Heart rate assessment in beef bulls prior to slaughter is associated with feed efficiency

Montanholi YR, Lam S, Miller SP

DALHOUSIE UNIVERSITY
Inspiring Minds
Faculty of Agriculture

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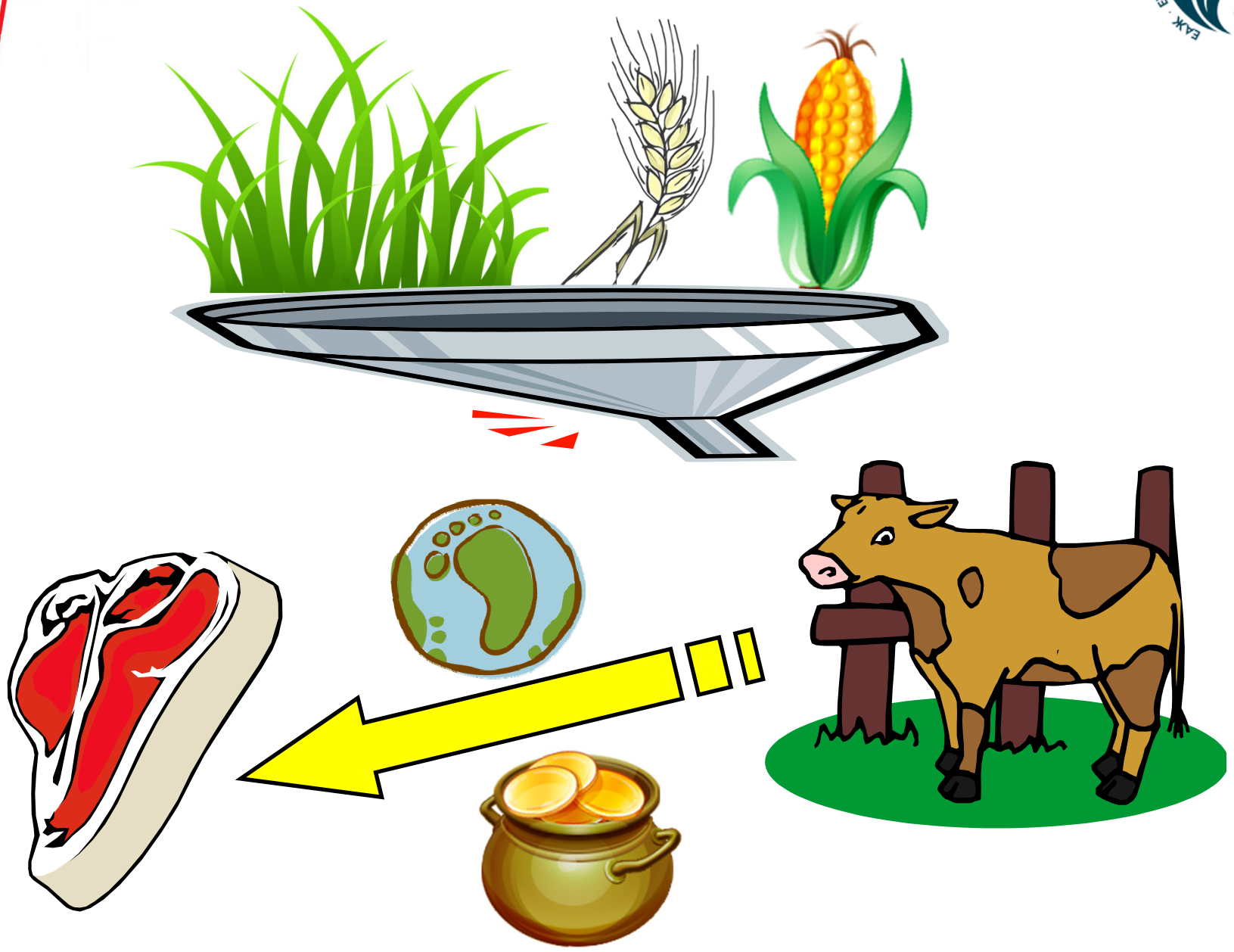
Te Ahuwhenua, Te Kai me te Whai Ora. Tuatahi

