HSA Conference 2025

**Animal Welfare Beyond the Farm Gate:
Latest developments in humane slaughter and transport of animals**

Scientific Programme

Welcome to the HSA Conference 2025

We are delighted to welcome you to Birmingham for the Humane Slaughter Association (HSA)'s Conference 2025: 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, Wrightfield, The Compleat Food Group and Bock Industries 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**

The Humane Slaughter Association (HSA)

The HSA is an international UK-based, independent charity and membership society. We are concerned exclusively with promoting evidence-based humane treatment of farmed animals during transport, slaughter, killing for welfare reasons or disease control, and at markets.

We work through research, education, training and promoting technical advances to bring real, practical and lasting improvements in food animal welfare.

The HSA is funded solely by donations and legacies from members and supporters. Please help us to continue to make practical and lasting improvements to animal welfare beyond the farm gate by becoming a member or donating to support our work.

Caring beyond the farm gate

Growing numbers of us are concerned about the welfare of animals that provide us with food and other products. At the HSA, we play a vital role in promoting, developing and advancing animal welfare for the humane transport, slaughter or killing of all livestock animals by:

- funding innovative research projects to actively look for ways to ensure that the welfare of farmed animals is maximised beyond the farm gate;
- promoting practical and evidence-based solutions, offering expert advice and guidance to livestock producers, regulators and consumers, leading to real-world improvements for farmed animals; and
- collaborating with all those seeking to provide practical evidence-based approaches to maximise animal welfare during transport and at the time of killing.

Conference Sponsors

Gold Sponsor:

Since 1913, Accles & Shelvoke's CASH® tools have led humane livestock stunning. UK-made, globally trusted for quality, safety, and compliance

Silver Sponsors:

LAPS - The poultry stunning system which puts animal welfare first. High welfare. Zero gas. Proven, sustainable technology with low environmental impact for modern poultry processing.

The Compleat Food Group is home to loved food brands and a leading supplier of own-label food into UK major retail and foodservice. With 6,000+ people across 17 sites and working alongside over 90 supply partners.

Bronze Sponsor:

Bock Industries designs and builds world-class humane, percussive stunning systems for poultry, pigs and fish. We turn research-informed design into field-proven performance.

Humane, Safe & Reliable Animal Stunning

CASH®
The humane choice since 1913
CE BNP MADE IN BRITAIN

WHEN ONLY THE BEST IS GOOD ENOUGH

Precision manufactured in the UK using the highest quality materials for over 100 years.

Often imitated - never replicated!

accles & SHELVOKE
By Fortifi

www.accles-shelvoke.com

Accles & Shelvoke Ltd
Phone: +44 121 313 3564 - Email: birminghamfrontmatec.com

Langford Abattoir

Bristol Veterinary School

University of BRISTOL

The Langford Abattoir

The abattoir at Bristol Veterinary School is a unique facility offering high-quality slaughter services to smallholders, farmers and local businesses whilst upholding the highest standards of animal welfare and food safety.

As one of the two veterinary schools in the UK with an on-site abattoir, we provide expert-led training for veterinary students, as well as educational visits for schools, colleges and universities.

Our skilled team, certified as Animal Welfare Officers, ensures humane and professional handling of cattle, sheep, pigs and goats. Whether you're looking for processing services or educational opportunities, we are here to help. To find out more about what we do and how we can assist you, please get in touch with our Abattoir Manager Aled Daniels and his team by emailing langford-abattoir@bristol.ac.uk or calling +44(0)1174283547.

Become a Member and Help us Shape the Future of Animal Welfare Today

Every day, millions of animals are transported and slaughtered for food.

The Humane Slaughter Association (HSA) is leading change beyond the farm gate through research and education

Our work improves the lives of countless animals in the UK and around the world, but we couldn't do what we do without the support of our community.

Scan for more info

www.hsa.org.uk/support/memberships

Caring beyond the farm gate

Registered Charity in England no 1159690: Charitable Incorporated Organisation

Humane Slaughter Association

Humane Slaughter Association

Scientific Programme:

Timetable of talks

HSA Conference 2025: Animal Welfare Beyond the Farm Gate: Latest developments in humane slaughter and transport of animals

21– 22 October 2025

Thinktank Birmingham Science Museum, UK, and online

Please note: panel discussions will not be livestreamed

All times are in BST (GMT+1) – Please note that changes to the programme may occur

Day 1 – Tuesday 21 October 2025

09:00 – 09:30 Registration

Session 1 – Controlled Atmosphere Stunning (Chair: Huw Golledge)

09:30 – 09:40 **Welcome and Introduction - Huw Golledge** *(CEO of the HSA)*

09:40 – 09:55 **Marien Gerritzen** *(Wageningen University & Research, NL)*
PigStun Project: Alternatives to high CO_2 stunning in pigs

09:55 – 10:10 **Jane Downes** *(Former Chair of AWC's Welfare at Killing Committee)*
Animal Welfare Committee (AWC) review of high concentration CO_2 stunning of pigs and alternatives

10:10 – 10:25 **Dorothy McKeegan** *(University of Glasgow, UK)*
Low atmospheric pressure stunning (LAPS) in poultry: Welfare, practice, and prospects for wider adoption

10:25 – 10:40 **Sebastian Strand** *(General Manager, HEFT International)*
Introducing the NEFS method for on-farm euthanasia and emergency response

10:40 – 11:05 **Controlled Atmosphere Killing Discussion Panel (in-person only)**
Session 1 Speakers

11:05 – 11:30 Morning coffee break

Session 2 – On-Farm (Chair: Birte Nielsen)

11:30 – 11:45 **Charlie Mason** *(Humane Slaughter Association)*
Lead-Free Ammunition: Is it fit for the humane killing of livestock?

11:45 – 12:05 **Anneleen Watteyn** *(ILVO, Belgium)*
Caught in the Middle: Animal Welfare, Ergonomics, and Costs of Broiler Catching Methods

12:05 – 12:25 **Vera Bavinck** *(Poultry Veterinarian for Kipster and FairPoultry)*
Kipster: Upright Catching

12:25 – 12:40 **Marianne Farish** *(Humane Slaughter Association)*
Emergency killing of neonates using blunt force trauma (BFT)

HSA Conference 2025: Animal Welfare Beyond the Farm Gate: Latest developments in humane slaughter and transport of animals

21– 22 October 2025

Thinktank Birmingham Science Museum, UK, and online

Day 1 – Continued

12:40 – 14:00 Lunch break

Session 3 - Training, Auditing and Other Welfare Initiatives (Chair: Charlie Mason)

14:00 – 14:15 **Grace Muita** *(Independent Researcher, Kenya)*
Training impacts on abattoir workers' knowledge, attitudes, and practices regarding animal welfare in Narok, Kenya

14:15 – 14:30 **Marianne Farish** *(Humane Slaughter Association)*
Development of training and eLearning at the HSA

14:30 – 14:45 **Alice Leathley & Collin Willson** *(Food Standards Agency, UK)*
Welfare Assurance Team

14:45 – 15:00 **Huw Golledge** *(CEO of the HSA)* **& Claire White** *(NFU)*
Is there a need for a Welfare at Slaughter Alliance?

15:00 – 15:30 **Enabling improvements to welfare at slaughter Discussion Panel (in-person only)**
Session 3 Speakers

15:30 – 16:00 Afternoon coffee break

Session 4 – Aquatics (Chair: Huw Golledge)

16:00 – 16:25 **Jeff Lines** *(Ace Aquatec, UK)*
Improving the welfare of Finfish at slaughter

16:25 – 16:55 **Bjørn Roth** *(Nofima, Norway)*
Stunning of crabs and lobsters

16:55 – 17:00 **Closing of Day 1 of the conference – Huw Golledge**

HSA Conference 2025: Animal Welfare Beyond the Farm Gate: Latest developments in humane slaughter and transport of animals

21– 22 October 2025

Thinktank Birmingham Science Museum, UK, and online

Day 2 – Wednesday 22 October 2025

09:00 – 09:30 Registration

09:30 – 09:40 **Opening Session - Huw Golledge** *(CEO of the HSA)*

Session 1 – Recent Advances (Chair: Bethan Apted)

09:40 – 09:55 **Jenny Bouwsema** *(Silsoe Livestock Systems)*
EEG instrumentation changes the characteristics of electric stunning (Schrödinger's fish?)

