On-farm poultry euthanasia technologies

Phase 1 Lab Based Evaluation

Evaluation of Euthanasia Technologies

- Institute for Applied Poultry Technologies (IAPT) project:
- "Applicability of Commercial Euthanasia Technologies to Alberta's Poultry Industry"
  - Two year study to evaluate different technologies for routine euthanasia.
  - What alternatives to cervical dislocation / blunt force trauma will work on Canadian commercial poultry farms for euthanasia?
  - Evaluation of different euthanasia technologies across a range of criteria including EEG pattern analysis (brain waves), post-application effects, and device use observations

Animal Care

- The study was reviewed by IAPT's Institutional Animal Care and Use Committee and followed the guidelines of the Canadian Council on Animal Care

Validation of EEG data

- EEG is a measurement of brain waves (electrical activity in the cerebral cortex of the brain) that can indicate when an animal has normal brain activity, is insensible or has no brain activity (brain dead).
- Before evaluating euthanasia devices the EEG data collection technique and equipment was validated in a proof of concept study
- A specific genetic line of epileptic chickens was used to evaluate the EEG data gathering equipment
- Grand mal seizures produce EEG patterns that indicate insensibility. Grand mal seizures could be reproduced in this line of chickens with intermittent light stimulation.
- Implanted brain electrodes were compared to stainless steel suture electrodes and human surface mount electrodes for their ability to characterize baseline, seizure and flat-line EEG activity in chickens

Validation of EEG data

Avatar EEG Unit

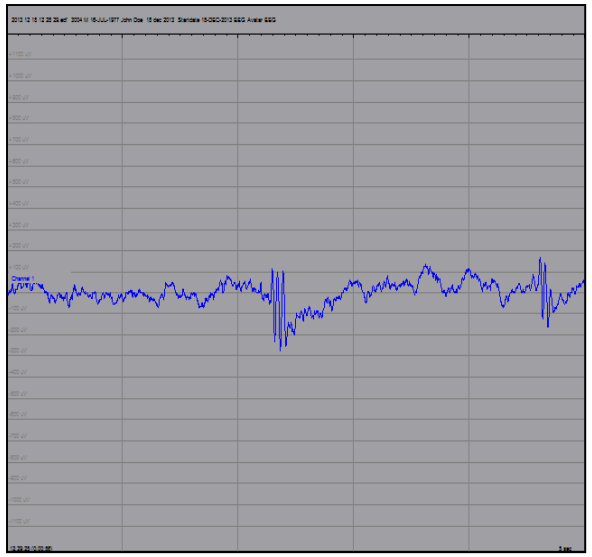
Stainless Steel
Suture Electrodes

Baseline, epileptiform and isoelectric EEG patterns

Figure 1. EEG tracings of Chickens before, during and after ILS stimulations at different conductions (Adapted from paper of Crawford RD 1974)

