Presentation of a “designed case study”

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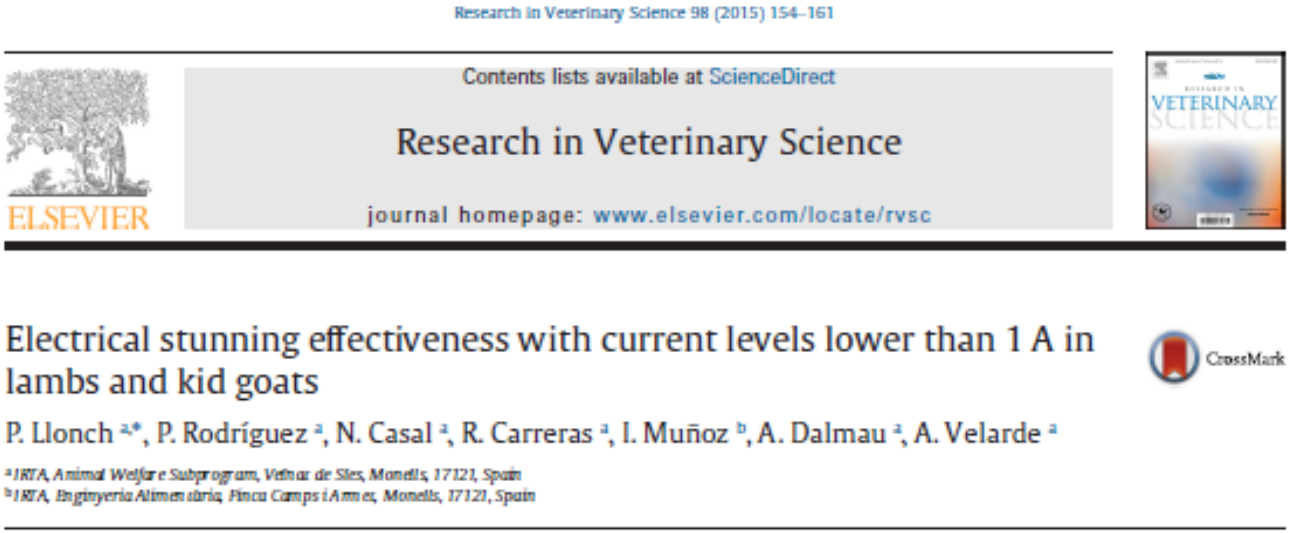
Fulfilling the requirements of the EFSA guidance

Designed Case:

- a) External literature review electrical stunning of small ruminants
  - Background: EFSA was asked to deliver an opinion on two studies on lamb stunning applying <1 Amp.
  - Year 2013
- b) Examples from a published study



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Electrical stunning effectiveness with current levels lower than 1 A in lambs and kid goats

P. Llonch [a,*], P. Rodríguez [a], N. Casal [a], R. Carreras [a], I. Muñoz [b], A. Dalmau [a], A. Velarde [a]

[a] IRTA, Animal Welfare Subprogram, Veïnat de Sies, Monells, 17121, Spain
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External literature review

EFSA supporting Publications 2015:EN-741 [68 pp.].

Review Of The Main Welfare Risks Related To Electrical Stunning Of Small Ruminants (Ovine And Caprine Species)[1]

A. O'Connor[1], R. S Dzikamunhenga[1], S. Totton[2], J. Sargeant[2], J. Glanville[3] and H. Wood[3]

- Available online: http://www.efsa.europa.eu/de/supporting/doc/741e.pdf
  - Consortium

