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CSIRO Livestock Industries Animal Welfare Research

Philosophies, Priorities & Programs



Overview

- **Philosophies**

- CSIRO role in Australia
- Why research animal welfare?

- **Priorities**

- Scientific research (incl. education of postgraduate students)
- Provision of scientific expertise
- Development of priorities

- **Programs**

- What we do
- How we collaborate

CSIRO role in Australia

- **What is CSIRO?**

- Australia's national science agency

- **Core purpose**

- To deliver great science and innovative solutions for industry, society and the environment.

CSIRO role in Australia

- **Primary roles**

- undertake scientific research
- assist Australian industry and to further the interests of the Australian community
- contribute to national and international objectives and responsibilities of the Commonwealth Government
- encourage or facilitate the application and use of the results of its own or any other scientific research

- **Secondary roles**

- international scientific liaison
- training of research workers
- publication of research results
- dissemination of information about science and technology

Where have we come from?

- **Pre-1820's: abuse of animals**
- **Early 20th Century: Prevention of cruelty**
- **Late 20th Century: Duty of care**

Freedom from hunger and thirst

Freedom from discomfort

Freedom from pain, injury and disease

Freedom to express normal behaviour

Freedom from fear and distress

Where have we come from?

- **Pre-1820's: abuse of animals**
- **Early 20th Century: Prevention of cruelty**
- **Late 20th Century: Duty of care**
- **21st Century: Consumer choice?**

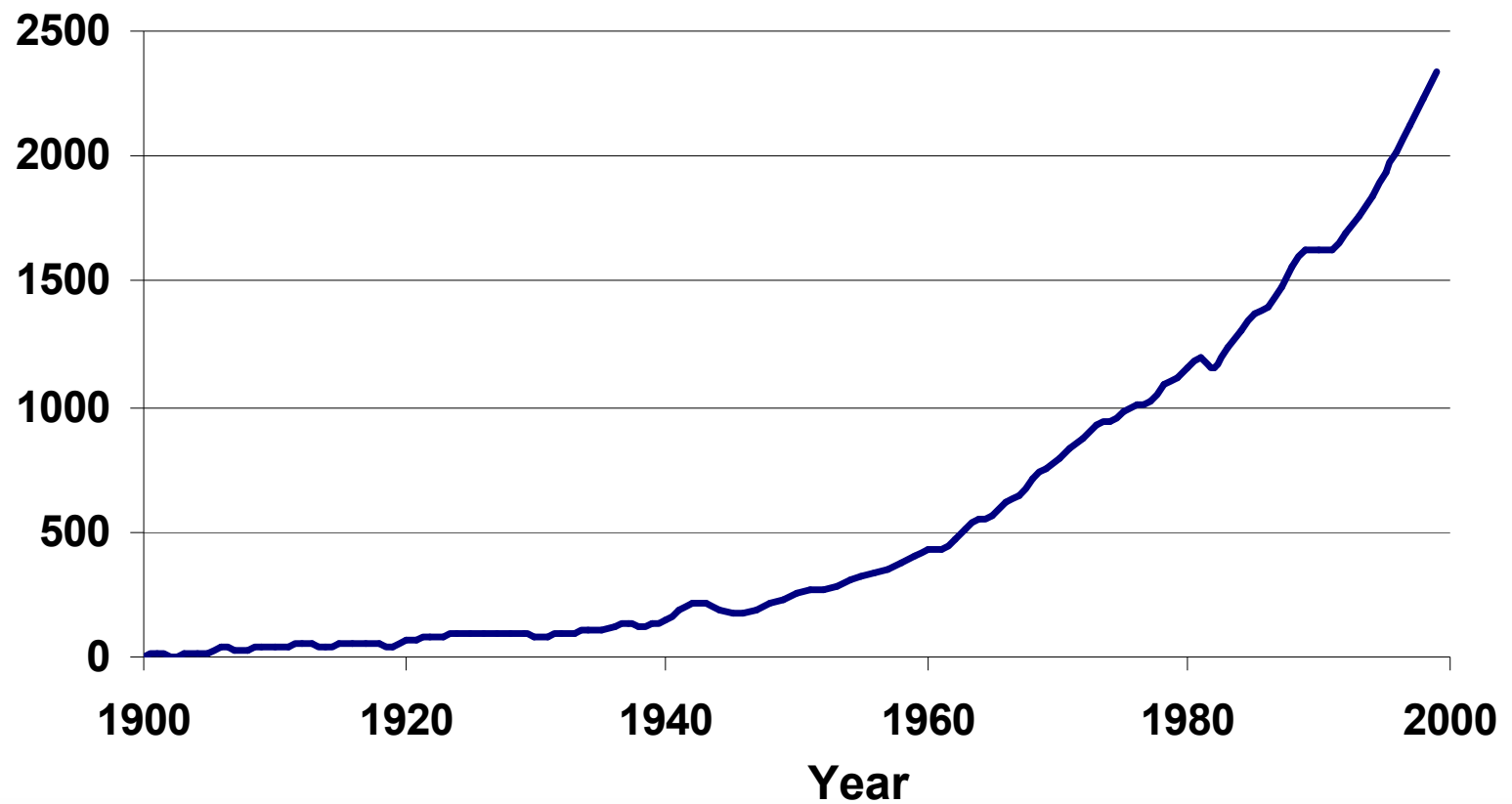
Where are we headed?

- **In reality, animal welfare is better than it has ever been....**

BUT

- **Changing attitudes**
- **Public & market opinion**

Growth in Australian economy 20th C



Where are we headed?

Stages of involvement in animal welfare

- **“Don’t mention the war”**
- **Look - we’re working on animal welfare issues**
- **Let’s identify the problem areas, deal with them, & proactively address market and societal interest in welfare**

The Australian Animal Welfare Strategy



AAWS Contact

**Australian Animal Welfare Unit
Department of Agriculture, Fisheries and Forestry
Email: animalwelfare@daff.gov.au
Telephone: 02 6272 3933**

Or visit: www.daff.gov.au/aaws

AAWS Goals

- **Enhanced national approach and commitment to high standards of animal welfare**
- **Sustainable improvements based on sound science**
- **Effective communication, education & training to build understanding**



Where are we headed?

Where are the issues that will have impact?