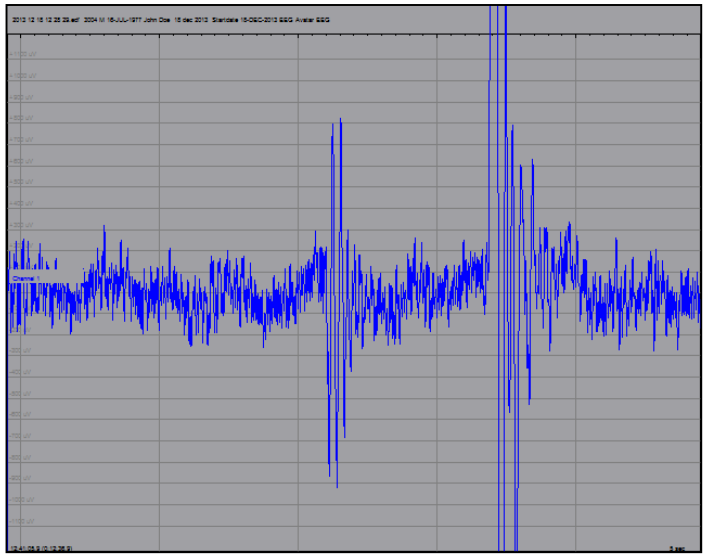
Suture Electrode Data

Baseline



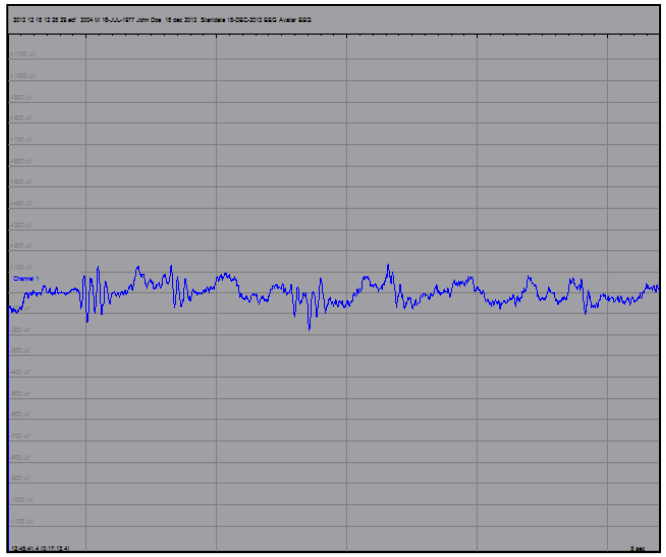
5 second interval, 100 µV amplitude scale illustrated. EEG pattern corresponds with normal baseline measurements.

Seizure



5 second interval, 100 µV amplitude scale illustrated. Note increased frequency and amplitude corresponding to reported literature consistent with a Class 3 seizure (observed clinically).

Recovery



5 second interval, 100 µV amplitude scale illustrated. Decreased electrical activity (as evidenced by a flattening of the EEG).

Suture data corresponded to implant and skin surface electrode data

Technical limitations:

- 60 hz artifact
- Movement artifact
- Loss of electrodes due to force from physical methods of euthanasia
- Limitations of technology for electrocution methods

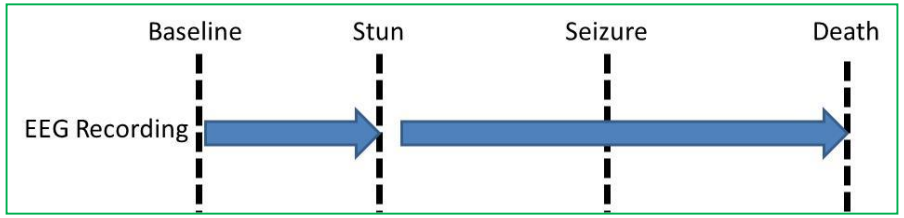
Evaluation of Euthanasia Technologies: Experimental Objectives

Using Eight prototype or commercially available on-farm poultry euthanasia devices:

1. Evaluate time to EEG flat line (isoelectric EEG pattern) and if possible insensibility (epileptiform EEG pattern)
   - Reporting on time to EEG flat line
2. Evaluate device use
3. Evaluate post-application effects on the animal

Experimental Design

- One group encumbered with EEG leads
- Demonstrate time to EEG flat-line after use of each euthanasia technology



- One group unencumbered to simulate on-farm conditions
  - Use specially designed scoring sheet
  - Evaluate safety, social acceptance and post-euthanasia effects

- 3 sizes of broiler chicken (200g, 1 kg and 2.5kg) and 1 size of turkey (7.5kg)
- 4 sizes of poultry * 2 groups (encumbered and unencumbered) * 8 devices = 64 groups

Device Code	Device	Description
1	**Prototype portable electrocution device**	Portable head to heart electrical stunner
2	**Commercial portable captive bolt tool**	Captive bolt non-penetrating blunt force trauma
3	**Hose connected, commercial pneumatic powered captive bolt tool**	Captive bolt non-penetrating blunt force trauma
4	**Cordless, commercial propane powered captive bolt tool**	Captive bolt non-penetrating blunt force trauma
5	**CO_2 asphyxiation tool**	CO2 gas asphyxiation
6	**Prototype nitrogen gas foaming system**	N2 gas asphyxiation
7	**Prototype – portable captive bolt tool**	Captive bolt non-penetrating blunt force trauma
8	**N/A**	Device dropped from trial
9	**Commercial portable captive bolt tool**	Captive bolt non-penetrating blunt force trauma

