

Welcome to the HSA Conference 2026

We are delighted to welcome you to Newcastle for the Humane Slaughter Association (HSA)'s Conference 2026: Animal Welfare Beyond the Farm Gate: Latest developments in humane slaughter and transport of animals.

The programme features talks covering a range of topical issues concerning the humane slaughter and transport of livestock animals. As always, our aim is that this meeting contributes to animal welfare "Beyond the Farm Gate" by providing an opportunity to learn about the latest research and thinking on key issues, and by offering a forum where controversial issues can be discussed constructively.

We would like to thank all those who are contributing to the meeting, as speakers and chairs, and delegates from around the world attending both in person and online. It is always heartening to see how many people are keen to engage with such challenging and often controversial areas of animal welfare, united by a shared commitment to improving the welfare of farmed animals.

I would like to thank our generous sponsors [Accles & Shelvoke](#), [CMC Industries](#), [Bock Industries](#), [Livetec](#) and [ABP Food Group](#) whose support has helped to ensure this meeting is accessible to those who might otherwise have not been able to attend.

Finally, please remember to fill in the short, online feedback form after the event. If you have any specific comments, please contact events@hsa.org.uk. Your feedback helps us to improve our events year-on-year.

We hope you have an informative and enjoyable meeting.

Best wishes,
Huw Golledge (CEO) and the HSA conference team

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Scientific Programme

Abstracts



Please note: The abstracts contained in this programme reflect the work of the individual authors and presenters. The opinions, findings, and conclusions expressed do not necessarily represent the views or official position of the Humane Slaughter Association.

WELFARE AT TIME OF KILLING FOR FARMED INSECTS

Meghan Barrett

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Trillions of insects are currently farmed as food and feed, and the industry is projected to grow by over 900% by 2033. No protections currently exist for the welfare of these animals at time of killing; insects may be microwaved, boiled, steamed, baked, frozen, shredded, drowned or asphyxiated without prior stunning or anesthesia. Standard operating procedures for each process can vary widely, further complicating our understanding of the welfare impacts of different slaughter methods. This talk will review the growing insects as food and feed industry and briefly discuss data for sentience in insects, before describing the killing methods used for insects farmed as food and feed and their potential welfare impacts. Data on the standard operating procedures needed to instantaneously (< 1 second) kill insect larvae with boiling and grinding methodologies will be shared. Preliminary data on the use of electrical stunning for insect larvae will also be provided and general challenges of stunning for insects with electricity and gas will be discussed. Finally, a list of research priorities will be shared for making progress on humane killing for farmed insects.

**RAPID EVIDENCE ASSESSMENT (REA) ON THE PRACTICAL AND WELFARE IMPLICATIONS OF
THE USE OF MECHANICAL BLUNT FORCE TRAUMA DEVICES TO EUTHANISE PIGLETS UNDER
10KG IN WEIGHT.**

Dr David G. Pritchard

Consultant in veterinary and animal welfare science, UK

Rapid Evidence Assessment (REA) on the practical and welfare implications of the use of mechanical blunt force trauma devices to euthanise piglets under 10kg in weight.

This Rapid evidence review (REA) focuses on the use of mechanical blunt force trauma (MBFT) for euthanasia of suckling piglets for the Pig Veterinary Society. It includes scoping literature reviews and the elicitation of expert opinion. The scope of the REA is limited to the practical and welfare issues for both piglets and operatives related to the handling, restraint and mechanical stunning of stunning /killing piglets in both indoor and outdoor systems. Narrative summaries are presented of approaches to welfare, behaviour, handling restraint, efficacy, pathophysiology and welfare assessments of ease and humaneness of killing processes, impacts on piglets and stockpersons, management, training, barriers, opportunities, legislation and codes.

Expert opinion was sought by structured face to face interviews with 11 experienced pig consultant veterinarians and 8 experienced pig producers distributed in the major pig producing areas which are responsible for most of the sow herds in England.

This REA focuses on the following key issues:

- What is the scale and pattern of euthanasia of piglets less than 10 kg on English outdoor and indoor pig farms?
- What mechanical methods are in use and are they effective in protecting the welfare of piglets?
- Are the methods of handling, restraint and checks on stunning in use fit for purpose and do they lead to delays?
- What are the impacts of stunning on piglets, stockpersons and others?
- Which is the easiest method of restraint and stunning of piglets?
- Which is the most humane method of restraint and stunning of piglets?
- What are the major barriers to improvement in welfare at piglet euthanasia?
- What changes and opportunities are needed to make improvements to the equipment, and also the training of managers, stockpersons and veterinarians?
- What would veterinarians and producers wish would happen to improve welfare during euthanasia?

Non penetrating captive bolt devices (NPCBD) are seen as effective methods for piglets up to 10kg and could be used as a replacement for manual percussion methods for piglets in most situations. Analysis of expert estimates of combinations of various methods of restraint and types of NPCBD for the ease of use and humaneness of killing as measured by requirement for a second shot found that both piglet's age and method of restraint were determinants but not the type of captive bolt used. There are practical concerns that the use of a captive bolt device will lead to delay in euthanasia to the detriment of the welfare of the piglet unless other methods are used. Reviews of the attitudes and impact of euthanasia on stockpersons, point to some barriers to the use of various methods. Recommendations made include research on welfare costs and benefits of methods of restraint, NPCBD use in small piglets and use of penetrating captive bolt in piglets less than 5kg; training in relation to equipment maintenance and reducing moral stress and proactive measures to retain pig farming's social licence to operate. Training of veterinarians and stockpersons should include discussion on ethics and moral stress as well as benefits of the piglets' euthanasia. Stockmen should not only be confident in their skills but also take pride in their work respecting and taking care of piglets at the end of their life and ensuring that they have a good death.

