



THE ANIMAL WELFARE SCIENCE CENTRE ANNUAL REPORT 2011-2012

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Background

The Animal Welfare Science Centre (AWSC) is a research centre of the University of Melbourne and was established in 1997 by the University of Melbourne, Monash University and the Department of Primary Industries (Victoria) as a collaborative Centre for research, teaching and training in animal welfare.

The AWSC has four partners –

- Department of Primary Industries, Victoria. (DPI Vic), Future Farming Systems Research Division.
- The University of Melbourne, (UOM), School of Land and Environment and Faculty of Veterinary Science.
- Monash University (School of Psychology and Psychiatry and Department of Physiology)
- The Ohio State University, (OSU), Department of Animal Sciences and College of Veterinary Medicine.

The Centre has considerable research and teaching capacity in animal welfare science and has made a number of important national and international contributions to research, teaching and training.

Operating Environment

Animal welfare awareness is growing in society, strongly influencing views on animal use and the acceptability of various animal management practices. Stakeholders in the animal welfare domain include the public, generally as consumers, owners or concerned observers, special interest groups, businesses based on the commercial supply of animals and animal products and those developing, implementing or auditing compliance with relevant policy at government or community level. Thus consumer and public attitudes to animal welfare have the potential to dramatically affect the use of animals in society, influencing the operations of livestock industries, medical research, the management of feral and wild animals and the care of recreational and companion animals.

While consumer and public attitudes to animal welfare ultimately determine society's use of domestic animals, science has a critical role in underpinning society's decisions on animal use and the attendant conditions and compromises. Lack of awareness of factual information means that many people are unaware of the conditions under which domestic animals live, how they are treated and their species-specific requirements.

Thus there are basically four key areas of activity necessary to rationally address animal welfare:

- animal welfare science
- understanding public and consumer attitudes to animal welfare
- public education and
- industry education

It is expected that certain animal production and management practices will be highlighted from time to time by community groups and that their viewpoints will be broadcast to the community. It is important that the community has a fully informed perspective that includes scientific information.

While research can be utilised to underpin the establishment, amendment or validation of industry welfare standards and practices, it is critical to deliver industry education, through staff selection and

training strategies, and modify legislation, codes of practice and/or welfare QA programs to achieve these welfare standards.

The Australian community, Industry and Government is served by two Commonwealth animal welfare initiatives which have been established under the Primary Industries Standing Committee (PISC), The Australian Animal Welfare Strategy (AAWS) and the National Animal Welfare Research Development and Extension Strategy.

The AAWS guides the development of new, nationally consistent policies that will enhance existing animal welfare arrangements in all Australian states and territories. The strategy covers the humane treatment of all animals in Australia including:

- livestock/production animals
- animals used for work, sport, recreation or display
- companion animals
- animals in the wild
- aquatic animals, and
- animals used in research and for teaching purposes.

The AWSC is recognised by the AAWS as a leading provider of animal welfare research and expert advice and provides representatives who sit on relevant working groups.

The AAWS facilitated the development of a relationship agreement between the AWSC, CSIRO and the Centre for Animal Welfare and Ethics at the University of Queensland (CAWE) whereby each organisation has agreed to collaborate in animal welfare research.

The National Animal Welfare Research Development and Extension Strategy brings together the core providers of farm animal welfare research with the major funding organisations to deliver targeted cross-sectoral research, development and extension within Australia's livestock industry sector.

The AWSC, together with CSIRO and CAWE are the Australian partners in the OIE Collaborating Centre for Animal Welfare Science and Bioethical Analysis which was formed in 2009 with the Animal Welfare Science and Bioethics Centre of Massey University and the Animal Behaviour and Welfare Research Centre of AgResearch in New Zealand. The OIE Centre supports the OIE region for Asia, the Far East and Oceania by, for example, building regional capacity through "twinning" programs and developing an animal welfare training course.

The AWSC has built upon key discipline strengths of animal behaviour, stress physiology and psychology and their importance in studying human/animal interaction, animal housing and husbandry and community attitudes and behaviour.

Animal Welfare Science Centre activities

The Centre conducts research in three program areas:

1. **Welfare methodology** or the development and validation of methods to assess animal welfare.
2. **Housing and husbandry effects on animal welfare.**
3. **Attitudinal effects:**
 - a. The effects of the attitudes of stockpeople, animal handlers and animal owners on the welfare of their animals.