- **Restriction of movement**
- **Surgical husbandry practices**
- **Long distance transport of animals for economic reasons**
- **Problems and diseases induced by the production environment and climate change**

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Priorities

- **Scientific research**

- Includes development of the next generation of scientists

- **Provision of scientific expertise**

- Contributing to the national agenda on animal welfare

**The Australian
Animal Welfare Strategy**



Priorities

- **Development of priorities**

- RDC strategic plans
- AAWS priority setting
- Discussions with industry, government and welfare interest groups
- Utilisation of other information (e.g. AWSC report)

- **Funding structure**

- 56% external funding, 44% CSIRO funding
- Majority of externally-funded projects are on a co-investment basis, typically 70% external agency & 30% CSIRO

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- How we collaborate

Overview

- **Established as a research group 4½ years ago**
- **Utilising CSIRO scientific disciplines**
- **Research focus on production animals**
 - Additional contributions on the use of animals in research

Overview

Scientists

Ian Colditz
Drewe Ferguson
Andrew Fisher
Caroline Lee
David Strom
Linda Agnew (Postdoc)
Ylva Strandberg (QBP)
Peter Kennedy (Rockhampton)
Jen Smith

Technical Staff

David Paull
Jim Lea
Matt Reed
Dom Niemeyer

Research students

Rebecca Doyle
Nicky Roberts
Sharon Pettiford
Chloé Pizzato
Audrey Giraud
Rémi Climent
François Brard

Collaborators

Geoff Hinch (UNE)
Alain Boissy (INRA France)
Dominique Blache (UWA)
Paul Hemsworth & John Barnett (AWSC)
Lindsay Matthews (AgResearch NZ)
Bernadette Earley (Teagasc Ireland)
Carol Petherick (QDPI&F)
Clive Phillips (UQ)

Outcomes of Animal Welfare Research

- **Scientifically sound measures of animal welfare (internationally accepted)**
- **Provide science to underpin policy development and inform public debate**
- **Enhance public and consumer confidence in Australian livestock industries and products**
- **Improved health, productivity and welfare of livestock**
- **Australian public expectations for farm animal welfare standards are met**

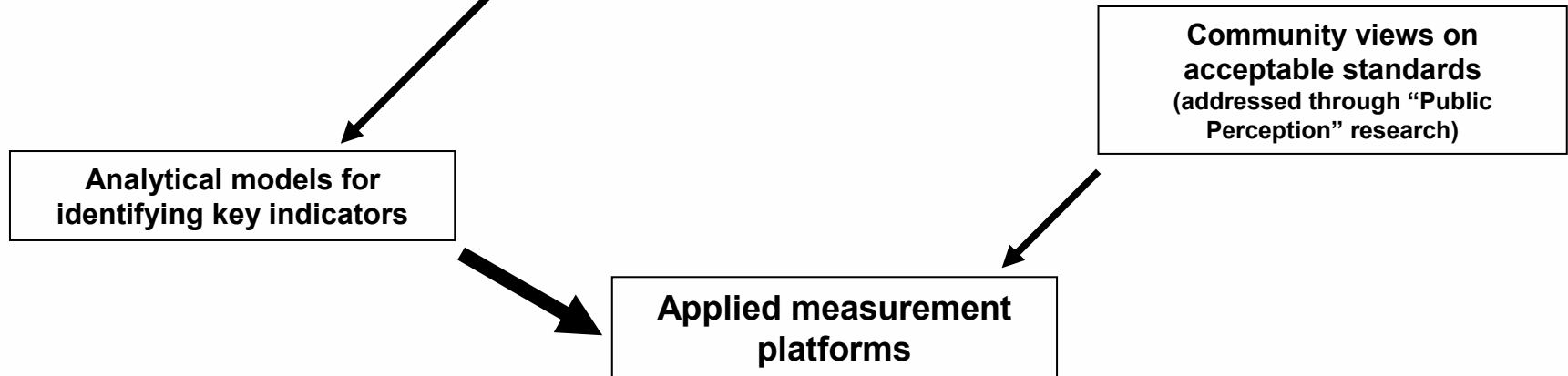
Four key strategies

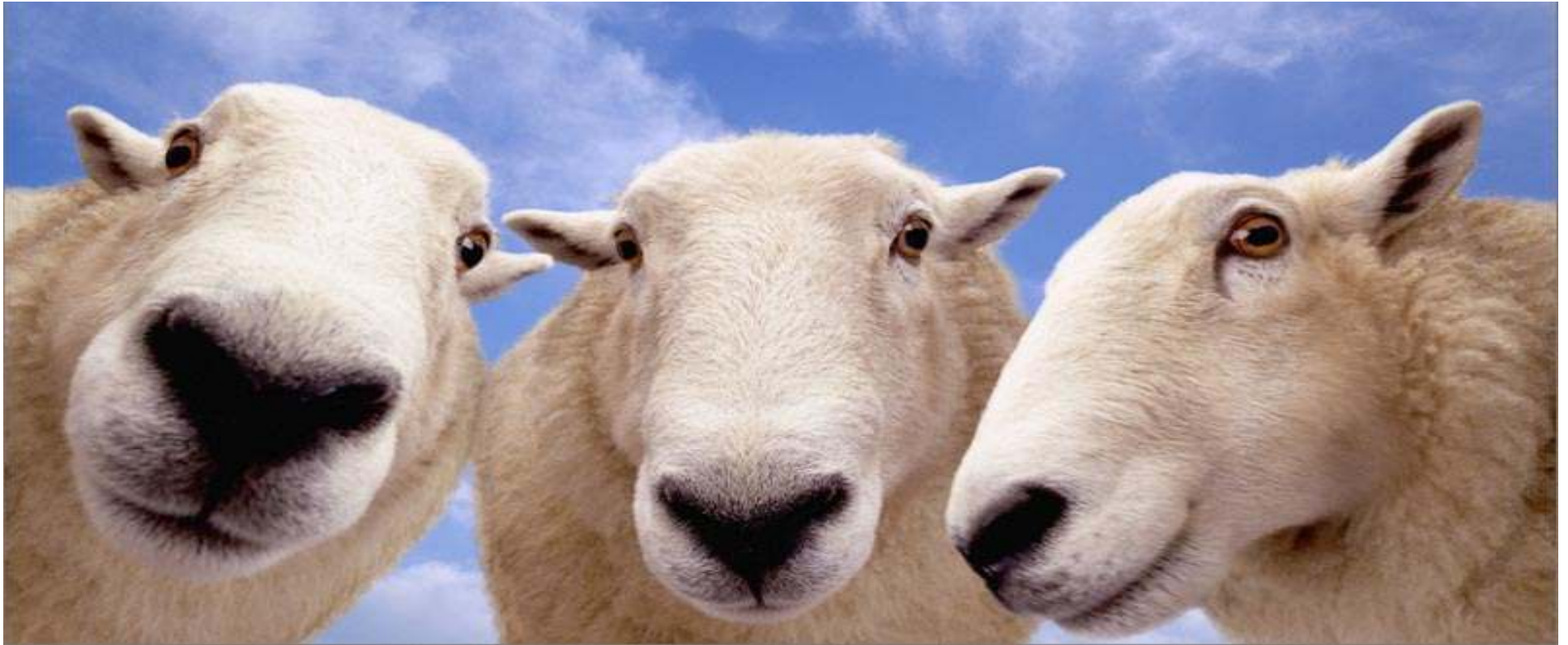
- **Biology of animal welfare and its measurement**
- **Animals adapted to their environment**
- **Assessment and improvement of practices**
- **Contributing to the National agenda on animal welfare**

