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TECHNICAL NOTE: RABBIT WELFARE DURING ELECTRICAL STUNNING AND SLAUGHTER AT A COMMERCIAL ABATTOIR

Rota Nodari S.[*], Lavazza A.[†], Candotti P.[*]

[*]National Reference Centre for Animal Welfare, IZSLER, via Bianchi 9. 25124 Brescia, Italy.
[†]National Reference Centre for Viral Diseases of Lagomorphs, IZSLER, via Bianchi 9. 25124, Brescia, Italy

Abstract: A total of 1020 crossbreed rabbits were individually examined to evaluate their welfare during electric stunning and slaughter in a commercial abattoir. Stunning (the position of electrodes and repetition of applications of current) and sticking (the position, length and depth of the cut) procedures were checked. The rabbits were monitored behaviourally from the application of the current to death. The stunning system was incorrectly applied one hundred and ten times (10.8%). Three rabbits failed to be stunned and were still conscious at sticking. Eighteen rabbits recovered before the onset of death, as shown by their corneal reflex and in a few cases, vocalization (n=3) and head movement (n=1) were observed. Corneal reflex seemed to be the best indicator of recovery at the abattoir.

Key Words: rabbit, welfare, electronarcosis, stunning, slaughter.

INTRODUCTION

Breeds and crossbreeds of the European rabbit (*Oryctolagus cuniculus* L.) are bred and slaughtered worldwide for meat production. In Northern Europe, the rabbit is mainly regarded as a laboratory animal and household pet, while in France, Italy, Spain, Portugal and Hungary rabbit meat is produced and consumed on a large scale (EFSA, 2006). Although rabbits are still traditionally home raised and slaughtered in Italy, 28.39 million rabbits of an average 2.6 kg reared on industrial farms are slaughtered per year in authorized rabbit abattoirs (ISTAT, 2007).

According to the provisions of the Italian Law (1993) on the protection of animals at the time of slaughter or killing, which in Italy applies the recommendations of the EU Council Directive 93/119/EC of 22 December 1993, the methods allowed for stunning rabbits are as follows: captive bolt pistol, concussion, electronarcosis and exposure to carbon dioxide. The captive bolt is considered a good method but only for small numbers of rabbits (EFSA, 2006), while electronarcosis is the most widely used stunning method in rabbit abattoirs when large stocks of animals are processed.

Few studies have investigated the physical activity and behaviour of electrically stunned rabbits (Anil *et al.*, 2000; Maria *et al.*, 2001). Electroencephalograms recorded after stunning showed that the bi-temporal application of 100 V of a 50 Hz sine wave alternating current (AC) for 1 sec is capable of inducing Grand Mal epileptic activity in rabbits. In this experiment, two rabbits showed tonic/clonic seizures i.e., the

Correspondence: S. Rota Nodari, sara.rotanodari@izsler.it
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typical clinical signs for epilepsy in other species, while other rabbits appeared to be simply exhausted after stunning (Anil *et al.*, 1998). Electrical stunning can be achieved in rabbits with a minimum voltage of 100V, which should provide currents in excess of 140 mA (Anil *et al.,* 1996).

A clinical scoring system to evaluate welfare at slaughter and particularly at stunning for red meat species was drawn up by Temple Grandin in the 90s and is currently successfully used in many abattoirs in the USA and Europe. On the other hand, very little work has been done on rabbits to evaluate the welfare of these animals when stunned and slaughtered on a large scale. The objective of this study was therefore to clinically evaluate the effectiveness of electrical stunning and slaughter in a commercial rabbit abbatoir.

