The expected welfare benefits of the proposed studies are the refinement of existing methods and development and testing of new stunning systems which will reduce distress and improve the quality and duration of unconsciousness following stunning. The project will also develop stun parameter guidelines (e.g. minimum currents for waterfowl), which can be used for existing stunning systems to improve welfare at slaughter. The results from the proposed project would provide scientific evidence that could directly underpin legislation (UK, EU and worldwide). These findings would also have direct relevance to animal welfare NGOs (development of guidelines and training), other animal charities, poultry producers and stunner manufacturers.

How will you look to maximise the outputs of this work?

If appropriate and with permission of the funding bodies, key findings of the project will be used to help promote the welfare of poultry during stunning/slaughter to the general public, this will be in the form of press releases and invited presentations. Unsuccessful results of developed approaches will be submitted for publication.

Species and numbers of animals expected to be used

- Other birds: No answer provided
- Domestic fowl (Gallus gallus domesticus): 40

Predicted harms

Typical procedures done to animals, for example injections or surgical procedures, including duration of the experiment and number of procedures.

Explain why you are using these types of animals and your choice of life stages.

Chickens, geese and ducks are being used, as they are the species in which these stunning methods are currently or will be used commercially for slaughter for human consumption. Birds used in this project will be of commercial slaughter age and weight to mirror industry practice.

Typically, what will be done to an animal used in your project?

The effectiveness and relative humaneness of stunning methods and parameters (magnetic induction heating, captive bolt, electrical stunning) will be assessed in this project. This will involve the evaluation of consciousness/sensibility with behavioural/brainstem indices and assessment of the electrical activity of the brain. This will be conducted in anaesthetised (non-recovery) and non-anaesthetised birds. The use of a non-recovery anaesthesia model for the first part of the magnetic induction heating study allows the assessment of brain function and temperature in response to this novel stunning method while reducing the potential for suffering. In this model stunning parameters will be revised and will be used in subsequent non-anaesthetised studies.

Anaesthesia and non-anaesthesia studies

Refinement

Give examples of the specific measures (e.g., increased monitoring, post-operative care, pain management, training of animals) to be taken, in relation to the procedures, to minimise welfare costs (harms) to the animals. Describe the mechanisms in place to take up emerging refinement techniques during the lifetime of the project.

Which animal models and methods will you use during this project? Explain why these models and methods cause the least pain, suffering, distress, or lasting harm to the animals.

The use of and constant monitoring of the terminal anaesthesia in the magnetic induction heating experiment will prevent pain, suffering and distress to birds. This model allows the testing and refinement of parameters without compromising welfare, this information will then inform subsequent experiments. In recovery experiments, birds will be carefully and constantly monitored for signs of excessive pain and distress (distress calls, rapid ventilation, rapid head shacking etc). After recovery experiments birds will be immediately euthanised to prevent lasting harm. Of the treatment groups electrical stunning has also been shown to produce a period electroanalgesia in poultry, when allowed to recover. This will reduce the potential for pain associated with recovery. Meanwhile captive bolt has been demonstrated to produce instantaneous irrecoverable stun in turkeys, which will prevent pain and suffering.

In a previous licence a local anaesthetic cream was applied to desensitise the skin prior to placing electrodes for assessment of the electrical activity of the brain. This was put into that licence as a refinement. However, it was found in experiments with turkeys that the additional capture and handling of the birds for placement of the LA cream caused moderate stress compared to the relatively mild pain associated with subdermal (under the skin) electrode placement. This requirement was removed in the amendment to that licence. In the subsequent experiments using these electrodes there were no obvious signs of pain and distress with the placement of electrodes without the local anaesthetic cream, birds were less stressed and easier to handle. This example demonstrates that in some cases the refinements made to improve animal welfare can have unforeseen consequences and cause harms. This highlights the need for constant monitoring of welfare even after introduction of refinements.

Why can’t you use animals that are less sentient?

Chickens, geese and ducks are being used, as they are the species in which the stunning methods are currently or will be used commercially for slaughter for human consumption, there are no less sentient species that can be used for this research. The use of a terminal anaesthesia-based model removes

How will you refine the procedures you're using to minimise the welfare costs (harms) for the animals?

Birds will be habituated to experimental staff prior to experimentation. This will include routine pen walks and low intensity handling. When birds are handled for experimentation care will be taken to avoid excessive or prolonged handling. All birds will be euthanised either during or immediately after experimentation.

The use of sub-dermal needle electrodes has been found in the previous two licences to provide sufficient signal quality without the need for anaesthesia and surgery, which is commonly used in welfare at slaughter experiments. In these licences this was a significant refinement that removed the need for induction of anaesthesia, surgery and recovery, which would have caused stress and pain.

What published best practice guidance will you follow to ensure experiments are conducted in the most refined way?

The ARRIVE 2.0 principles will be followed for experimental reporting in study design to ensure the most relevant and transparent experimental design. The methods to be used in this project have been standardised and published in peer-reviewed journals and a PhD thesis.

How will you stay informed about advances in the 3Rs, and implement these advances effectively, during the project?

The institution, is active in dissemination of NC3Rs and3Rs relevant news, providing training and updates via a newsletter, emails and online notifications.