- b. The effects of attitudes to animal welfare on consumer and community behaviour.

These programs support the fourth program area:

4. Tertiary, post-graduate and industry education and training.

Through these programs, the Centre aims to:

- Develop scientifically defensible welfare methodology.
- Use scientifically defensible methodology to establish, amend or validate animal welfare standards and practices.
- Develop and support industry education and training strategies and provide scientific advice to support the modification of codes of practice and the development of quality assurance programs to introduce scientifically defensible welfare standards in the animal industries.
- Understand public and consumer attitudes to animal welfare to assist Governments and industry in:
 - developing animal welfare policy
 - assuring local and international consumers, public and other governments of the sound welfare standards for Australian domestic animals.
- Ensure tertiary students entering the animal industries are better prepared to provide sound, science-based advice on animal welfare practices to industry, interest groups and the public.
- Provide high quality postgraduate and postdoctoral training for the next generation of researchers and teachers in animal welfare science.

The Centre's activities are guided by our vision and mission:

Our Vision

“Animal welfare and its constant improvement are societal and cultural norms”

Our Mission

“To contribute to improved animal welfare as a world leading provider of expert information, advice and education underpinned by rigorous research”

Centre personnel

Staff of the Centre

The Centre's research and teaching capacity is considerable with scientific expertise and experience in the key disciplines of animal behaviour, psychology, stress physiology and veterinary medicine.

Scientists

Dr. Ian Bland (School of Land and Environment, The University of Melbourne) – Lecturer in Animal Science and Management. Ian is interested in the behaviour and welfare of neonatal/weaned pigs and zoo animal animals.

Mr. Kym Butler (Future Farming Systems Research, DPI, Werribee) – Kym works within the Biometrics Unit, Future Farming Systems Research and applies biometric analysis to the Centre's research projects.

Dr. Peter Cakebread (School of Land and Environment, The University of Melbourne) –Senior Lecturer in Animal Science and Management. Peter's research interests include welfare implications of common dental procedures in horses, behavioural and welfare effects of jaw and dental abnormalities in sows and locomotion and welfare effects of lameness in sows.

Dr. Angus Campbell (Faculty of Veterinary Science, The University of Melbourne) – Angus completed his PhD through the Mackinnon Project in Nov 2006. He provides consultancy services on animal production and farm management to individual farmers, and has considerable experience in delivering educational programs to small groups of farmers.

Prof. Grahame Coleman (School of Psychology and Psychiatry, Monash University) –Grahame has followed a research career in aspects of human and animal behaviour associated with biological rhythmicity and sleep and changes in stress-related and reproductive hormones. Current research interests focus primarily on human-animal interactions in farm and companion animals and public attitudes to animal welfare.

Prof. Andrew Fisher (Faculty of Veterinary Science, The University of Melbourne) – Chair of Cattle and Sheep Production Medicine with the Faculty of Veterinary Science, Andrew has significant experience in the area of animal welfare, with a particular focus on production animal management and transport. Research interests include welfare aspects of flexible feeding systems of dairy cows.

Ms. Gervaise Gaunt (Future Farming Systems Research, DPI, Rutherglen) – A livestock research and extension scientist, with extensive experience in project development, management, analysis, interpretation, delivery and communication. Research interests include identifying strategies that improve the management of sheep for meat and wool production.

Prof. Paul Hemsworth (School of Land and Environment, The University of Melbourne) – Director of the Centre: A research career studying the behaviour and welfare of farm and companion animals, particularly examining the influence of the social and physical environment on farm animal behaviour and welfare and the influence of human-animal interactions on animal welfare and productivity.

Dr. Ellen Jongman (Future Farming Systems Research, DPI, Werribee) - Research interests include the effect of housing, husbandry procedures and management on the welfare of sheep and dairy cows

Dr. Mariko Lauber (Bureau of Animal Welfare, Attwood) – Research interests include behavioural development in dairy calves and its implication in assessing animal welfare implications of new practices and technologies. Current activities focusing on industry, public and tertiary training in animal welfare.

Dr. Brian Leury (School of Land and Environment, The University of Melbourne) – Research interests include animal nutrition and physiology.