Biology of animal welfare and its measurement

Key biological response pathways

	Behaviour	Physiology	Cognition	Gene & protein expression	Health
<u>Animal / Stressor models</u>					





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Biology of animal welfare and its measurement: Animal Cognition

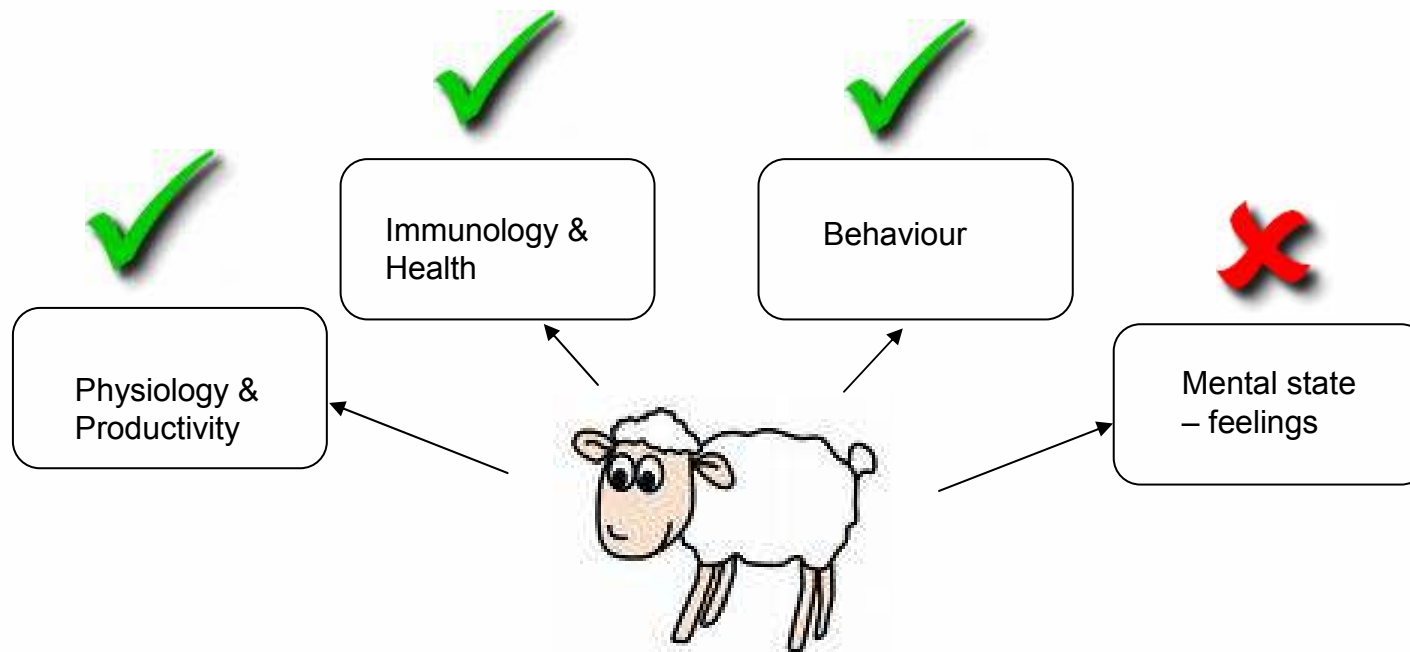
Caroline Lee and Rebecca Doyle (PhD student)



