Exploring the use of sodium nitrite as a humane method for mass euthanasia of poultry

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Problem & Relevance

- **Disease outbreaks in the poultry industry may require mass euthanasia.**
  - Fifty million chickens and turkeys died or were euthanized due to avian influenza in 2014-2015.
- **Humane methods of euthanasia are imperative during mass euthanasia events.**
  - Common methods of mass euthanasia are difficult with caged laying hens (e.g. water-based foam or tenting barn for CO_2 use).
- **Sodium nitrite ($NaNO_2$) may be a solution.**
  - When ingested at high concentrations, it prevents O_2 transportation in the blood to render the animal unconscious and then dead.

Hypothesis & Prediction

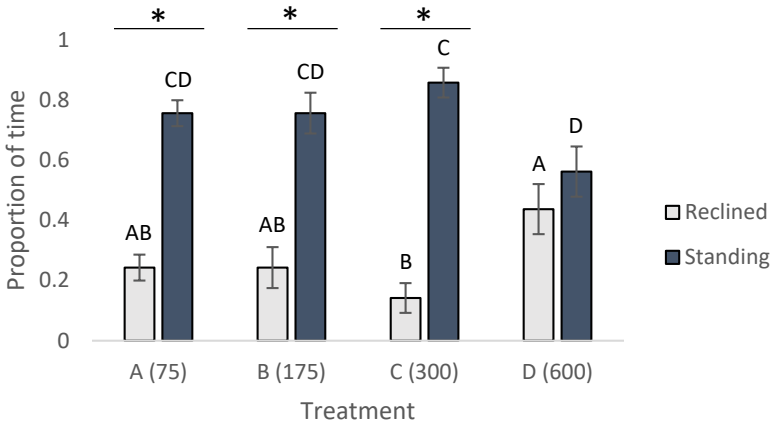
- **Hypothesis:** Feeding sodium nitrite at high enough doses will humanely kill layer hens.
- **Prediction:** Soon after eating, birds fed a sufficient dose will become lethargic, lose posture, and then die without evidence of suffering.

Methods

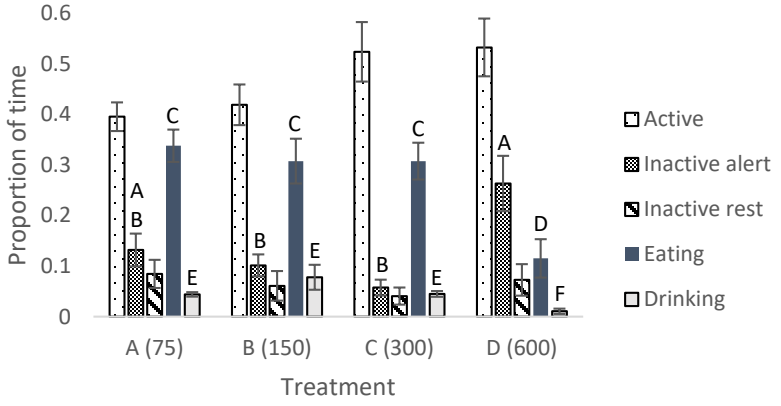
- Thirty-two laying hens (18 wk of age) were individually housed.
- Feed was removed at 1600 h the day before feeding sodium nitrite.
- At 900 h on the day of the experiment each bird was fed feed mixed with 1 of 4 sodium nitrite doses:
  - A = 75 mg/kg BW; n=8
  - B = 150 mg/kg BW; n=8
  - C = 300 mg/kg BW; n=8
  - D = 600 mg/kg BW; n=8
- Proportion of time spent active, inactive and alert, inactive and resting, drinking, and eating, as well as proportion of time spent standing and reclined (lying/sitting), was quantified using continuous, focal sampling from video for 3 h post-feeding.
- General linear mixed model
  - Significance $P < 0.05$
  - Data presented as raw means ± SE

Results

- D hens spent equal time reclined and standing; A, B, and C hens spent more time standing.*
- D hens spent more time reclined[ab], less time standing[cd], than C hens.



- D hens spent more time inactive alert[ab] than B and C hens.
- D hens spent less time eating[cd] and drinking[ef] than A, B, and C hens.



An example of hens housed in traditional battery pens. This housing often prevents the use of common mass euthanasia methods used for floor-raised birds.

Description of Death

Only 1 hen died, a D hen fed 600 mg/kg BW sodium nitrite.

Time since feeding	
1 h 7 m	Eating stops
1 h 12 m	Light panting starts
2 h 5 m	Lying on side
2 h 34 m	Total loss of posture; feather erection
2 h 34.5 m	Violent convulsions
2 h 35.5 m	Tremors and wing flapping
2 h 36.5 m	Palpebral reflex failed

Conclusions/Discussion

- The 600 mg/kg sodium nitrite dosed feed caused hens to be lethargic and eat and drink less. This could be due to sedation and/or aversion to the taste of sodium nitrite.
- The hen that died did so in an apparently humane manner.
- It is not possible to say if sodium nitrite is a humane method of euthanasia and future research should investigate feeding in an encapsulated form.