Experiment set up

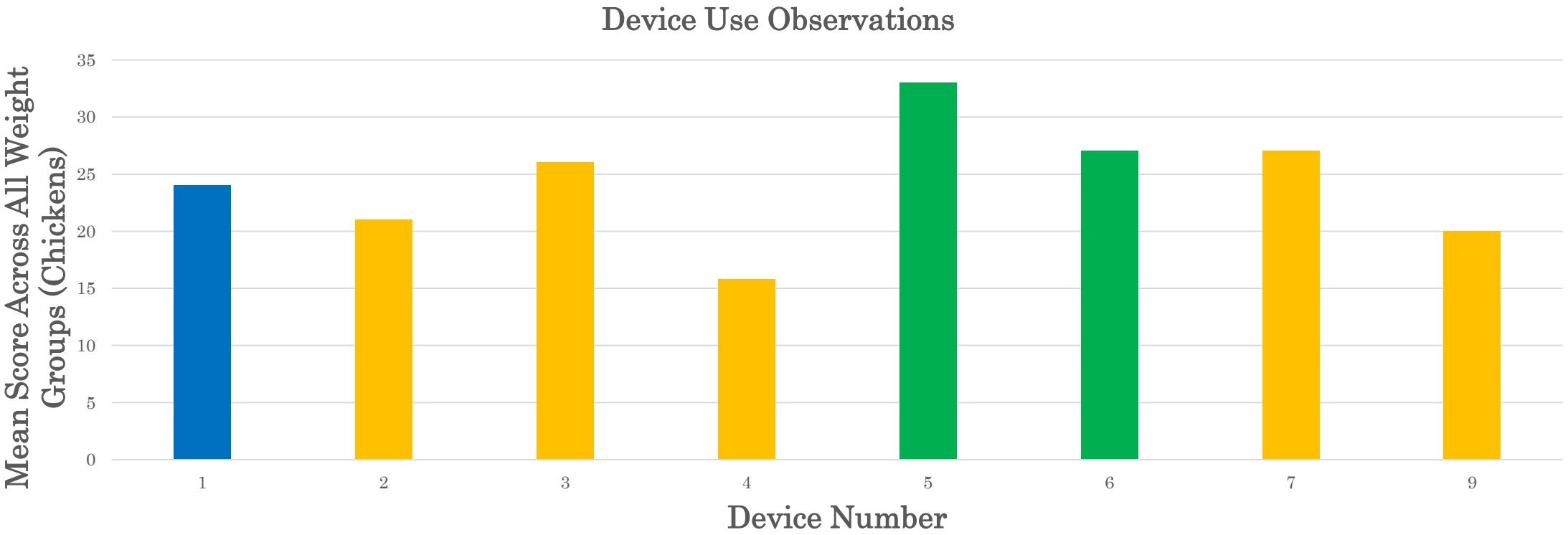
EEG/ECG Set up for Captive Bolt euthanasia devices.

EEG/ECG Set up for Gas/Foam euthanasia devices. (Note gas level recording meters and closed circuit video camera for observations)

Scoring (unencumbered observations, no EEG/ECG):