University of Guelph

IOWA STATE UNIVERSITY College of Veterinary Medicine

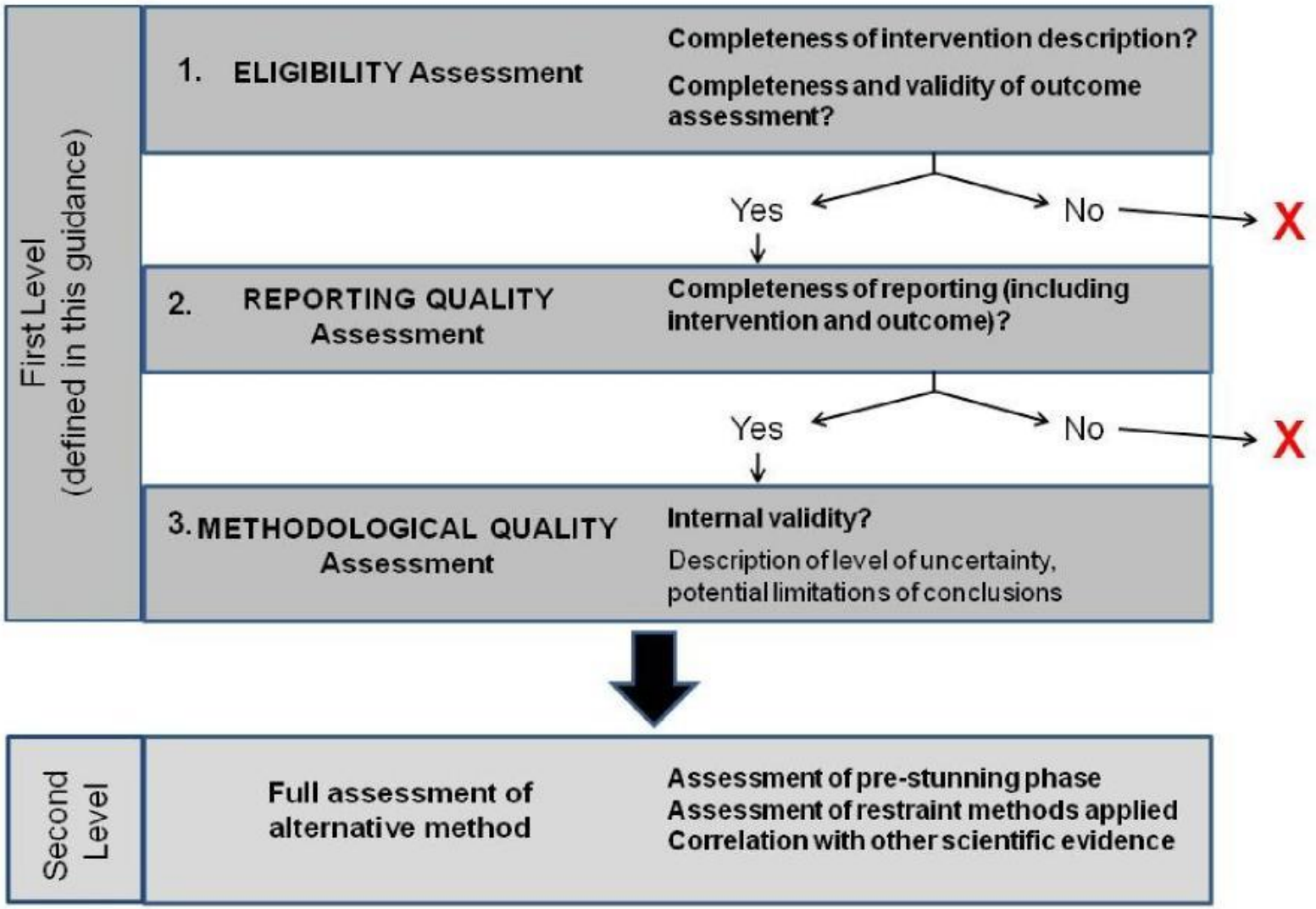
CPHAZ Centre for Public Health and Zoonoses

YHEC York Health Economics Consortium

  - Comprehensive review of animal welfare aspects of electrical stunning methods for small ruminants with an emphasis on low ampere stunning
  - "State of the art" description

Literature review applies “modern assessment criteria”

stepwise procedure of the opinion



External literature review

- Key databases (SCI, CAB, MedLine)
- 1599 records, duplicates…
- 894 papers assessed for relevance
- Relevance: electrical stunning, small ruminants, onset and duration of unconsciousness
- Text:18 papers on electrical stunning in sheep (no goats)
- **No papers covered all parameters detailed in the EFSA guidance.**