Outline

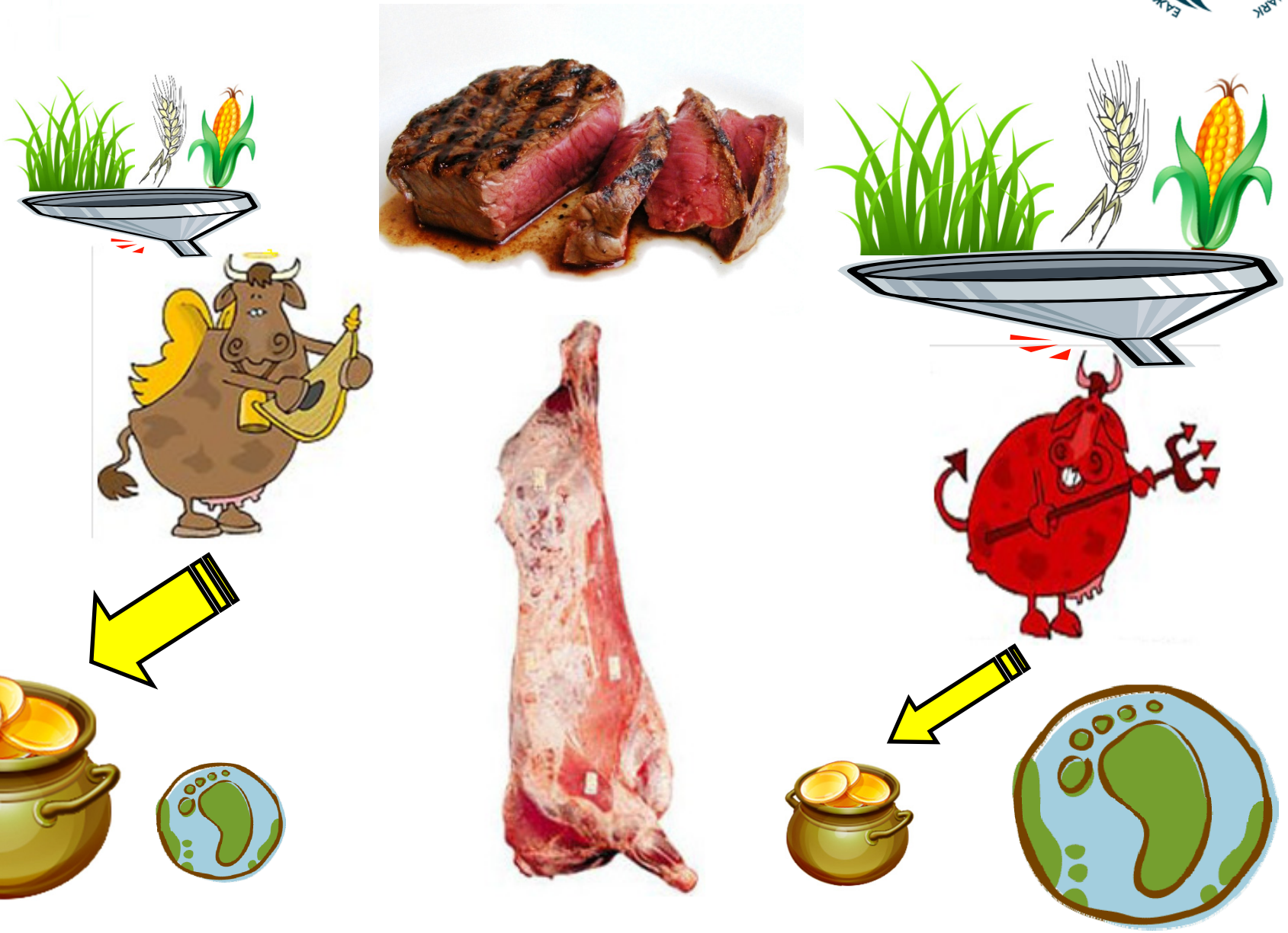
- Why feed efficiency?
- Measuring feed efficiency
- Biology of feed efficiency
- The heart example
- Acknowledgments

Why feed efficiency?

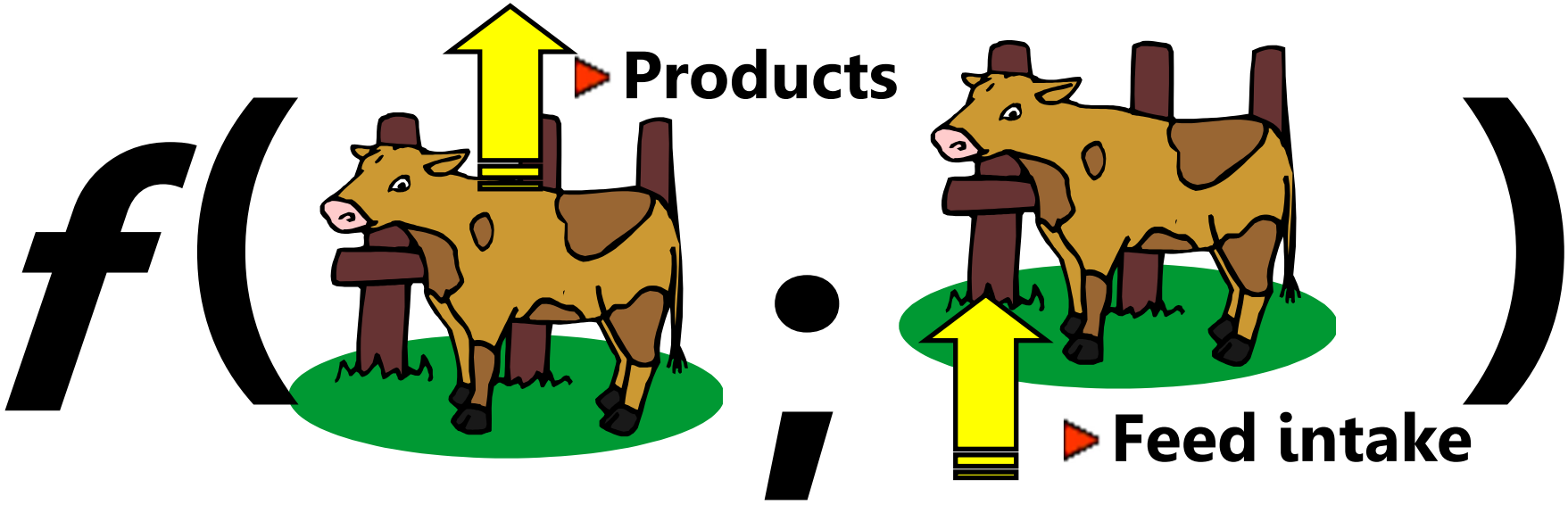


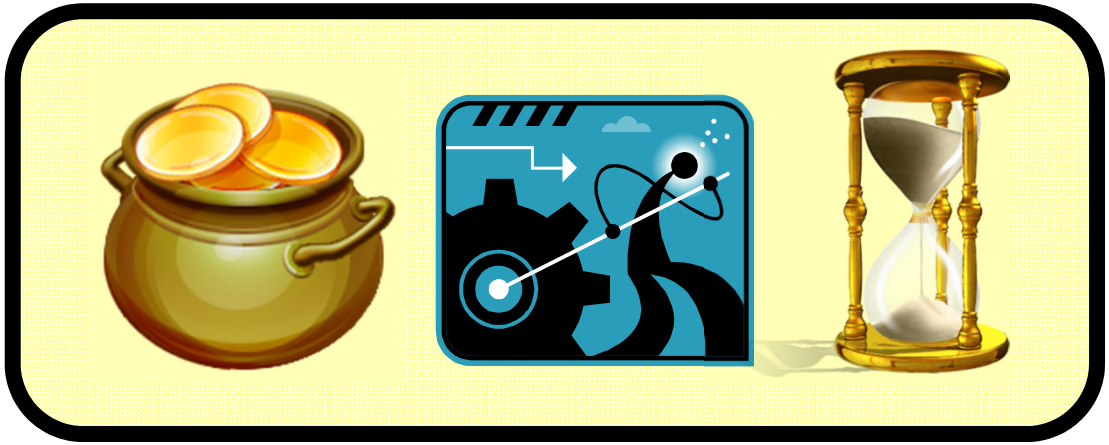
Why feed efficiency?