MATERIALS AND METHODS

Animals

A total of 1020 rabbits in 10 batches from 8 commercial farms were individually examined by the same observer in order to evaluate the efficacy of stunning and slaughter. The trial was carried out in October and November 2007 in an EU-approved rabbit abbatoir in northern Italy. All the rabbits were finishing crossbreed rabbits of mixed sex, 90 days old, weighting 2.5 kg on average. Rabbits were transported daily to the abattoir in cages 35 cm high at a density of 15 rabbits/480 cm^2. The abattoir received two lorry-loads of animals at 7.30 or 10.30 a.m. Each lorry-load consisted of 1 to 3 batches of rabbits and transport time was between 20 min to 3 h. After arrival, animals were unloaded in cages and kept outdoors under shelter until slaughter. The plant had a capacity of 1800 rabbits/d at a rate of 220 rabbits/h. Slaughtering was divided into two shifts: morning from 8 to 12 a.m. and afternoon from 1 to 4 p.m. The same slaughterman was used for the duration of the trial.

Stunning and slaughter

Stunning was manually performed with a V-shaped device that had an electrode mounted on each arm (PZ004C, Gozlin®, Italy). The slaughterman took a rabbit out of the cage, placed the animal on the top of the cage and positioned the two arms of the stunner between the eyes and the ears of the rabbit. The apparatus incorporated a device which measured the impedance of the load and prevented the functioning of the apparatus if the minimum required current was not available. It also had an audible device indicating the duration of its application to an animal and a device indicating voltage and current. The stunning system (TS003, Gozlin®, Italy) incorporated a device capable of measuring impedance and giving a constant voltage of 117 V (peak to peak) and minimum 1.1 A for 1.31±0.29 s (mean±standard deviation; as measured on a sample of 50 rabbits). After stunning, rabbits were hung head down on a rail and slaughtered. The time interval between stunning and sticking, measured on a sample of 50 rabbits, was 5.55±0.88 s.

Parameters recorded and statistical analysis

Each rabbit was individually observed from leaving the cage until the onset of death. The parameters recorded were those listed in Table 1. A chi-square test was applied on the selected parameters.

RESULTS AND DISCUSSION

The results of the observations on 1020 rabbits for each parameter are reported in Table 1.

Electrodes were incorrectly applied to 10.8% of the rabbits. A low temperature and the tiredness of the slaughterman in the second shift did not negatively affect his performance (Table 2).

Table 1: Parameters recorded in 1020 rabbits.

Parameter	Parameter level (No. of observations)	
Timing		
Temperature	Mild, >5°C(480)	Cold, <5°C (540)
Time of the day	Morning (870)	Afternoon (150)
Current application		
Position of the electrodes	Correct[1] (910)	Incorrect[2](110)
Number of current application	One (909)	More than one (111)
Vocalization at current application	Absent (1019)	Present[3](1)
Flight at current application	Absent (1019)	Present (1)
Sticking		
Application (position, length and depth of the cut)	Correct (1020)	Incorrect (0)
Vocalization at sticking	Absent (1017)	Present (3)
Stunning (variables measured from sticking to death)		
Corneal reflex (elicited by fingerprint contact of the eyeball)	Absent (1002)	Present (18)
Gasping	Absent (729)	Present (291)
Blinking	Absent (993)	Present (27)
Vocalization	Absent (1017)	Present (3)
Head righting	Absent (1019)	Present (1)
Rhythmic breathing (more than 18 breaths per min)	Absent (1020)	Present (0)

[1]Correct means electrodes placed between the the eyes and ears. [2]Incorrect: 106 times too close to the nose of the animal, in 4 cases a forelimb was interposed between the arm of the stunning system and the head of the animal. [3]Electrodes were correctly positioned.

Current application was repeated for 111 rabbits, 97 times in the morning and 14 times in the afternoon shift. The electrodes were applied correctly 101 times and only 10 times incorrectly. The slaughterman repeated the application if the first application was not considered long enough. Three rabbits received 4 applications, seven rabbits 3, and 100 rabbits 2. Only 1 rabbit that had received 2 applications showed a flight reaction, while the other 110 did not show any abnormal behaviour. Tonic immobility is a common behaviour displayed by all prey species in case of danger, particularly in nervous rabbits, making it even more difficult to determine whether or not pain is present (Mayer, 2007). We cannot therefore exclude the fact that rabbits which were immobilized at stunning were showing a 'conservation-withdrawal' reflex or tonic immobility, which is more difficult to interpret than the 'fight or flight' reaction.