09:55 – 10:10 **Angela Ramon-Perez** *(Autonomous University of Barcelona, Spain)*
Automated evaluation of pig consciousness in the slaughterhouse: sensor development

10:10 – 10:25 **Ben Sturgeon** *(Crustacean Compassion, UK)*
Transition to higher welfare decapod crustacean transport

10:25 – 10:45 **Gissela García** *(IRTA, Spain)*
Stability and spatial uniformity of different gases and gas mixtures in a closed cabinet type gas stunning system

10:45 – 11.30 Morning coffee break

Session 2 – Religious Slaughter (Chair: Huw Golledge)

11:30 – 11:50 **Awal Fuseini** *(AHDB, UK)*
Halal slaughter of beef in the UK: a quest to find a welfare-friendly and halal compliant method of slaughter

11:50 – 12:10 **Ari Zivotofsky** *(Gonda Brain Science Center, Israel)*
An analysis of the acceptability of the DTS cattle stunning system for use in shechita (kosher slaughter)

12:10 – 12:40 **Religious slaughter discussion panel (in-person only)**

12:40 – 13.45 Lunch break

HSA Conference 2025: Animal Welfare Beyond the Farm Gate: Latest developments in humane slaughter and transport of animals

21– 22 October 2025

Thinktank Birmingham Science Museum, UK, and online

Day 2 – Continued

Session 3 - On-Farm (Chair: Susan Richmond)

13:45 – 14:05	**Anneleen Watteyn** *(ILVO, Belgium)* Gotta catch 'em all: prototype innovations for hen welfare
14:05 – 14:20	**Troy Gibson** *(Royal Veterinary College, UK)* Effectiveness of air pellet guns for on-farm poultry dispatch
14:20 – 14:40	**Penny Lawlis** *(Acer Consulting, Canada)* Applying a One Welfare approach to depopulation

14:40 – 15:15 Afternoon coffee break

Session 4 – Current Practice (Abattoirs) (Chair: Birte Nielsen)

15:15 – 15:35	**Eleanor Gannon** *(Harper Adams University, UK)* Assessing risk factors for official veterinarian–food business operator conflicts in UK slaughterhouses
15:35 – 15:50	**Beatrice Benedetti** *(University of Bologna, Italy)* Assessment of stunning effectiveness in donkeys using electroencephalogram
15:50 – 16:05	**Eduardo David Valencia Gonzaga** *(IRTA, Spain)* Preliminary results: evaluation of non-penetrative captive bolt in inducing unconsciousness in cattle
16:05 – 16:20	**Lily Chandler** *(Harper Adams University, UK)* Bridging the gap between perception and reality: welfare assessment of pigs during gas stunning
16:20 – 16:35	**Katharine Fletcher** *(Royal Veterinary College, UK)* Pathophysiology of penetrating captive bolt gun stunning of horses
16:35 – 17:00	***Closing of conference – Huw Golledge***

Humane Slaughter Association

Scientific Programme:

Speaker 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.

PIGSTUN PROJECT: ALTERNATIVES TO HIGH CO_2 STUNNING IN PIGS

Marien Gerritzen

Wageningen University & Research, NL

In EU pig slaughterhouses two stunning methods are most commonly applied: electrical stunning and carbon dioxide stunning at high concentration. Carbon dioxide stunning of pigs is widely used because of its efficiency and reduced pre-slaughter stress, as pigs are handled and stunned in groups. However, exposure to high concentration of CO_2 is aversive, causing hyperventilation and is painful to inhale. Electrical stunning results in immediate unconsciousness of the animal but, prior to stunning the animals need to be lined up in a row and going from a group to a single line involves stress and (painful) stimuli such as with electric prods.

To support the move away from current high CO_2 stunning systems, PigStun tested 4 novel approaches and stunning systems.

- **Optimized CAS process:** This system facilitates pre-grouped animals transported into a CAS system and continuously checks and optimizes the gas climate. Starting point is high CO_2.
- **Argon retrofit system:** a gas stunning system that can be retrofit into existing Dip-Lift and paternoster stunning systems.
- **Helium:** involves helium in a new designed Lift system
- **Improved Electrical Stunning:** improved stunning process with special emphasis on throughput rate, pre-stunning handling.

It is concluded that the alternatives tested have the potential to increase animal welfare. However, some reduce meat quality or affect throughput rates. Reducing pre-stun stress through improved handling poses a significant improvement to animal welfare and may increase meat quality and worker satisfaction.

The four alternatives are at a different level of commercial readiness.

ANIMAL WELFARE COMMITTEE (AWC) REVIEW OF HIGH CONCENTRATION CO_2 STUNNING OF PIGS AND ALTERNATIVES

Jane Downes

Former Chair of AWC's Welfare at Killing Committee

Using a high concentration of carbon dioxide (CO_2) to stun pigs during slaughter is the subject of significant scientific, ethical and policy debate. CO_2 stunning is widely used globally due to its practicality. Some welfare advantages in the pre-slaughter handling systems compared to conventional electrical stunning have also been argued. Nonetheless, extensive evidence indicates that pigs exposed to high concentrations of CO_2 experience significant aversion, pain, and respiratory distress before loss of consciousness. As such, the method raises significant animal welfare concerns. The Animal Welfare Committee (AWC) has submitted a report to Defra reviewing the evidence on the welfare impacts of high concentration CO_2 gas stunning of pigs and of potential alternative methods.

This presentation will summarise AWC's key findings and recommendations, including an exploration of potential alternatives. Research and innovation needs identified by the AWC will be highlighted as well as regulatory and industry challenges in transitioning away from CO_2. Delegates will gain insight into the reasoning behind the AWC's conclusions and recommendations.

LOW ATMOSPHERIC PRESSURE STUNNING (LAPS) IN POULTRY: WELFARE, PRACTICE, AND PROSPECTS FOR WIDER ADOPTION

Dorothy McKeegan

University of Glasgow, UK

Low atmospheric pressure stunning (LAPS) is a novel approach to pre-slaughter stunning of poultry in which birds are rendered unconscious by exposure to gradual decompression, causing progressive hypobaric hypoxia. Between 2011 and 2018, the welfare impact of this approach was thoroughly investigated in a series of innovative studies that characterised the behavioural, cardiac, brain, and pathological responses to LAPS in broiler chickens, as well as the influence of ambient temperature (which affects air density and hence the extent of hypoxia). Collectively, this work showed that LAPS is a high welfare approach and based on this evidence, EFSA concluded that LAPS should be approved for use in the EU. Furthermore, EFSA ranked LAPS as having the lowest welfare hazards among current poultry stunning systems. In May 2018, the European Commission added LAPS to the Council Regulation (EC) 1099/2009 (Annex I & II), making it legal for use in the EU. LAPS is also permitted in the US and Canada. Despite these encouraging developments, commercial uptake of LAPS has been slow. Various potential factors preventing wider adoption have been identified such as regulatory acceptance, industry perceptions, and infrastructure requirements. We will discuss these and consider how they might be overcome. Using developments in Canada as a case example, where LAPS is in routine use, we will examine practical experiences from commercial operations, including system integration and welfare monitoring. While LAPS has significant potential to improve poultry welfare at slaughter worldwide, we must understand barriers and determine routes to commercial feasibility to realise these benefits.

