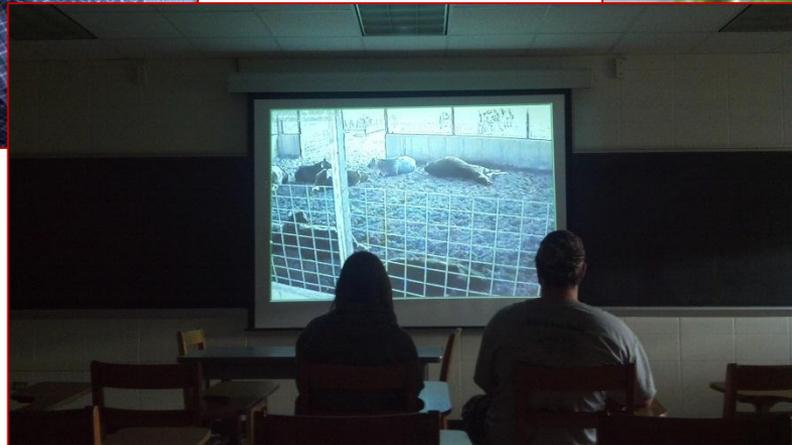
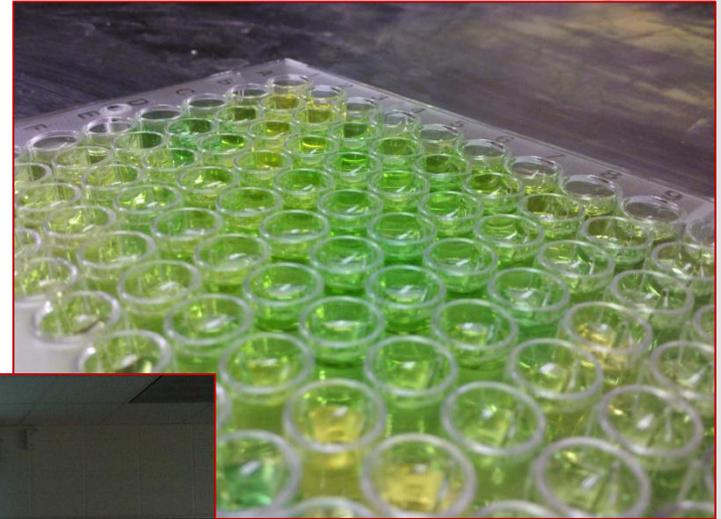


2013 Reciprocal Meat Conference – Auburn University

The Science of Animal Welfare: Why a multifaceted approach is necessary



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How do we define meat quality?

- A definition of meat quality requires assessment of multiple variables:
 - Purpose of the product
 - Physical properties of the product
 - Stability of the significant quality attributes
 - Desires of the product consumer
- The likelihood of isolating a single variable to define meat quality does not appear to be logically possible!



How do we define animal welfare?

- Dawkins (2008) suggested that animal welfare assessment must be carefully considered for the following reasons:
 - The ambiguity of some measures of animal welfare
 - The difference in perceived, natural, and actual states of animal well-being



How do we define animal welfare?

- A single variable cannot provide an all-encompassing definition of animal welfare.
- Duncan (1997) described two schools of thought regarding animal welfare assessment:
 - Biological Function
 - Focused on objective and quantitative assessment of the physical status of the animal.
 - Feelings
 - Focused on the quantification of an animal's psychological status, typically through behavioral observation.



How do we define animal welfare?

- ◎ Two categorical descriptions of animal welfare definitions have been identified:
(Rushen and de Passillé, 1992)
 1. Those that emphasize emotional suffering
 2. Those that emphasize the long term biological function of an animal
- ◎ Dawkins (2008) suggested a two-question approach to animal welfare assessment:
 1. Is the animal healthy?
 2. Does the animal have what it wants?

A framework for animal welfare assessment

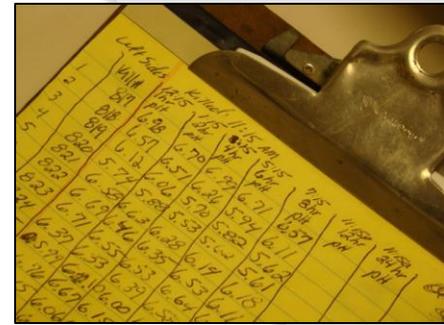
- ◎ The Five Freedoms (FAWC, 2013)
 - Freedom from thirst, hunger, and malnutrition
 - Freedom from pain, injury, and disease
 - Freedom from discomfort due to the environment
 - Freedom from fear and distress
 - Freedom to express normal behavior for the species



No single variable can be used to quantify an animal's welfare state without context.



