

**Question to EURCAW-Poultry-SFA**

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Type of production: Duck

Level: Slaughter, Killing

Key words: Physiology, Stress

Background context provided by the solicitor

The question is about the key parameters for electrical waterbath stunning in ducks and the effectiveness in inducing unconsciousness. In a duck slaughterhouse the parameters are usually as follows: 230 volt, 150 Hz and 3.1 A. The waterbath has capacity for 13 ducks. The stun to stick interval is 18 seconds until the automatic knife and 30 seconds until the controller. According to the reg 1099/2009 this is a simple stunning. Also according to an EFSA SO from 2006 there is no scientific evidence that these parameters are effective for stunning ducks.

In annex I, chapter I, table 2, point 3 from reg 1099/2009 it is stated that the stun to stick interval is a key parameter. However, the regulation doesn't state what the maximum interval can be. We have done some research to find what is the recommended stun to stick interval. According to the EFSA SO Killing of Animals: Poultry 2019 and HSA 2015 Electrical waterbath stunning of poultry 'Accurate, consistent severing of at least both common carotid arteries and both external jugular veins, as soon as possible and within 10 seconds of high frequency stunning and 15 seconds of 'standard' frequency (eg 50 Hz) stunning'. We have thus concluded that according these parameters the stun to stick interval has to be 10 seconds. Can we make this sort of conclusion from the study above? According to art 5 of the above mentioned reg the EFSA opinions can be used to keep a high level reliability of certain stunning methods. We think this is the case. Furthermore according to an EFSA SO 2006 'killing ducks in a water bath stunner requires currents of at least 130 mA per bird (sinusoidal AC at 50 Hz). 'A reversible stun can be achieved by raising (above 50 HZ) the frequency..., however, no current/frequency combination above 50Hz which will result in an effective stun has been shown to date'. There is more research that confirms this statement (the article can be found in the annex).

Question

1. Do you know more current scientific articles or information about the use of key parameters for electrical waterbath stunning in ducks?
2. Is there scientific evidence to guarantee that the parameters used in the slaughter house (230 volt, 150 Hz and 3.1 A for 13 ducks) together with the stun to stick interval of 18 seconds until the

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automatic knife and 30 seconds until the controller) provide efficient stunning until death due to bleeding?

Answer

1. Current scientific articles or information about the use of key parameters for electrical waterbath stunning in ducks

In 2019, European Food Safety Authority (EFSA) published a scientific opinion on “Slaughter of animals: poultry” (EFSA, 2019). This document was based on an extensive literature research and included 2 papers related to electrical stunning in ducks.

A literature research on Web of Science (WoS) has been carried out from 1900 to 2023, and only 6 scientific papers have been found with regards to electrical waterbath stunning in ducks and none of the papers was published after 2019 (Table 1). The studies from Beyssen et al. (2004b), and Hindle et al. (2010) were referenced by EFSA opinion. Therefore, no recent scientific publications report the effectiveness of stunning ducks using different electrical parameters.

Table 1. Information related to scientific studies of electrical stunning in ducks from Web of Science.

Reference	Comments
Beyssen, C., Babile, R., & Fernandez, X. (2004a). Electrocardiogram spectral analysis and somatosensory evoked potentials as tools to assess electrical stunning efficiency in ducks. <i>British Poultry Science</i> , 45(3), 409–415. https://doi.org/10.1080/00071660410001730923	Alternating current (AC) Voltage: not provided Frequency: 600 Hz Current: 150 mA Time of exposure: 4 s Ineffective stunning, assessed with electroencephalography.
Beyssen, C., Babile, R., & Fernandez, X. (2004b). The effect of current intensity during “head-only” electrical stunning on brain function in force-fed ducks. <i>Animal Research</i> , 53(2), 155–161. https://doi.org/10.1051/animres:2004002	Head-only electrical stunning. Not relevant for waterbath stunning
Fernandez, X., Lahirigoyen, E., Auvergne, A., Molette, C., & Bouillier-Oudot, M. (2010). The effects of stunning methods on product qualities in force-fed ducks and geese. 1. Carcass downgrading and meat quality. <i>ANIMAL</i> , 4(1), 128–138. https://doi.org/10.1017/S1751731109990851	Alternating current (AC) Voltage: not provided Frequency: 50 Hz Current: 130 mA Time of exposure: 5 s No stunning efficiency assessment.
Hindle, V., Lamboojij, E., Reimert, H. G. M., Workel, L. D., & Gerritzen, M. (2010). Animal welfare concerns during the use of the water bath for stunning broilers, hens, and ducks. <i>Poultry Science</i> , 89(3), 401–412. https://doi.org/10.3382/ps.2009-00297	Alternating current (AC) Voltage: 150 to 310 V Frequency: 50 Hz Current: 156 ± 49 mA (range: 77-243 mA). Time of exposure: 5 s Stunning efficiency assessed with electroencephalography.