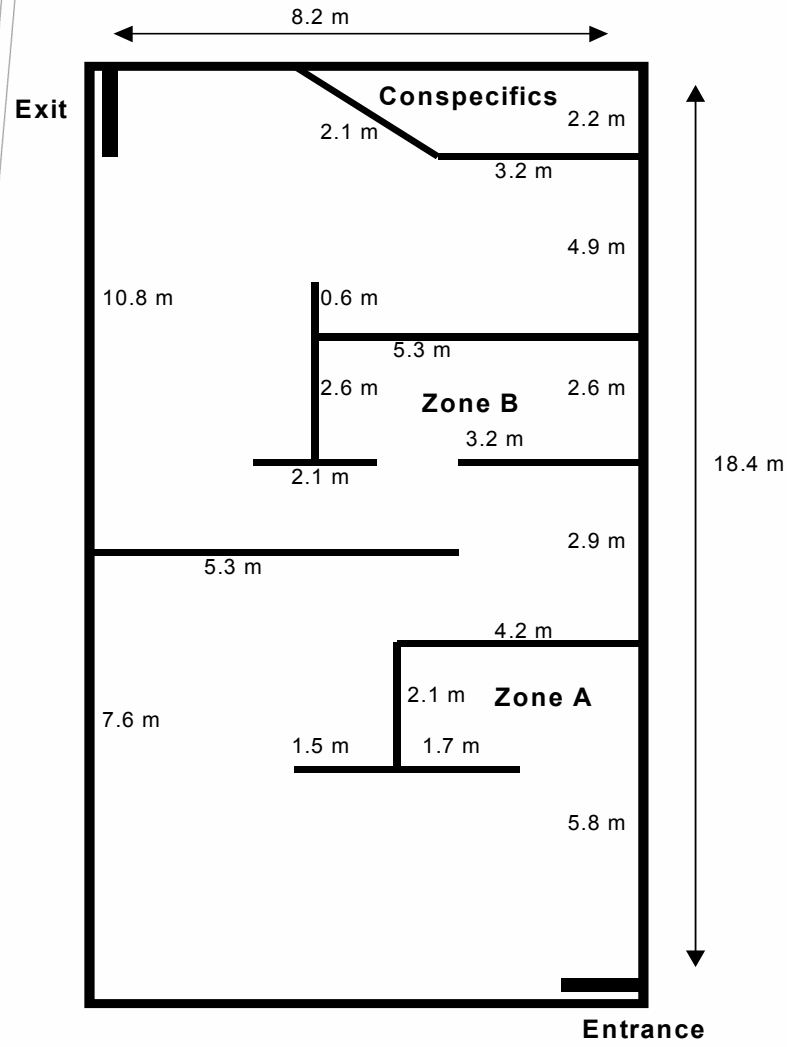
Introduction

- **Why measure animal cognition?**

- Assess welfare - how do animals feel?
- Improve welfare - practices and environment
- Knowledge gap - greater understanding needed



Maze design



Cognitive capacity and animal welfare

Mental abilities can be used to gain insight into how animals perceive a situation

Cognitive bias – the individual's perception of a situation based on their emotional state

When an animal is in a positive mental state it assesses a situation as more likely to result in a positive outcome

When an animal is in an adverse mental state it assesses a situation as more likely to result in a negative outcome





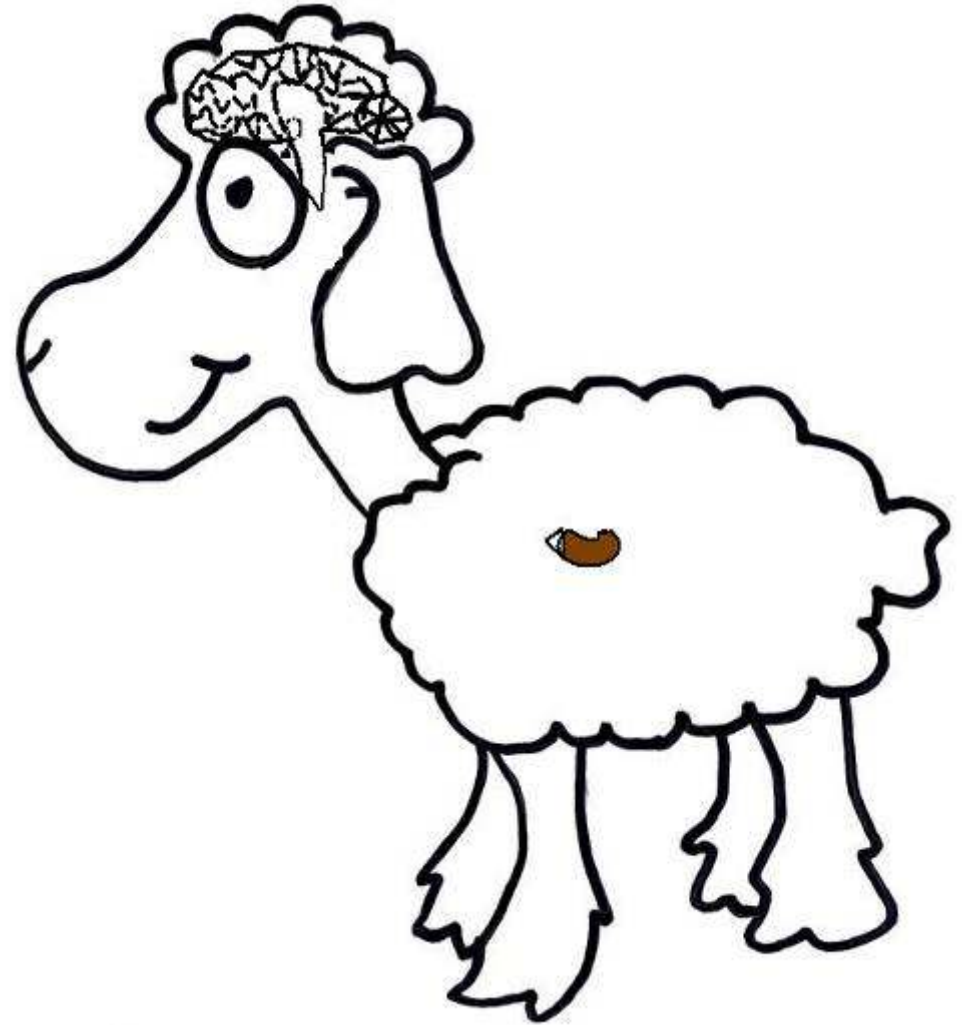
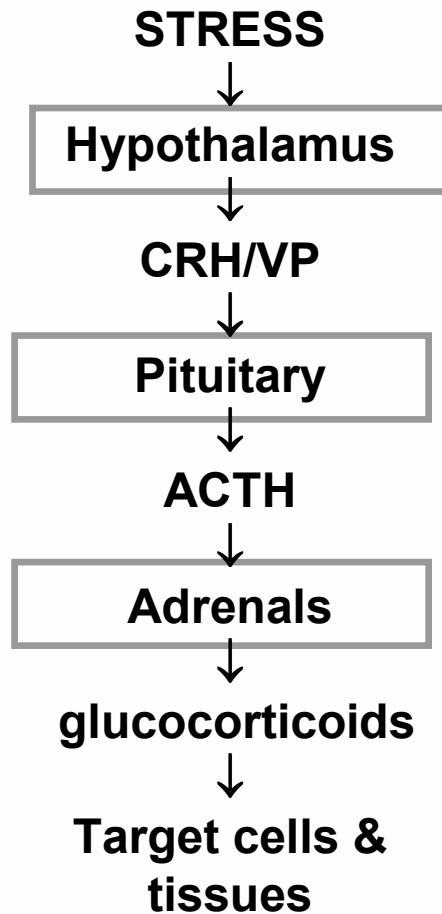
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Biology of animal welfare and its measurement: Neuroendocrine and immune approaches to welfare