Why feed efficiency?

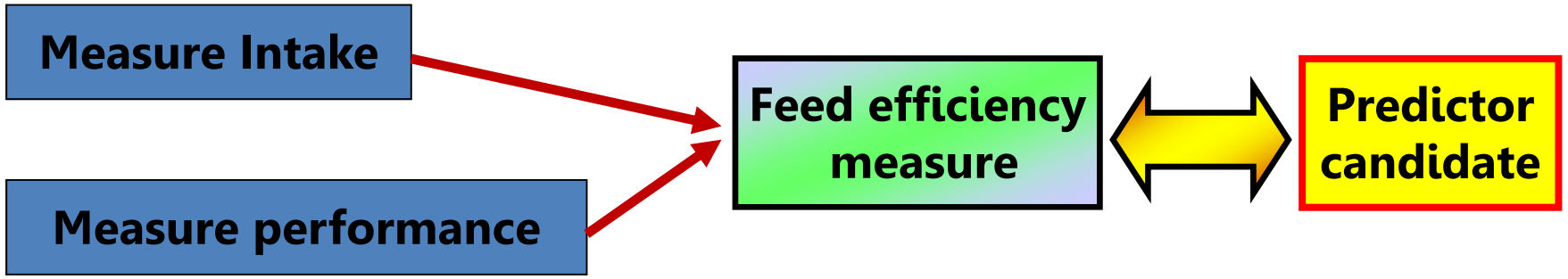


Measuring feed efficiency





Biology of feed efficiency



- Advancing knowledge (deeper roots!).
- New phenotypes for selection programs.
- Monitoring response to selection.

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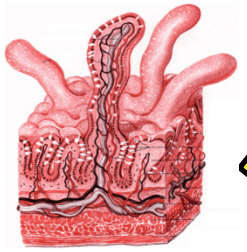
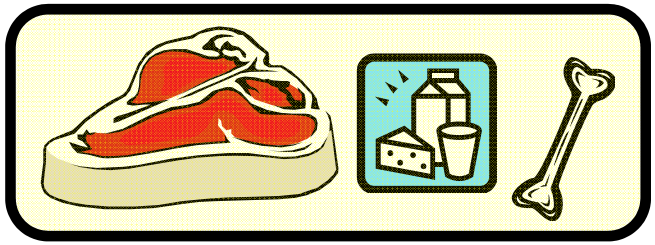
ASSOCIATIONS OF FEED EFFICIENCY WITH FERTILITY AND SEXUAL MATURITY IN YOUNG BEEF BULLS

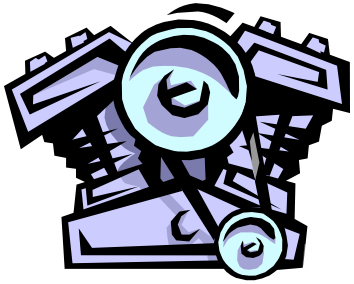
Ananda Fontoura, Yuri Montanholi, Mariana Amorim, Steve Miller

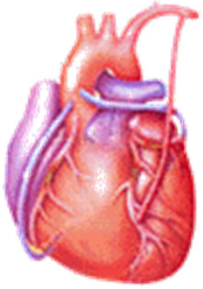
Measuring feed efficiency

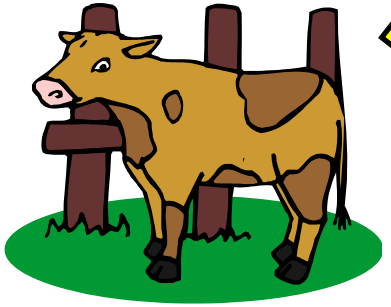
RFI = Intake observed - Intake predicted

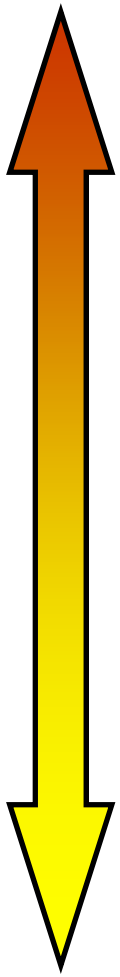








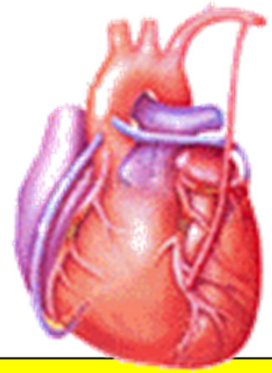




Low-RFI

High-RFI

Biology of feed efficiency



Rumen microbiology

Genetics

Blood plasma metabolites

Individual organs function

Digestion physiology

Immunology

Bio-climatology

Behavior

Infrared imaging

Theriogenology

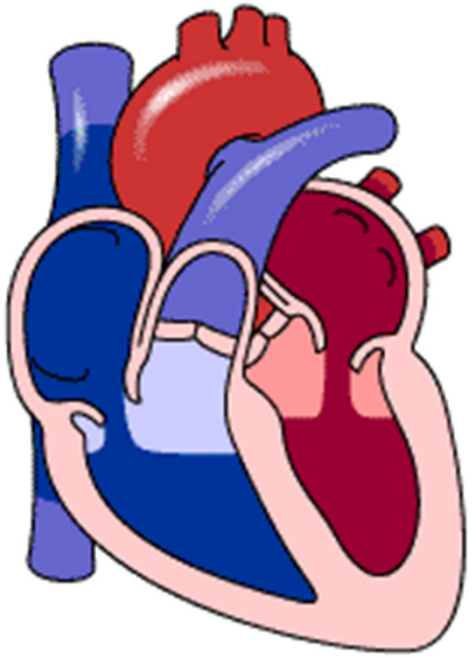
Body composition

Calorimetry

Heart - Introduction

Heart: a major "service function"