**A QUALITATIVE ANALYSIS OF STOCKPERSON'S KNOWLEDGE, BELIEFS, AND PERCEPTIONS
OF ON-FARM EMERGENCY KILLING OF PIGLETS**

Lesley Jessiman

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Around 10-20% of all piglets born will die pre-weaning (Farmer and Edwards, 2022). Stockpeople are required to kill compromised piglets quickly to prevent prolonged suffering. Current guidance recommends a mechanical device for this intervention, but does not define what constitutes an emergency. Assurance schemes and regulators are rapidly tightening rules on how piglets can be killed in emergencies, and public scrutiny of on-farm practices has intensified. On-farm killing of neonatal piglets in emergencies is governed by welfare legislation and industry codes, but "emergency" is not formally defined (Animal Welfare Committee, 2021). RSPCA Assured no longer permits manual blunt force trauma (MBFT) under any circumstances. Red Tractor allows it in exceptional emergencies, subject to mandatory documentation, and the EU is currently reviewing the formal authorisation of mechanical devices for on-farm killing. This study explored how UK pig stockpeople experience and interpret the emergency killing of neonatal piglets, examining their knowledge of regulations and guidance, preferred methods, practical constraints, and judgment on when an emergency intervention is needed, to identify opportunities for improved support. Semi-structured interviews with eight stockpersons were analysed using Braun and Clarke's (2022) reflexive thematic analysis. Five themes were identified. (Theme 1) Anticipated public and media scrutiny changed decision-making. MBFT was avoided even when effective, killing was moved out of sight, and the mechanical device was favoured as more defensible if witnessed. (Theme 2) Confidence, not just legality, determined routine method choice, with the mechanical device displacing manual methods almost entirely. (Theme 3) Guidance and equipment design assumed an ease of use that did not match practice, and stockpersons developed their own workarounds, such as stabilising piglets over a wheelbarrow. (Theme 4) MBFT training was built informally through peer demonstration, with no veterinary input, yet it remained the only fallback if the mechanical device failed. (Theme 5) Finally, stockpeople did not treat "emergency" as a fixed rule; instead, they judged less obvious cases through experience. Emergency killing of neonatal piglets is not a standardised procedure. It is an interpretive, experience-based judgement shaped by anticipated scrutiny, method confidence, equipment limitations and uneven training, often while stockpersons conceal work, they are proud of for fear of judgement. Supporting stockpersons with clearer guidance and structured training in both permitted methods is essential to improving piglet welfare and stockperson's well-being together.

**"ABATTOIR AIR QUALITY: AN UNKNOWN QUANTITY". VOLATILE ORGANIC COMPOUND
CHARACTERISATION IN BEEF ABATTOIRS**

**Eleanor Gannon, Dr. Karim Farag, Prof. James A. Covington, Dr. Gemma Charlton, Dr.
Trenton Stewart, Dr. Yasser Qureshi, Dr. Lynn McIntyre**

- Harper Adams University, UK
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Abattoir systems are yet to be classified for their odour profile as processing facilities of livestock in the production cycle, despite their detrimental environmental, anthropic and economic impact. This study establishes the volatile organic compound (VOC) profiles of commercial cattle abattoirs operating under two contrasting management systems: an ultra-modern facility and a traditional handling architecture. Compounds were collected in the lairage and stun box, alongside continuous monitoring of general air quality concentrations using a bespoke device that recorded environmental parameters and agricultural gases (NH₃, CH₄, SO₂, H₂S, TVOC, PM). VOCs were sampled at the beginning and end of the working week and analysed using TD-GC-TOF-MS in a time-course analysis. Animal- and production-related factors (start vs. end of week, morning vs. afternoon, age, sex, breed, number of consignments, kill rate, lairage time, and transport time) were correlated with the presence or absence of individual VOCs and with air-quality thresholds using three binary machine-learning models (LR, SVM, RF) and a Tweedie-GLM. Two-hundred and one VOCs were identified, including alcohols, aldehydes, amines, alkanes, alkenes, esters, nitriles, phenols, and ketones. Significant associations were detected between production-week phase and specific compounds, climate, time of day, production period, overnight animals held, kill rate, lairage and transport duration with VOC group concentrations ($p < 0.05 - 0.001$). Many of the detected compounds are biologically linked to animal metabolism, waste decomposition, and sanitation processes, highlighting their relevance to animal welfare, meat quality, and worker environmental safety. These findings support the development of VOC-based monitoring methodologies for abattoirs and provide evidence to inform best practices and mitigation policies aimed at improving lairage conditions.

AUTOMATED MONITORING OF PIG AND BROILER CHICKEN WELFARE DURING THE PRE-SLAUGHTER AND STUNNING PHASE

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The pre-slaughter phase (e.g. catching, crating, and loading) is a stressful and critical period preceding the transportation and slaughter of broiler chickens. This study compared two manual catching methods (inverted versus upright) and mechanical catching using a cost/benefit analysis focused on animal welfare, the ergonomics of the catchers, and economic aspects. In total, 15 commercial farms were investigated during catching, crating, and loading of approximately 5,000 broiler chickens per catching method per flock (upright vs. inverted vs. mechanical: n=3; upright vs. inverted: n=9; inverted vs. mechanical: n=3 flocks). On-farm measurements were conducted during depopulation to collect data on key economic (person-hours per 1,000 chickens), ergonomic (catcher survey), and animal welfare (wing flapping frequency, catcher bird-interaction) indicators. Additional animal welfare data (incidence of catch damage and dead-on-arrival prevalence) were gathered at the slaughterhouse. Furthermore, an expert assessed video recordings of simulated manual catching movements (e.g. inverted and upright) to collect additional ergonomic information. Concerning animal welfare, compared to inverted catching, upright catching led to a lower wing flapping frequency (2.0 ± 0.1 vs. 5.4 ± 0.1 , $P < 0.001$) and a more positive catcher-bird interaction (3.7 ± 0.2 vs. 4.4 ± 0.2 , $P < 0.01$), both on a 7-point Likert scale. The incidence of catch damage was lower for upright versus mechanical catching ($15.5 \pm 1.3\%$ vs. $17.7 \pm 1.4\%$, $P = 0.046$). In addition, more person-hours per 1,000 broiler chickens were needed for upright catching compared to inverted catching as well as mechanical catching (1.6 ± 0.1 h vs. 1.0 ± 0.1 h vs. 0.6 ± 0.3 h, $P < 0.001$). Furthermore, upright catching was 1.5 and 1.2 times more expensive than inverted and mechanical catching, respectively. This results in an increased cost of € 0.012 (upright) and € 0.006 (mechanical) per kg of live weight compared to inverted catching. Concerning ergonomics, manual catching was indicated as very demanding by the expert, and catchers didn't favour upright catching because they scored it as more labour-intensive than inverted catching. In conclusion, this study revealed some animal welfare advantages of upright compared to inverted and mechanical catching. On the other hand, mechanical catching is more beneficial according to the well-being of the catchers. Challenges to adopting upright catching to the benefit of animal welfare include compensating additional labour costs, dealing with the negative opinion of catchers, and preventing longer loading times.

ONE YEAR OF SLAUGHTERHOUSE-BASED MONITORING REVEALS THE WELFARE STATUS OF SPENT HENS IN FLANDERS

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The welfare of laying hens is determined by multiple stages throughout their relatively long production cycle, including rearing, egg production, transport, and slaughter. In Flanders, where all spent hens are processed in slaughterhouses, this setting offers a unique and practical opportunity for large-scale welfare monitoring. This study presents the first results of a standardized, slaughterhouse-based monitoring protocol implemented over one year, aiming to assess the current welfare status of spent hens at flock level.