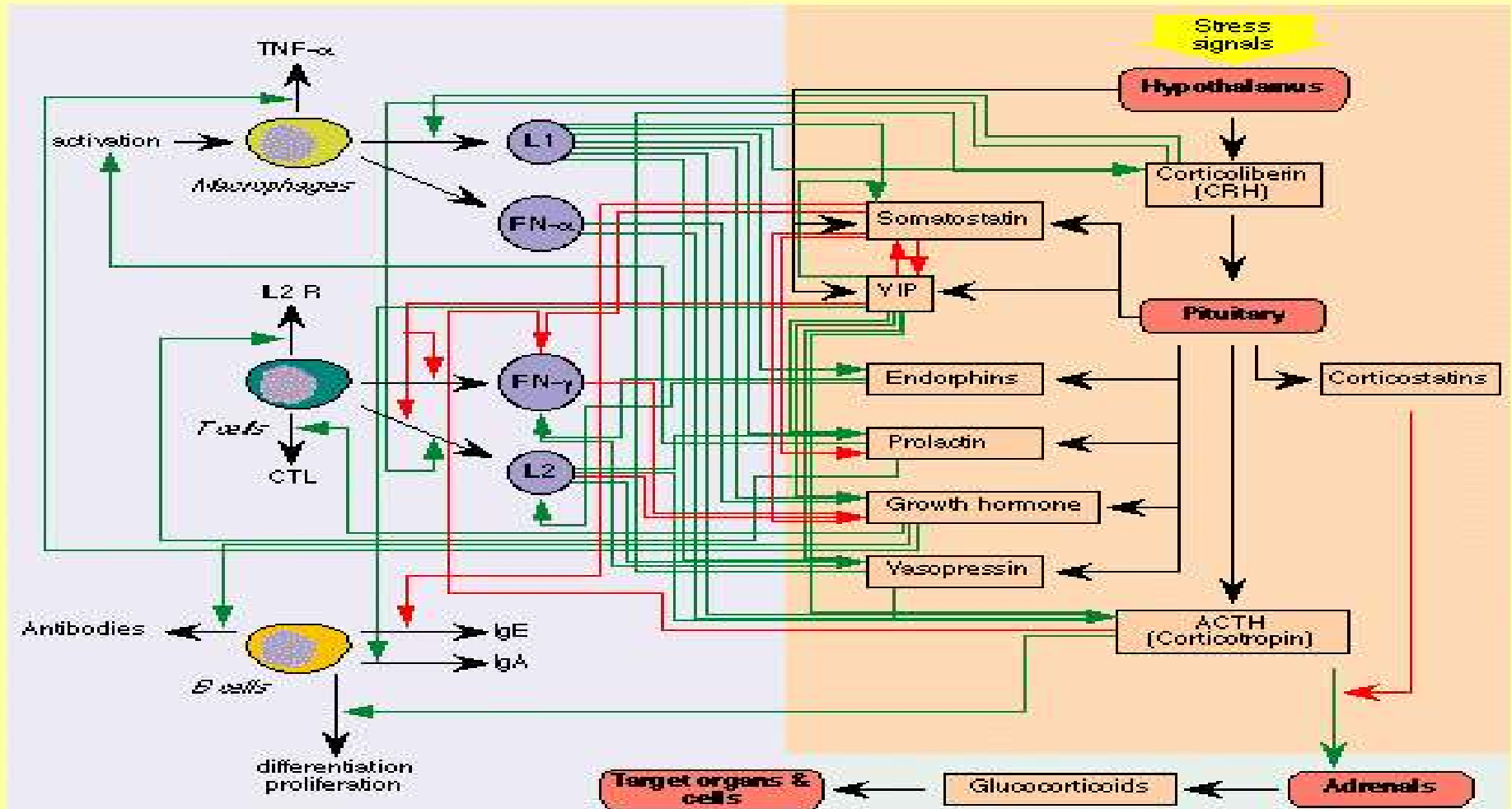
Linda Agnew **and** **Ian Colditz**
(MLA-funded PostDoc)



Hypothalamo-pituitary-adrenal axis



HPA axis – immune system bidirectional communication

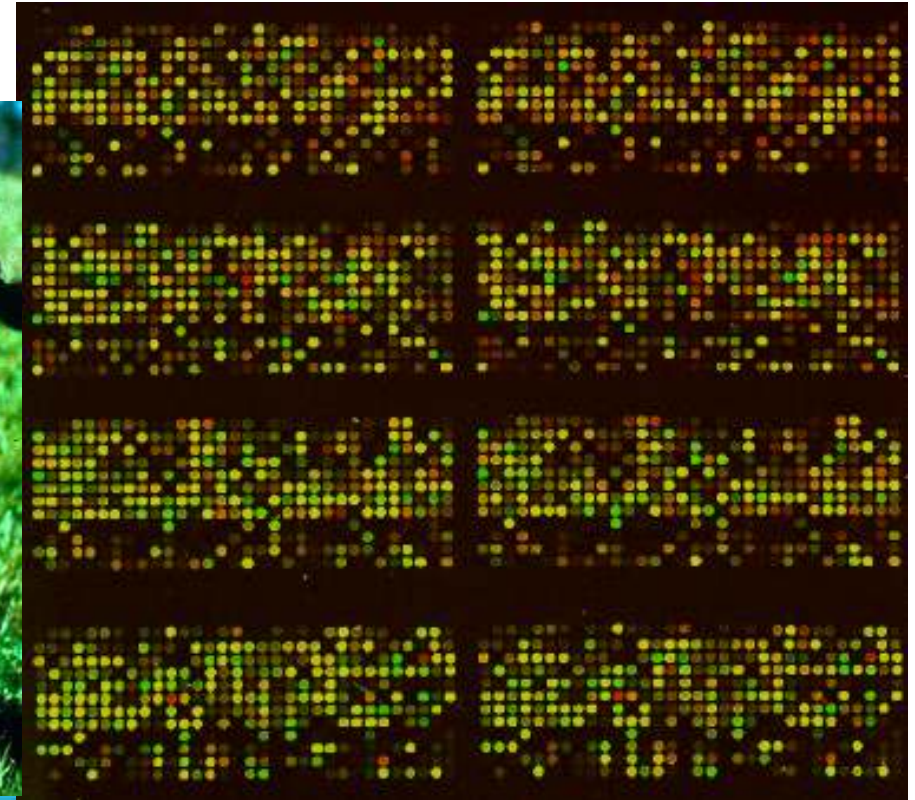


Heat shock stress proteins

- **Ubiquitous**
- **2% – 15% cellular protein**
- **Multi-gene family**
- **Molecular chaperones**
- **Expressed in response to stressors**
 - Environmental
 - Cellular
 - Disease states