Assoc. Prof. Steve Moeller (Department of Animal Sciences, The Ohio State University) –Research interests include human-animal interactions in swine, the effects of housing systems on the welfare of swine and the effects of genetics on pork quality.

Dr. Jean-Loup Rault (School of Land and Environment, The University of Melbourne) – PhD from Purdue University aimed to elucidate the involvement of oxytocin in social behaviour. He has also worked on swine castration, swine euthanasia and human animal interactions. Jean-Loup has worked with an array of species but will focus his research in Melbourne on pigs and poultry. His position is supported by Australian Pork Limited, Australian Egg Corporation Limited and Rural Industries Research Corporation (Chicken meat).

Prof. Alan Tilbrook (SARDI Livestock and Farming Systems) – Deputy Director of the Centre: A research career in endocrinology and behaviour of domestic animals. Particular interests include the endocrine and neuroendocrine control of reproduction in males, the effects of stress on reproduction and endocrine and behavioural responses to stress.

Associate Scientists

Dr. Naomi Botheras – Naomi has research/extension experience in the US where she worked with dairy, swine and poultry producers and scientists in the area of farm animal welfare.

Assoc. Prof. Pauleen Bennett (School of Psychological Science, La Trobe University, Bendigo) - A research career studying behavioural neuroscience related to animal learning and memory formation. Research interest in human-animal interactions, particularly with respect to companion animal species.

Dr. Greg Cronin (Faculty of Veterinary Science, University of Sydney) - A research career studying the behaviour and productivity of pigs and in particular the effects of the environment on maternal behaviour and the role of maternal behaviour in piglet survival and growth. Interested also in alternative housing systems for sows during gestation and farrowing/ lactation and housing systems for poultry.

Dr. Keven Kerswell (Honorary Research Fellow, School of Land and Environment, The University of Melbourne) – Research interests include the characteristics of companion animal owners and communication in the dog.

Dr. Rebecca Morrison (Rivalea Australia, Corowa, NSW) - Rebecca is a Research Scientist at Australia's largest pork production enterprise. She conducted her PhD (Behaviour and welfare of pigs in deep-bedded, group housing systems) with Prof. Paul Hemsworth and Dr. Greg Cronin at the University of Melbourne. Rebecca has worked at the University of Minnesota as the Sustainable Swine Production Systems Scientist, working and researching a range of non-crated farrowing systems.

Dr. Samia Toukhsati – Research interests include animal cognition and welfare, and her recent research has included understanding human-animal interactions, particularly with regard to companion animal owner attitudes and behaviours.

Administration and technical staff

Samantha Borg, Technical Officer, DPI, Victoria

Melanie Conley, Research Assistant, The University of Melbourne

Judy Nash, Research assistant, The University of Melbourne

Vanessa Rohlf, Research Assistant, Monash University

Maxine Rice, Research assistant, The University of Melbourne

Bruce Schirmer, Technical Officer, DPI, Victoria

Jeremy Skuse, Executive Officer, AWSC

Tracey Storey, Technical Officer, The University of Melbourne

Postgraduate students

Linda Beer (Masters student, The University of Melbourne) - Linda's project aims to retrospectively analyse data collected at greyhound race tracks across Victoria to determine the prevalence of injuries sustained by greyhounds during racing, and to identify possible factors that may increase or decrease the likelihood of a greyhound sustaining a serious injury during a race.

Mia Cobb (PhD candidate, Monash University) - Researching the effects of social and environmental enrichment on the welfare of dogs housed in kennel facilities.

Jo Coombe (PhD candidate, The University of Melbourne) - Studying the effects of flexible feeding systems on the health and welfare of dairy cows.

Anoma Dilrukshi (PhD candidate, The University of Melbourne) - The aim of Anoma's research is to define dairy cow behaviour and welfare in feeding systems based on total mixed ration fed in conjunction with grazed pasture.

Joanna Engel (PhD candidate, The University of Melbourne) - The research investigates the effects of housing design on the welfare of laying hens, both physiologically and behaviourally. The housing design consists of three factors; rearing floor space allowance, production floor space allowance, and production nest box access.

Sally Haynes (PhD candidate, The University of Melbourne) - This PhD examines the human-canine relationship in animal shelters during the first 8 days in quarantine kennels, specifically the relationship between the attitudes and behaviours of human handlers and the behaviour and welfare of the dogs. The research will contribute to the training of dog handlers in animal shelters to improve dog behaviour, ease of handling and outcomes as well as providing valuable scientific knowledge regarding the human-canine relationship.