The LEGMONI app is used for this purpose, enabling real-time data input by a trained inspector and immediate access to flock-level results. The protocol combines observations at different stages during the slaughterhouse process. Monitoring begins in the lairage area, where flock-level observations include bird in-crate behaviour and environmental conditions. Subsequently, a sample of 1% per flock, with maximum 100 birds, is assessed after stunning. At this stage, animal-based indicators such as plumage condition, skin lesions, and footpad dermatitis are scored using a standardized 4-point scale. Keel bone damage (fractures and deviations) is evaluated through palpation. Further along the slaughter line, after defeathering, catch lesions are recorded, including fresh fractures and bruising on wings, legs, and breast, based on two observation periods of three minutes each. Finally, slaughterhouse records are used to collect additional information, including dead on arrival (DOA), carcass rejection rates, and relevant production data such as housing system, flock age, and hen type (white or brown).

Between September 2025 and September 2026, approximately 100 Flemish flocks are being monitored using this protocol. For each flock, mean scores or prevalence values per welfare indicator are calculated, with the flock considered as the experimental unit. Statistical analyses will be performed using generalized linear models and results will be presented as means $\pm$ standard error. At the time of abstract submission, data collection is ongoing. Comprehensive results on the prevalence and severity of key welfare indicators, as well as their variability between flocks and production systems, will be presented at the conference. These findings will provide the first large-scale, systematic overview of the welfare status of laying hens in Flanders and will serve as a basis for future monitoring and benchmarking. Furthermore, this monitoring may lead to targeted improvements in welfare within the sector.

**SURVEY OVERVIEW OF CONTROLLED ATMOSPHERE STUNNING PRACTICES AND ANIMAL
WELFARE ASSESSMENT IN POULTRY SLAUGHTERHOUSES**

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Controlled atmosphere stunning (CAS) has gained increasing attention in recent years as an alternative to electrical waterbath stunning in poultry slaughterhouses (SLHs), mainly because it avoids the shackling of conscious birds. Among stunning methods listed in Annex I to Regulation (EC) No 1099/2009, CO₂ in two phases is widely used in Europe, although negative welfare outcomes may occur because loss of consciousness is not immediate during induction phase. Further information is needed on how to assess animal welfare in CAS systems and develop observation protocols.

A questionnaire survey has been drawn up in poultry SLHs using CAS systems in 4 European countries to gather information on stunning procedures, better understand how animal welfare is assessed, and support the selection of SLHs for future on-site investigations.

This work was co-funded by the European Union's Horizon Europe Project 101136346 EUPAHW. The survey targeted official veterinarians and competent authorities, and their responses were collected between November and December 2025. The questionnaire covered general SLH information, technical and operational aspects of the CAS system, assessment of animal-based indicators (ABI) during gas exposure and at the exit from the CAS stunner, and indicators to confirm death. As data collection is currently being finalized, this contribution presents a preliminary overview of the responses available.

A total of 32 responses were obtained from Spain (14), France (10), Italy (7), and Netherlands (1), with some SLHs operating more than one CAS slaughter line. Broiler chickens (27) were the most represented species, with an average capacity of 38.4 million birds/year, 134,383 birds/day, and a mean line speed of 8,550 birds/hour. Turkeys (6) showed corresponding values of 7.2 million birds/year, 24,500 birds/day, and 3,058 birds/hour. Tunnel systems (22) were the predominant type of CAS stunner, followed by closed cabinets (7) and pit systems (3), with CO₂ (81%) more frequently used than CO₂ mixed with O₂ (19%). CAS systems mainly operated in two (41%) or five phases (38%). Regarding ABI assessment, 23 of 32 SLHs monitored signs of aversion during gas exposure, mainly through observation windows, daily or on a sample from each batch. The most used ABIs by SLHs were wing flapping (91% of SLHs), loss of posture (74%), gasping (61%), and head shaking (44%). At the exit from the CAS stunner, 30 SLHs assessed ABIs, mainly after shackling, including wing flapping (93%), muscle tone (90%), breathing (83%), vocalization (63%), and spontaneous blinking (53%). For the assessment of death, 29 respondents checked either all birds (10) or a sample of animals (19) during bleeding, for muscle tone (93%), breathing (90%), and corneal reflex or cessation of bleeding (41%).

These preliminary findings provide an overview of CAS practices and welfare assessment in poultry slaughter, support selection of SLHs for on-site visits, and highlight areas for further investigation.

**IDENTIFICATION OF ANIMAL WELFARE CONCERNS DURING SHACKLING AND ELECTRICAL
WATERBATH STUNNING OF DUCKS UNDER COMMERCIAL CONDITIONS**

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Waterbath stunning (WBS) has been widely studied in broilers and turkeys; however, there is limited scientific evidence regarding its effectiveness and animal welfare implications in ducks, which differ in anatomy, physiology and behaviour.

This study aimed to identify potential animal welfare concerns in ducks during slaughter to improve stunning practices and welfare outcomes. It was conducted in nine commercial slaughterhouses located in Spain, Italy and France by three trained observers. Data were collected between March 2025 and January 2026 within the framework of EUPAH&W SOA14 activity co-funded by the European Union's Horizon Europe Project 101136346 EUPAHW; co-funded by EURCAW-Poultry-SFA Project 101198566—EURCAW-Poultry-SFA 2025-2027—SMP-FOOD-2025-EURL-EURC-PJG-IBA.

A systematic assessment of animal welfare indicators was performed, including occurrence of wing flapping on the shackle line, animals falling from the line, presence of runts or very small birds, operator handling practices during line stoppages and pre-stun shocks during WBS. In addition, stunning effectiveness was evaluated through Animal Based Indicators of the state of consciousness such as tonic - clonic seizures, breathing, spontaneous blinking, wing flapping, head shaking, head raising, spontaneous swallowing and nictitating membrane reflex. Furthermore, information on shackling conditions and key electrical parameters of the stunning process were collected to better understand their relationship with animal welfare and (un)consciousness outcomes.

As statistics are currently being finalised, this abstract presents a preliminary descriptive overview of the data collected across the different slaughterhouses visited. Wing flapping on the shackle line was observed in all slaughterhouses, with the proportion of affected birds ranging from 11.96% to 53.63% (n = 2,109 birds observed). Pre-stun shocks showed greater variability between slaughterhouses, ranging from 13.67% to 97.6% (n = 1,798 birds observed). Animals falling from the line were rarely observed, with a minimum of 0% and a maximum of 0.3% (n = 7,205 birds observed).