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	The results from this study lead the authors to question the validity of present recommendations set at 130 mA for ducks for those animals stunned at frequencies higher than 50 Hz.
Fernandez, X., Lahirigoyen, E., Bouillier-Oudot, M., Vitezica, Z., & Auvergne, A. (2010). The effects of stunning methods on product qualities in force-fed ducks and geese. 2. Fatty liver quality. <i>Animal</i> , 4(1), 139–146. https://doi.org/10.1017/S1751731109990863	Alternating current (AC) Voltage: not provided Frequency: 50 Hz Current: 130 mA Time of exposure: 5 s. No stunning efficiency assessment
Raj, A. B. M., Richardson, R. I., Wilkins, L. J., & Wootton, S. B. (1998). Carcase and meat quality in ducks killed with either gas mixtures or an electric current under commercial processing conditions. <i>British Poultry Science</i> , 39(3), 404–407. https://doi.org/10.1080/00071669888962	Alternating current (AC) Voltage: 380 V Frequency: 50 Hz Current: not provided Time of exposure: 4 s No stunning efficiency assessment

2. *Is there scientific evidence to guarantee that the parameters used in the SL (230 volt, 150 Hz and 3.1 A for 13 ducks) together with the stun to stick interval of 18 seconds until the automatic knife and 30 seconds until the controller) provide efficient stunning until death due to bleeding?*

The electrical parameters mentioned by the applicant are in concordance actual Regulation 1099/2009 on the protection of animals at the time of killing, Annex 1, Chapter 2, Table 2. The application of 3.1 A in a multibird electrical waterbath stunning represent a current per duck of 238 mA.

*Table 2 — Electrical requirements for waterbath stunning equipment
(average values per animal)*

Frequency (Hz)	Chickens	Turkeys	Ducks and geese	Quails
< 200 Hz	100 mA	250 mA	130 mA	45 mA
From 200 to 400 Hz	150 mA	400 mA	Not permitted	Not permitted
From 400 to 1 500 Hz	200 mA	400 mA	Not permitted	Not permitted

Hindle et al. (2010) raised concerns about the efficiency of using 130 mA for ducks, particularly when animals are stunned at frequencies higher than 50 Hz.

Furthermore, there is no scientific evidence to ascertain that waterbath electrical stunning set at 230 volts, 150 Hz, and 3.1 A for 13 ducks (equivalent to an average of 238 mA per duck) will result in effective stunning. There is neither knowledge about the duration of unconsciousness that would determine the maximum stun to stick interval to prevent ducks recover consciousness. According to EFSA (2019) vessels supplying

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oxygenated blood to the brain, i.e. both carotid arteries, must be severed **as soon as possible after stunning (neck-cutting)**.

To assess the effectiveness of the stunning parameters, it is recommended to assess the state of consciousness after exit of the waterbath, before neck cutting and during bleeding.

Monitoring the state of consciousness

According to Council Regulation (EC) No 1099/20094 on the protection of animals at the time of killing requires the implementation of monitoring procedures to check that the stunning process delivers the expected results in a reliable way. Waterbath stunning is intended to induce unconsciousness until death that occurs due to bleeding.

To evaluate the effectiveness of electrical parameters with waterbath stunning and stun-to-stick interval in achieving unconsciousness until death through bleeding during the slaughter process, monitoring the state of consciousness is essential. Training the operators responsible for monitoring stun efficiency is very important to ensure precise assessments. This routine procedure is in concordance with the recommendations from EFSA on the “Scientific Opinion on monitoring procedures at slaughterhouses for poultry” (EFSA, 2013).

Webinars related to assessment of consciousness after waterbath stunning of broiler chickens and turkeys performed by the EURCAW Poultry-SFA can be found here:

- <https://www.eurcaw-poultry-sfa.eu/en/minisite/sfawc/webinar-assessment-consciousness-after-waterbath-stunning-broiler-chicken-0>
- <https://www.eurcaw-poultry-sfa.eu/en/minisite/sfawc/webinar-assessment-consciousness-after-waterbath-stunning-turkeys>

The indicators for monitoring consciousness were refined for broiler chickens and turkeys under commercial conditions (Contreras-Jodar et al. 2022; Contreras-Jodar et al. 2023) but not for ducks. Further studies are needed under commercial conditions to refine the indicators for ducks.

Conclusion

Based on the aforementioned information, no new studies on electrical stunning in ducks have been published since the EFSA's opinion in 2019. Additionally, there is no scientific reference assessing the effectiveness of waterbath electrical stunning parameters set at 230 volts, 150 Hz, and 3.1 A for 13 ducks (equivalent to 243 mA per duck). No knowledge is available about the longest stun-to-sticks interval that will guarantee that all ducks die from bleeding before recovering consciousness, therefore it should be recommended: to perform sticking as soon as possible and to undertake studies to determine the maximum time from stun to stick. By the meantime, consciousness should be assessed before and after neck-cutting in order to assess if all ducks are effectively stun and remain unconscious until death, under these conditions.

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Relevant references and others documents

- Beysen, C., Babile, R., & Fernandez, X. (2004a). Electrocorticogram spectral analysis and somatosensory evoked potentials as tools to assess electrical stunning efficiency in ducks. *British Poultry Science*, 45(3), 409–415. <https://doi.org/10.1080/00071660410001730923>
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- Contreras-Jodar, A., Varvaró-Porter, A., Michel, V., & Velarde, A. (2022). Inter-Observer Repeatability of Indicators of Consciousness after Waterbath Stunning in Broiler Chickens. *Animals*, 12(14), 1800. <https://doi.org/10.3390/ani12141800>
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- Fernandez, X., Lahirigoyen, E., Bouillier-Oudot, M., Vitezica, Z., & Auvergne, A. (2010). The effects of stunning methods on product qualities in force-fed ducks and geese. 2. Fatty liver quality. *Animal*, 4(1), 139–146. <https://doi.org/10.1017/S1751731109990863>
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