

Under pressure: determining optimum air pressure for humane euthanasia of mature broiler breeders with an air-powered non-penetrating captive bolt device

L. Serpa^{1,2}, T.M. Widowski^{1,2}, K. Schwean-Lardner³ and S. Torrey^{1,2}

¹Campbell Centre for the Study of Animal Welfare, University of Guelph, Guelph, ON

²Department of Animal Biosciences, University of Guelph, Guelph, ON

³ Department of Animal and Poultry Science, University of Saskatchewan, Saskatoon, SK

Presenting author: S. Torrey

Non-penetrating captive bolt devices have been commercially developed for on-farm euthanasia of poultry species. While a prototype device powered by compressed air was scientifically validated for use on turkeys and piglets, no data existed on the use of commercially available devices for broiler breeders. Our objective was to assess the efficacy of the Zephyr-EXL (Bock Industries), powered at different air pressures, for inducing rapid loss of consciousness and death in mature broiler breeder roosters. We hypothesized that higher air pressures would have higher success rates, but would result in greater external and internal damage. Seventy-five mature broiler breeder roosters (>45 wk of age; 4.7 ± 0.4 kg) were killed with the Zephyr-EXL, with 15 roosters killed at each of 80, 90, 100, 110 and 120 psi. We assessed presence or absence of palpebral and nictitating eye reflex immediately after device application to evaluate efficacy, and scored the external damage to the skull on a 3 point scale (from no visible blood to extensive blood from site and orifices). On a subsample of birds (5 per pressure), macroscopic dissections were performed to assess damage to brain, brain stem and spinal cord. Data were analyzed with a Kruskal Wallis analysis. All but one rooster was rendered unconscious immediately after device application (one failure at 90 psi). Overall, there was no effect of treatment on external damage ($P=0.091$), but roosters killed at 120 psi (score= 1.27 ± 0.15) had higher damage scores than all others combined (0.71 ± 0.09 ; $P=0.0086$). There were no other differences among pressures in subcutaneous hemorrhages, subdural dorsal hemorrhages, subdural ventral hemorrhages or internal skull damage. Our results suggest that pressures between 80-120 psi are equally effective at humanely killing broiler breeder roosters, although 120 psi resulted in more blood loss, potentially deeming this pressure too high for biosecurity and aesthetic reasons.

PRESENTED AT EUROPEAN POULTRY WELFARE CONGRESS, PLOUFRAGEN, FRANCE, JUNE 2017

Assessing the effect of dehydration on onset of insensibility and death during on-farm euthanasia in broiler chickens

B. I. Baker¹, S. Torrey², P.V. Turner², T.M. Widowski², T.D. Knezacek¹, J. Fricke³, S.Gomis³, H.L. Classen¹, K. Schwean-Lardner¹.

¹ Department of Animal and Poultry Science, University of Saskatchewan, Saskatoon, SK

² Campbell Centre for the Study of Animal Welfare, University of Guelph, 50 Stone Road East, Guelph, Ontario

³ Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK

Presenting author: B. Baker

Evidence from preliminary studies investigating poultry euthanasia suggest that dehydrated cull birds respond differently compared to healthy birds. Despite this, the majority of euthanasia research has focused on healthy end-of-production birds. The objective of this study was to determine how dehydration, common in cull birds, affects the time until onset of insensibility and death with three euthanasia methods. Broiler chickens' (n=179) access to water was removed for either 0, 24, 48 or 72h prior to euthanasia at 8, 22, 36 or 50d of age. Four methods were used: mechanical cervical dislocation (Koechner Euthanasia Device (KED)), non-penetrative captive bolt (Zephyr EXL (Z) at 22-50d), manual cervical dislocation (MCD) or controls euthanized with T-61. Birds were euthanized and monitored for indicators of insensibility and death: loss of pupillary light (PL), palpebral blink (PB), nictitating membrane reflex (NM), time until feather erection (FE), start and end of cloacal winking (CW), and end of convulsions (CNV). Data were analyzed as a two-way factorial (CRD) using Proc Mixed SAS 9.4. Planned contrasts were used to assess if variables differed between 0h (Non) and all dehydrated birds (Dehy). Significance was determined when $p < 0.05$. The results indicated that the start and end of CW in Dehy occurred later compared to Non at 22 (96.3 v 70.5, 118.2 v 99.7s for start or end respectively), 36 (93.6 v 64.7, 122.7 v 88.0s) and 50d (91.0 v 55.3, 122.5 v 84.7s). Time until end of CNV was longer in Dehy than Non at 22 (109.7, 85.5s), 36 (98.6, 73.2s) and 50d (106.2, 65.5s). Time until FE was longer for Dehy than Non at 36 (63.9, 41.3) and 50d (69.6, 45.5s). Time until loss of PB was longer in Dehy than Non at 8 (20.9, 12.2s) and 36d (20.1, 12.0s). Dehydration did not impact PL or NM. A euthanasia method effect was seen, with insensibility induced fastest by Z, and death by MCD. An interaction between method and dehydration level occurred with NIC (at 22d), where dehydration had no effect when the Z was used, but delayed time of death when CD was used. In conclusion, the indicators tested for the onset of death (time until start and end of CW, and CNV) were longer in Dehy at 22, 36 and 50d, compared to Non, suggesting that the onset of death in dehydrated birds is longer than healthy birds. Keywords: Dehydration, culling, welfare, unconsciousness

PRESENTED AT POULTRY SCIENCE CONGRESS, ORLANDO, FLORIDA, JULY 2017

Assessing the welfare impact of on-farm euthanasia methods on broilers

B. I. Baker¹, S. Torrey², P.V. Turner², T.M. Widowski², T.D. Knezacek¹, J. Fricke³, S.Gomis³, H.L. Classen¹, K. Schwean-Lardner¹.

¹. Department of Animal and Poultry Science, University of Saskatchewan, Saskatoon, SK,

². Campbell Centre for the Study of Animal Welfare, University of Guelph, 50 Stone Road East, Guelph, Ontario

³. Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK

Presenting author: B. Baker

This study uses behavioral reflexes and pathology to assess the ability of three euthanasia methods to produce insensibility and death in broilers. The methods (manual cervical dislocation (MCD), mechanical cervical dislocation with Koechner Euthanasia Device (KED) and Zephyr EXL, a non-penetrative captive bolt (Z) were tested on 240 cull birds at 7, 21 and 35d of age. Efficacy at inducing insensibility and death was measured by time until loss of reflexes post-euthanasia; palpebral blink (PB), nictitating membrane (NM), pupillary light (PL), cloacal winking (CW) and convulsions (CVN). Damage was assessed by scoring pathology; skin tears, separation distance between vertebrae with cervical dislocation (SEP), spinal cord transection, subcutaneous hemorrhaging at head, subdural hemorrhaging, skull fracture, severity and number of vertebral fractures. Reflex data were analyzed as a RCBD (block=farm) using Proc Mixed, and score data was log transformed and analyzed as an assumed Poisson distribution in a CRD in SAS 9.4. Significance was considered at $p \leq 0.05$. Indicators of insensibility showed a treatment effect with loss of PL and PB occurring fastest in Z, then MCD and lastly KED, at 7, 21 and 35d. Time until loss of NM was shortest with Z usage, then MCD and KED at 21 and 35d. Euthanasia method also affected indicators of death. Time until CW end was shortest with use of MCD, then KED or Z at 7, 21 and 35d. Length of CVN was shortest in MCD, then Z or KED at 7 and 21d. Skin tears were lower with MCD (3%, 3%) then Z (22%, 63%) or KED (46%, 53%) at 21 and 35d. For 21 and 35d, skull fracture, subdural and subcutaneous hemorrhaging scores were highest with Z use, then MCD or KED. MCD had 98% of spinal cords transected and KED had 81%. SEP was higher with use of MCD vs. KED at 7 (2.97, 1.03), 21 (2.97, 1.40) and 35d (3.00, 1.27). At 7, 21 and 35d the vertebral fracture severity was highest with use of the KED (1.93, 2.03, 1.83) then MCD (1.17, 1.10, 1.00) or Z (0, 0 for 21 and 35d respectively). The KED resulted in the highest number of vertebral fractures at 21 and 35d. The results indicate that the Z induces insensibility fastest. MCD is the fastest at inducing death, whilst the KED took longest to induce insensibility and death, and had the highest scores for severity of vertebral fracture and number of fractures.

