PROCEEDINGS OF THE 11th WORLD RABBIT CONGRESS
Qingdao (China) - June 15-18, 2016
ISSN 2308-1910

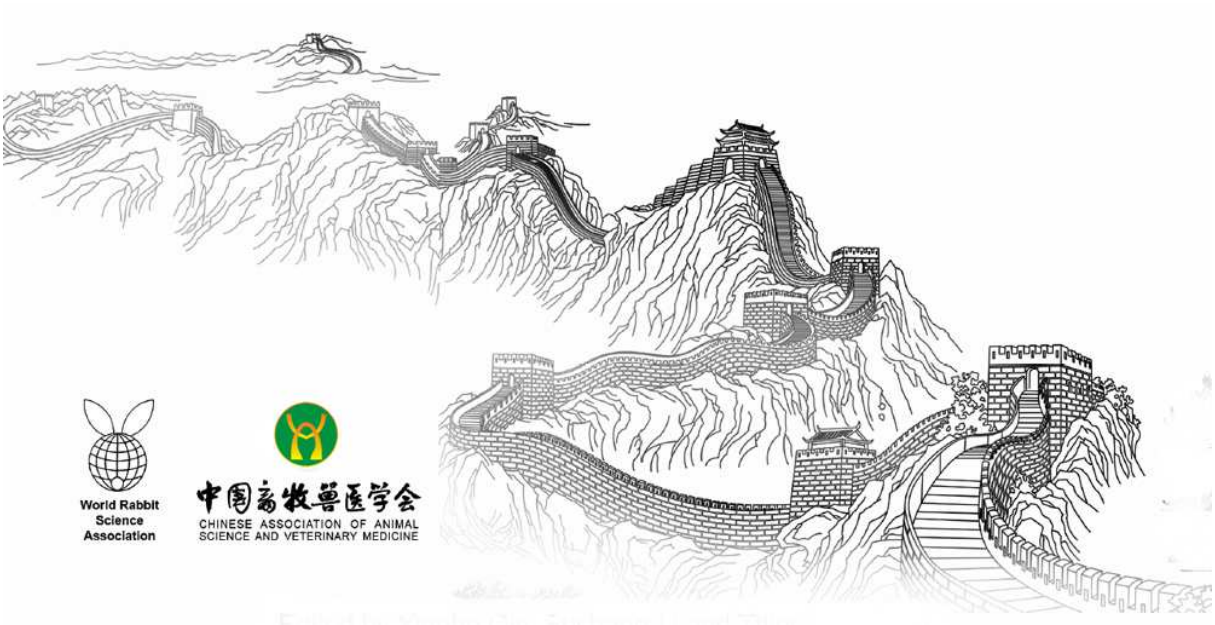
Session
Ethology and Welfare

Walsh J., Percival A., Lawlis P., Turner P.V.

EFFICACY OF BLUNT FORCE TRAUMA VERSUS NON-PENETRATING CAPTIVE BOLT FOR ON-FARM EUTHANASIA OF PRE-WEANED KITS, GROWERS AND ADULT RABBITS.

Full text of the communication

How to cite this paper :
Walsh J., Percival A., Lawlis P., Turner P.V., 2016 - Efficacy of blunt force trauma versus non-penetrating captive bolt for on-farm euthanasia of pre-weaned kits, growers and adult rabbits. *Proceedings 11th World Rabbit Congress - June 15-18, 2016 - Qingdao - China, 731-734.*



EFFICACY OF BLUNT FORCE TRAUMA VERSUS NON-PENETRATING CAPTIVE BOLT FOR ON-FARM EUTHANASIA OF PRE-WEANED KITS, GROWERS AND ADULT RABBITS

Walsh J.[1]*, Percival A.[1], Lawlis P.[2], Turner P.V.[1]

[1]Dept. of Pathobiology, University of Guelph, N1G 2W1, Guelph, Canada
[2]Ontario Ministry of Food, Agriculture, and Rural Affairs, N4T 1W2, Woodstock, Canada
*Corresponding author: jwalsh03@uoguelph.ca

ABSTRACT

Livestock producers must identify animals that need to be euthanized in a timely fashion and use humane, effective methods. There is a lack of information as to which methods are most effective for euthanizing commercial meat rabbits on-farm. This research gap has left rabbit producers and their veterinarians without the tools and resources needed to develop appropriate on-farm euthanasia plans. The aim of this research was to evaluate and compare blunt force trauma (BFT) and a non-penetrating captive bolt (NPCB) device as to their effectiveness and humaneness for euthanizing pre-weaned kits, growers and adult rabbits. After a technique was performed, rabbits were assessed for immediate and sustained insensibility and time to death. All rabbits (n=58 for BFT, n=63 for NPCB) were dissected post mortem to assess and score macroscopic damage to the skull and brain. There was a significant difference in risk of method failure between the two methods (P<0.001). The NPCB caused immediate insensibility and resulted in death without return to sensibility in 100% of the animals for which it was used. There was an overall risk of failure for BFT 22% of the time, increasing to 43% when just adult rabbits were evaluated. Brain hemorrhage and skull fracture scores were more severe (P<0.001) for rabbits killed by NPCB versus BFT. The results of this research indicate that blunt force trauma is not a reliable or effective method for euthanasia of adult rabbits; having a high risk of failure and inflicting less damage to the brain than the NPCB. The non-penetrating captive bolt device was reliable and effective, and caused marked, irreversible damage to the brain.