Categories of animal welfare assessment variables



- Applied
 - Visual assessments of animal health and welfare.
- Behavioral
 - Closest achievable quantification of an animal's emotional state. (Duncan, 1997)
- Technical
 - Inherently objective and detailed quantification of an animal's biochemical and physiological state.

Applied measures of animal welfare

- Visual assessments of animals that are typically evaluated through the use of a scoring system.
 - Examples: Body condition scoring, lameness scoring, feather condition scoring, scoring of wounds or lesions
- Common components of animal welfare auditing programs.
- Context is necessary to understand the welfare implications of many applied measures.



Behavioral measures of animal welfare



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- Closest achievable quantification of an animal's emotional state. (Duncan, 1997)
- Three major types of behavior assessment: (Mittlöhner *et al.*, 2001)
 - **Scan** – Count the number of animals displaying specific behaviors at intervals ≤ 15 min.
 - **Focal** – Record the amount of time a single animal spends on specific behaviors. Extrapolation may be a challenge for some variables.
 - **Time** – A hybrid of scan and focal, not recommended for animal behavior assessment.

Behavioral measures of animal welfare



Behavioral measures of animal welfare

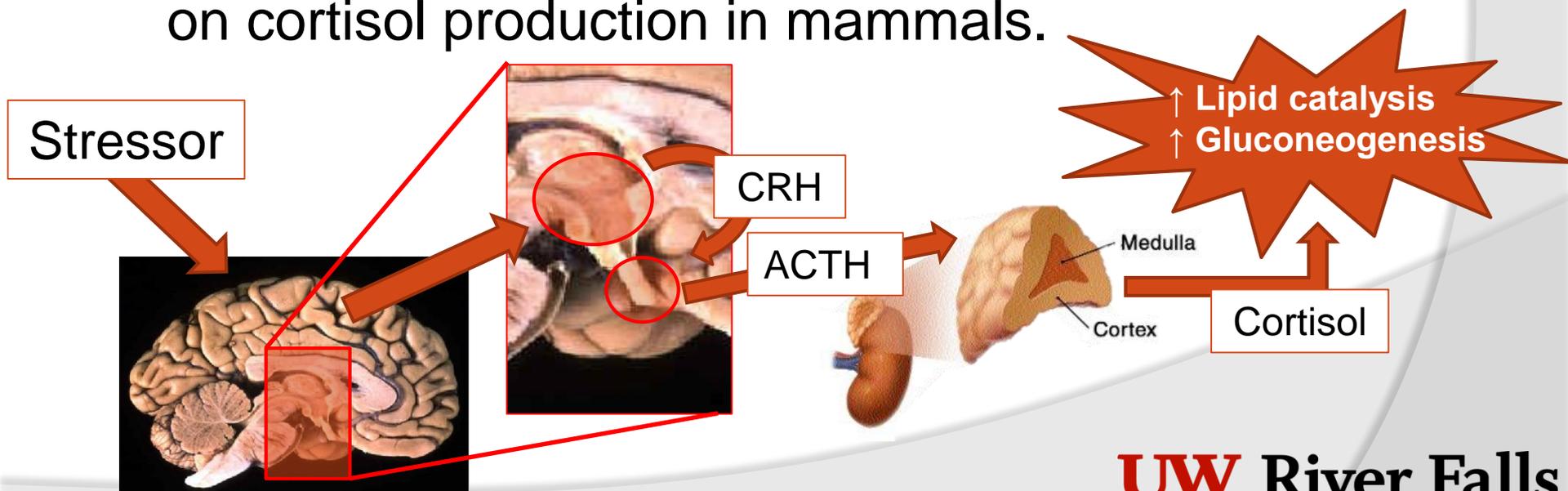
- Newer research has identified the value of automated behavioral data collection.
- Data loggers that detect changes in three-dimensional position are commonly used to detect changes in lying and standing time budgets.
 - Data collection and editing parameters are important. (Ledgerwood *et al.*, 2010)
 - Sampling interval ≤ 30 s.
 - Removal of data points that suggest extremely rapid postural changes.



Photo courtesy of Dana Wagner

Technical measures of animal welfare

- Inherently objective and detailed quantification of an animal's biochemical and physiological state.
 - Focus is typically directed toward the Hypothalamo-pituitary-adrenal (HPA) axis with specific emphasis on cortisol production in mammals.



