11, 20, 30-35, 60-70 weeks). Zephyr-E (120 psi) and Zephyr-EXL (98-100 psi) were powered by compressed air while TED was powered by a gas canister. None of the three devices has been scientifically assessed on layer chickens. Comparison among the devices and age groups were computed statistically with GLM in SAS. Insensibility was observed immediately after device application as measured by pupil, nictitating membrane and pedal reflexes in all birds. With the Zephyr-E, 12.3% failures were recorded (five 60 week old roosters and two 30 week old hens) and no failures were recorded for the other devices. Cessation of heart rate was longest ($P=0.009$) with TED (201 ± 5 s), followed by Zephyr-EXL (192 ± 5 s), and the lowest in Zephyr-E (176 ± 5 s). Similarly, mean end time of convulsions ($P=0.0315$) and cloacal contractions ($P=0.0100P$) were longest in TED and shortest in Zephyr-E. Older birds experienced the shortest time ($P<0.0001$) to cessation of heart beat, onset of tonic convulsions, conclusion of convulsions and cessation of cloacal contraction. External bleeding was observed with all three devices (TED- 82.8%, Zephyr-EXL-85.9% - Zephyr-E-79.8%). The highest level of subcutaneous hemorrhages ($P<0.0001$) occurred with TED in comparison to the other two devices. There was no effect of device on the skull damage ($P=0.1334$). The least brain damage as measured by subdural hemorrhages was caused by Zephyr-E ($P<0.0001$). Results demonstrated that all three devices induced immediate insensibility leading to death in all age groups of layer chickens. Due to the failure rates, however, TED and Zephyr-EXL appears to be more efficient than the Zephyr-E for on farm killing of layer chickens.

Key words: Euthanasia, non-penetrating captive bolts, layer chickens

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Efficacies of manual, assisted manual and mechanical cervical dislocation methods in anesthetized layer chicks

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Mechanical cervical dislocation devices are marketed to provide poultry producers with humane onfarm euthanasia methods. However, most are not yet scientifically evaluated. This study compared the efficacies of the Koechner Euthanizing Device (KED- small size), Manual Cervical dislocation (MCD) and Assisted Manual Cervical Dislocation (AMCD; the bird's ventral neck is placed on a table edge and the back of the neck was pressed firmly) on anesthetized, healthy layer chicks (2-3 day old, BW=41.8±3.5g, n=8). Chicks were anesthetized with an intramuscular injection of medetomidine (0.3mg/kg BW) and ketamine (30mg/kg BW). MCD and AMCD were also evaluated using conscious chicks to determine effect of anesthesia. Time at which pupillary reflex disappeared, duration of gasping, and cessation of heart beat were recorded. Severity of damage caused by the devices was assessed by skin damage, transection of spinal cord, gross subcutaneous hemorrhage at the site of cervical dislocation (0-4 scale) and microscopic brain trauma and hemorrhage (0-4 scale). Data were analyzed by using Proc Glimmix procedure of SAS ver. 9.4. Time to loss of pupillary reflex, cessation of heart beat, and duration of gasping were longer in conscious than in anesthetized chicks (95.2±5.7s vs 72.2±5.9s, 170.2±11.7s vs 138.6±12.1s and 91.9±10.1s vs 53.9±11.2s respectively; P =0.002, 0.007, 0.0221). Latency to loss of pupillary reflex did not differ among the 3 methods. Cessation of heart beat (196.4±32.5s) occurred later and duration of gasping (103.4±13.9s) was longer for the KED (P =0.0051, 0.0233) compared to MCD (130.9±33.2, 32.2±16.1) and AMCD (137.9±32.5,137.9±32.5). There was no skin trauma with the KED, while 16% and 12.5% of those killed with MCD and AMCD, respectively, had evidence of skin trauma. Mean score for gross subcutaneous hemorrhage of the neck was lower for KED (1.00±0.2) than AMCD (2.3±0.2) and MCD (1.87± 0.2). The spinal cord was transected in 100% of MCD and AMCD, and 12.5% of KED. Neither subdural nor parenchymal hemorrhages were noted microscopically in the brains of chicks for any of the killing methods. Since time to loss of pupillary reflex was longer in conscious chicks, we predict that the KED will result in a longer time to onset of insensibility and cessation of heart beat in conscious birds.

KEYWORDS: Euthanasia, chicks, welfare, sensibility, anesthesia

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