Overall, the present findings provide a preliminary overview of potential animal welfare concerns in ducks during WBS. They help identify critical points where welfare may be compromised. They also highlight the importance of developing reliable protocols to assess consciousness and ensure animal welfare during stunning and killing.

A separate communication has been submitted focusing specifically on the inter-observer repeatability analysis of these indicators.

**ASSESSING STATE OF CONSCIOUSNESS AFTER WATERBATH STUNNING IN DUCKS:
STUNNING EFFICIENCY, AND INTER-OBSERVER REPEATABILITY UNDER COMMERCIAL
CONDITIONS**

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Waterbath stunning (WBS) is the most widely used method to render ducks unconscious prior to bleeding in European slaughterhouses (SLH). However, it is not always fully effective. Therefore, slaughter line operators need to be trained to identify birds showing signs of consciousness after stunning, to re-stun them promptly and minimise the impact on animal welfare. To this end, a list of relevant Animal Based Indicators (ABI) that are valid, feasible, and repeatable is required. This study aims to assess the repeatability of ABI of consciousness to evaluate the efficiency of stunning in ducks.

This study compared the assessments of three trained observers across nine slaughterhouses visited in Spain, Italy and France. Data were collected between March 2025 and January 2026 after defining a set of seven ABI for assessing stunning effectiveness in ducks: breathing (BR), spontaneous blinking (SB), wing flapping (WF), head shaking (HS), head raising (HR), spontaneous swallowing (SS), and nictitating membrane reflex (NM). Tonic-clonic seizures were also recorded, as they are associated with unconsciousness. These indicators were assessed simultaneously by the observers, at two different points on the slaughter line: after exiting the WBS and before neck cutting (phase 1, $n = 1627$ ducks), and during bleeding, between 1 and 35 seconds after the neck cut (phase 2, $n = 3748$ ducks). Data were analysed at individual duck level and the combination of crude percentage of agreement (PoA) and Fleiss' kappa (k) interpreted according to Fleiss (2003) was used to assess the inter-observer repeatability of the ABIs.

It was not possible to assess birds before neck cutting in 4 out of 9 SLH, resulting in, differences in the sample sizes between phases 1 and 2. A preliminary overview of during bleeding results, including both prevalence of the ABI and the repeatability between observers, is presented in this abstract. During bleeding, the indicators with the highest average prevalence across all SLH were WF (from 0% to 16.44% depending on the SLH) and HR (from 0% to 6.67%), followed by BR (from 0% to 3.87%) and HS (from 0% to 4.36%). The prevalence of SB, NM, and SS were all below 1%. The agreement between observers differed between ABI: considered excellent for WF ($k=0.77$), fair to good for HR ($k=0.73$) and poor for BR, SB, HS and SS ($k<0.4$). Results on phase 1 will be analysed in the upcoming months.

The results suggest that a shortlist of relevant indicators to monitor during bleeding could include wing flapping and head raising, which are the ABI of consciousness that were the most frequently observed in SLH and both showing a Fleiss' kappa above 0.7.

This study was carried out in the framework of EUPAH&W SOA14 activity co-funded by the European Union's Horizon Europe Project 101136346 EUPAHW; co-funded by EURCAW-Poultry-SFA Project 101198566EURCAW-Poultry-SFA 2025-2027—SMP-FOOD-2025-EURL-EURC-PJG-IBA.

**NEUROPHYSIOLOGICAL SIGNATURES OF STUNNING IN CEPHALOPODS: TOWARD
HUMANE SLAUGHTERING PRACTICES**

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Cephalopods have been consumed as food for millennia and today represent a substantial fraction of global marine fisheries and aquatic animal product exports. Despite growing evidence for functional analogies between cephalopod and vertebrate brains, complex cognitive abilities, and sentience, no standardized slaughtering practices exist for these invertebrates. Current fishery practices most commonly rely on anoxia or ice chilling, and unlike vertebrates, cephalopods are not covered by Council Regulation (EC) 1099/2009 on the protection of animals at the time of killing.

We investigated the neurophysiological basis underlying humane slaughtering methods in cephalopods by combining minimally invasive recordings of neural activity with electrical stunning protocols in *Sepia officinalis* and *Octopus vulgaris*. Using Ag/AgCl subcutaneous electrodes placed over the optic lobes and the supraoesophageal mass, we recorded visually evoked and resting-state neural signals in live, lightly sedated animals, characterizing EEG-like activity across frequency bands from 1 to 40 Hz. In baseline conditions, spectrograms and power spectral density analyses revealed that bioelectrical activity was predominantly distributed across low-frequency bands (Delta, Theta, and Alpha), while during visual stimulation electrophysiological signatures showed evoked responses, supporting the presence of mammal-like neural dynamics associated with sensory processing and putative conscious states.

Animals were subsequently subjected to electrical stunning using a purpose-built device, testing different combinations of voltage and frequency. Following stunning, neural recordings revealed marked alterations in frequency band power and, in more than 50% of cases, increased amplitudes of visually evoked responses immediately prior to the loss of organized neural activity. In cuttlefish, stunning resulted in a rapid silencing of neural traces, whereas in octopus it induced erratic, high-amplitude epileptic-like activity consistent with seizure-like dynamics. These changes suggest the induction of a transient unconsciousness-like state.

Together, these findings demonstrate that (i) minimally invasive electrophysiological approaches can reliably characterize brain dynamics in cephalopods, and (ii) electrical stunning profoundly disrupts neural activity in a manner compatible with rapid loss of sensory integration. Our study provides a neurophysiological framework for assessing stunning efficacy and supports the development of evidence-based, humane slaughtering practices for cephalopods, in alignment with broader animal welfare principles.

IN-WATER BATCH STUNNING OF DECAPOD CRUSTACEANS

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Electrical stunning is rapidly becoming the recommended stunning method prior to slaughter for decapod crustaceans and it is understood that guidance is soon to be published by DEFRA, endorsing this method of stunning prior to slaughter. Whilst this may be the most humane method for slaughter, there is a lack of technology available to meet the needs of the shellfish sector when this guidance comes into force. Whilst individual animal stunning units and industrial scale units are already commercially available, there is a gap for a mid-range, in-water crustacean stunning device. Suitable parameters were identified for such a unit using European lobsters (*Homarus gammarus*). Initial testing determined an electrical field capable of rendering behavioural insensibility within 1 second. Once the electrical field of interest was identified, different stun durations were tested, revealing suitable parameters for both a reversible and irreversible stun. Behavioural insensibility was verified using electroencephalograms to determine neurological activity. Specific details of the tested parameters have been deliberately omitted to check intellectual property rights with the industry partner.