INTRODUCING THE NEFS METHOD FOR ON-FARM EUTHANASIA AND EMERGENCY RESPONSE

Sebastian Strand
Nicole Krefting
Philip Krefting

HEFT International, Karrastrandvagen 124C, 451 76, Uddevalla, Sweden

Farmers are the backbone of society, providing essential resources while carrying the ethical responsibility of caring for animals. This responsibility extends beyond nutrition and protection -it includes making difficult decisions when animals become sick, injured, or unviable. Euthanising animals is emotionally taxing and often conducted under less-than-ideal conditions. On farm euthanasia occurs in many settings, including culling non-viable animals, one-day old chicks, mishatchings, parent stock, and large-scale depopulations due to disease outbreaks or logistical disruptions. Traditional methods such as blunt force trauma, CO_2 gassing, maceration and bolt pistol can be imprecise, distressing, and difficult to perform humanely. Many require significant restraint, force, and reattempts, causing stress for both animals and caretakers. Despite widespread recognition of the challenges, practical and scalable alternatives have remained limited. Nitrogen stunning has long been understood to inflict minimal distress due to its inert nature and presence in atmospheric air. However, its similar weight to air makes it difficult to isolate and maintain at sufficient concentration. In the early 2000s the idea of using high expansion foam infused with nitrogen to create a localised, oxygen-depleted environment was introduced. When oxygen levels fall below 2%, animals lose consciousness rapidly, providing a humane and effective stunning process. The foam acts as a containment medium and prevents air ingress. For this to work reliably, foam criteria such as stability and continuous replenishment - must be carefully controlled. For more than a decade, significant developments to the method have been made to minimise foam exposure, perform the method in a closed environment, improve foam characteristics, reduce the filling time and optimise consumption of consumables. In late 2021, HEFT submitted this improved method for inclusion under Regulation (EC) No 1099/2009 for on farm euthanasia and emergency depopulation. After an extensive review, EFSA published a Scientific Opinion in June 2024, concluding that the method provides animal welfare outcomes at least equivalent to existing approved methods such as CO_2 stunning and water bath electrocution. The assessment also identified key welfare parameters, including foam expansion ratio, filling time, distribution, residual oxygen, bubble size, stocking density, foam agent quality, ambient temperature, and exposure time. Procedural adherence was recognised as critical to consistent welfare outcomes. Although the studies submitted used early-generation equipment and foam agents not designed for this application, results demonstrated satisfactory stunning effectiveness and robustness. Continued technical refinements both in foam agent and system design have improved the reliability and welfare profile of the method further. Following EFSA's opinion, additional discussions and data submissions have been made to the European Commission to address outstanding questions and support regulatory progression. By developing a method that is more humane, practical, and safer for both animals and caretakers, we believe this technology represents meaningful progress in a field where innovation has been lacking. While no single method can be universally perfect, continued development and adoption of improved techniques can make a real difference for animals and for the people trusted with their care.

LEAD-FREE AMMUNITION: IS IT FIT FOR HUMANE KILLING OF LIVESTOCK?

C W Mason

The Humane Slaughter Association

Aside from captive-bolt devices and lethal injection, veterinary surgeons, RSPCA inspectors and knackermen have traditionally used free-bullet humane killers to carry out emergency killing of farm livestock and equines. These are normally single-shot weapons (purpose-built, or adapted general-purpose handguns), that discharge a subsonic, round-nose lead bullet with a muzzle/impact energy ranging between 200 to 300 Joules (150 to 220 foot pounds). They are either discharged in full contact with the subject's head, or from a distance not exceeding five centimetres. Ideally, humane killer bullets should penetrate beyond the foramen magnum, distort sufficiently to cause massive trauma and damage to the hind-brain, brain-stem and upper spinal cord, coming to rest in the upper part of the resulting carcase.

UK legislation, likely to come into force in 2029, banning the use of lead ammunition doesn't include an exemption for close-quarters, humane killing of animals. This gives cause for concern because the non-lead alternatives (copper and steel) are less dense and not as malleable as lead; these have animal welfare and health-and-safety implications:

1. They may not distort sufficiently to cause sufficient damage to cause immediate death.
2. The bullets may over-penetrate and possibly exit, endangering the operator, bystanders and/or nearby animals.

The HSA is collaborating with the RSPCA Inspectorate, Simpson Brothers, and independent veterinary surgeons to compare the performance of lead-free alternatives with that of traditional lead rounds currently used for this purpose. The project aims to verify that the tested ammunition provides a humane and safe alternative to lead. The work is still in its early stages and this presentation will outline the project and give a brief summary of progress to date.

CAUGHT IN THE MIDDLE: ANIMAL WELFARE, ERGONOMICS, AND COSTS OF BROILER CATCHING METHODS

Femke Delanglez, Anneleen Watteyn, Bart Ampe, Veerle Segers, An Garmyn, Evelyne Delezie, Nathalie Sleeckx, Ine Kempen, Niels Demaître, Hilde Van Meirhaeghe, Gunther Antonissen, Frank Tuyttens

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 ± 1.3% vs. 17.7 ± 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.

KIPSTER: UPRIGHT CATCHING

Vera Bavinck

Poultry Veterinarian for Kipster and FairPoultry

To maximize the welfare of laying hens, Kipster is catching their laying hens in an upright position when placed in crates for transport to the slaughterhouse. The experience covers 6 years, 12 flocks of 24000 hens each, in which challenges and solutions have been faced. This presentation focusses on the practical implications, realistic results and aims to inspire others to rethink the way laying hens are caught.

EMERGENCY KILLING OF NEONATES USING BLUNT-FORCE TRAUMA (BFT)

Charlie W Mason and Marianne Farish

The Humane Slaughter Association

Blunt-force trauma (BFT) is widely used to kill neonate piglets, lambs and kids on-farm. BFT is a firm and accurate percussive blow to the head provoking severe damage to the brain sufficient to kill the animal. Mechanical BFT is the method of choice, both for emergencies and non-emergencies, and for this a non-penetrating captive-bolt device can be used by competently trained operators to kill neonates up to a specified weight. In an emergency, manual BFT is sometimes used to kill neonates that are in severe pain or suffering, and where there is no other practical possibility to alleviate this pain and suffering. Correctly performed, manual BFT is an effective and humane method of killing neonates up to five kilograms in weight, but it must only be used in an emergency and when no other option is available, i.e. when delay, handling, moving or restraint would cause avoidable pain suffering or distress to the animal. It must never be used as a routine method of killing otherwise healthy surplus or under-performing animals.

With focus on animal welfare, this presentation will give an overview of these two methods used for killing neonates on-farm, emphasising what constitutes an emergency killing. It will also highlight the prevailing confusion in the UK surrounding the use of manual BFT, caused by differences in slaughter legislation arising from devolved government.

TRAINING IMPACTS ON ABATTOIR WORKERS' KNOWLEDGE, ATTITUDES, AND PRACTICES REGARDING ANIMAL WELFARE IN NAROK, KENYA

Grace Muita

Independent Researcher, Kenya

This study assesses the impact of training on the knowledge, attitudes, and practices (KAP) of abattoir workers in two major slaughterhouses in Narok County, Kenya. Training workshops is being conducted on animal handling and welfare at slaughter. A pre and post training assessment using questionnaires will compare results from both these assessments. This will indicate to what extent the training has been effective, and where changes need to be implemented. This is a significant step towards promoting animal welfare at slaughter in Narok County.

DEVELOPMENT OF TRAINING AND ELEARNING AT THE HSA

Marianne Farish

The Humane Slaughter Association

One of the Humane Slaughter Association's core objectives is to advance animal welfare through the delivery of high-quality education and training in methods of humane transport, slaughter and killing of farmed animals. Our established in-person theory and practical training courses are widely respected and will remain a cornerstone of our educational offering with new added features. Building on this strong foundation, the HSA is expending our reach through a catalogue of online learning opportunities. This will make our training more accessible and flexible for a wider global audience.

HSA are working with FAI farms, to develop a bespoke cloud-based learning management system to host engaging and interactive online and blended learning courses under the HSA brand. This innovative platform will enable us to create, develop and deliver an expanded range of workshops, webinars, and self-paced online training programmes.

This presentation will give a brief insight into how we are developing and integrating our eLearning and in-person education resources and the future of our online course provision for advancing animal welfare.

WELFARE ASSURANCE TEAM

Alice Leathley and Collin Willson

Food Standards Agency, UK

In 2016 Food Standards Agency Executive Management Team and FSA Board endorsed a welfare assurance programme to enhance animal welfare standards in abattoirs, augment the delivery of official controls, and to compliment animal welfare policy decisions. Welfare Assurance Team (WAT) was created, and a programme of work was developed to facilitate this consisting of risk-based unannounced inspections to ensure effective delivery of official controls in abattoirs, and themed inspections to ensure compliance with specific activities and/or changing priorities such as legislative or policy changes that impact on delivery. WAT also provide incident support using subject matter experts animal welfare knowledge to support local teams in managing ad-hoc welfare incidents.