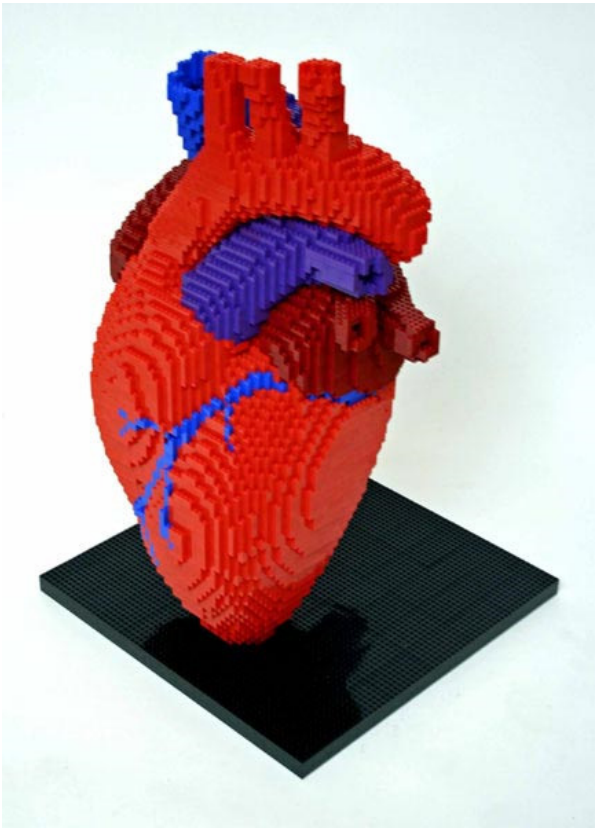
Function	% basal energy expenditure
Service functions	
Kidney work	6 to 7
Heart work	9 to 11
Respiration	6 to 7
Nervous functions	10 to 15
Liver functions	5 to 10
Total	36 to 50
Cell maintenance	
Protein resynthesis	9 to 12
Lipid resynthesis	2 to 4
Ion transport	30 to 40
Total	40 to 56



(Baldwin et al. 1980)

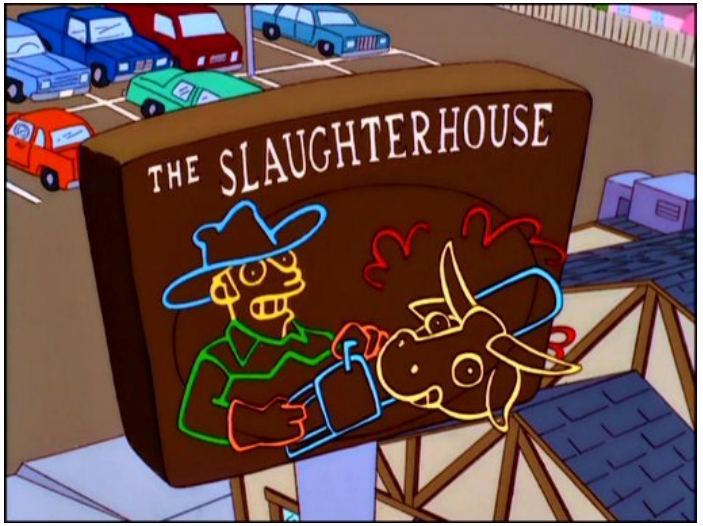
Heart - Hypothesis

- **Heart function accounts for a portion of maintenance requirements. Therefore, it is reasonable to hypothesize that heart rate is associated with variation in feed efficiency.**



Heart - Objective

- **To evaluate the association of heart rate and feed efficiency in young beef bulls undergoing various conditions prior slaughter.**