External literature review – results – study design

Study	Setting	Country	Sample Size	Breed	Age (weeks)	Weight (kg)
Anil & McKinstry (1991)	NR	NR	12	Mixed	NR	NR
Berg et al. (2012)	Commercial	Sweden	200 (Trial 1) 135 (Trial 2)	Texel, Crosses, Other Meat Types	8 to 12	30 (approx.)
Blackmore & Newhook (1981)	NR	NR	34	Romney, Cheviot cross	"two tooth to full mouth" and 1 week old	NR
Blackmore & Newhook (1982)	NR	NR	16	Romney, Romney cross	52 to 104 and 16 to 24	NR
Bórnez et al. (2009)	Commercial	Spain	103	Spanish Machengo	10	25
Bórnez et al. (2010)	Commercial	Spain	100	Spanish Machenga	4.3	12.80 (0.20)[b]
Cook et al. (1995)	Laboratory	NR	17	Romney Cross	52 to 104	32 to 49
Croft & Hume (1956)	Commercial	United Kingdom	31	NR	NR	NR
Devine et al. (1986)	NR	NR	35	Mixed	52	30 (approx.)
Gregory & Wotton (1984)	NR	NR	91	NR	NR	41 (15)[c]
Gregory & Wotton (1984)	Commercial	United Kingdom	10764	NR	NR	NR
Gregory & Wotton (1985)	NR	NR	22	NR	NR	40.5 (5.2)[d]
Gregory & Wotton (1988)	NR	NR	21	NR	NR	57 (15)[c]
Hoenderken et al. (1981)	NR	The Netherlands	NR	NR	NR	NR
Kuhne et al. (1979)	NR	NR	18	Merino, Karakul	2 (Merino), 0.1 to 0.28 (Karakul)	NR
Lambooy (1982)	NR	NR	67	Texel	NR	43 (8)[c]
Velarde et al. (2002)	NR	NR	24	Ripollesa	12 to 14	22.6 (0.45)[d]
Velarde et al. (2000)	NR	NR	89	Ripollesa	12 to 14	22 (18-28)[e]

(a):NR = Not reported or Not discernible
(b): Authors did not report whether the dispersion was a standard error or standard deviation
(c): Standard deviation
(d): Standard error
(e): Range

NR = not reported: e.g. age, weight, breed, country

External literature review – results - interventions

	Stunning Method	Current Type	Current Waveform	Minimum Current (A)	Exposed Minimum Voltage (V)	Delivered Minimum Voltage (V)	Frequency (Hz)	Minimum Time Exposure (s)
Anil et al. (1991)								
n=12 mature sheep	HTB[a]	NR[b]	NR	NR	300	NR	50	3
Berg et al. (2012)								
Trial 1, 0.6A	HO[c]	Sine AC	NR	0.6	Up to 230	NR	50	10.5
Trial 1, 0.8A	HO	Sine AC	NR	0.8	Up to 230	NR	50	10.5
Trial 1, 1.0A	HO	Sine AC	NR	1.0	Up to 230	NR	50	10.5
Trial 1, 1.25A	HO	Sine AC	NR	1.25	Up to 230	NR	50	10.5
Trial 2, 1.25A, 14s	HO	Sine AC	NR	1.25	Up to 230	NR	50	14
Trial 2, 1.25A, 3s	HO	Sine AC	NR	1.25	Up to 230	NR	50	3
Blackmore & Newhook (1981)								
Head-only stunned and slaughtered	HO	NR	NR	0.7 (approx.)	NR	150	50	NR
Head-only, not slaughtered	HO	NR	NR	0.7 (approx.)	NR	150	50	NR
Head-to-back, not slaughtered	HTB	NR	NR	0.7 (approx.)	NR	150	50	NR

NR = not reported ?

External literature review – results – interventions ff.