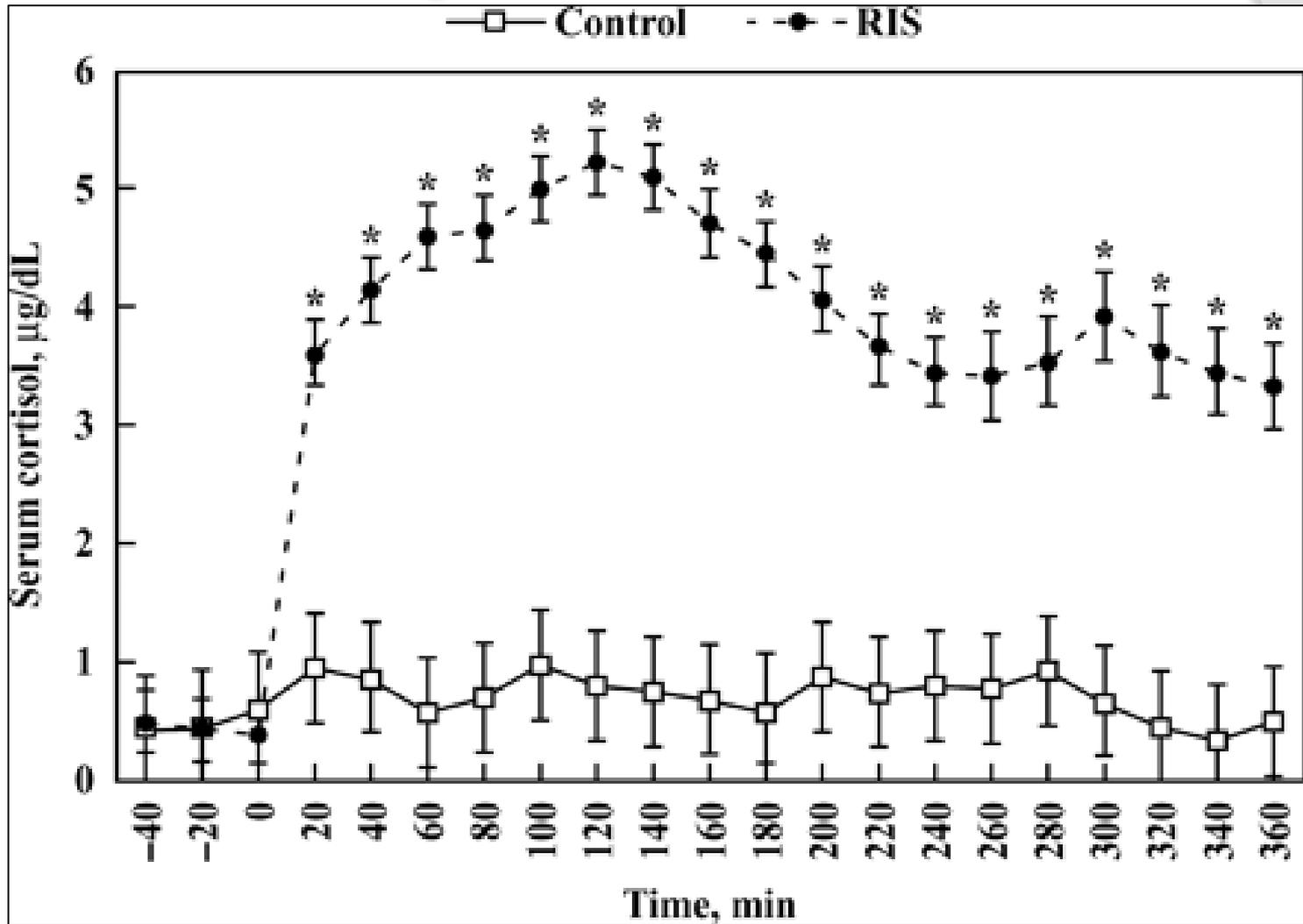
Linking animal welfare and meat science

(Apple *et al.*, 2005)

- 32 Holstein steer calves.
- Assigned to various restraint and isolation treatments immediately before slaughter.
 - 0, 2, 4, or 6 hours
- Measured cortisol, glucose, and lactate.