IS THERE A NEED FOR A WELFARE AT SLAUGHTER ALLIANCE?

Huw Golledge[1] and Claire White[2]

[1]CEO of the HSA
[2]National Farmers' Union

In this talk we discuss a proposal to form a cross-sector UK Welfare at Slaughter Alliance which would bring together key stakeholders involved in the slaughter and transport of livestock animals in the UK. The British Veterinary Association, National Farmers' Union and Humane Slaughter Association have been developing plans for such an alliance.

The primary aim of the Alliance would be to enable members to collectively work towards the most humane methods of slaughter in all settings in the UK, in an impartial setting. The alliance would enable progress through seeking practical solutions to key welfare challenges. The alliance would also act as a key connection between government, regulators, NGOs and industry.

This talk will outline plans as developed so far, outlining the opportunities and challenges, and seek the audience's views on this concept.

IMPROVING THE WELFARE OF FINFISH AT SLAUGHTER

Jenny Bouwsema[1], Jeff Lines[1], Jimmy Turnbull[2], Maureen Ellis[2], Amaya Albalat[2]

[1]Ace Aquatec
[2]University of Stirling

In the last decade, the welfare of farmed fish has gained attention with practices during slaughter being particularly challenging from a welfare perspective. In our project entitled 'Humane slaughter of finfish: demonstrate, validate and facilitate market update' we sought to investigate how in-water electric stunning could improve the welfare of fish at slaughter. The focus of this project was on important commercial species where the protection of welfare is generally not mandated and is a low priority for producers and consumers.

To introduce higher welfare practices for these species requires a pragmatic approach, including understanding motivating factors for producers. This can allow the uptake of higher welfare systems even in the absence of direct interest in welfare. Key factors include commercial needs such as capital and operating costs, processing speeds and carcass quality, as well as the needs of the staff on a processing line.

Over the course of this project, we worked with several species including tilapia, pangasius, Japanese amberjack and sea bream. We were able to identify effective and efficient stunning parameters for each species and encountered varying needs and motivations in each industry. For tilapia, we found rapid and enthusiastic uptake of stunning with a significant producer, driven partly by improvements in efficiency and staff welfare. By contrast, the pangasius industry, which has previously expressed some interest in adopting improvements at slaughter, suffered a global fall in product value during the course of the project, and market uncertainty led to difficulty in finding producers willing to commit to the infrastructure required for a commercial trial. The Japanese market is different yet again, with many small producers and processors dealing with a range of fish species. To meet this need we developed an alternative approach to generating a flexible power supply and are currently developing a prototype stunner for this part of the Japanese market.

In this overview we will discuss the successes, possibilities and outcomes of this project, along with the practical motivators that drive forward welfare improvements on the ground.

EEG INSTRUMENTATION CHANGES THE CHARACTERISTICS OF ELECTRIC STUNNING (SCHRÖDINGER'S FISH?)

Jenny Bouwsema[1], Jeff Lines[1], Jimmy Turnbull[2]

[1] Silsoe Livestock Systems

[2] University of Stirling

Regulatory bodies routinely require EEG assessments of consciousness for animals undergoing pre-slaughter stunning. Not only does EEG not provide clear boundaries between levels of consciousness but it also appears that the introduction of EEG instrumentation into electrical stunning systems may significantly alter the quality of stun received.

Here we present data from trials in which we titrated stun settings for pangasius to achieve power-efficient but effective stunning, before instrumenting fish to record EEG before, during and after stun application. We noticed that instrumented animals responded very differently from their un-instrumented conspecifics, appearing to be ineffectively stunned or with consciousness returning sooner while stun parameters remained constant. Achieving consistently successful stuns in instrumented animals required significant increases in the electric field strength. Limits on permitted numbers of unsuccessful stuns within experiments mean that we have not been able to test this observation with a full trial, but having noted similar observations in other species, we consider it a plausible indicator of an important effect.

We hypothesize that the presence of EEG electrodes is changing the distribution of current around the brain and we present some electrical modeling to illustrate this possibility.

This observation is both important and problematic when EEG is used to investigate consciousness at the threshold of commercially viable stunning. We suggest that this effect might also be found in other animals.

AUTOMATED EVALUATION OF PIG CONSCIOUSNESS IN THE SLAUGHTERHOUSE: SENSOR DEVELOPMENT

Angela Ramon-Perez[1], Sofia Gol[2], Josep Reixach[2], Jordi Sanchez[3], Xavier Manteca[1], Pol Llonch[1]

[1]Department of Animal and Food Science, School of Veterinary Science, Autonomous University of Barcelona, Building V, Travessera dels Turons, 08193 Cerdanyola del Vallès, Barcelona, Spain.
[2]Selección Batallé S.A, Riudarenes, Girona, Spain
[3]Nuna Solutions, IT & Industrial Automation for Meat Industry, Calafell, Catalonia, Spain

Animal welfare during slaughter is an ethical, legal, and social priority in pig production. Among the different phases of the slaughter process, stunning is one of the most critical points as it must induce a rapid and effective loss of consciousness. However, monitoring the state of consciousness in each pig is labour-intensive and requires considerable human resources due to the high line speeds. Although a combination of several indicators is needed for assessing unconsciousness accurately, the corneal reflex is widely used since it is very sensitive and is one of the first indicators to reappear when the animal starts regaining consciousness. Technology and artificial intelligence are becoming promising tools for continuous, real-time, and individualised assessments in slaughterhouses, although commercial application remains a challenge. This ongoing study aims to develop and evaluate the feasibility of an automated sensor for monitoring pig consciousness in a commercial slaughterhouse by detecting the corneal reflex. The prototype sensor is a system integrating automatic blink detection using computer vision. It consists of a high-quality IP camera connected to an air blower directed towards the pigs' cornea. A Raspberry Pi PLC handles digital I/O control, synchronising the activation of the air stimulus and the video capture. Video sequences are then processed by a GPU-enabled industrial PC running a neural network based on YOLO and OpenCV, which detects the presence or absence of the corneal reflex. The system provides real-time alerts via coloured light signals on-site and also sends notifications through a dedicated app, allowing for immediate corrective action if needed. The study is being conducted in a commercial slaughterhouse operating at a chain speed of 550 pigs per hour, using CO2 stunning. The trial has been performed on three days, collecting 1737 assessments of corneal reflex automatically to monitor the stunning effectiveness. From all the assessments, only five animals showed a positive corneal reflex. The low number of positive cases represents a limitation for this study, so further testing and data collection are needed to increase the sample size for algorithm development and later validation under commercial conditions. Despite this limitation, the current dataset is already contributing to the training of the neural network, and the system is designed to continuously improve its accuracy as new data are collected in real slaughterhouse conditions. This automated assessment approach could significantly enhance the objective and effective monitoring of animal welfare in slaughterhouses.

TRANSITION TO HIGHER WELFARE DECAPOD CRUSTACEAN TRANSPORT

Ben Sturgeon

Crustacean Compassion, UK

The study assessed the impact of higher welfare for live decapod crustacea during transport. Three scenarios were evaluated: (i) baseline, (ii) lower stocking vivier transport, and (iii) kill at source. Economic modelling established costs, benefits and trade-offs associated with improved welfare mechanisms in transport.

Scenario Model Results and Key Discussion Points

1. Business as usual (BAU)
Under BAU, fishers and processors face a chaotic sourcing model that introduces high price volatility and waste. Transport costs of vivier are significant, with the proportion of total realisable value of the animal to 4%, or 9.5% of value of the product at point of transport. This was far higher than carcass-only transport.

2. BAU plus high welfare (BAUHW)
Higher welfare resulted in 33% extra cost of transport compared to BAU. Reducing density in vivier transport impacts margins and would affect the market. However, this cost is relative compared to the swings faced through other market forces (i.e. Irish fishers reporting 40% drop in demand). BAUHW can therefore be considered viable vs BAU, but more costly than carcass only.