	Electrode Position	Electrode Type and Characteristics	Max. stun to stick interval (seconds)[a]	Prevention of Shock/Restraint Method
Anil et al. (1991)	Head-to-back	Hand-held head-to-back electrode set	NR[b]	NR
Berg et al. (2012)	Between the eye and the ear on each side of the head	Scissor-type stunning tongs (Electronic Stunning Equipment BTR 108, Freund, Germany)	11.9[c] (2.59)[d]	Lambs remained in a pen with a small group of other lambs when stunned. No additional method of restraint was used.
Blackmore & Newhook (1981)				
Head-only stunned and slaughtered	Two electrodes applied to the occipital region of the head.	NR	NR	NR
Head-only, not slaughtered		NR	NA[e]	NR
Head-to-back, not slaughtered	As above, with a third electrode placed on the back in the mid-thoracic region	NR	NA	NR

Electrode type and characteristics = not reported

Prevention of shocks/ restraint method = not reported

Example: Reporting of Electrode type and characteristics

Electrode

- Form
- Size
- Sharpness
- Material
- Electrode holder ….

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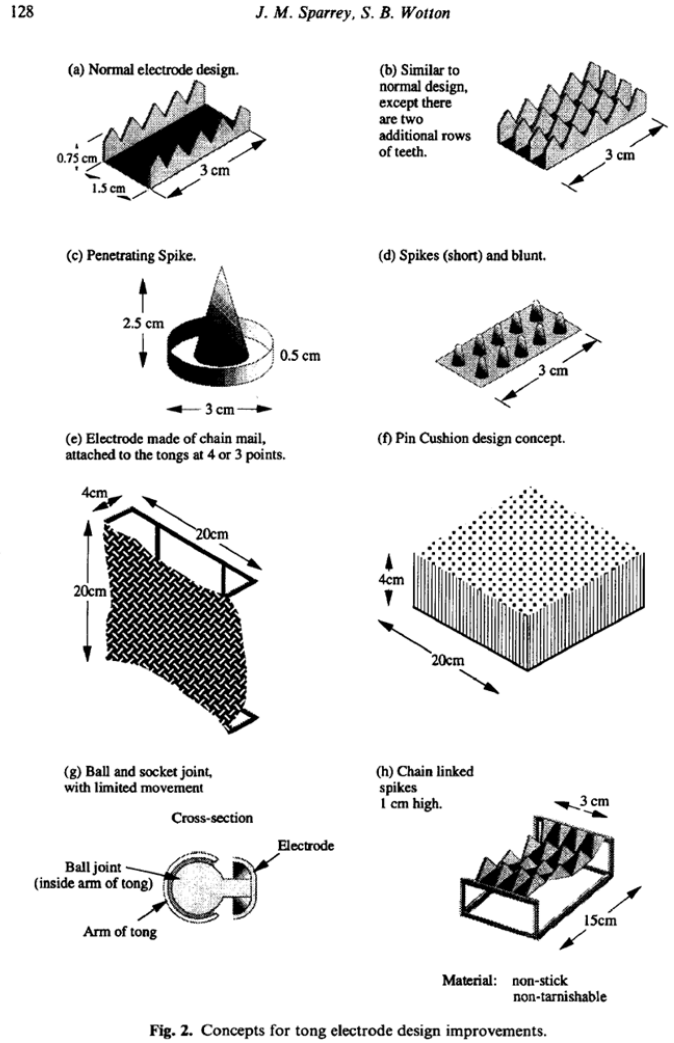


Fig. 2. Concepts for tong electrode design improvements.

External literature review - results - onset of unconsciousness

	Sample size (n)	# Successfully stunned	% Successfully stunned	EFSA criteria met?[a]
Anil & McKinstry (1991)	**Authors defined a successful stun as an epileptiform ECoG**			
HTB[b], 300V, 3s	11[c]	11	100%	Yes
Berg et al. (2012)	**"Good stun quality" was assessed 3s after removal of tongs and defined as absence of ALL of the following: corneal reflex, eye movements (defined as both eyes co-ordinated, fixed at an object), rhythmic breathing (defined as at least two breaths), head-righting reflex and excessive kicking during the tonic phase (defined as any substantial kicking i.e. more than a minor pull) during the general tonic phase)**			
0.6A, 10.5s	50	17	34%	No[d]
0.8A, 10.5s	50	32	64%	
1.0A, 10.5s	50	43	86%	
1.25A, 10.5s	48	44	91.7%	
Bórnez et al. (2009)	**"animal is unable to respond to normal stimuli, including pain, but have breathing not-rhymic" [sic]**			
HO	20	20	100%	No