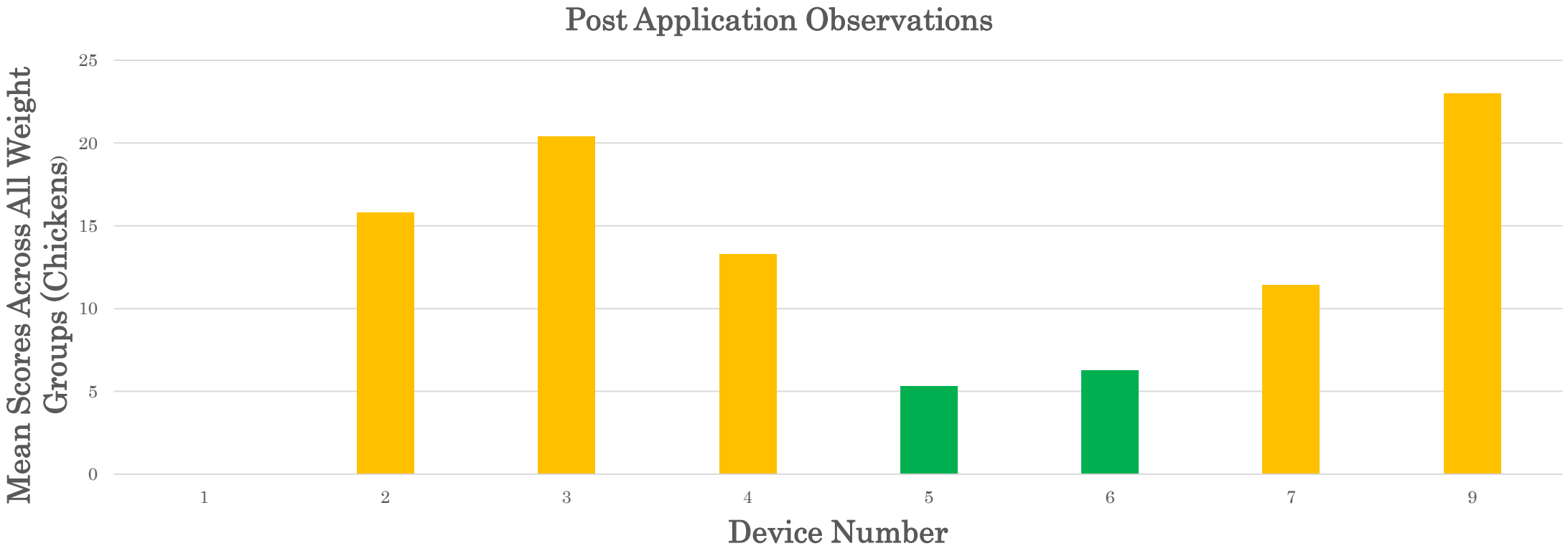
- Device Use Observations:
  - Scale of 0 – 3 (0 is poor, 3 is excellent)
  - Scored on each of:
    - ease of use
    - social acceptance
    - operator safety
    - failure to stun/kill
- Post Application Observations:
  - Scale of 0 – 3 (0 is none, 3 is severe or excessive)
  - Scored on each of:
    - vocalization post-stun
    - visible convulsions
    - visible bleeding,
    - visible damage

Results:



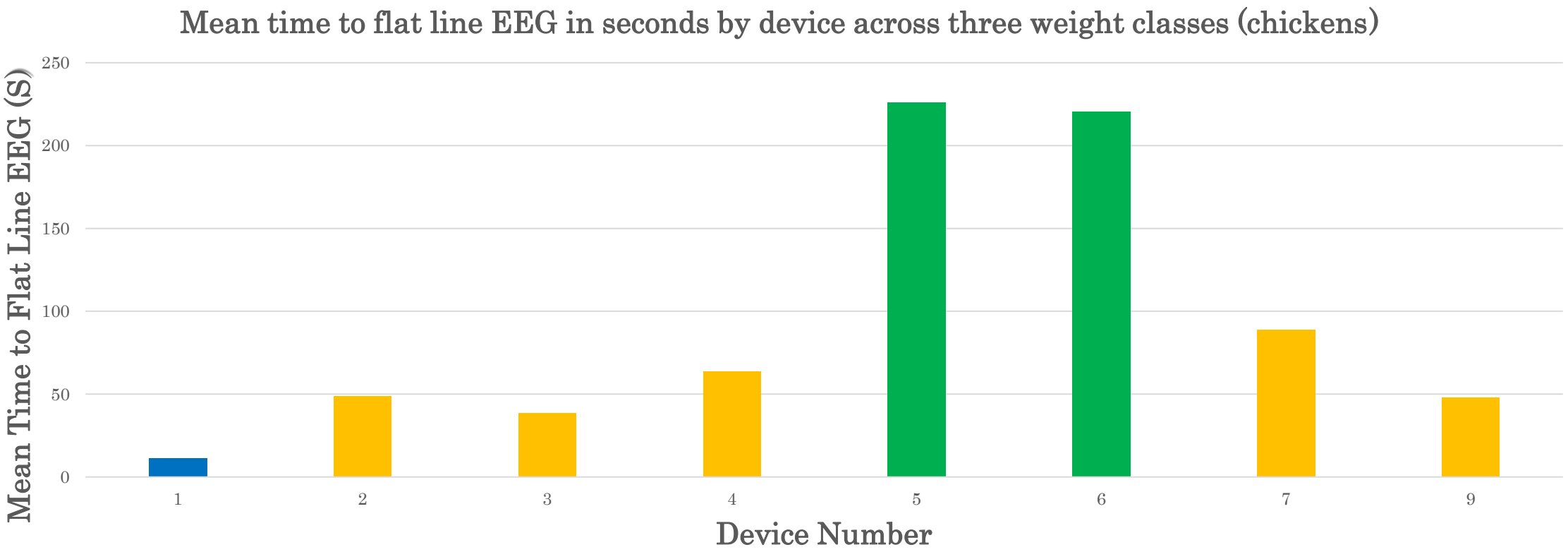
***NOTE: No score for device 1 for 200 gram weight class.**
Ease of use, social acceptance, operator safety, failure to stun/kill (higher scores are better)
Chickens, weight class A = 250g, B = 1kg, C = 2.5kg