**CAN ICE SLURRY BE REFINED AS A HUMANE SLAUGHTER METHOD FOR NILE TILAPIA
(*OREOCHROMIS NILOTICUS*)?**

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Nile tilapia (*Oreochromis niloticus*) is the most widely farmed fish in Africa and among the most numerous farmed vertebrates globally. At harvest, fish are routinely placed on ice, where they may remain conscious for many hours. Ice slurry is widely assumed to be more 'humane', yet the HSA classifies both methods as unacceptable, noting that cold-induced immobility is routinely mistaken for insensibility and that loss of consciousness can exceed nine minutes. For tilapia, EEG evidence confirms that visually evoked responses can persist for up to eleven minutes in ice slurry and recover fully on rewarming. This contribution argues that the field must test empirically whether any defined parameter combination can satisfy a defensible humane (or more humane) standard — and must remain open to the conclusion that an alternative approach is required.

The talk reviews how ice-slurry methods have been assessed for warm-water fish, identifying recurring problems: heavy reliance on behavioural and reflex indicators that are unreliable under hypothermia, inconsistently defined endpoints, and limited attention to species-specific factors such as salinity and body size. It examines why "less harmful than dry ice" is insufficient when regulatory bodies including EFSA and WOA require immediate, irreversible unconsciousness.

An ongoing laboratory study at Complutense University of Madrid is presented as a worked example of welfare-centred validation. Harvest-size Nile tilapia (250–400 g) are exposed to ice slurry in a randomised 3×3 factorial design varying ice-to-water ratio (0.5:1, 1:1, 1.5:1) and salinity (0, 10, 20 ppt) at 25°C, with a control simulating current practice. Apparent loss of consciousness is defined as the simultaneous absence of opercular movement, vestibular reflex and response to tail pinch — a composite chosen to reduce misclassification of cold-induced immobility as insensibility, though its limitations relative to EEG validation are acknowledged. Secondary outcomes include time to apparent death, reflex scores and video-recorded behaviour. Two replicate blocks (total n = 176) and mixed-effects regression quantify effects and interactions. All work complies with EU Directive 2010/63/EU, Spain's RD 53/2013, and UCM ethics committee approval.

This work does not assume refinement of ice slurry will deliver humane slaughter. It tests whether defined parameter combinations can meaningfully shorten time to unconsciousness in semi-intensive systems in the Global South — and what the findings imply for whether chilling-based methods can ever satisfy the HSA's principle that fish must be rendered immediately unconscious and insensible to pain until death. Implications for policy, funding and farmer guidance for tilapia production are discussed.

**BALANCING PERCUSSIVE STUNNING EFFECTIVENESS AND PRODUCT PRESENTATION IN
PIRARUCU (ARAPAIMA GIGAS) AND EMERGING AQUACULTURE SPECIES IN BRAZIL**

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Rapid and reliable induction of insensibility at slaughter remains a critical welfare concern in aquaculture, particularly in production systems lacking standardized stunning protocols. In Brazil, a rapidly expanding and diverse aquaculture sector includes multiple native and emerging species for which slaughter practices are often inconsistent and may rely on ice slurry immersion without prior stunning, conditions that can prolong time to insensibility and increase variability in outcomes. This study evaluated the performance of a pneumatic non-penetrative captive bolt (NPCB; Zephyr-F, Boch Industries, Pittsburgh, PA, USA) across four farmed fish species in Brazil, including pirarucu (*Arapaima gigas*; mean mass = 8.8 kg), pintado (*Pseudoplatystoma* spp.; mean mass = 1.4 kg), piau (*Leporinus* sp.; mean mass = 1.0 kg), and caranha (*Piaractus brachipomus*; mean mass = 1.8 kg). Trials were conducted under commercial farm conditions using an adaptive experimental design in which operating conditions were iteratively adjusted until ten consecutive fish were successfully stunned without recovery or unacceptable cranial damage, with recovery defined as the reappearance of coordinated movement or opercular activity following a single strike. With the exception of pirarucu, fish were not bled following stunning, providing a conservative assessment of effectiveness by allowing the potential for recovery under ice slurry conditions. Stunning effectiveness varied across species and was influenced by fish morphology, with large-bodied and round-bodied species presenting greater challenges and requiring optimization to achieve consistent outcomes. For all species other than pirarucu, a balance was required between effective stunning and preservation of head appearance, where visible cranial damage reduces market acceptability. The study demonstrates that effective application of NPCB stunning requires species-specific consideration and highlights the importance of adoptable, on-farm approaches to improving consistency and animal welfare at slaughter.

**IMPROVING ANIMAL WELFARE DURING LONG-DISTANCE LIVESTOCK TRANSHUMANT
MIGRATION THROUGH PASTORALIST TRAINING AND CAPACITY BUILDING**

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Seasonal transhumant migration represents one of the largest traditional livestock movement systems globally, yet animal welfare management during such movements largely depends on the knowledge and practices of pastoral livestock owners. In the Himalayan region of Jammu and Kashmir, India, approximately 80,000 transhumant families migrate annually with sheep and goats, travelling 200–400 km over several weeks between winter settlements and high-altitude summer pastures. During migration, livestock face welfare risks including prolonged walking distances, hoof injuries, climatic stress, dehydration, and limited access to veterinary services.

This study assessed animal welfare awareness and management practices among transhumant pastoralists along major migratory routes. A cross-sectional survey and field observations were conducted among 132 pastoral livestock owners managing flocks of 40–180 animals. Results revealed substantial gaps in welfare awareness: only 34% of respondents recognised early signs of dehydration or exhaustion, 29% identified early indicators of lameness, and 22% reported knowledge of basic first aid for injured animals. Only 17% had previously received any animal welfare or livestock management training.

Animal-based welfare observations during migration indicated lameness prevalence of 11–14%, minor injury incidence of 9–12%, and body condition loss reported in 38% of flocks, particularly among young animals. Pastoralists who reported prior training or regular veterinary interaction showed approximately 30% lower incidence of lameness and injuries, suggesting a clear relationship between pastoral knowledge and improved welfare outcomes.

This study provides one of the first structured assessments linking pastoral training and livestock welfare outcomes in transhumant migration systems.

Based on these findings, a conceptual Pastoral Welfare Training Model is proposed focusing on five key competencies for pastoral livestock owners:

1. Recognition of early welfare indicators (lameness, dehydration, exhaustion)
2. Humane herd movement and rest scheduling during migration
3. Basic field-level first aid for migration-related injuries
4. Management of vulnerable animals (young, pregnant, or weak individuals)
5. Improved water, feeding, and rest planning along migratory routes

Conclusion: Strengthening pastoral welfare awareness through targeted training and mobile veterinary outreach could significantly improve livestock welfare during seasonal migration in remote pastoral landscapes where more than 85% of migratory livestock owners currently lack veterinary access.