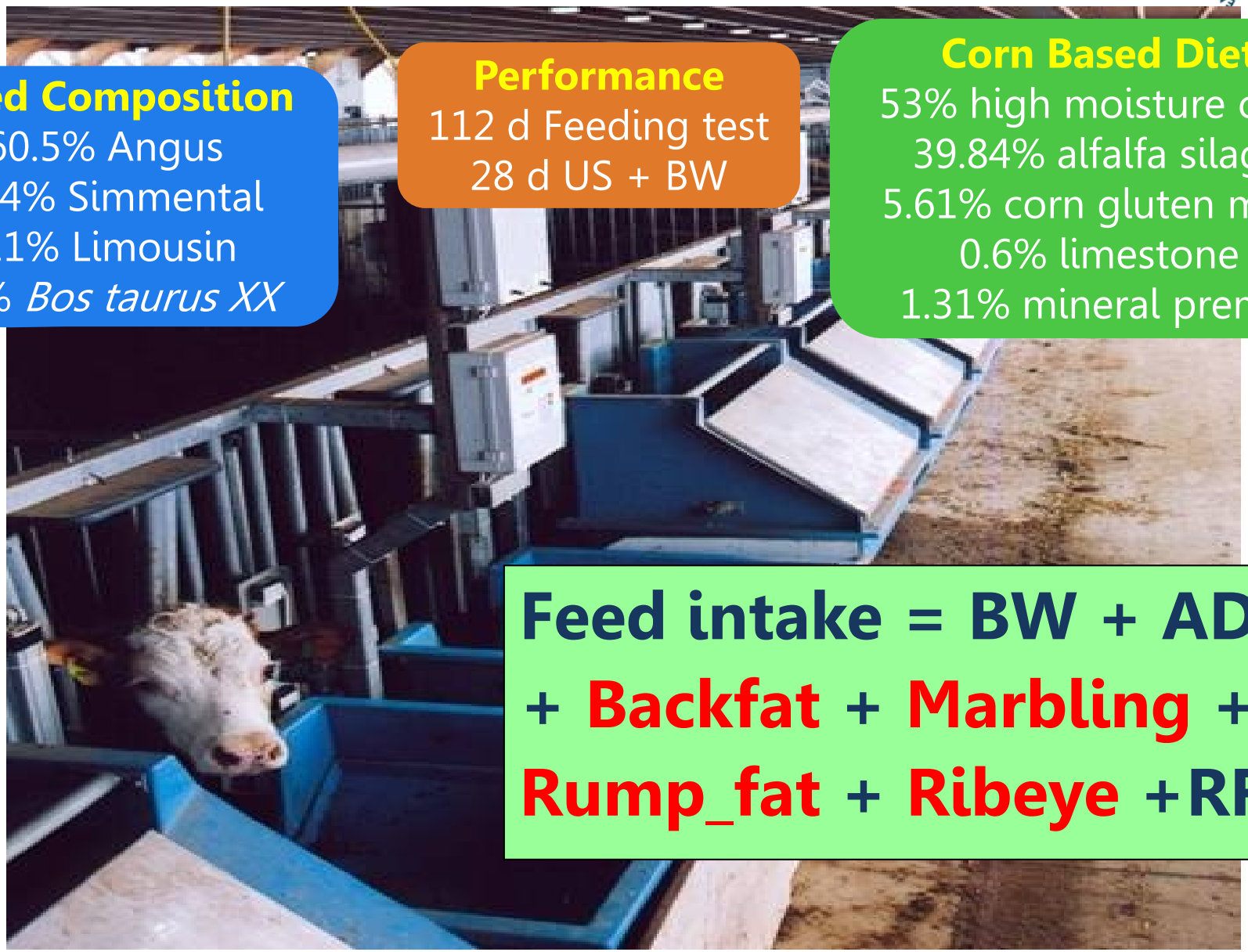


Heart – Material & Methods

Breed Composition
60.5% Angus
24.4% Simmental
4.1% Limousin
11% *Bos taurus XX*

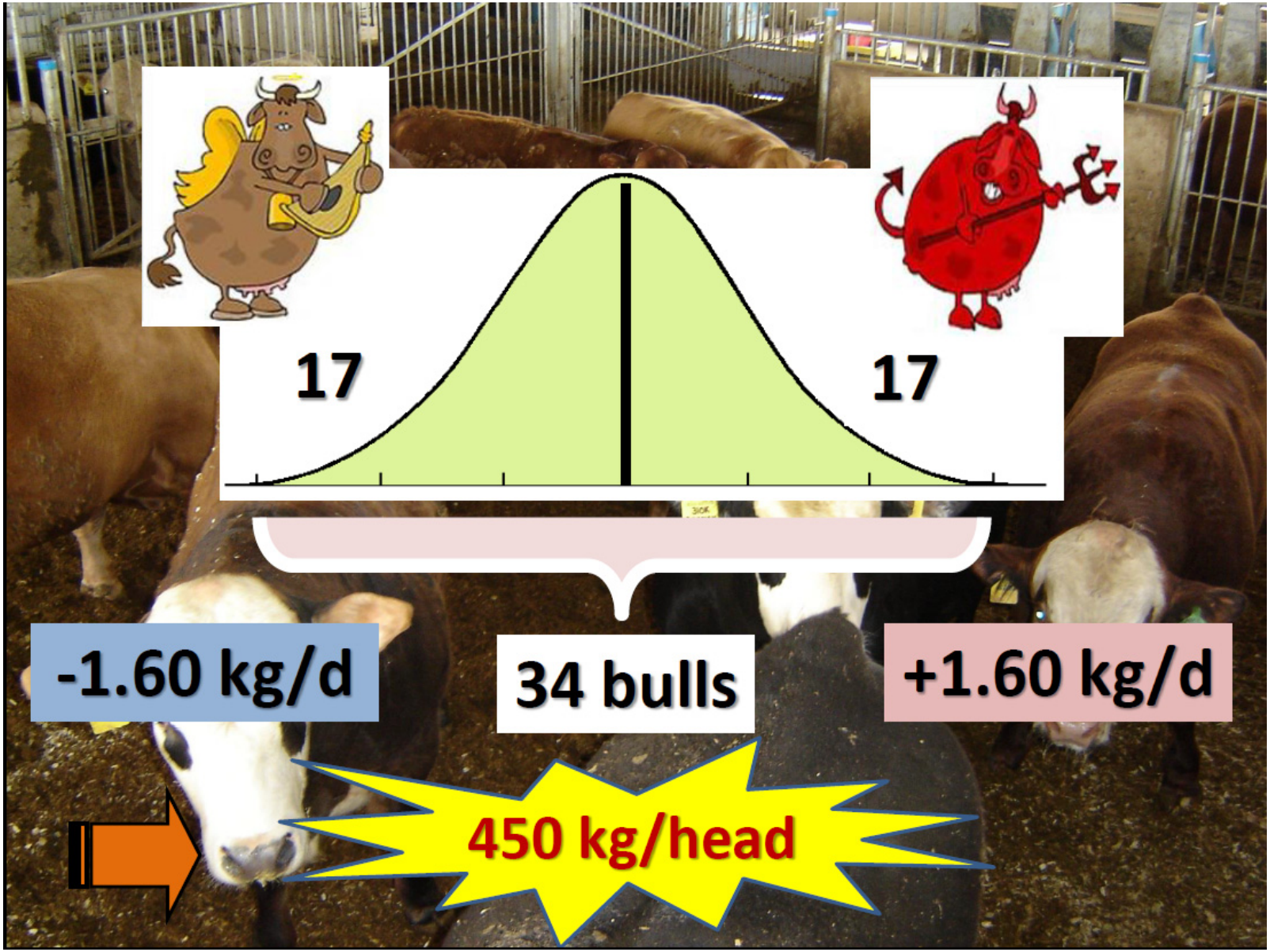
Performance
112 d Feeding test
28 d US + BW

Corn Based Diet
53% high moisture corn
39.84% alfalfa silage
5.61% corn gluten meal
0.6% limestone
1.31% mineral premix