Key words: Rabbit euthanasia, Blunt force trauma, Non-penetrating captive bolt.

INTRODUCTION

Commercial meat rabbit producers are faced daily with the task of euthanizing sick and injured rabbits. Because of a lack of research, they are without the tools, resources, and specific knowledge and training regarding which euthanasia methods to use and correct application. An appropriate euthanasia method is one that rapidly renders the animal insensible leading to a swift death. The method must result in minimal pain or distress (CVMA, 2014). Other important considerations when choosing a method are cost, practicality, repeatability, esthetics for an observer and for the operator, and ease of use. The CVMA expects all commercial food animal producers to have an on-farm euthanasia plan for every livestock species they raise that is approved by their veterinarian (CVMA, 2014).

Blunt force trauma (BFT) is the most common on-farm rabbit euthanasia method (Walsh et al, 2016). While BFT can be a humane technique when performed correctly, there can be a steep learning curve for correct application, it is not esthetically appealing, and a reluctance to use the technique may result in delays in killing animals that are suffering or in pain. Ontario abattoirs are not permitted to use BFT to stun rabbits prior to slaughter (CFIA, 2014) and some have switched to using a purpose designed non-penetrating captive bolt (NPCB) device. A similar device has been validated for euthanizing piglets up to 9 kg (Casey-Trott et al, 2014), as well as various poultry species, but it has not been validated for rabbits. The objective of this research was to evaluate and compare BFT and NPCB for euthanasia of pre-weaned kits, growers and adult rabbits.

MATERIALS AND METHODS

Euthanasia techniques

Three large (n=400 does) rabbit farms were recruited to participate in this study. Producers were experienced and had all been raising meat rabbits for >5 years. Their method of on-farm euthanasia was BFT. The NPCB was used exclusively by research personnel during this trial, and the operator was trained and the technique validated prior to use on live rabbits. All rabbits used in this study were ones targeted for euthanasia by the producer and euthanasia was conducted on-farm. The procedures and protocol for this research were reviewed and approved by the University of Guelph Animal Care Committee (AUP3366).

The BFT technique used by producers varied, but in all cases the rabbit was suspended by its back legs prior to striking the animal on the head with a heavy object or against a hard surface. When the NPCB was used, rabbits were restrained in a container with non-slip flooring, with the operator's hand resting on the shoulder blades, thumb and forefinger around the neck. The NPCB (Zephyr-E, Bock Industries, Philipsburg, PA, USA) was connected to an air compressor and then was positioned on the frontal and parietal bones, in the centre of the head, with the device barrel placed in front of the ears and behind the eyes. The device was discharged twice in the same location using previously validated pressures, based on rabbit weight (55 psi for pre-weaned kits, 70 psi for growers, and 90 psi for adults).

Ante mortem observations

After the euthanasia method was applied, the observers assessed insensibility by evaluating the corneal, palpebral, pupillary light, and pedal withdrawal reflexes. Any tonic/clonic convulsions were recorded and timed. Cardiac arrest was assessed through palpation and direct auscultation.
Time to death was recorded based on lack of voluntary or involuntary movement, complete loss of reflexes, and cardiac arrest. If any of the following occurred: the animal was not immediately insensible, it returned to sensibility or rhythmic breathing or any purposeful vocalizations were noted the application of the euthanasia technique was deemed a failure, and the method or an alternative method were immediately reapplied.

Assessing euthanasia technique damage

Rabbit cadavers were assessed at the University of Guelph the same study day for damage. Survey radiographs were conducted on 4 growers from each technique at the OVC Health Sciences Complex. Dissections were conducted to score gross skull fractures, as well as subcutaneous and subdural hemorrhage (Casey-Trott, 2014). Brain sections were subsequently trimmed, fixed, and scored for microscopic evidence of damage (results not presented).

Statistical analyses

Statistical analyses were performed using SPSS (SPSS Statistics for Windows, Version 23.0. 2014. Armonk, NY: IBM Corp.). Macroscopic scoring of damage was analyzed using a Kruskal Wallis 1-way ANOVA with method as the main factor. Chi-square analyses were used to evaluate the relationships between technique and failure rate. Time convulsing was log transformed and analyzed with a 1-way ANOVA Tukey test with treatment as the main factor. A p-value <0.05 was accepted for significance.

RESULTS AND DISCUSSION

Euthanasia method had a significant effect on the risk of euthanasia failure ($x^2(2) = 18.67$, $p<0.001$). Use of the NPCB resulted in immediate insensibility and rapid death without a return to sensibility 100% of the time that it was applied. BFT had an overall risk of failure 22% of the time it was used. Method failure was highest in the adults, with 43% failure rate (Table 1). Macroscopic analyses demonstrated that less specific skull and brain damage occurred with BFT, although damage was sometimes seen to other structures, such as leg or scapula fractures. A majority of rabbits killed successfully with BFT had

minimal gross evidence of brain hemorrhage and minor skull fractures (Table 2). Brain hemorrhage and skull fracture scores were significantly greater ($p<0.001$) for rabbits killed by NPCB.