Glucocorticoid receptor

- **Ligand-dependent nuclear receptor**
- **Ubiquitously present in nucleated cells**
- **Associate with hsps**
- **Activity of glucocorticoid mediated via interaction with GR**
- **Regulated via negative feedback**



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Biology of animal welfare and its measurement: Beef CRC collaborations- Gene expression & welfare



Drewe Ferguson, Ylva Strandberg and Ian Colditz



Gene expression and animal welfare

- Understanding the biology of animal welfare at the cellular level
- Uses the gene expression skills of CSIRO within the Beef CRC
- Collaborative with John Barnett, Paul Hemsworth et al (AWSC)
- Also involving other CRC partners incl. Clive Phillips (CAWE UQ)
- Studying the effects of fear and other stressors on gene expression pathways
 - Microarray analysis





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Biology of animal welfare and its measurement: An example of bringing it all together:

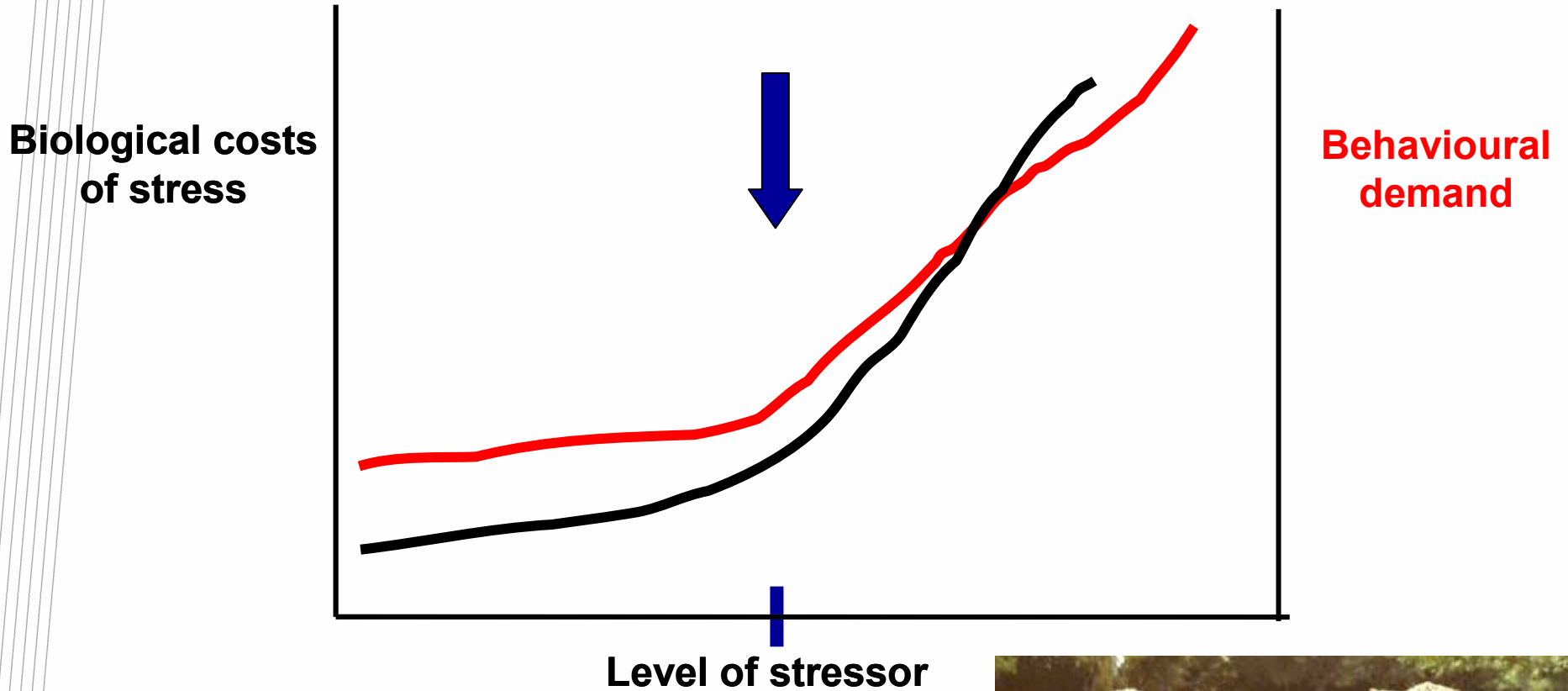
Does animal motivation for stressor avoidance
correspond to the biological costs of stress?

Andrew Fisher, Nicky Roberts (PhD student)