Lauren Hemsworth (PhD candidate, Monash University) - Investigating the welfare of recreational horses in Victoria with emphasis on the occurrence and factors associated with horse welfare.

Tiffani Howell (PhD candidate, Monash University) - Working on the development of a minimally-invasive method for recording EEG in dogs.

Ho Hei Man (Masters student, The University of Melbourne) - carrying out observations on the relationship between aggression and feeding behaviour in group housed gestating sows, with an emphasis on the importance of hierarchy status in accessing the food around the feed drops.

Marcus Karlen (PhD candidate, The University of Melbourne) - Lameness is a common affliction of breeding sows. However, lameness is difficult to diagnose, variations in the physical and physiological state of the sow translate in variations on the sow's gait. Initially this study seeks to establish reliable and repeatable gait scoring to improve detection of mild lameness in sows and then utilise this in the investigation of the importance of the level of aggression on the incidence of lameness in group housed sows.

Tammie King (PhD candidate, Monash University) - Working on methods to identify 'ideal' companion dogs for Australia. Nowadays, dogs are primarily kept as pets, no longer serving the working role for which they were once bred. With differing lifestyles and an increase in urban living it is necessary to determine what constitutes an ideal dog in the present day and ways to accurately identify these desirable behaviour traits.

Megan McCarthy (PhD candidate, Monash University) - aims to undertake a cross-cultural examination of attitudes and behaviours towards pet ownership, specifically cats and dogs, in Australia and Thailand. This study will examine two culturally distinct nations with diverse histories of pet ownership practices. This research will provide a better understanding of how culture is constructed in the process of human interaction with cats and dogs. It is hoped the findings can be utilised to inform animal welfare education programs and policy.

Kate Mornement (PhD candidate, Monash University) - Working on a behavioural assessment of adult shelter dogs to develop a standard, verified protocol to assist in the re-homing of dogs. There are two aims of this study; to review current assessment protocols used by shelters to evaluate adoption suitability (Part 1) and to develop and scientifically validate a standardised shelter dog assessment protocol (Part 2) to potentially be used in shelters and pounds Australia wide.

Christina Ng (Masters student, The University of Melbourne) – working on a project to develop and evaluate an assessment tool to monitor the welfare of dry sows and parturient/lactating sows and their piglets in husbandry and housing systems under study in Pork CRC-funded projects and assess the potential welfare implications of these systems.

Jessica Pempek (PhD candidate, The Ohio State University) - Conducting research examining the effects of individual or paired housing on the behaviour and performance of dairy heifer calves.

Maxine Rice (Masters student, The University of Melbourne) - The relationship between social behavior, feeding behaviour and stress in lambs in intensive finishing systems.

Lauren Roberts (PhD candidate, Monash University) - The objectives of the study include developing a supervisor questionnaire for assessing pig stockperson handling and work performance along with developing a self-report questionnaire to assess stockperson attitudes, behaviour and technical knowledge. The questionnaires will not only provide us with an individual report for each employee, but a large-scale average on work performance, attitudes, behaviour and technical knowledge within the pig industry. This benchmark can then be used in future studies to develop targeted programs.

Vanessa Rohlf (PhD candidate, Monash University) - Studying relationships between owner attitudes and their behaviour towards dogs.

Sally Sherwen (PhD candidate, The University of Melbourne) - Studying the relationship between the visitor behaviour and zoo animal behaviour.

Clara Singh (Masters student, The University of Melbourne) – carrying out observations on maternal behaviour and piglet suckling behaviour in follow-on sow lactation pens.

Bronwyn Stevens (PhD candidate, The University of Melbourne) - Investigating the hypothesis that restricting an animal's access to a highly preferred resource will result in altered biological function.

Megan Verdon (PhD candidate, The University of Melbourne) - Megan's study hypothesises that pigs display specific and consistent behaviours, such as aggressiveness, and that these behaviours can be used to classify the social strategy (dominant, sub-dominant and submissive) a pig adopts when group-housed under stress. In addition, a relationship should exist between a pigs' social strategy and its performance in terms of welfare and productivity. Consequently, her study aims to test whether the distribution of strategies within a group affects the performance of individuals in that group, as well as the group as a whole.