Table 1: Number of rabbits, average weight and percent method failure in each age group euthanized by BFT vs NPCB.

Method	**Age Group (weeks old)**	**N**	**Body Weight (kg) (mean +/- SE)**	**Method Failure Rate**
Blunt force trauma	Pre-weaned kits (0-5)	23	0.1 +/- 0.1	13%
	Growers (5-12)	21	3.0 +/- 1.6	19%
	Adults (13+)	14	4.0 +/- 0.9	43%
	Overall	58	1.4 +/- 1.5	22%
Non-penetrating captive bolt device	Pre-weaned kits (0-5)	17	0.2 +/- 0.2	0%
	Growers (5-12)	26	1.4 +/- 0.4	0%
	Adults (13+)	20	3.3 +/- 0.7	0%
	Overall	63	1.7 +/- 1.3	0%

Table 2: Distribution of gross injury scores by euthanasia technique in rabbit cadavers.

Method	Damage[1]	Mild	Moderate	Marked
Blunt Force Trauma	SC	37	6	2
	SD	28	16	1
	SK	27	8	10
Non-penetrating captive bolt	SC	1	8	54
	SD	14	32	17
	SK	0	36	27

[1]Damage: subcutaneous (SC), subdural (SD) and skull fracture (SK). N=45 for BFT: SC, SD, SK; and N=63 for NPCB: SC, SD, SK.

Duration of convulsions was significantly shorter ($P=0.012$) for animals killed by BFT versus NPCB. On average, rabbits convulsed for 50s after BFT and 62s after NPCB. In broiler chickens, a correlation was found between the end of convulsions and time of brain death, as indicated by a flat line EEG (Dawson et. al. 2009). These results suggest that when BFT is applied correctly it may result in a faster time to brain death. However, as long as insensibility is immediate, the animal is not experiencing pain. Thus, this may affect esthetics more than animal welfare if two procedures are otherwise identical, in terms of euthanasia efficacy.

Physical euthanasia methods are meant to target the brain causing rapid and direct destruction (CVMA, 2014). These results show that BFT may not always induce sufficient damage to the targeted area on the first application to induce euthanasia. The probable causes of low brain damage scores in this study with BFT include insufficient force used and/or poor accuracy in hitting the animal's head correctly. Research observations of BFT application suggest that poor target accuracy is the biggest concern and is a result of improper restraint. BFT requires force to be directly applied to the rabbit's frontal and parietal bones with a heavy object or hard surface. In this study, producers were observed to restrain rabbits by their hind legs, in which position, they were potentially able to change position, making alignment of the hard object with the head difficult for the operator. Proper restraint while ensuring operator safety is challenging with BFT, particularly for large rabbits. While it may be an effective technique under controlled conditions, the high error rate noted in adult animals suggests that alternate methods of euthanasia should be used and that training must occur prior to the technique being used on any size of rabbit.

CONCLUSIONS

Blunt force trauma was not a reliable or effective method of euthanasia. These results indicate that it has a high risk of failure, resulting in insufficient skull or brain damage. The non-penetrating captive bolt was a reliable and effective euthanasia method with 100% success. This device caused immediate insensibility, progressing to death, and resulted in significant skull and brain damage.

ACKNOWLEDGEMENTS

This study was funded by the Ontario Ministry of Agriculture, Food, and Rural Affairs (UofG2014-2095). We thank the participating rabbit producers and acknowledge Sarah Copeland for technical assistance. We are grateful to Lucia Costanzo for her statistical analysis support.

REFERENCES

Canadian Food Inspection Agency (CFIA). [Internet]. 2014. Chapter 12: Food animal humane handling and slaughter – animal welfare requirements Part C: Poultry and rabbit species. [Cited 20 December 2015]. Available at: http://www.inspection.gc.ca/food/meat-and-poultry-products/manual-of-procedures/chapter-12/animal-welfare-requirements/eng/1392144659190/1392144660111?chap=0

Casey-Trott, T.M., Milliman, S. T., Turner, P.V., Nykamp, S.G., Lawlis, P.C., Widowski, T.M. 2014. Effectiveness of a nonpenetrating captive bolt for euthanasia of 3 kg to 9 kg pigs. J. Anim. Sci. 92: 5166-5174.

CVMA. Euthanasia- Position Statement. 2014. Available from CVMA (https://www.canadianveterinarians.net/documents/euthanasia).

Dawson, M. D., K. J. Johnson, E. R. Benson, R. L. Alphin, S. Seta, and G. W. Malone. 2009. Determining cessation of brain activity during depopulation or euthanasia of broilers using accelerometers. J. Appl. Poult. Res. 18: 135-142.

Walsh, J., Tapscott, B., Turner, P. 2016. Evaluation of producer attitudes regarding on-farm euthanasia methods for commercial meat rabbits. Unpublished raw data.

==========