3. Carcass only movement i.e. kill at source
Carcass-only transport is significantly cheaper than vivier, at under half the cost (>60% cheaper), taking overall transport cost to 1.5% of total realisable value, and under 1.8% of value of the shipped product. It is cheaper and more efficient but misses margins that may be obtained on vivier vs frozen product. This margin may be reduced further as freezing technology improves, and organised supply chains becomes appealing.

Conclusions

Minimising welfare-harming transport is consistent with structured, long-term and resilient markets.
Minimising suffering during vivier is more expensive as a proportion of overall value realisation but possible within current vivier models, considering other market pressures.
While vivier products have a price premium, it is in the interest of retailers and food service to make them interchangeable minimising supply gaps. Combined with expensive vivier, a convergence of cost of live vs carcass promotes a shift towards frozen/chilled. Many exporters and retailers now offer both types of products.

Early slaughter and adding value would be advantageous especially where the vivier market is volatile. Huge swings (including collapses) in market value between countries year-on-year is observed; Irish fishers for ex, show huge shifts in demand. Carcass-only production fitting modern market demands supports industry with far-sighted processors and fishers seeing opportunity to avoid volatility and damage supply chains.

Consumer preferences regarding availability, welfare and price are required but aspects including COVID, Brexit and climate alongside developments of freezing technology and market rationalisation, mean that vivier can be questioned. Outside of simple welfare, vivier hinders traceability, disease control, fails to model sustainable transport, creates waste, & is more expensive. The proper application of animal welfare policies (like live transport of terrestrial animals) alongside economic modelling provides an unanswerable case.

STABILITY AND SPATIAL UNIFORMITY OF DIFFERENT GASES AND GAS MIXTURES IN A CLOSED CABINET TYPE GAS STUNNING SYSTEM

Geomara Gissela García[1], Alexandra Contreras-Jodar[1], Troy John Gibson[2], Virginie Michel[3], David Valencia[1], Júlia Ribalta[1], Aranzazu Varvaró-Porter[1], Fernando Andrés Pazmiño[4], Antonio Velarde[1]

[1]Institut de Recerca i Tecnologia Agroalimentàries (IRTA), Animal Welfare, Veïnat de Sies, Monells, 17121 Girona, Spain; gissela.garcia@irta.cat (G.G.G.); alexandra.contreras@irta.cat (A.C.-J.); david.valencia@irta.cat; julia.ribalta@irta.cat (J.R.); aranzazu.varvaro@irta.cat (A.V.-P.); antonio.velarde@irta.cat (A.V.)
[2]Department of Pathobiology and Population Sciences, Royal Veterinary College, University of London, Hatfield AL9 7TA, UK; tgibson@rvc.ac.uk
[3]Direction of Strategy and Programmes, French Agency for Food, Environmental and Occupational Health & Safety (ANSES), 14 Rue Pierre et Marie Curie, 94701 Maisons-Alfort, France; virginie.michel@anses.fr
[4]Department of Parasitology and Immunology, Faculty of Veterinary Medicine, Central University of Ecuador, Ciudadela Universitaria s/n, 170521 Quito, EC; fapazmino@uce.edu.ec

In the European Union (EU), the slaughter of rabbits is regulated by Council Regulation (EC) No 1099/2009 concerning the protection of animals at the time of killing. According to this regulation and the 2020 scientific opinion of the European Food Safety Authority (EFSA), the following five methods of stunning rabbits are permitted: head-only electrical stunning, head-to-body electrical stunning, mechanical stunning using a penetrative and non-penetrative captive bolt, mechanical stunning using percussive blow to the head.

However, these methods present challenges in terms of handling stress, animal welfare, and operational efficiency. A 2022 survey revealed that 93% of EU slaughterhouses use head-only electrical stunning (HOES), with 99.99% of rabbits stunned using this method, while and 7% using captive bolt stunning. Although gas stunning has been investigated as a potential alternative, it is not permitted in the EU due to animal welfare concerns, particularly the aversive effects with the inhalation of carbon dioxide (CO_2) at high concentration. The aim of this study was to evaluate the gas distribution dynamics and concentration stability of various gas mixtures as a first step toward assesing their effect on animal welfare.

The stability and spatial uniformity of seven gas treatments and gas mixtures: carbon dioxide (CO_2), nitrogen (N_2), argon (Ar), and mixture of CO_2 (20% CO_2 + 80% N_2, 40% CO_2 + 60% N_2, 20% CO_2 + 80% Ar, and 40% CO_2 + 60% Ar) were evaluated in a closed cabinet type gas stunning system with the following dimensions: 200 cm (length) x 110 cm (width) x 60 cm (height), with an internal volume of 1.32 m^3. Gas stability was assessed based on the time required to reach 90% CO_2 (for the CO_2 treatment) and 0.5% residual O_2 (for the remaining gases and gas mixtures), using continuous gas monitoring with six fixed probes during five replicate cycles per treatment. For CO_2, the times to reach 30%, 60%, and 90% concentration were also determined. For the other gases, the times to reach 10%, 5%, 1.5%, and 0.5% O_2.

The CO_2 treatment reached a concentration of 90% in an average of 12.6 ± 0.5 minutes. The gas to decreases fastest the O2 to 0.5% O_2 was N_2 (6.4 ± 0.55 min), which was significantly faster than Ar (8.2 ± 0.45 minutes, p = 0.0014) and the C20A80 mixture (7.8 ± 0.45 min, p = 0.0177). Average times were observed for C40N60 (7.0 ± 0.0 min) and C40A60 (7.4 ± 0.55 min), while there was no significant difference (p = 0.9958) between C20N80 (8.0 ± 1.22 min) and Ar.

Continues on next page

Spatial homogeneity was evaluated at the end of the gas application phase by comparing the mean gas concentrations across all the probes. The CO_2 treatment exhibited the greatest variability, with probe-to-probe differences in CO_2 concentration reaching up to 1.01%. However, these differences were not statistically significant ($p = 0.45$), indicating moderate variability. In contrast, inert gases and gas mixtures (Ar, N_2, and their combinations with CO_2) showed highly uniform distributions, with O_2 differences between probes typically below 0.07% and standard deviations ranging from 0.02 to 0.07. No significant differences were observed between probes within these treatments ($p > 0.05$), confirming the high spatial uniformity of gas concentrations.

In conclusion, gas mixtures of CO_2 with either N_2 or Ar reached the target O_2 concentrations (≤ 0.5%) more quickly and were more uniformly distributed than CO_2, which exhibited slightly higher variability. These findings suggest that such mixtures may provide greater stability and uniformity of gas within the stunning system. Consequently, these properties could lead to more consistent exposure conditions and potentially improve animal welfare during the gas stunning process for rabbits.

HALAL SLAUGHTER OF BEEF IN THE UK: A QUEST TO FIND A WELFARE-FRIENDLY AND HALAL COMPLIANT METHOD OF SLAUGHTER

Awal Fuseini

AHDB, UK

The demand for Halal beef is on an upward trajectory in the UK and across the EU. However, one of the fundamental requirements of Halal slaughter is for animals to remain alive at the point of slaughter. With the majority of UK and EU abattoirs using penetrative captive bolt, most Muslims do not accept this method of stunning because of the gross physical damage it causes to the brain, which likely results in the death of some animals before exsanguination. New Zealand developed the Jarvis Beef stunner which is not accepted in the EU due to the use of low voltage post-stun immobilisation. Malaysia and some countries in the Gulf Cooperation Council (GCC) approve non-penetrative captive bolt stunning for Halal meat production, however, this is contra to EU and UK legislative requirements on the stunning of ruminants over 10 kg.

For stunning to be Halal-compliant, it must be non-lethal and must not impede the volume of blood loss or cause physical injury. A few researchers have made attempts at finding a solution to the lack of a Halal compliant method of stunning for beef. This presentation will discuss two beef stunning methods in their developmental stages that are likely to be accepted for Halal slaughter; the Single Pulse Ultra High Current (SPUC) which was funded by the Humane Slaughter Association (HSA) and Diathermic Syncope (DTS) which is being developed by researchers in Australia.