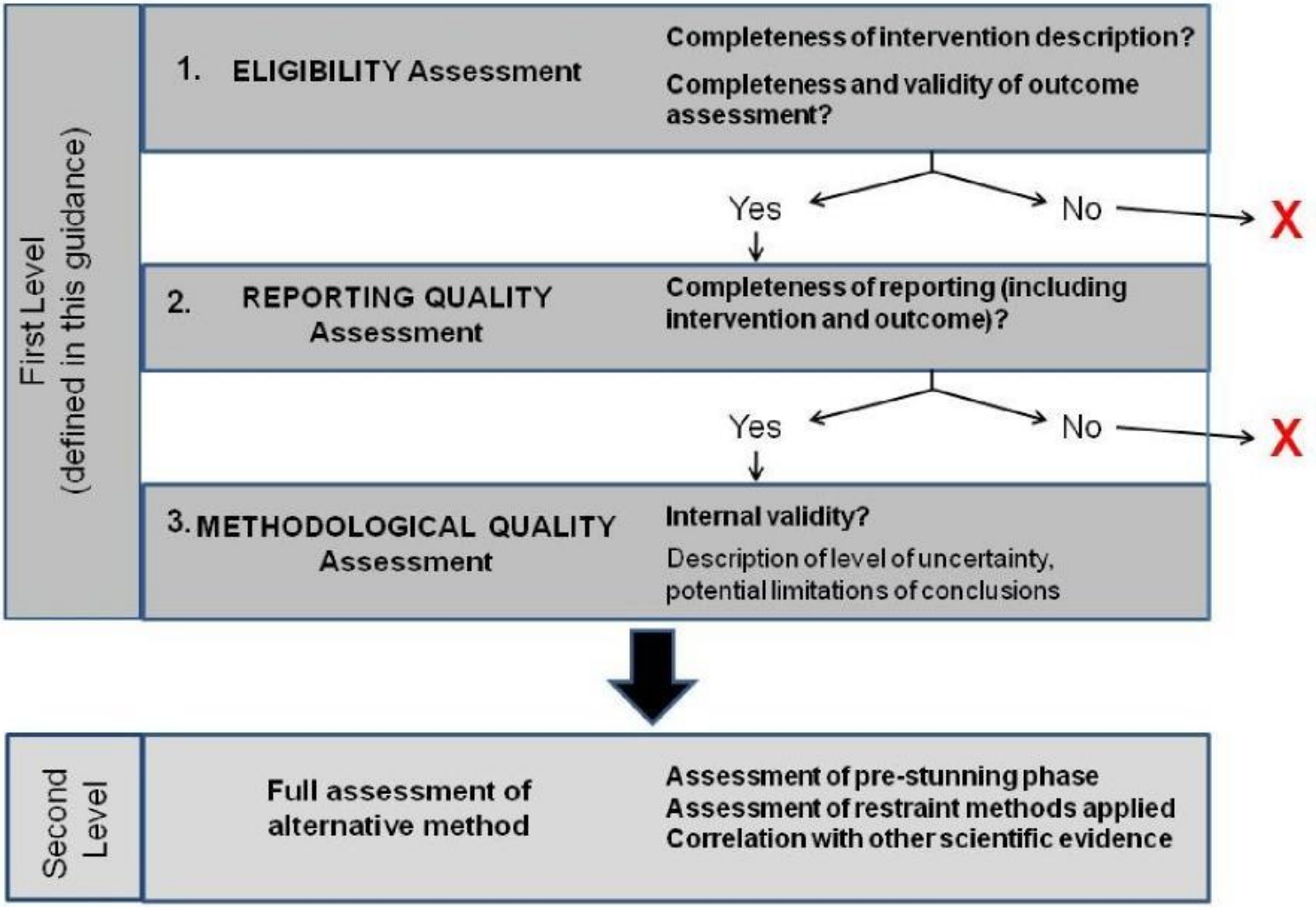
Different ways to describe onset of unconsciousness have been used