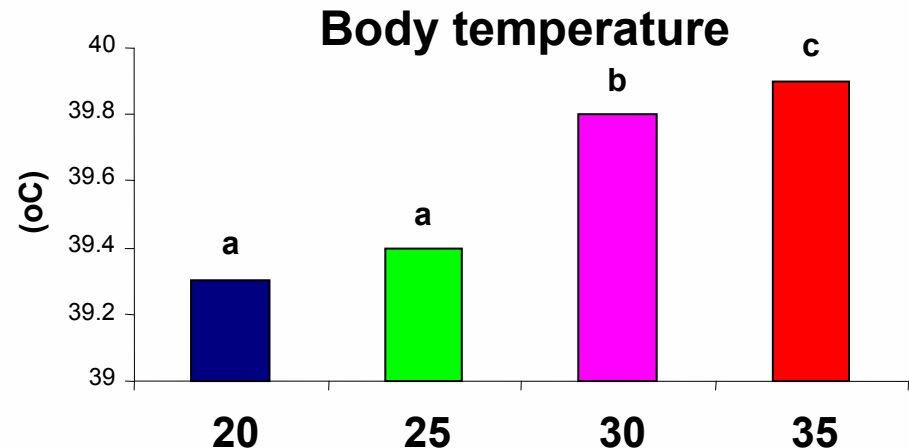
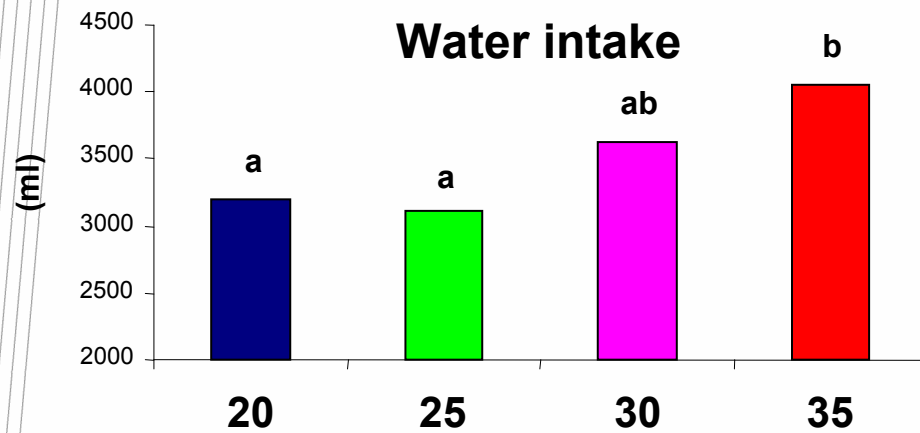
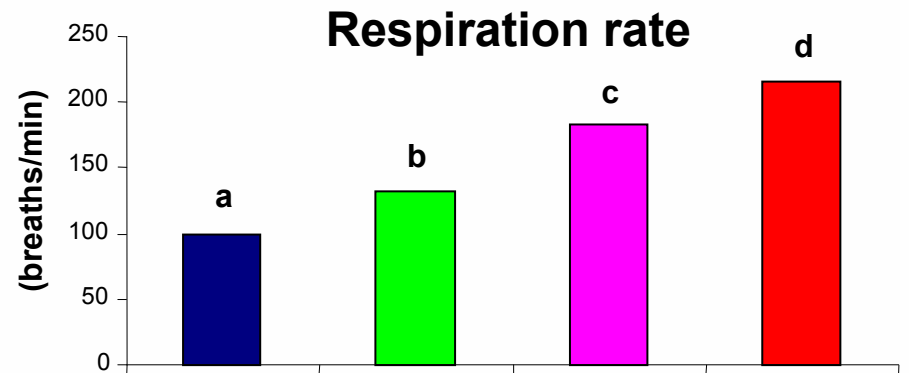
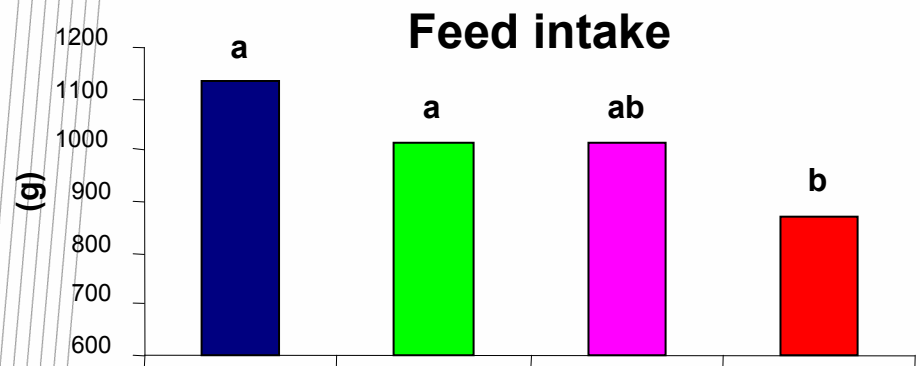
John Barnett and Paul Hemsworth (AWSC), Geoff Hinch (UNE)



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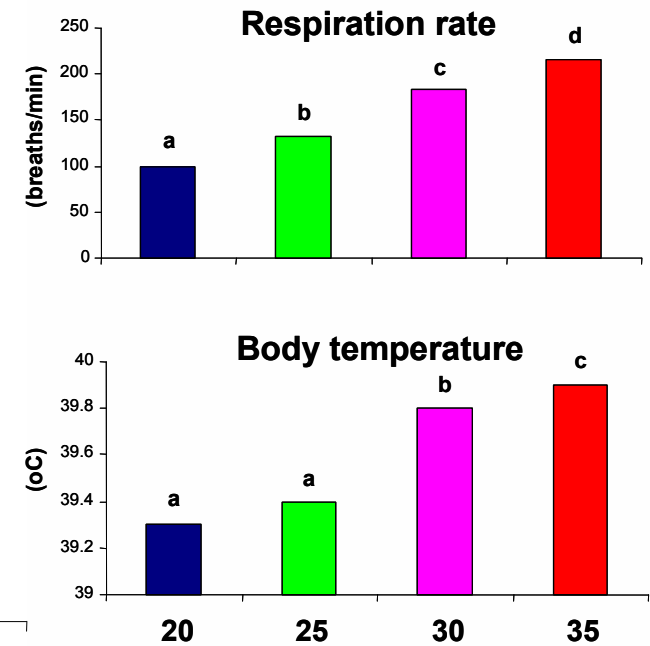
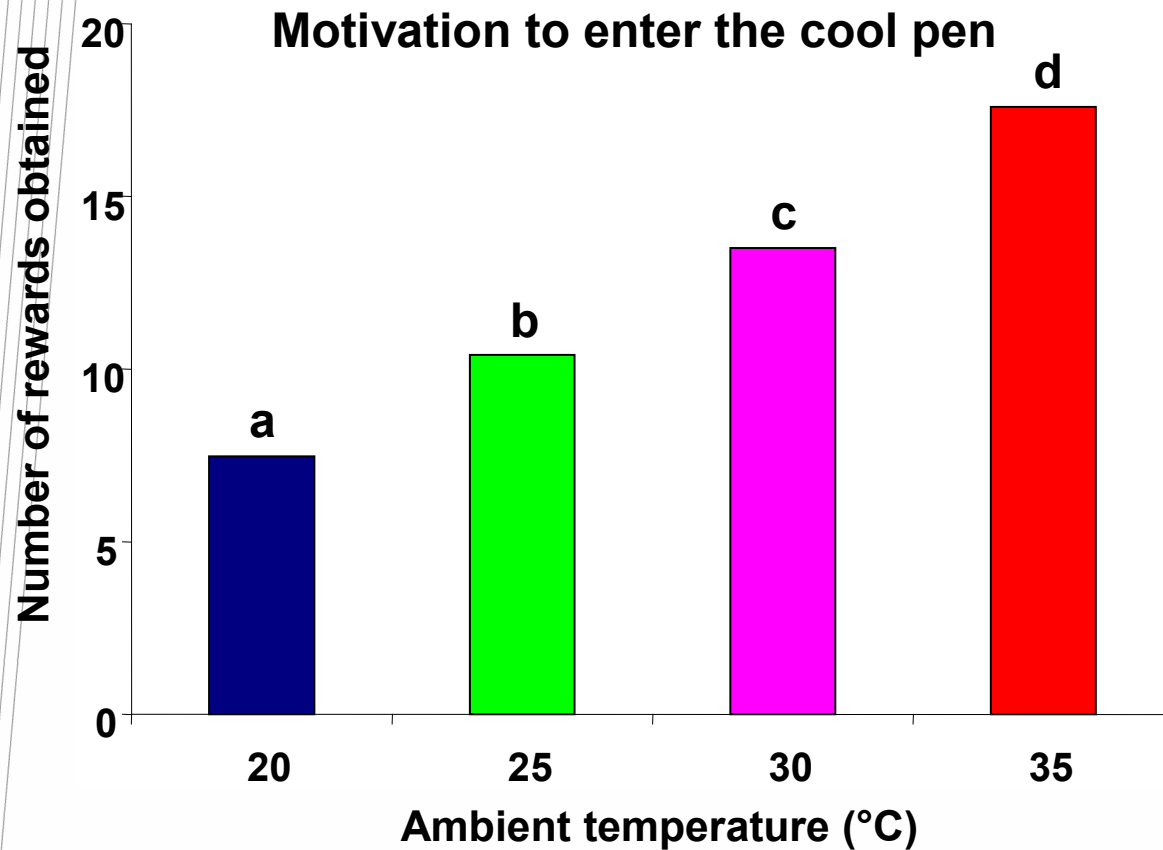


