Humane euthanasia of neonates II: field study of the effectiveness of the Zephyr EXL non-penetrating captive-bolt system for euthanasia of newborn piglets

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Abstract

A previous study demonstrated the effectiveness of the Bock Industries Zephyr EXL non-penetrating captive bolt, using the abolition of visual-evoked potentials as a determination of brain death, in piglets in a laboratory. A second trial, reported here, involved the field-testing of this device, on-farm, in a commercial setting. Two hundred and seven piglets (mean [± SEM] dead weight: 1.86 [± 0.74] kg) requiring dispatch under the farm’s protocols were euthanised with the device and demonstrated immediate loss of consciousness, subjectively assessed by behavioural signs and no recovery. Post mortem examination of the heads was undertaken confirming massive traumatic damage to the cerebrum with associated haemorrhage and bone plate shards forced down to the level of the corpus callosum in the majority of cases. A further trial of 106 piglets demonstrated that under commercial production conditions it took less than 7 s to select, place and euthanase a piglet using the device. One hundred percent of animals in the study were immediately killed. Given this complete kill rate and the sample size of the study, a statistical 95% confidence interval provides a maximum percentage of animals that would not immediately be stunned/killed, by this mechanical non-penetrating captive-bolt system, to be at most 1.2% and at least 0%. The results here, combined with the previous study, allow recommendation of the Bock Industries Zephyr EXL as being suitable as a single application euthanasia device for piglets up to 10.9 kg liveweight.

Keywords: animal welfare, captive bolt, euthanasia, mechanical stunning, piglet, Zephyr EXL

Introduction

On-farm casualty killing, or the killing of surplus animals, is traditionally performed by manual blunt-force trauma which is carried out by administering a blow to the head either with a hammer or similar heavy instrument or, by swinging the young animal against the floor or a wall (Farm Animal Welfare Committee [FAWC] 2017). Although this method is widely used, it is heavily dependent on the strength and skill of the stockperson and, consequently, the probability of achieving an immediate and humane kill in all cases is low. Furthermore, a lack of proper training and human error can result in pain and distress for the animal. It is also a method of killing that is aesthetically unpleasant for both the operator and any bystanders. Council Regulation (EC) 1099/2009 of 24 September 2009 on the Protection of Animals at the Time of Killing, Annex 1 limits the use of a manual percussive blow to the head or wall to piglets ≤ 5 kg liveweight, stating that this method shall not be used as a routine method but only where there are no other methods available for stunning and no more than seventy animals per operative, per day, may be killed by this method.

Earlier field studies using the lower powered Zephyr E (bolt energy = 20 J) employed a three-application method (two in rapid succession on the frontal bone followed by a third at the back of the skull behind one ear) (Casey-Trott et al 2013) or, a two-application method (Casey-Trott et al 2014) for the euthanasia of piglets. Following these studies, the manufacturer, Bock Industries PA, USA developed the Zephyr EXL, which delivers more power (bolt energy = 27.7 cf 20 J) to negate the requirement for repeat application of the device to the animal. A previous study examined the effectiveness of the higher powered Zephyr EXL non-penetrating captive-bolt system, for the euthanasia of newborn and weaned piglets up to 10.9 kg liveweight (Grist et al 2017). This study, conducted under laboratory conditions, demonstrated that a single application positioned on the frontal-parietal bone abolished visual-evoked potentials immediately in all the piglets. The American Veterinary Medical Association (AVMA 2013), amongst others, encourages those using manual blunt-force trauma as a euthanasia method to seek alternative techniques, for example, they recommended that a mechanical percussive blow to the head can be used for piglets up to three weeks of age. As such, this non-penetrating captive bolt mechanical blunt force trauma (MBFT) device, ie the Zephyr EXL, can be considered to comply...