Results:



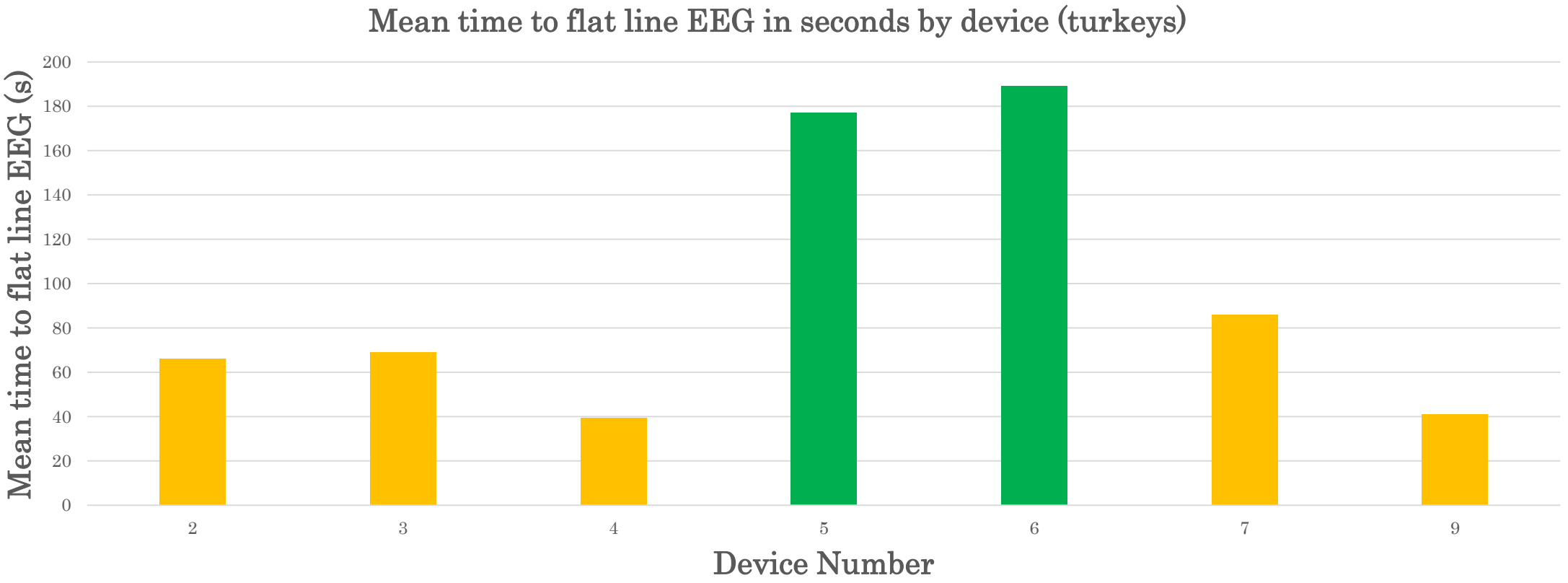
***NOTE: No score for device 1 for 200 gram weight class.**
****NOTE: Failure to kill recorded with device 4**
Vocalization post-stun, visible convulsions, visible bleeding, visible damage (lower scores are better)
Chickens, weight class A = 250g, B = 1kg, C = 2.5kg

Results:



*NOTE: No score for devices 1 and 3 for 200 gram weight class.
**NOTE: Failure to kill recorded for device 4.
Chickens, weight class A = 250g, B = 1kg, C = 2.5kg

Results:



*NOTE: Device 1 was not tested on turkeys (they were too big to fit the device)
**NOTE: Failure to kill recorded for Device 4.

Conclusions

- Time to flat line EEG was longest using gas-based euthanasia devices.
- There is variation in performance amongst different types of captive bolt technologies with respect to time to flat line EEG, device-use and post-application effects
- Portable electrocution devices may be useful for on-farm poultry euthanasia if they can move beyond the prototype stage