AN ANALYSIS OF THE ACCEPTABILITY OF THE DTS CATTLE STUNNING SYSTEM FOR USE IN SHECHITA (KOSHER SLAUGHTER)

Ari Zivotofsky

Gonda Brain Science Center, Israel

In the modern Western world, most slaughter of animals for food is required by law to be pre-stunned and thus, most meat for the non-religious market is indeed pre-stunned. Currently recognized stunning methods include: Penetrating captive bolt, non-penetrating captive bolt, electrical, and gas. According to Jewish law, each of these methods has problematic issues for kosher slaughter (shechita), and thus animals slaughtered via shechita for the kosher market are never pre-stunned. This has effectively barred shechita in certain jurisdictions that do not permit a derogation for shechita.

Over the last two decades an Australian company has been developing a new stunning method for cattle under the name: DTS: Diathermic Syncope®, about which they explain: “The project was planned and executed under end-user-centred design principles, with the Halal and Kosher markets in mind” and about which they assert “The aim of the system is to selectively increase the temperature of the brain [using microwaves], to the point that hyperthermic syncope (fainting) occurs”.

In light of those stated goals of the company, this talk will analyze the acceptability of the system for shechita. This talk will evaluate the mechanism of loss of consciousness with DTS, its effect on the brain, and how well the system answers the religious-legal requirements of kosher slaughter. As will be shown, the system does not in fact induce hyperthermic syncope (nor any form of syncope), it induces an epileptiform seizure, and it has a reasonable probability of causing physical defects in the animal that are unacceptable under Jewish law for kosher slaughter. An analysis of the religious requirements in light of data presented by the developers themselves will show the total incompatibility of the DTS system with kosher slaughter, as well as raise animal welfare concerns with the system. This analysis inter-alia reaffirms the compatibility of shechita with animal welfare requirements.

GOTTA CATCH 'EM ALL: PROTOTYPE INNOVATIONS FOR HEN WELFARE

Femke Delanglez, Anneleen Watteyn, Bart Ampe, Gunther Antonissen, Jan Detand, Wout Verroens, Frank Tuyttens

Burg. Van Gansberghelaan 119, 9090 Merelbeke-Melle, Belgium
Salisburylaan 133, 9820 Merelbeke-Melle, Belgium
Graaf Karel de Goedelaan 5, 8500 Kortrijk, Belgium

The whole catching process of end-of-lay hens, including catching and loading, can result in stress and injury to both hens and catchers. The design, shape, and size of the openings of the crating systems affect the ease of placing the hens inside and the likelihood of caught hens escaping. The goal of this study was to reduce the risks associated with opening (escapes) and closing (body part entrapments) drawers of a modular container system. Removable add-ons were therefore developed that can be easily attached to a container drawer before filling it and quickly removed after filling. After a market research to capture all requirements, two prototypes were designed and constructed to meet those needs. Prototype 1 consists of a metal tube with vertical flaps and prototype 2 is a rectangular frame with horizontal flaps.

The add-on prototypes were tested on five commercial aviary farms. Per flock, a subset of 800 end-of-lay hens was assigned one of three treatments, (1) standard container (3 x 5 drawers) without any add-on, (2) standard container with prototype 1 or (3) standard container with prototype 2. Several parameters were scored during loading in the containers: filling time (s), number of hen escapes, number of body part entrapments, level of restlessness, and level of loading inefficiency (both the latter on a 1-7 Likert scale). Assessments were also conducted at the slaughterhouse (prevalence of bruises and fractures on the carcass and of dead on arrivals, DOA). Those on-farm and at slaughter indicators were analysed using linear mixed models with treatment as a fixed effect and the flock as a random effect. The animal-based measurements were supplemented by a post-loading catcher survey. This compared the prototypes with the standard type and used a binomial test with a probability of 0.5 to analyse rank.

Hens were calmer with prototype 1 than with prototype 2 (4.20 vs. 5.67, P=0.02), but the difference with the standard container was not significant (4.80). Loading was scored to be less efficient for prototype 2 compared to the standard container (respectively, 5.33 and 3.20, P=0.05). Prototype 1 (3.60) scored similar to the standard container (5.33), although not significantly different from prototype 2. The filling time, prevalence of body part entrapments, escapes or DOA did not differ significantly between treatments, but prototype 1 resulted in fewer breast bruises than the standard container (0.53 % vs. 0.94 %, P=0.04). Catchers preferred prototype 1 and the standard container over prototype 2 for ease of use and hen calmness. Prototype 2 showed no advantages in terms of efficiency or animal and catcher well-being.

Prototype 1 is promising, but more testing on a larger scale could provide valuable insights into the effectiveness of this prototype and would reveal whether further design improvements are needed to enhance both animal welfare and the well-being of catchers.

EFFECTIVENESS OF AIR PELLET GUNS FOR ON-FARM POULTRY DISPATCH

Troy J Gibson[1], Safiyyah Goollam Kader[1], Stella Joannou[1], Freja Petrie[1], Filipe Dalla Costa[2], Natalie Chancellor[1], Jade Spence[3], Susan Richmond[3], Charlie W Mason[3]

[1]Animal Welfare Science and Ethics Group, Department of Pathobiology and Population Sciences, Royal Veterinary College, Hawkshead Lane, Hatfield AL9 7TA, UK
[2]Department of Strategy and Innovation, MSD Animal Health, São Paulo 01000-000, Brazil
[3]Humane Slaughter Association, Wheathampstead AL4 8AN, UK

Effective, humane, and practical methods for on-farm culling and slaughter of poultry are essential for disease control and the protection of animal welfare. This study evaluated the potential of air pellet pistols as a mechanical dispatch tool for turkeys, ducks, and geese, using a three-part assessment examining device performance, trauma (cadavers), and live bird evaluations incorporating EEG and behavioural indicators.

Part 1: Physical and Mechanical Properties of Air Pellet Guns

Seven air pellet pistols with 46 gun/pellet combinations were tested. Variables such as calibre, muzzle velocity, kinetic energy, and penetration depth (in ballistics gelatine) were evaluated. The .22 Crosman 2240 and .177 Victory CP2 demonstrated the most consistent performance and were selected for cadaver testing with the three highest-performing pellets.

Part 2: Cadaver Testing of Air Pellet Trauma

Cadaver testing assessed brain trauma in 62 turkey, 16 duck, and 16 goose heads shot with either the .22 Crosman 2240 or .177 Victory CP2 pistols. In turkeys, 61% of heads showed severe cerebral damage (hyperpallium, mesopallium, nidopallium), and 18% had severe hindbrain trauma. However, 23% of pellets failed to penetrate the cranial cavity, particularly when using standard hollow-point pellets. The Crosman Pirana pellet was identified as the most effective and was used in subsequent duck and goose cadaver trials. In ducks, 81% showed damage to the pallium and midbrain. In geese, 75% had forebrain and midbrain trauma, and 56% had hindbrain damage. However, 25% of pellets were lodged superficially or failed to penetrate the skull.

Part 3: EEG and Behavioural Assessment in Live Birds

Live trials in turkeys (n = 26) and geese (n = 26) compared air pellet pistol (.22 Crosman 2240 with pirana pellets) stunning to non-penetrating captive bolt (NPCB) (Cash Small Animal Tool).

All NPCB stunned turkeys (n = 12) collapsed immediately, showed no rhythmic breathing or brainstem reflexes, and had rapid onset of isoelectric EEG traces. In the air pellet pistol group, 85% (11/13) reached isoelectric EEG, with one bird showing an initial period of normal-like EEG that transitioned to isoelectric by the end of the recording period. This bird also had a brief period of rhythmic breathing but no other brainstem reflexes.

In geese, only 8% (1/13) shot with the air pellet pistol reached isoelectric EEG. One bird displayed normal-like EEG after the shot and was immediately euthanised. In the NPCB group, 23% (3/13) of geese exhibited signs suggestive of incomplete stunning, including normal-like EEG, rhythmic breathing, nictitating membrane reflex, and jaw tension.

In conclusion air pellet pistols show potential as a low cost method for poultry dispatch but did not consistently induce rapid, irreversible unconsciousness particularly in geese. Further refinement is needed before air pellet systems can be recommended as a humane, on-farm euthanasia method.