Culling, cervical dislocation, death, insensibility

PRESENTED AT POULTRY SCIENCE CONGRESS, ORLANDO, FLORIDA, JULY 2017

Examining the efficacies of two non-penetrating captive bolt devices for the on-farm euthanasia of broiler breeders.

L. Serpa^{1,2}, T.M. Widowski^{1,2}, P. Lawlis^{2,3}, K. Schwean-Lardner⁴, P. V. Turner^{2,5}, S. Torrey^{1,2}.

¹University of Guelph, Department of Animal Biosciences, 50 Stone Rd E, Guelph, ON,

²Campbell Centre for the Study of Animal Welfare, University of Guelph, Guelph, ON,

³Ministry of Agriculture, Food and Rural Affairs, 1 Stone Rd W, Guelph, Ontario,

⁴University of Saskatchewan, Saskatoon, Saskatchewan,

⁵University of Guelph, Department of Pathobiology, 50 Stone Rd E, Guelph, ON

Presenting author: L. Serpa

On-farm euthanasia of cull birds is a common practice and is a crucial part of any animal welfare program. Although methods of euthanasia vary widely between farms due to differing management practices, any technique being used should rapidly result in the irreversible loss of sensibility while minimizing the amount of distress to the animal. However, there is very little data on euthanasia methods, particularly for poultry species. The aim of this study was to assess the efficacies of two non-penetrating captive bolt devices, the TED[®] and Zephyr-EXL[®], for the on-farm euthanasia of cull broiler breeders, where the TED[®] is a gas-powered device and the Zephyr-EXL[®] is pneumatically powered. To achieve this, focal trials were conducted on 100 roosters, 100 hens and 100 pullets collectively from four different broiler breeder farms across Ontario. Measures of sensibility including nictitating membrane reflex, pupillary light reflex, duration of clonic and tonic convulsions, time to cloacal relaxation and time to cessation of convulsions were recorded for every bird. Once all convulsions had ceased, the birds were assessed and scored for damage caused by the device on a 3 point scale, where 0 was no external bleeding and 2 was extensive blood loss at the site of device application. A general linear model was used to compare the device, age and sex effects, along with their interactions, with Tukey tests run post-hoc. The results showed that the TED[®] and the Zephyr-EXL[®] were successful 96.7% and 97.3% of the time, respectively. Time to cessation of convulsions differed between sexes ($p=0.0042$) and ages ($p<0.001$); mature female birds ceased convulsions sooner ($170.7 \pm 7.5s$) than any of the males ($236.0 \pm 6.5s$) and younger females ($280.4 \pm 10.6s$). Cloacal relaxation was observed to be the last reflex before complete cessation of movements in 266 birds, suggesting it could be a conservative indicator of time of death. The Zephyr-EXL[®] caused significantly more damage than the TED[®] ($p<0.0001$), at the site of application (1.4 for the TED[®]; 1.8 for the Zephyr-EXL[®]). In conclusion, both devices induced immediate loss of sensibility by directly disrupting brain functions and thus effectively providing a humane death.

PRESENTED AT NORTH AMERICAN REGIONAL MEETING OF INTERNATIONAL SOCIETY FOR APPLIED ETHOLOGY, AMES, IOWA, MAY 2017