Table 2: Position of the electrodes.[1]

Temperature	Shift	Incorrect	Correct	Total
Mild	Morning	50	370	420
	Afternoon	5	55	60
Cold	Morning	45	405	450
	Afternoon	10	80	90
Mild + cold	Morning	95	775	870
	Afternoon	15	135	150

[1]Any significant difference on the correct or incorrect electrode position was observed in function of the temperature and shift.

Table 3: Behaviours recorded after sticking.

		Electrode position			
Behaviour		Correct	Incorrect	Total	*P*-value[1]
Corneal reflex	Present	15	3	18	0.43
	Absent	895	107	1002	
Gasping	Present	260	31	291	1.0
	Absent	650	79	729	
Blinking	Present	25	2	27	0.76
	Absent	885	108	993	
Vocalization	Present	3	0	3	1.0
	Absent	1017	0	1017	
Head movement	Present	1	0	1	1.0
	Absent	1019	0	1019	

[1]$P<0.05$ indicates a significant difference between correct and incorrect electrodes position and the presence or absence of the behaviour.

Sticking was correctly performed in all cases, but 3 rabbits squealed at sticking and 2 of them showed a flight reaction due to incorrect positioning of the electrodes. Since a loud, piercing scream is a sign of pain and fear, as when the rabbit is caught by a predator (Mayer, 2007) a squeal or a cry at time of sticking clearly indicates a state of consciousness.

Eighteen rabbits showed a return of reflexes after sticking. A summary of the behaviours recorded after sticking in relation to the position of the electrodes is presented in Table 3 and the specific parameters of the 18 rabbits that recovered before death are reported in Table 4. Electrode position had no significant effect on the occurrence of the behaviours. No rhythmic breathing was recorded after sticking in any rabbit, but of the 18 rabbits (1.76%) that had a corneal reflex 3 rabbits squealed and 1 showed head movement. Gasping (31.9% of the rabbits) is a respiratory pattern, also called terminal breathing, observed just before death, as a consequence of cerebral ischemia (Pluta and Romaniuk, 1990) and could be considered

Table 4: Behaviours recorded in rabbits that recovered before death.

	Rabbit No.																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Position of the electrodes incorrect								X					X					
Extra current applications			X															X
Vocalization at current application																		
Flight at current application																		
Vocalization at sticking																		
Corneal reflex	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Gasping	X	X		X	X	X	X	X	X	X		X	X	X	X	X		X
Blinking	X	X						X							X	X		
Vocalization				X		X									X			
Head righting					X													
Rhythmic breathing																		

X: means the occurrence of the parameter or the behaviour

a positive sign, anticipating the onset of death. However, it was also observed in 15 of the 18 rabbits with a corneal reflex. Electrodes were incorrectly positioned only on 2 of the 18 rabbits that showed signs of recovery and therefore cannot be considered the sole cause of recovery.

In monitoring rabbit welfare at slaughter it is important to recognise a stunned state: cessation of rhythmical breathing (Anil *et al.,* 2000) is probably not the most reliable indicator of recovery, as the animal's fur and the head-down position make it difficult to judge the animals' state. Although rhythmic breathing was not recorded, we cannot exclude the fact that it may have gone unidentified due to procedural difficulties.

CONCLUSIONS

The data obtained in this survey showed that electrodes may have been incorrectly positioned on many animals, probably causing unnecessary suffering. Recovery before death, although recorded in only a few animals, indicated that the duration of stunning is not always adequate. Further studies are necessary to determine why electric stunning does not provide sufficient duration of insensibility in all rabbits. Based on our data and bearing in mind the experiment performed by Anil *et al.* (2000), in which the return of corneal reflex anticipated the return of breathing in 6 out of 10 stunned rabbits, the onset of corneal reflex could therefore be considered the most reliable and effective indicator of return to sensibility at slaughter.

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