Does animal motivation for stressor avoidance correspond to the biological costs of stress?



Ambient temperature (°C)

Does animal motivation for stressor avoidance correspond to the biological costs of stress?



Four key strategies

- **Biology of animal welfare and its measurement**
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Identification & selection of animals that are adapted to their environment

Jen Smith, Drewe Ferguson, Caroline Lee



Animals adapted to their environment

- **Genetic selection of bare-breech Merino sheep**

- **Funded by AWI**
- **Collaborative with WA Dept. Agriculture**



- **Contribution of sheep temperament to productivity & mothering ability**

- **Funded by MLA**
- **Collaborative with Dominique Blache (UWA)**



- **Quantitative trait loci for welfare-associated traits**

- **Lamb survival**

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Assess and improve welfare outcomes of livestock husbandry practices

Animal Welfare Outcomes of Livestock Road Transport Practices

Drewe Ferguson, Andrew Fisher



Animal Welfare Outcomes of Livestock Road Transport Practices

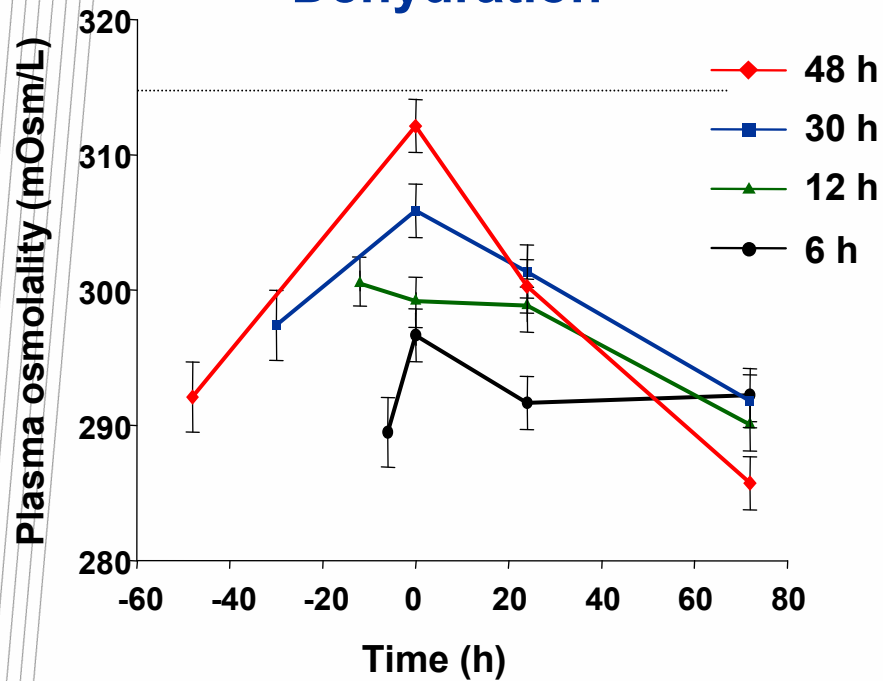
Research Components

- Quantification of the stress responses during initial stages of transport (Cattle)
- Effect of transport duration
 - Cattle (6, 12, 30 and 48 h)
 - Sheep (12, 30 and 48 h)
- Effect of pre-transport curfews (cattle and sheep)
 - 0, 12 and 24 h curfew x 12 and 24 h transport



Effect of transport duration in cattle: 6, 12, 30 & 48 h

Dehydration



Behaviour



Animal Welfare Outcomes of Livestock Road Transport Practices



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AUSTRALIAN ANIMAL WELFARE STANDARDS AND GUIDELINES FOR THE LAND TRANSPORT OF LIVESTOCK



Assessment and improvement of practices

Surgical husbandry procedures

REVIEW

Welfare consequences of mulesing of sheep

C LEE and AD FISHER
CSIRO Livestock Industries, FD McMaster Laboratory, Armidale NSW 2350
Andrew.Fisher@csiro.au

Aust Vet J 2007;85:89–93

10.1111/j.1751-0813.2007.00114.x

PRODUCTION ANIMALS

The effect of a topical anaesthetic formulation, systemic flunixin and carprofen, singly or in combination, on cortisol and behavioural responses of Merino lambs to mulesing

DR PAULL, C LEE, IG COLDITZ, SJ ATKINSON and AD FISHER
CSIRO Livestock Industries, FD McMaster Laboratory, Armidale NSW 2350
Andrew.Fisher@csiro.au

Aust Vet J 2007;85:98–106

doi: 10.1111/j.1751-0813.2007.00115.x

PRODUCTION ANIMALS

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Thank you

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