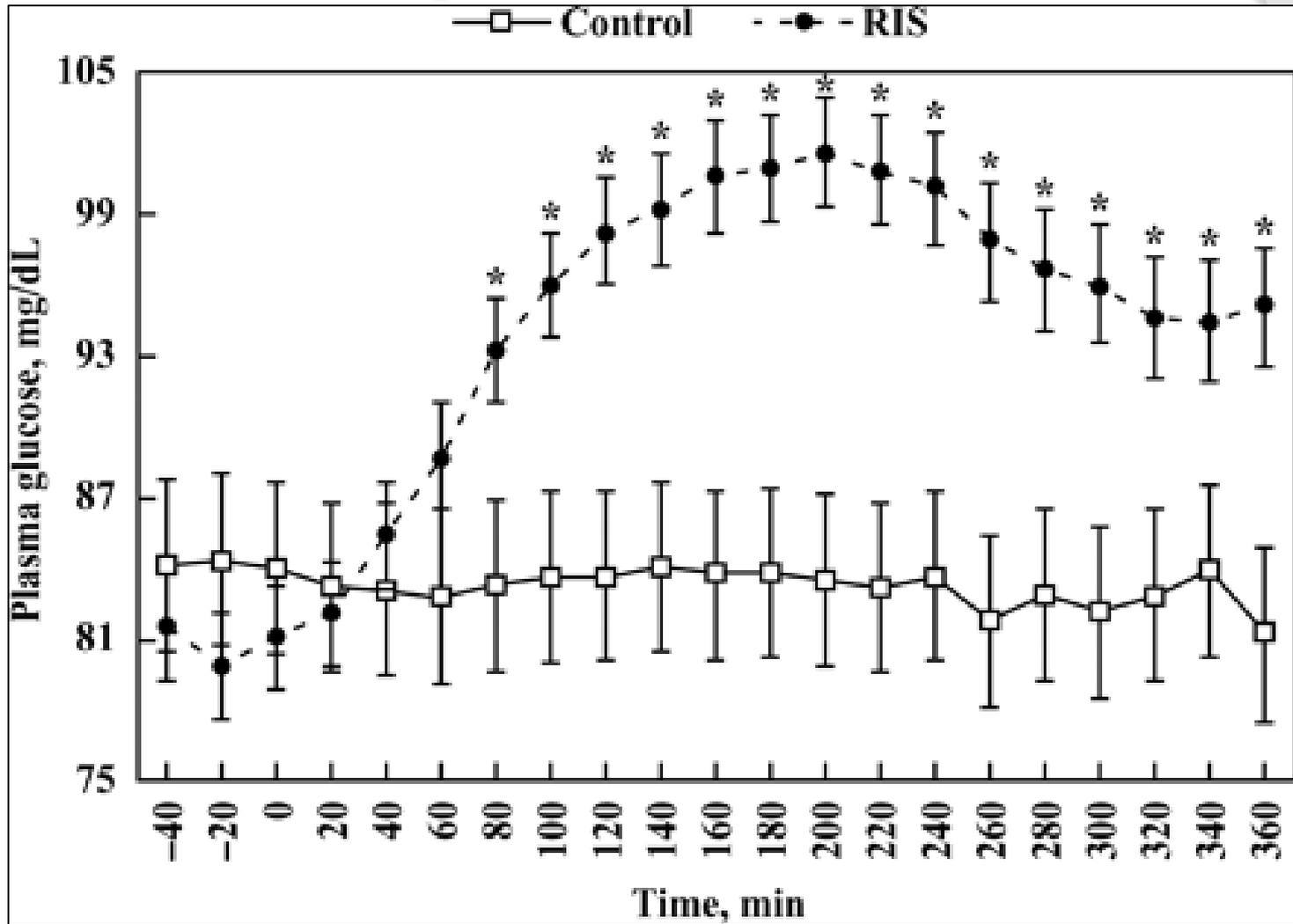


Cortisol response to stress:



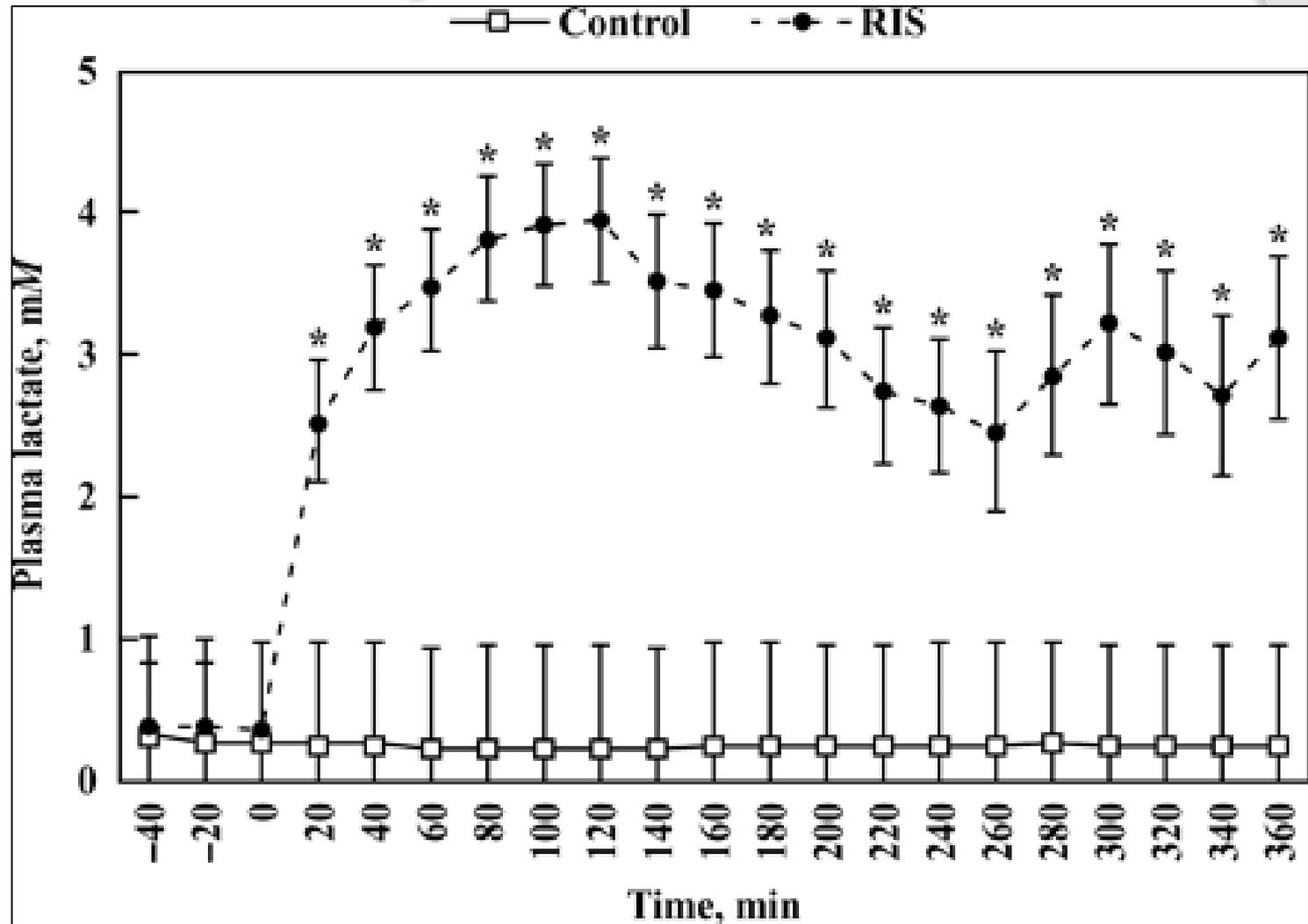
Apple *et al.*, 2005

Glucose response to stress:



Apple et al., 2005

Lactate response to stress:



Apple et al., 2005

Interesting points:

- The 6 h restraint and isolation treatment produced dark cutting meat in all but two calves (both from one block).
 - The authors explained that the following events occurred during this block:
 - The weather suddenly turned colder.
 - The students on the trial stayed close to, and touched, the calves during restraint.
 - The authors concluded that nonthreatening human presence and gentle touch may have reduced the stress response in these calves.
- In a later study, treadmill exercise was used to attempt induction of the dark-cutting condition in Holstein steer calves, but was ineffective. (Apple *et al.*, 2006)
 - Cortisol levels were similar between the restraint stress and exercise stress studies (5 – 7 $\mu\text{g}/\text{dL}$).

Steps and challenges with animal welfare assessment

- Rushen and de Passillé (1992) presented a four – step process for animal welfare assessment:
 1. The development of a global definition of animal welfare that includes all animals as a foundation for setting societal standards.
 2. The use of science to define acceptable criteria for animal environments and indicators of welfare.
 3. The performance of animal welfare assessment.
 4. Evaluation of the acceptability of differences between the actual measurements and the standards developed in steps 1 and 2.



Conclusion

- The relationship between animal welfare and meat science presents opportunity for additional interdisciplinary discovery regarding food animals.
- Care must be taken to select outcome variables that provide appropriate context to interpret research results.
- A balance of applied, behavioral, and technical measures is necessary to ensure the robust understanding of animal welfare data.

Questions and Discussion



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WORK TOGETHER. STAND APART.

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