Catherine Webb (PhD candidate, The University of Melbourne) - Using aversion learning and other preference testing techniques, Catherine will investigate the dog's perception of a range of dog training collars and methods to assess both their effectiveness and impact on dog welfare.

Board of Management

Professor Mike Rickard

Chair.

Dr. Ron Prestidge

Executive Director, Future Farming Systems Research, DPI, Victoria.

Professor Rick Roush

Dean, School of Land and Environment, The University of Melbourne.*

Professor Ken Hinchcliff

Dean, Faculty of Veterinary Science, The University of Melbourne.*

Professor Grahame Coleman	School of Psychology and Psychiatry, Monash University.
Professor Ron Kensinger	Chair, Department of Animal Sciences, The Ohio State University.
Professor Paul Hemsworth	Director AWSC, The University of Melbourne.
Professor Alan Tilbrook	Deputy-Director, AWSC, SARDI Livestock and Farming Systems.
*	Prof. Roush and Hinchcliffe alternate on a year by year basis

Advisory Committee

Robert Holmes	Chair - Veterinarian, Animal Behaviour Clinics
Onn Ben David	Deputy Chair - Veterinarian, Caulfield South Veterinary Clinic
Darryl D'Souza	General Manager, Research and Innovation, Australian Pork Limited
Lisa Dwyer	Dairy farmer, Hawkesdale, Victoria
Michelle Edge	CEO, Australian Meat Processors Corporation
Geoff Fiskin	Beef / Sheep farmer, Lal Lal, Victoria
Ian McCauley	Scientist, Future Farming Systems Research, DPI Victoria
David Mellor	Director, Animal Welfare Science and Bioethics Centre, Scientist, Massey University
Denise Noonan	Animal Welfare Officer, University of Adelaide
Glenys Oogjes	Executive Director, Animals Australia
Siobhan O'Sullivan	Social Scientist, The University of Melbourne
Clive Phillips	Director, Centre for Animal Welfare and Ethics, University of Queensland
Philip Szepe	Managing Director, Kinross Farm
Steve Tate	Director, Bureau of Animal Welfare

AWSC Representation on committees in a technical/advisory capacity

Grahame Coleman, Monash University

Animal Welfare Advisory Committee Victoria, (AWAC)

AWAC Responsible Pet Ownership Advisory Committee

AUSAWAC Education and training Working Group

Andrew Fisher, The University of Melbourne

World Organisation for Animal Health, (OIE) Working Group on Animal Welfare in Beef Cattle Production

American Veterinary Medicine Association Animal Welfare Curriculum Planning Group

Sheep Welfare Standards Writing Group

DPI Victoria Livestock Industry Consultative Committee

Cattle Welfare Standards Reference Group

Paul Hemsworth, The University of Melbourne

Animal Welfare Advisory Committee Victoria (AWAC)

OIE Collaborating Centre for Animal Welfare Science and Bioethical Analysis Management Committee

Dairy Australia Animal Welfare Reference Group

Hassad-Australia Animal Welfare Committee

National Animal Welfare R,D&E Strategy Steering Committee

Australian Egg Corporation Limited Hen Welfare Advisory Group

AUSAWAC Animals in research and teaching Working Group

AUSAWAC Research and development Working Group

Ellen Jongman, Department of Primary Industries, Victoria

Consultative Forum on the Livestock Export Industry

Steve Moeller, The Ohio State University

National Pork Board Animal Science Committee

Bobby Moser, The Ohio State University

Livestock Care Standards Board

Jean-Loup Rault, The University of Melbourne

Australian Pork Limited Specialist Group 2 (Genetics, reproduction and welfare)

Jeremy Skuse, Animal Welfare Science Centre

Australian Pork Limited Specialist Group 4 (Industry capability and technology transfer)

Executive Officer, National Animal Welfare R,D&E Strategy Steering Committee

Summary of Centre RD&E projects and 2011/12 project funding if applicable

Program 1 Welfare methodology

Novel peptide mediates the inhibitory effects of stress on female reproduction

Investigators:	A. Tilbrook, I. Clarke, P. Hemsworth
Students:	M. Papargiris (PhD) and C. Keating (PhD)
Funding:	ARC Discovery
11/12 Funding:	n/a
Commencement date:	January 2009
Completion date:	December 2011