Remarks: Findings may inform welfare strategies for pastoral livestock systems across Asia, Africa, and other mountainous regions where seasonal livestock migration remains common.

FEEDING IN TRANSIT: WELFARE CONSIDERATIONS FOR UNWEANED CALVES DURING LONG DISTANCE TRANSPORT

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Millions of unweaned calves are transported each year from their dairy farm of birth to rearing farms or slaughter locations. In the EU, at least 1.5 million calves are transported across national borders annually, mostly heading to veal or beef producing systems. Transport itself poses challenges to calf health and welfare, due to risks such as increased handling, exposure to motion stress, changes in nutrition, and commingling of unfamiliar animals with associated transfer of pathogens.

Long-distance transport, which is typically categorised as any transport exceeding 8 hours, poses additional challenges. During long-distance transport, calves experience extended periods of feed deprivation, while simultaneously being exposed to variable environmental conditions and potential fatigue associated with prolonged standing and limited rest. Given their limited energy reserves and reliance on liquid feed, prolonged fasting represents a critical risk factor for impaired welfare and compromised post-transport health.

Current legislation primarily focuses on journey duration, animal age and weight, and vehicle conditions. Although minimum provisions for feeding and watering are specified, such requirements are largely based on practical or historical considerations and have not always been informed by scientific evaluation of calves' physiological needs. As a result, existing provisions may fall short of ensuring adequate energy and hydration during long-distance transport.

Recent research has begun to explore alternative approaches to managing feed deprivation in transported calves, including access to increased milk or milk replacer volumes prior to transport, provision of feed during transit, and the use of scheduled rest stops where calves are fed. However, on-board feeding systems present practical challenges, including limited access, hygiene concerns, and calves' unfamiliarity with feeding equipment, which may restrict effective intake during transport.

Drawing on findings from our own experimental and field-based work, together with evidence from other applied studies, this presentation explores feeding strategies before and during transport that may improve calf welfare during and after long-distance transport.

**EMERGENCY MANAGEMENT OF OVERTURNED TRUCKS TRANSPORTING PIGS: AN
INTERVIEW-BASED CASE STUDY IN FRANCE**

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Millions of pigs are transported on French roads every year, whether for domestic production, or for international trade involving or requiring transit through France. Although data are limited on the number of vehicles circulating as well as the number of accidents involving transported pigs, newspaper articles frequently report disturbance to local traffic due to overturned trucks. These accidents also receive coverage because of their public-facing nature and the high number of animals involved; about 190 market-weight pigs are typically loaded in each truck. Transporters are required by European law to prepare a contingency plan, but its use and practicality remain unknown. To date, there is little information available about how these accidents are managed by the professionals present on-site: transporters, first responders, and veterinarians. Thus, we gathered experiential feedback from members of each professional group using a semi-structured interview guide. Participants were asked to describe their job responsibilities, recount at least one accident, and share their views on potential pathways for improvement of the preparedness and management of these emergencies to protect the welfare of both animals and humans. A total of 9 interviews were conducted, of which 8 were in-person. Apart from one interview with 3 persons, all others were with a single individual, with a duration of 64 ± 15 minutes. These 3 transporters, 4 firefighters, and 4 veterinarians (one also professional firefighter), responded to at least one overturned truck. Transcripts were checked for accuracy and translated to English before using an applied thematic analysis, which is currently ongoing (complete results will be presented). Preliminary results indicated that all participants prioritized safety and efficiency when handling overturned trucks, but it differed both between and within professional groups on how this should be coordinated. Interviewees reported not referring to the contingency plan but rather relied on the expertise and network of the professionals present on-site. The time required to handle the event and access to proper euthanasia methods were identified as the main risk factor to the animals' welfare. Some participants reported feeling uncomfortable by how animals were handled or euthanized, but all recognized that everyone was trying their best under the circumstances. Interviewees disagreed on whether the animals should be extracted before or after lifting the truck back up, although they recognize the correct course of action might differ from one event to the next. A clearer understanding of whose jurisdiction prevailed, who should make the decisions, as well as easy access to a list of relevant contacts (nearby on-call swine veterinarians, transporters, or crane operators) were identified as potential solutions to reduce the duration of the intervention and associated fatalities.

**WELFARE IMPLICATIONS OF TEMPORARY STAY DURATIONS AND RESOURCE ACCESS FOR
GROWING PIGS AT ASSEMBLY BARN**

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Assembly barns are a critical link for biosecurity and veterinary inspection within the Danish pig export chain. In 2023, exports reached 15.2 million pigs (aged 10-12 weeks), making Denmark one of Europe's largest exporters of live pigs. These assembly barns also serve as official points of departure if pigs travel <100 km to the assembly barn or remain there for a rest period of >6 h with access to water. Despite the high volume of ~30 kg pigs moving through this system, the physiological efficacy of these resting periods in ensuring animal recovery and fitness for further transport remains poorly understood. In this study, commissioned by the Danish Ministry of Food, Agriculture and Fisheries, the aim is to evaluate how resting duration (1 h vs. 6 h) and resource availability (feed and additional drinkers) influence physiological and behavioral indicators of welfare and transport recovery in growing pigs during their stay at an assembly barn. A total of 20 journeys will be evaluated across three treatments: (1) a 1 h stay to emulate a "passing through" scenario necessary for veterinary inspection and biosecurity purposes; (2) a standard 6 h rest time following current regulatory minimums with water and no feed; and (3) a 6 h rest supplemented with ad libitum feed and two additional drinkers per pen. Body weight and physiological indicators will be assessed immediately upon arrival and at the end of the stay. Physiological indicators of energy metabolism (glucose, NEFA, insulin), muscular fatigue (creatine kinase, lactate), and hydration status (hematocrit, albumin), will be measured via jugular blood sampling. Feed residuals will be recorded at the pen level. Automated digital sensors will be employed to measure per-pen water intake. Microclimate data, including temperature (°C), relative humidity (%), and dew point (°C), will be recorded every minute through data loggers, both at the barn level and within the animal occupied zone. Behavioral patterns will be recorded with video cameras, and postures (upright, lying), consumption (feeding, drinking), social dynamics (aggression), huddling behavior, and locomotive play will be evaluated. Data will be analyzed using generalized linear mixed models in R, with journey, deck and pen treated as random effects. Data are being collected from April to September 2026, and preliminary results will be presented.