Feed intake = BW + ADG + Backfat + Marbling + Rump_fat + Ribeye +RFI

Heart – Material & Methods

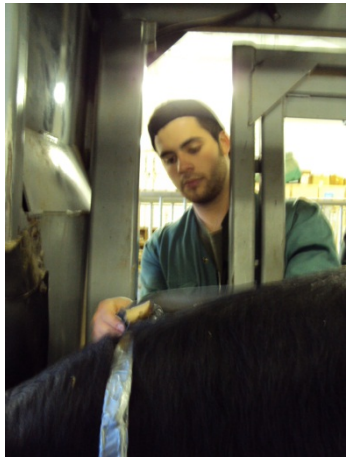


Heart – Material & Methods

Polar Equine RS800CX

Heart – Material & Methods

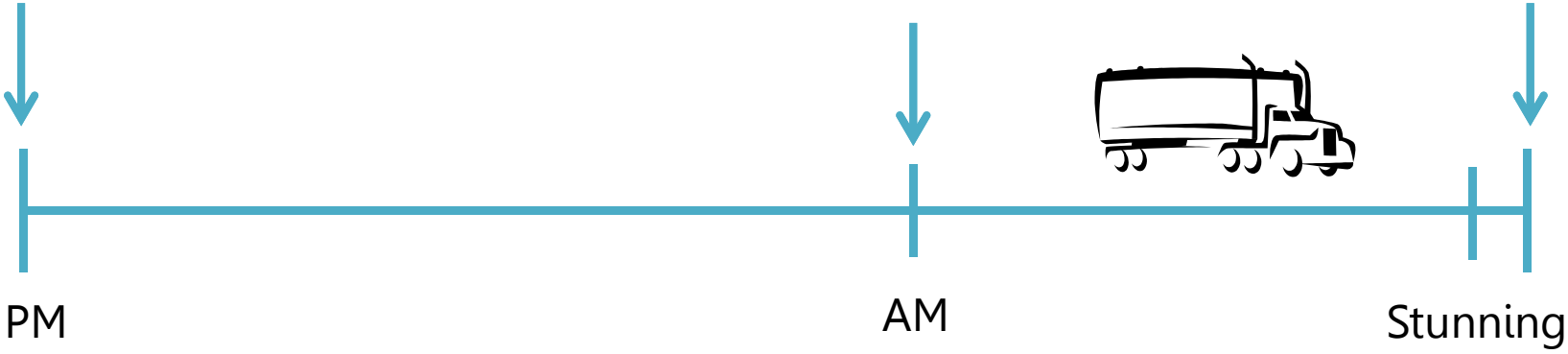
Heart – Material & Methods



HR monitors

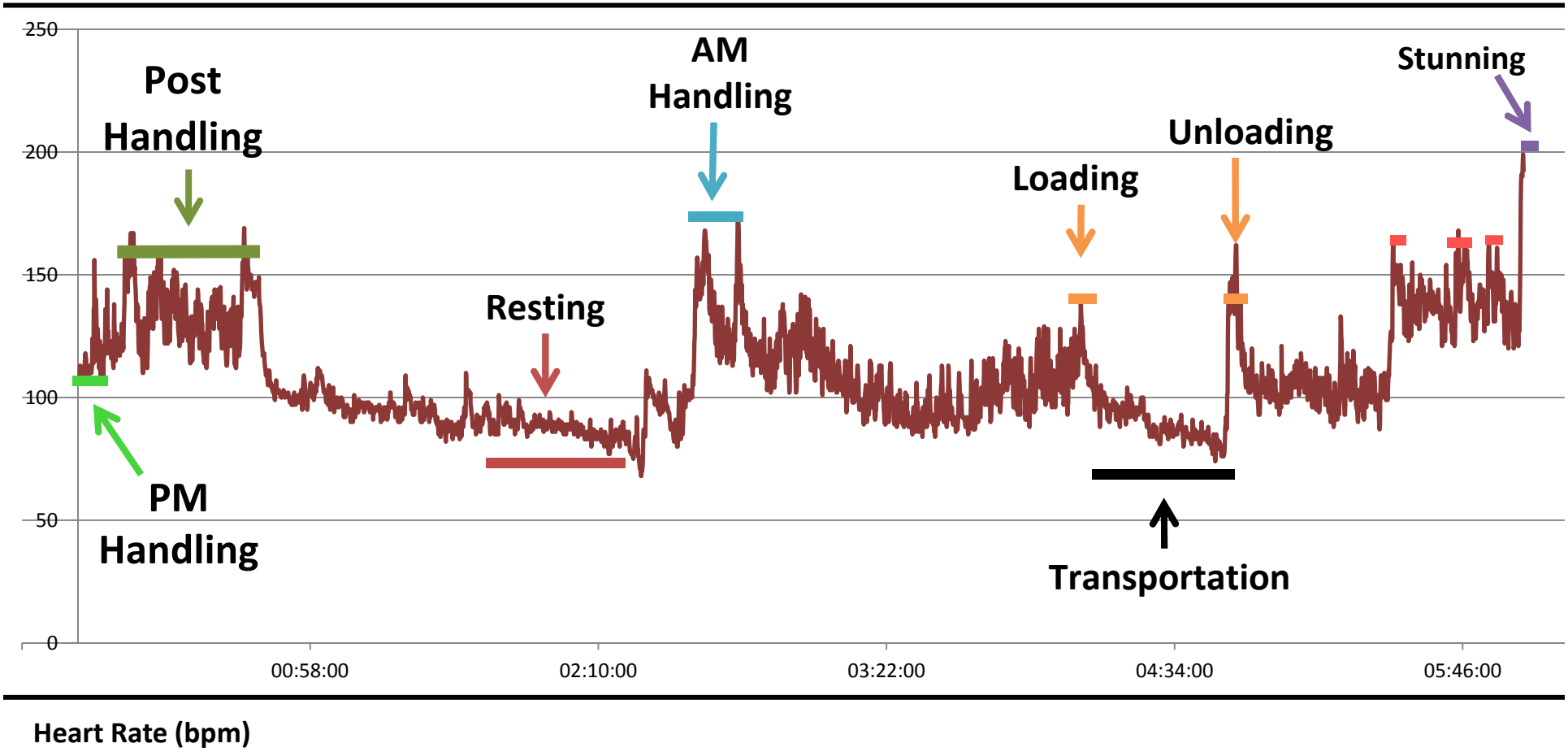
Check monitors

Remove belts



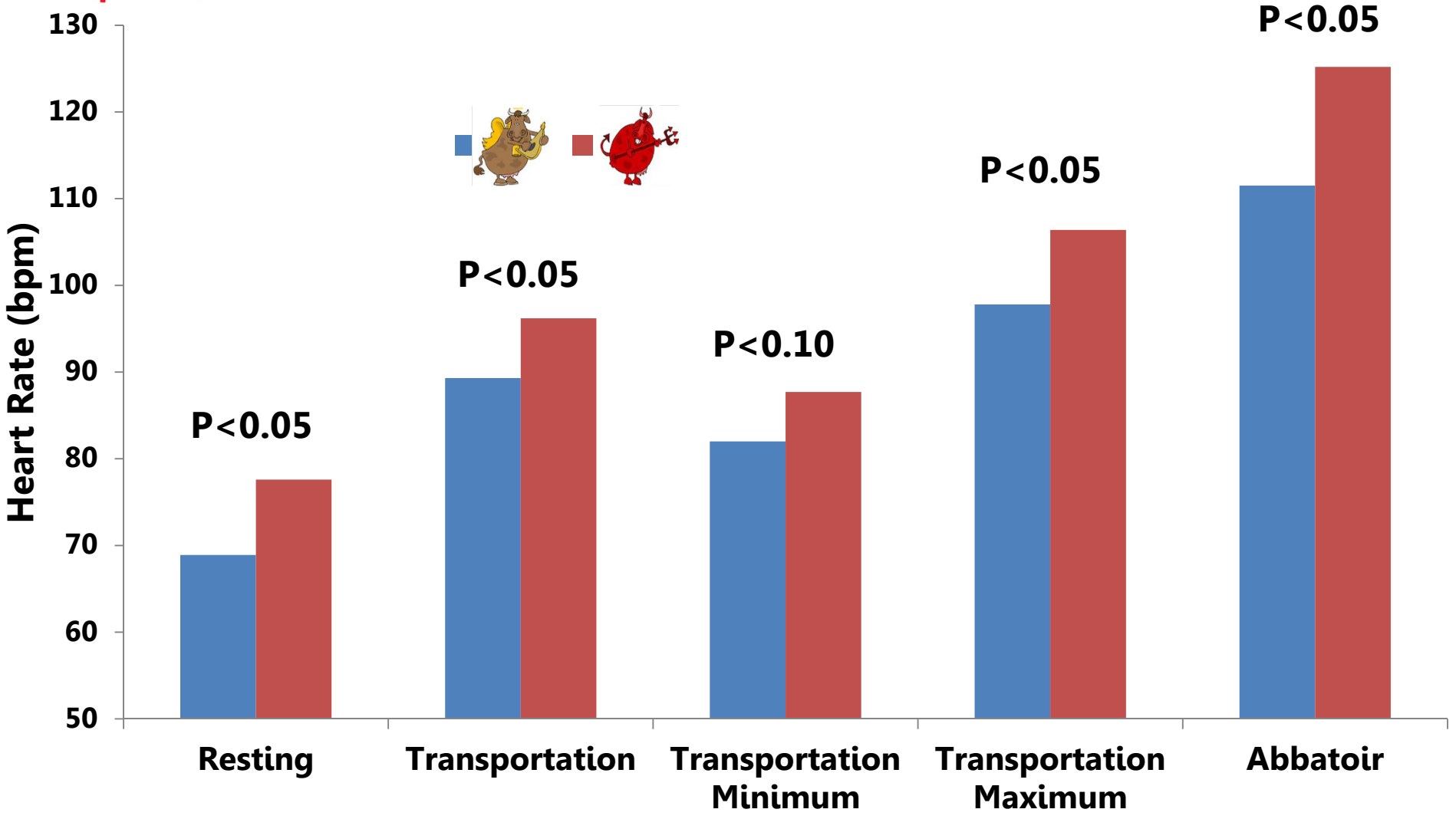
Heart – Results & Discussion

"Cattle-cardiogram"



Heart Rate (bpm)

Heart – Results & Discussion



Heart – Conclusion & Implications

Heart rate was consistently lower on more feed efficient bulls across different situations.

- **Robust assessment**
- **"Friendly" to general public**

Heart – Follow up…

- Why Heart Rate varies according to feed efficiency?
- How to implement HR assessment in the (livestock) beef industry?