Interim conclusions – Eligibility assessment

- The studies don't fulfill " EFSA-criteria" for eligibility assessment
- **"Lack of comprehensive reporting of the methods of stunning."**
- "This is not surprising as the criteria are very extensive and were published after the majority of studies.
- "The scientific work was not published with the intention to evaluate a new stunning method."
- **But: That does not mean, that we cannot draw conclusions from these studies.**

Literature review next step- reporting assessment

stepwise procedure of the opinion



Conclusion of the external scientific report

- EFSA needs to make an effort to alert the community of researchers of the standards of reporting in the EFSA guidance.
  - Minimum reporting criteria
  - REFLECT and STROBE statements

    Reporting guid**E**lines **F**or randomized contro**L**led trials for liv**E**sto**C**k and food safe**T**y (http://www.reflect-statement.org/statement/)

    STrengthening the **R**eporting of **OB**servational studies in **E**pidemiology (http://www.strobe-statement.org/)
  - SAMPL guidelines

    "**S**tatistical **A**nalyses and **M**ethods in the **P**ublished **L**iterature" (http://www.equator-network.org/wp-content/uploads/2013/07/SAMPL-Guidelines-6-27-13.pdf)

Fulfilling the requirements of the EFSA guidance – Part 2

Designed Case:

- b) Examples from a recently published study

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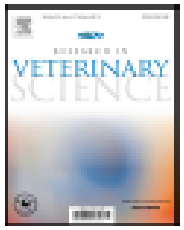

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Examples from a published study

Llonch et al (2015)

- 480 lambs (Pascual, Lechal, Rechal) and kid goats, carcass weight: <7kg-16kg) experimental environment
- Head-only and Head to Body electrical stunning
- Current intensities 0,3A; 0,5A; 0,7A; 1,0A
- Assessed stunning effectiveness (behavior, reflexes, EEG)
- Recorded stun stick interval
- Recorded minimum RMS Voltage

Examples from a published study – Llonch et al 2015

Description of intervention - Current characteristics

- The equipment provided a 50 Hz biphasic sine-wave alternating current (AC).
- With the capacity to set a constant value for the current to be applied, modulating the voltage output up to 230 V.
- Settings: 0.3, 0.5, 0.7 and 1.0 A root means square.

- **>>> The description is sufficient**.

Examples from a published study – Llonch et al 2015

Description of intervention – Electrode characteristics

- The stunning system was connected either to **double-electrode scissor-type dry stunning tongs (PZ004, Gozlin, Modena, Italy)** or **triple-electrode tongs (2A Handset, Jarvis, Auckland, New Zealand)** to apply HO and HB electrical stunning, respectively
- The HO system used a **gun grip made of a plastic material with stainless steel electrodes**.
- The HB system consisted of **two frontal stainless steel tongs and a third caudal (35 cm) stainless steel plate electrode**.
- **>>> If this study was used to describe a new stunning method, the description of electrodes should be improved (e.g. form, contact surface, size, sharpness, provide description and picture)**

Examples from a published study – Llonch et al 2015

Description of intervention – electrical contact and prevention of shocks - calibration

- During the current application, preheated (40–45° C) tap water was sprayed automatically to the three points of contact between the electrodes and the skin.
- Both systems had a switch to let the current flow in order to prevent electrical shock before stunning.
- All the equipment was checked and calibrated daily before starting the experiments according to the manufacturer's recommendations.

- **>>> The description is sufficient**.

TAKE HOME:

- We always need to improve stunning (modified / new methods)
- Research needed but also possibility for objective evaluation
- To be able to evaluate a modified or new stunning method we need “high quality studies”,
(target ≠ “so far publications”)
  - Unambiguous and exact description of intervention
  - Unambiguous and exact assessment of onset and duration of unconsciousness must be possible
  - Only if these are adequately reported, the assessment will proceed to reporting and methodological quality criteria
- The EFSA opinion provides helpful guidelines

THANK YOU

Any questions?