AUTOMATIC LOADING OF BROILERS FOR PROCESSING: AN ALTERNATIVE TO MANUAL CATCHING

Marco Facchinetti

CMC Industries, Italy

Manual catching of broilers, where the birds are held upside down by one or two legs can cause significant animal welfare issues. The wrist flicks needed to flip birds into drawers can lead to fear reactions, leg dislocations, wing fractures, and severe bruising of the broilers, causing suffering of the animals and financial losses for both producers and slaughterhouses. Manual catching requires hard physical labor in dark and dirty environments, resulting in high worker turnover, human joint injuries and respiratory issues.

Automatic loading eliminates many of the issues related to animal welfare, biosecurity, and worker safety. Birds are loaded in a natural, low-stress manner, kept in an upright position, and gently deposited into the drawers, without direct human contact, reducing stress level, fear reactions and wing-flapping. The maximum loading weight and stocking density can be customized, and a new vision system counts the number of birds loaded.

Designed under EHEDG (European Hygienic Engineering & Design Group) hygienic guidelines, the Apollo machine allows for an easy and complete washdown and disinfection. Requiring less operators inside the barn, the loading machine reduces human-introduced pathogens (e.g., *Campylobacter* and bird flu) and limits litter disruption, minimizing ammonia and gas release during the loading process.

Automation diminishes the physical human effort of the loading process, reducing the risk of repetitive strain injuries, back problems, and forklift collision while maintaining consistent loading speeds (16–26 tons/hours). Backed by scientific literature and global regulatory trends (such as UK Government reports), automatic loading can be considered the right catching solution for a sustainable and high-quality poultry production.

AVMA HUMANE ENDINGS: GUIDELINES FOR THE DEPOPULATION OF ANIMALS

Cia Johnson

American Veterinary Medical Association, USA

The AVMA has built a reputation for developing veterinary guidance that is scientific, comprehensive, and inclusive of diverse perspectives. The current suite of guidance documents includes the AVMA Guidelines for the Depopulation of Animals (2026), AVMA Guidelines for the Humane Slaughter of Animals (2024), and AVMA Guidelines for the Euthanasia of Animals (2020). These Guidelines, along with an associated decision tree, serve as important resources for navigating end-of-life decisions. The process by which AVMA Panels are convened and these important documents are reviewed and revised will be discussed during this presentation.

The latest edition of the AVMA Guidelines for the Depopulation of Animals was published in January 2026 and reflects nearly three years of review and revision by the Panel and its working groups. This presentation will provide an overview of the 2026 Guidelines, with emphasis on changes intended to support transparent and consistent decision-making during depopulation events. Key updates include a revised three-tier classification system for depopulation methods, expanded ethical considerations, and revised criteria for evaluating available methods within the circumstances of a particular event. The Guidelines also emphasize that depopulation requires extensive planning and process control and recognize that decisions made during animal health and other emergencies may be influenced by animal welfare, human safety, available resources, environmental considerations, regulatory requirements, and the scale and urgency of the event.
01-0001-5010-04-07

**REDUCING STRESS AND IMPROVING ANIMAL WELFARE: THE ROLE OF MOBILE SLAUGHTER
UNITS AND POLICY IMPLICATIONS FOR ALTERNATIVE SLAUGHTER METHODS**

Enrica Massalin, Jacopo Goracci, Yvonne Nino

Eurogroup for animals, Belgium

Pre-slaughter handling is a major animal welfare concern, particularly in extensive and outdoor-based systems, where loading, transport, lairage, and exposure to unfamiliar environments induce significant physiological stress, with negative implications for both animal welfare and meat quality (Faucitano, 2018). Reducing or eliminating these stressors represents a key challenge for improving welfare outcomes in livestock production systems.

This study supports the role of mobile slaughter units (MSUs) and on-farm slaughter as effective strategies to minimise transport-related stress and improve animal welfare at slaughter. Evidence from outdoor-reared Cinta senese pigs shows that on-farm slaughter significantly reduces physiological stress indicators, including cortisol, LDH and CPK levels, while maintaining meat quality and microbiological safety within regulatory thresholds (Amarie et al., 2025). These findings are consistent with broader evidence indicating that reducing transport and lairage improves welfare outcomes and preserves product quality (Knierim et al., 2015).

Beyond animal welfare, MSUs contribute to the reconfiguration of supply chains by shortening distances between production and processing, thereby enhancing traceability, transparency and logistical efficiency (Bosona & Gebresenbet, 2013). In this context, the transition from live animal transport to carcass-based trade models has been identified as a key opportunity to reduce systemic welfare risks while strengthening the economic sustainability of local value chains (Eurogroup for Animals, 2023).

However, the adoption of MSUs is constrained by regulatory and organisational challenges, for example regarding the provision and financing of official veterinary controls within existing EU frameworks. Evidence from countries such as Sweden (SLU, 2026) shows that mobile slaughter systems can operate effectively when supported by adapted veterinary service models and context-specific regulatory implementation (Hultgren et al., 2022). Mobile and on-farm slaughter systems offer an opportunity to reorganise veterinary service delivery by reducing transport-related demands and enabling more localised inspection models. The Authors argue that MSUs should be understood not as niche or exceptional solutions, but as part of a broader transition towards welfare-oriented, territorially embedded and logistics-efficient livestock systems. A proportionate, risk-based interpretation of existing regulations, combined with targeted public support and innovation in veterinary service delivery, is necessary to enable their wider implementation.

Overall, mobile and on-farm slaughter systems represent a credible pathway to reduce pre-slaughter stress, improve animal welfare outcomes, and strengthen the coherence between production systems, supply chain organisation and societal expectations, while maintaining high standards of food safety and regulatory compliance.

**INTERNATIONAL GUIDANCE ON EQUINE WELFARE AT SLAUGHTER, INCLUDING IN
RESOURCE-RESTRICTED CONTEXTS: PUBLICATION OF GUIDELINES BY HUMANE
SLAUGHTER ASSOCIATION, ROYAL VETERINARY COLLEGE, WORLD HORSE WELFARE**

Kate Fletcher

Humane Slaughter Association, UK

Equid welfare at slaughter has been scarcely researched, despite millions of equids being slaughtered around the world each year in myriad of contexts. Evidence of the different methods used and the various risks to welfare are limited. Current research has focused on identifying transport-related risks, with no clear picture as to the risks presented to equids upon arrival at the abattoir or the effectiveness of different slaughter methods used across the world. Additionally, with a high proportion of equids slaughtered in low- and middle-income countries (LMIC's), welfare could be further compromised with restricted resources, and inadequate or insufficiently enforced policy and legislation. This lack of knowledge, understanding and compliance means that equid welfare could potentially be compromised during all stages of the slaughter process in a range of countries and contexts.