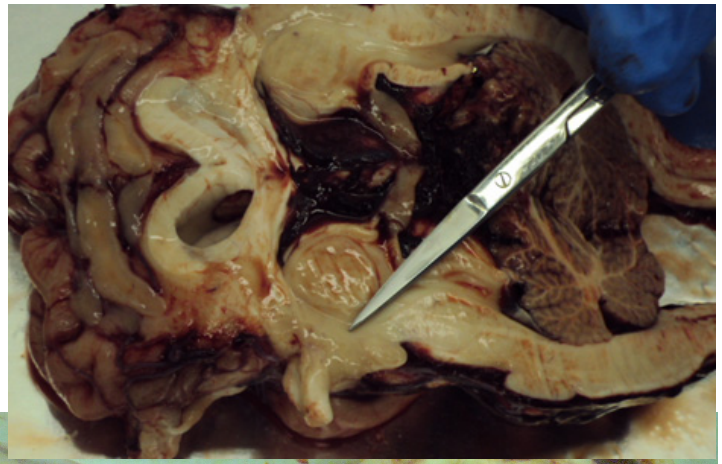
Heart – Ongoing studies

- **Blood volume: Indocyanine Green**

- **Stroke volume: Blood volume /HR**

Heart – Ongoing studies

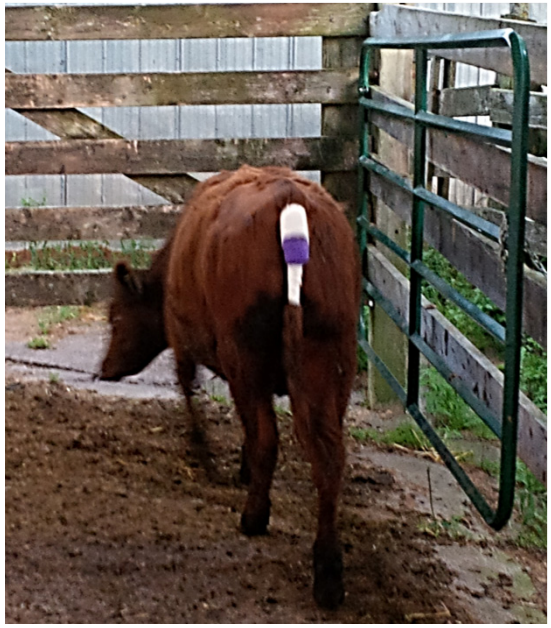
- **Molecular biology**



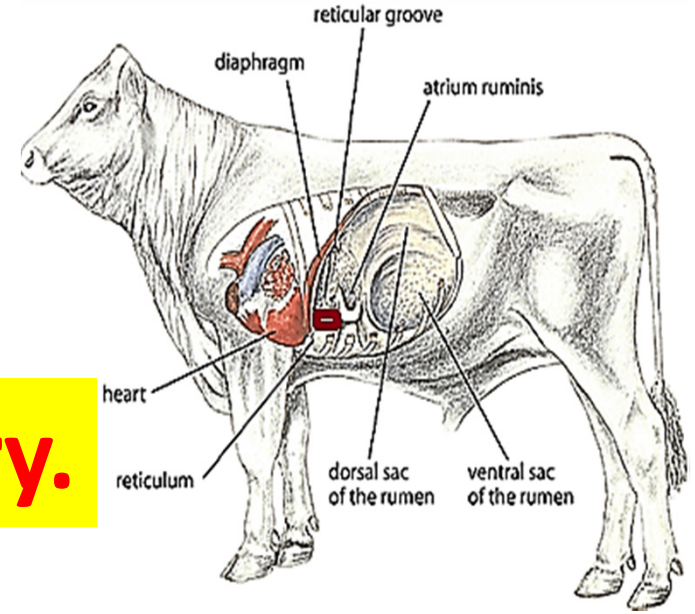
- **Morphometry**

- **Histology**
  - Fiber diameter
  - Fiber length

Heart – Ongoing studies



Assessments for heart rate …



… applicable in the industry.

Acknowledgments

- Jasper Munro
- Stéphanie Bourgon
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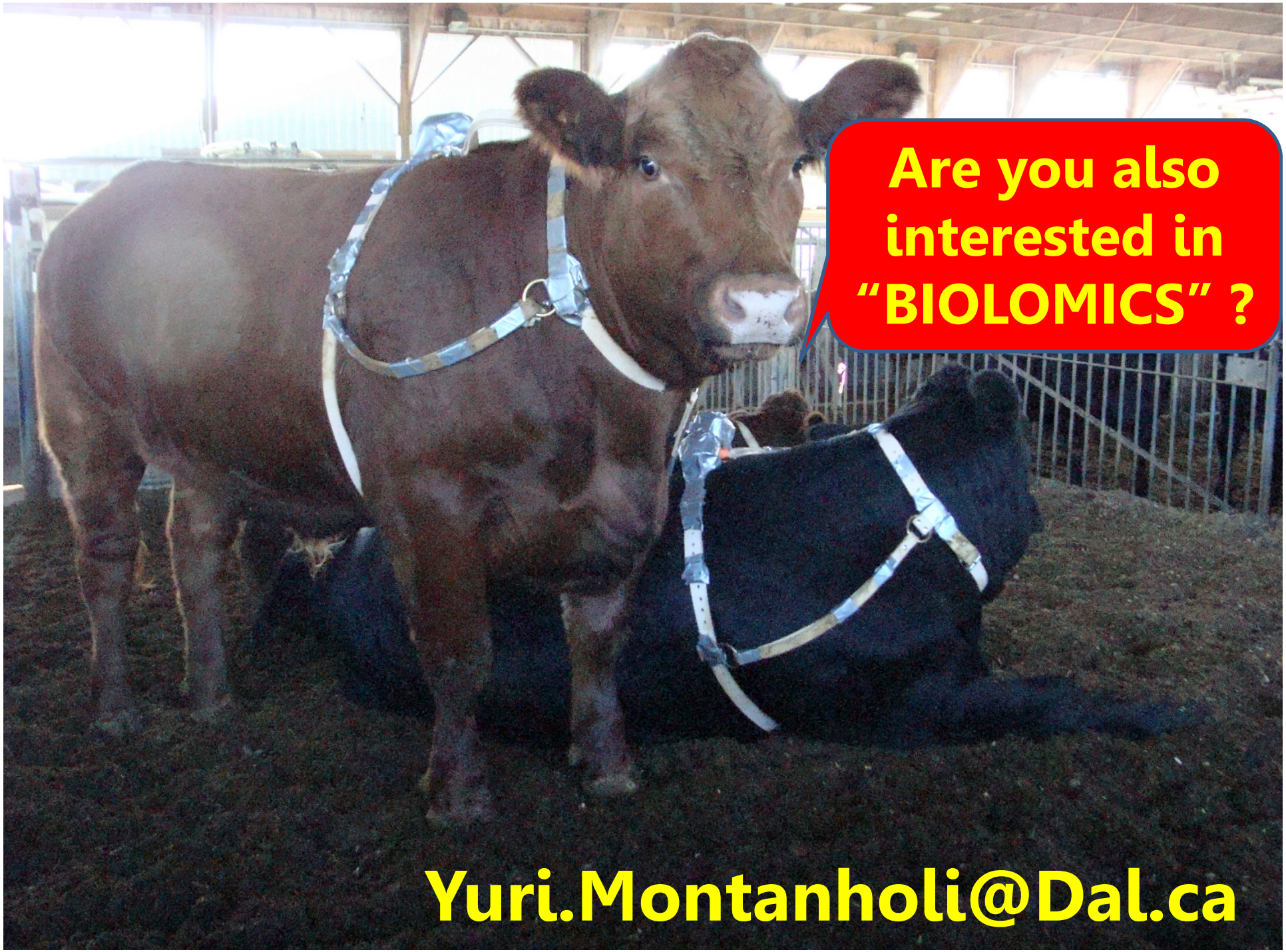
- Nara Cônsolo
- Agathe d'Hautefeuille
- Ellen Crane

Acknowledgments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Yuri.Montanholi@Dal.ca