APPLYING A ONE WELFARE APPROACH TO DEPOPULATION

Steve Roche, Penny Lawlis, Julia Saraceni

Acer Consulting, Canada

With the increasing threat of African Swine Fever (ASF) in North America, training for response and depopulation have been a priority for several years. Animal Health Canada (AHC) has funded several initiatives to support the swine industry in preparing to respond if ASF is detected in Canada. Firstly, a project was undertaken to establish an inventory of existing training courses and tools related to swine euthanasia and depopulation for use in the preparedness for, and response to, an ASF outbreak in Canada. An extensive online review of existing training tools for mass-depopulation of swine was conducted. Further, twenty-three key informant interviews were held with stakeholders from industry, government, and academia. During these discussions, participants were asked to speak about gaps in the current training tools and resources, as well as valuable tools and resources that were currently available. The results of this project identified several gaps, including information deficits in areas of mental health and animal welfare during mass depopulation. Subsequently, AHC funded an additional project with a One Welfare focus, which included a Canadian depopulation workshop featuring international experts. The goal of the workshop was to build an information network and provide Canadian industry members with international expertise in depopulation for ASF to enhance a Canadian response. AHC has identified One Welfare as a framework that recognizes the many interconnections between human welfare, animal welfare and the integrity of the environment. It is a known fact that the health and welfare of farmed animals is closely linked to the well-being of agricultural producers and other animal care givers. The information from the workshop was used to develop an online training program, covering both animal welfare and human health during a mass depopulation event. The course includes aspects of prevention and monitoring to ensure welfare is protected before, during, and after a depopulation event, as well as a foundational understanding of ASF and its potential impact on the Canadian pork industry. It explores why ASF preparedness is critical, highlighting the economic, logistical, and animal welfare challenges that arise in the event of an outbreak, the principles of emergency response, the structure and purpose of an ASF depopulation plan, the operational reality of depopulation during an ASF outbreak and guidance on post-event activities to protect mental health. The course is designed to be completed in 6-8 hours and will be hosted on AHC's website. Animal disease events requiring response and control activities (including depopulation) have a significant impact on the well-being of those involved; therefore, it is critical to include mental health support in all training for disease preparedness and response.

ASSESSING RISK FACTORS FOR OFFICIAL VETERINARIAN–FOOD BUSINESS OPERATOR CONFLICTS IN UK SLAUGHTERHOUSES

Eleanor Gannon[1], Kelly Gouveia[2], Nicola Beesley[2]

[1]TG7 Foulkes-Crowther Building Harper Adams University, Dept. of Animal Health, Behaviour and Welfare Edgmond, Newport TF10 8NB
[2]University of Chester , School of Natural Sciences, Faculty of Science and Engineering, Exton Park campus, Parkgate Rd, Chester CH1 4BJ

Effective working relationships between Official Veterinarians (OVs) and Food Business Operators (FBOs) are crucial for implementation of Official Controls and safeguarding of animal welfare and food hygiene requirements. Yet, little is understood of this dynamic in practice, and a growing body of literature suggests that interactions between operators and enforcers in slaughterhouses are likely to have significant challenges. However, we do not yet understand the nature of these challenges nor potential risk factors that could contribute to the breakdown of this relationship. In this study, we assessed potential risk factors for the OV-FBO relationship from the OV's perspective. This was achieved by capturing the views of OVs on their working relationship with their FBO as well as their needs for future training particularly on communication skills, through an online questionnaire which collated a total of 114 responses from current OVs working in the profession. A high number of veterinarians reported having disagreements with their FBO over welfare and hygiene requirements. Significant associations were found between the species and method of slaughter, where those working with red meat, mixed species, mechanical and/or electrical stun methods were more likely to have disagreements. Respondents commonly reported feeling unsupported in enforcing compliance, and many had to involve a higher power to resolve conflict. Respondents also felt that their FBO impacted their job satisfaction, and that the stress and pressure of OV work was not supported by industry. We show that OVs face communicative challenges in achieving compliance and highlight the need for professional support, where potentially CPD Training in conflict resolution could provide an empowering solution.

ASSESSMENT OF STUNNING EFFECTIVENESS IN DONKEYS USING ELECTROENCEPHALOGRAM

Beatrice Benedetti[1], Katharine Fletcher[2], Barbara Padalino[1,3], Mariano Hernández Gil[4], Troy John Gibson[2]

[1]Department of Agricultural and Food Sciences, University of Bologna, Viale Giuseppe Fanin 46, 40127 Bologna, Italy
[2]Animal Welfare Science and Ethics Group, Department of Pathobiology and Population Sciences, Royal Veterinary College, Hawkshead Lane, Hatfield AL9 7TA, UK
[3]Faculty of Science and Engineering, Southern Cross University, Lismore, NSW 2480, Australia
[4]Department of Medicine, Surgery and Zootechnics for Equines, Faculty of Veterinary Medicine and Zootechnics, National Autonomous University of Mexico (UNAM), Avenida Universidad 3000, Colonia UNAM, C.U., Coyoacán, México D.F., 04510

Donkeys and other equids are currently being slaughtered all around the world for human consumption and their by-products. To ensure they are in an irreversible state of unconsciousness prior to bleeding, they are usually stunned with a penetrating captive bolt (PCB) device. In commercial settings, the effectiveness of stunning is usually assessed by observing behavioural signs and brainstem reflexes. However, electroencephalography (EEG) provides a more direct indicator of functional brain activity, making it the most accurate tool for assessing stunning success.

Literature on factors affecting PCB stunning is available for the more common livestock species, while little information on donkeys. In addition, there are no guidelines for the ideal shot angle and position for donkeys, and anecdotally, the position suggested for horses is usually used (HSA, 2016).
With these premises, this study aimed to assess the stunning effectiveness of donkeys shot with pneumatic PCB using EEG analysis and to determine if there are differences between shot deviation from ideal position and presence of normal-like EEG after stunning.

The study was conducted in a commercial abattoir in Mexico on 13 donkeys. Subdermal electrodes were placed and EEG recordings were taken before, during and 30 seconds after stunning. After stunning, heads were removed and shot deviation from ideal position (for horses), both rostro-caudal and lateral, was measured. EEG recordings were analysed and classified in 5 categories: normal-like EEG, movement artifacts, transitional EEG, high amplitude-low frequency EEG and isoelectric EEG (Gibson et al., 2009). Associations between the presence of normal-like EEG and shot deviation were tested with Mann-Whitney test.

Six donkeys (46.2 %) had periods of normal-like EEG after stunning, for a maximum of 9 sec. During this phase, there was an increase in alpha, beta and theta activity. Moreover, four donkeys (30.8%) did not reach isoelectric EEG during the 30 seconds of recording. For shot position, most of the shots were deviated caudally and to the left. There was a significant association ($p=0.02$) between rostral-caudal deviation and ineffectively stunned donkeys (i.e. the ones that had periods of normal-like EEG).

This study revealed a high number of ineffective stunning and a number of animals that did not reach isoelectric EEG, namely a reliable sign of irreversible unconsciousness, before the end of the recordings. These results highlight welfare concerns related to the delayed or incomplete loss of consciousness in these donkeys. In conclusion, it is important to ensure exsanguination occurs without delay whilst assessing stunning effectiveness in each individual. Furthermore, the association between conscious brain activity and shot deviation confirmed the need for species-specific guidelines for shot angle and position in donkeys.

Humane Slaughter Association 2016 www.hsa.org.uk
Gibson T J, et al. 2009. doi: 10.1080/00480169.2009.36884

PRELIMINARY RESULTS: EVALUATION OF NONPENETRATIVE CAPTIVE BOLT IN INDUCING UNCONSCIOUSNESS IN CATTLE

Eduardo David Valencia G[1],Alexandra Contreras-Jodar[1,2], Troy John Gibson[3], Antonio Velarde[1]

[1]Institut de Recerca i Tecnologia Agroalimentàries (IRTA), Animal Welfare, Veïnat de Sies, Monells,17121 Girona, Spain.
[2]Department of Agri-Food Engineering and Biotechnology (DEAB), Universitat Politècnica de Catalunya, BarcelonaTech (UPC), Castelldefels, Spain.
[3]Animal Welfare Science and Ethics Group, Department of Pathobiology and Population Sciences, Royal Veterinary College, Hawkshead Lane, Hatfield AL9 7TA, UK.