The Humane Slaughter Association, together with World Horse Welfare and the Royal Veterinary College, has produced guidelines for those in charge of the commercial slaughter of equids. The purpose of such recommendations is to outline the minimum standards that should be adhered to in order to minimise stress and maximise welfare prior to slaughter and achieve humane and effective stunning or slaughter. All persons responsible for the commercial slaughter of Equidae should be appropriately trained to equal or exceed these minimum standards.

These guidelines draw on empirical observations from the field and from published literature, to make practical recommendations for where policy, legislation and general conduct should be improved for the slaughter of equids.

PROMOTING AND SUPPORTING PRE-STUNNED HALAL MEAT

George Eustice

There has long been concern about the scale of non-stun slaughter under the religious slaughter exemptions in UK law for both Halal and Kosher markets. While every Government since 1875 has expressed a view that all animals should be stunned prior to slaughter, every government has also permitted a narrow exemption for religious communities.

The majority of Halal meat in the UK is pre-stunned (with a recoverable stun) and there has been progress in demonstrating that animals will recover at certain stunning parameters through initiatives like the Demonstration of Life protocol. Markets for Halal meat in the Middle East and parts of Asia are also generally more open to pre-stunning of animals at the point of slaughter and the main suppliers to the market are Australia and New Zealand, neither of which permit a religious derogation for such exports.

There is now a current initiative to build a new UK Export Accreditation standard for pre-stunned Halal lamb which would be backed by the UK Accreditation Service (UKAS). It would be modelled closely on the standard currently used by New Zealand which has a high degree of acceptability in export markets and would be open to any Halal meat processor in the UK that practices pre-stunning at the point of slaughter. The objective is to create new export opportunities for those abattoirs that practice pre-stunning which will strengthen the incentive for adoption.

**BEHAVIOURAL, BRAINSTEM AND ELECTROENCEPHALOGRAPHIC ASSESSMENT OF THE
TIME TO LOSS OF CONSCIOUSNESS IN POULTRY FOLLOWING NON-STUNNED SLAUGHTER**

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Stunning prior to slaughter is required in the UK, Europe and many other countries, although derogations exist for non-stunned slaughter for the needs of some religious communities. However, unlike for cattle, there are limited empirical data on the time to loss of consciousness in poultry following non-stunned slaughter. This study assessed the time to loss of consciousness in broilers (*Gallus gallus domesticus*) and ducks (*Anas platyrhynchos*) using behavioural, brainstem and electroencephalographic (EEG) indicators.

Part 1: Behavioural and pathology assessment of commercial Halal non-stunned slaughter of broilers

Behavioural responses and neck pathology were assessed in 57 broilers following commercial non-stunned Halal slaughter. Birds were removed from the line immediately after manual neck cutting and monitored for attempted rhythmic breathing, nictitating membrane reflexes, neck and beak tension, balance, gaping and neck pathology. The median time to loss of beak and neck tension was 29 (13–71) and 32 (8–146) s, respectively, and the nictitating membrane reflex was lost at 37 (13–174) s. Unilateral, compared with bilateral, severance of the carotid arteries significantly delayed loss of beak tension (53 ± 11 vs 29 ± 1 s; $P < 0.001$), left nictitating membrane reflex (112 ± 35 vs 34 ± 2 s; $P = 0.023$), and gaping (105 ± 43 vs 27 ± 2 s; $P = 0.015$).

Part 2: Electrophysiological and behavioural assessment of non-stunned slaughter of broilers

Twenty-two broilers underwent non-stunned slaughter in the laboratory by a single manual neck cut severing the carotid arteries, jugular veins, trachea and oesophagus. Behavioural and brainstem responses were recorded alongside EEG waveform morphology and changes in EEG power spectra. Following non-stunned slaughter, EEG power in the theta, alpha and beta bands remained near pre-treatment values for approximately 30 s post-cut. Afterwards there was a progressive suppression of EEG power, with the mean time to an isoelectric EEG waveform of 55 ± 13 s following non-stunned slaughter.

Part 3: Behavioural and brainstem assessment of Halal non-stunned slaughter of ducks

Thirty-four White Pekin ducks were assessed during commercial Halal non-stunned slaughter. Birds were removed from the line immediately after manual neck cutting and monitored for time to collapse, loss of balance, nictitating membrane reflexes, and neck and beak tension. There was wide variation in the time to loss of behavioural and brainstem indices, ranging from 20–334 s for neck tension and 20–383 s for beak tension. Mean time to loss of balance was 166 ± 14 (22–355) s. There was a moderate correlation ($R = 0.60$ and 0.62) between distance of the neck cut from the jaw and time to loss of balance and neck tension, respectively.

Conclusions

These studies highlight the importance of bilateral severance of both carotid arteries during non-stunned slaughter. They indicate that broilers and ducks may remain conscious for a period after neck cutting and therefore may experience pain and distress prior to loss of consciousness by cerebral hypoxia.

**RAPID LOSS OF CONSCIOUSNESS IN CATTLE FOLLOWING NON-STUN SLAUGHTER:
EVIDENCE FROM A SYSTEMATIC REVIEW**

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Background: Accepting that it is ethical for meat to be consumed as food, then in any context, religious or secular, it is indefensible for animals to be subjected to undue pain. Animal slaughter must therefore be predicated on minimization of pain. Non-stun slaughter (NSS) of bovines involves ventral neck incisions resulting in abrupt loss of cortical blood flow causing near instantaneous loss of consciousness (LOC). However, some reports have suggested that LOC after NSS is not instantaneous. This paper presents an overview of the neurobiology underlying NSS and a systematic review of the literature on time to LOC in bovines following NSS. Methods: A literature review was conducted across PubMed, Google Scholar, Cochrane Library, Medline, and Web of Science, with three co-authors independently screening articles to reduce bias. Only original research and review articles specifically addressing time to LOC in bovines after NSS were included; studies not focused on this outcome were excluded. The quality of evidence was ranked based on hierarchy of evidence utilizing predefined criteria. Results: Fifteen studies were identified: 4 high-, 3 medium-, and 8 low-quality. Discussion: High quality evidence consistently indicates that LOC occurs within 10 seconds of NSS of bovines when done correctly with low-stress, ideal slaughterhouse conditions. Study limitations include the relatively small number of relevant studies, many of which rely on subjective or indirect measures of LOC—such as brainstem reflexes or brain death indicators. Clinical Relevance: Our findings provide important insights to optimize NSS practices, promoting animal welfare while maintaining religious requirements.

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