This study aimed to evaluate the efficacy of the non-penetrative captive bolt (NPCB) to induce immediate unconsciousness (< 1 s) and its duration in cattle stunning. One hundred and five animals at a commercial slaughterhouse were divided into four categories (C1 to C4) according to breed, sex, and body weight: C1) beef females of 390-450 kg (n=22); C2) dairy males of 420-490 kg (n=24); C3) dairy and beef or mixed-breed males of 490-530 kg (n=29); and C4) beef males of 620-720 kg (n=30). This study was approved by the Ethics Committee for Animal and Human Experimentation (CEEAH) under protocol CEA/12687/P1/1. The stunning was performed with a pneumatically powered NPCB (USSS–2A, JARVIS® Jarvis Products Corporation; Middletown, CT, USA) with an airline pressure that differed according to the animal category (C1: 13 bars, 190 psi; C2: 14.5 bars, 210 psi; C3 and C4: 16.5 bars, 240 psi). Stunning effectiveness was evaluated using animal-based indicators of the state of consciousness (behaviour and brainstem reflexes) and brain activity (EEG). All animals were continuously recorded with high-quality video from the moment they entered the stun box until bleeding (to assess heart activity). This allowed for accurate post hoc analysis of reflexes and behaviours as they occurred. If animals started to show signs of consciousness, they were restunned with a penetrative captive bolt. A two-minute EEG baseline was recorded for each animal prior to the NPCB shot. Following stunning, EEG activity was monitored until it became isoelectric and all physiological reflexes ceased, for a total duration of 3 to 4 min. Then, a ventral-neck incision was performed, and pulsatile bleeding from both carotids confirmed the presence of cardiac activity. Preliminary results show that all animals were rendered unconscious after the NPCB shot, from which 87.6% (92/105) did not recover consciousness (C1: 100% (22/22); C2: 87.5% (21/24); C3: 86.2% (25/29); and C4: 80.0% (24/30)). The 12.4% (13/105) that recovered consciousness showed the indicators of consciousness from 10 to 30 seconds after the NPBC shot. Currently videos and EEG recordings are under analysis to corroborate these results. In conclusion, NPCB is effective in inducing immediate unconsciousness in all animals and irreversible in most of them. These results open a pathway for a future use of NPCB as an alternative to PCB. Future research of this study will address a comparison between NPCB and PCB.

BRIDGING THE GAP BETWEEN PERCEPTION AND REALITY: WELFARE ASSESSMENT OF PIGS DURING GAS STUNNING

Lily Chandler and Karim Farag

Harper Adams University, UK

Gas stunning is the predominant method used for pig slaughter in England and Wales, accounting for approximately 88–90% of cases. Despite its widespread use, gas stunning has been reported in some studies, as aversive to pigs, raising concerns about its welfare implications. This study aimed to evaluate the alignment between public and industry perceptions of pig welfare during gas stunning and empirical behavioural evidence, with the broader goal of informing future commercial practices.

Behavioural data were collected from 100 Landrace × Duroc × Large White pigs at a UK abattoir and compared with control data from a UK pig farm. Perceptions were assessed through 11 semi-structured interviews with abattoir staff and a public survey (n = 152). Results revealed a significant increase ($p < 0.05$) in behavioural stress indicators during gas stunning compared to the control group. Public awareness of stunning practices was limited: 66% of respondents reported no prior education on the process, and 80% were unaware that gas stunning is the most common method in the UK.

Misunderstandings regarding the benefits of gas stunning were prevalent, and sentiment towards pig welfare became more negative following prompted awareness. Industry professionals also demonstrated limited understanding of alternative methods, though welfare standards at the observed abattoir were found to be high.

This study highlights a critical disconnect between perceived and actual welfare outcomes during gas stunning. Findings underscore the need for improved transparency and education to align public perception with scientific evidence and to support the development of more welfare-conscious stunning practices. Raising awareness may drive consumer demand for higher welfare standards, potentially influencing industry practices both nationally and internationally.

PATHOPHYSIOLOGY OF PENETRATING CAPTIVE BOLT GUN STUNNING OF HORSES

Katharine Fletcher[1], Beatrice Benedetti[2], Martina Felici[2], Daniele Bigi[2], Georgina Limon[3,4], Barbara Padalino[2,5], Andrew Grist[6], Mariano Hernández Gil[7], Troy John Gibson[1]

[1]Animal Welfare Science and Ethics Group, Department of Pathobiology and Population Sciences, Royal Veterinary College, Hawkshead Lane, Hatfield AL9 7TA, UK
[2]Department of Agricultural and Food Sciences, University of Bologna, Viale Giuseppe Fanin 46, 40127 Bologna, Italy
[3]Veterinary Epidemiology, Economics and Public Health Group, Department of Pathobiology and Population Sciences, Royal Veterinary College, Hawkshead Lane, Hatfield AL9 7TA, UK
[4]The Pirbright Institute, Woking GU24 0NF, UK
[5]Faculty of Science and Engineering, Southern Cross University, Lismore, NSW 2480, Australia
[6]Animal Welfare and Behaviour Group, School of Veterinary Sciences, University of Bristol, Langford BS40 5DU, UK
[7]Department of Medicine, Surgery and Zootechnics for Equines, Faculty of Veterinary Medicine and Zootechnics, National Autonomous University of Mexico (UNAM), Avenida Universidad 3000, Colonia UNAM, C.U., Coyoacán, México D.F., 04510

There is limited research into the effectiveness of penetrating captive bolt (PCB) stunning of horses, despite this being a widely used method worldwide. This study aimed to assess PCB stunning effectiveness through pathophysiology for: (i) 23 horses stunned under commercial slaughter in Italy with either a .22 or .25 Cash Special PCB, and (ii) 100 horses stunned in a regulated abattoir in Mexico, stunned using pneumatic PCB.

Horses were examined for behavioural signs of consciousness/unconsciousness immediately after PCB stunning, with heads then assessed for shot positioning and macroscopic gross brain pathology to determine level of brain trauma. In Italy, at least one sign of an ineffective stun was observed in 26% (6/23) of animals. Damage to critical brainstem structures was found in 83% (19/23) with 91% (21/23) of animals having a shot position deviating ≥10mm either rostral/caudal or lateral from the suggested shot position outlined by the Humane Slaughter Association (HSA) (10mm above the intersection of an X drawn on the forehead, from the inside corner of each eye to the opposite ear). There was an significant association between an absence of damage to critical brainstem structures and signs of ineffective stunning ($P < 0.001$).

In Mexico, 25% (25/100) received more than one shot and 28% (28/100) displayed behavioural signs of ineffective stunning following pneumatic PCB. All these 28 horses had ≥10mm deviation from the HSA suggested position, with rostral-caudal deviation associated with an absence of damage to the thalamus, midbrain, and pons. No damage was found to critical brain structures (thalamus, midbrain, pons and medulla) in 44% (44/100) animals, with this associated with ineffective stunning ($P < 0.001$, OR: 8.33; 95% CI: 2.97-23.40). Overall, 16% of shots missed the brain (16/100), with a higher proportion of poll shots (30%) missing the brain compared to frontal shots (12%), risking potential paralysis from spinal cord damage. A higher proportion of ineffectively stunned animals showed eye reflexes in Mexico compared to in Italy, which may have been due to a potentially shallower depth of stun in Mexico, sample size, or difficulties assessing eye reflexes in Italy immediately post-shot.

In conclusion, these studies found relationships between behavioural signs of ineffective stunning and an absence of damage to critical brain structures evaluated through gross macroscopic pathology. Appropriate position within 10mm of the HSA suggested stunning position, suitably adjusted angle and correct performance of PCB is therefore vital to achieving an effective stun, by targeting critical brain structures responsible for maintaining consciousness and prioritising proper maintenance of PCB's. Animals should be routinely checked between stunning and exsanguination, with minimal time between these stages, to minimise recovery of consciousness and alleviate suffering for horses throughout the slaughter process.