Stress inhibits reproduction in females but the specific mechanisms driving this inhibition are unknown. This project offers a novel approach to elucidating stress-induced inhibitors of reproduction. A novel peptide, gonadotropin inhibitory hormone (GnIH), which is present in the brain, is proposed to be the principle protagonist in mediating the inhibitory effects of stress on sexual behaviour and secretion of reproductive hormones in the female. This project will determine the impact of stress on the synthesis and secretion of GnIH and will quantify the effects of GnIH in mediating the inhibitory effects of stress on reproduction in females.

In the first year we showed that stress did not influence the level of mRNA of GnIH in the hypothalamus and we established a working GnIH radioimmunoassay. We also showed that GnIH administered centrally did not influence the secretion of luteinizing hormone in ovariectomized ewes. It was also reaffirmed that the stress hormone cortisol inhibits sexual receptivity but not sexual motivation or the ability of females to attract males. Further, we established that the mechanism of action of cortisol to inhibit receptivity does not involve disruption of the oestradiol signal to induce oestrus.

We plan to generate data to assist in the mechanisms by which stress inhibits sexual motivation and sexual attractivity including the role of GnIH and other relevant neuropeptides.

We have published three journal articles to date and have presented data at national and international laboratories. We have submitted an abstract to the International Congress of Neuroendocrinology. To date, publications and presentation of data at international laboratories has generated substantial debate to the point where requests to collaborate internationally have been forthcoming.

Validating the use of proximity loggers in measuring feeder visits, displacements and social interactions in pigs in competitive feeding situations

Investigators:	M. Rice, P. Hemsworth, E. Jongman, R. Morrison
Funding:	Australian Pork Limited
11/12 Funding:	\$ 11,000
Commencement date:	January 2009
Completion date:	December 2011

High levels of aggression which occur when mixing sows has prompted a large amount of research into the optimal housing, group size and space allowance to reduce aggression. Recently APL funded a

research project examining the behavioural characteristics of individual sows which may predict aggression in groups.

When working with a large number of animals behavioural studies can be time consuming, and sometimes impossible to do with videos (e.g. large space allowances, and large group sizes often make video observations more complicated and tracking individual animals becomes very difficult).

The use of proximity loggers may provide an opportunity to overcome these limitations, however they have not been used within this setting. This project will enable a greater understanding of the full potential of the proximity logger in this setting and secondly validate a methodology for measuring displacements from feeders which could later be tested as a predictive test of aggression.

Objectives

1. To examine the practicability of using proximity loggers with intensively group housed pigs
2. To investigate the accuracy of the proximity logger in determining displacements of pigs from feeders and by whom
3. To examine the repeatability of these displacement observations over time.

Usefulness of preference for resources and biological functioning to assess animal welfare

Investigators: A. Tilbrook, P. Hemsworth, C. Lee

Funding: Australian Pork Limited

11/12 Funding: \$ 58,000

Commencement date: November 2010

Completion date: March 2013

Animal welfare (AW) elicits a range of views within the community, which lead to marked attitudes to AW issues. Welfare groups lobbying specific animal industries/ practices indicate the strength and implications of these views.

Science has a critical role in underpinning our decisions on animal use and attendant conditions and compromises. Biologists have the responsibility of establishing the facts on how animals biologically respond to various practices, whether they relate to farming, laboratory or general community uses of animals. Gaining a consensus on the welfare implications of a specific animal use would appear to be an easier task to achieve amongst scientists than within the general community. However, conflicts have arisen in science around the definition of AW and the methodology used to assess AW varies amongst scientists.

Differing definitions of AW provoke debate on AW assessment and standards. This unease with the definition exists both within science and more broadly when decisions on acceptable welfare standards are being made by individuals or the community. This is a limitation, since an important step in developing defensible policies on animal care and use is to assemble factual information on the animal's biological responses to the particular system or treatment.

While there is limited evidence that deprivation of highly preferred resources results in biological dysfunction, research utilizing well-accepted stress models is required to understand the relationships between these concepts and methodologies. Particularly, research is required to examine the effects of deprivation of these resources on the animal's behaviour, physiology, health and fitness.

Therefore, the general objective of this project is to improve our understanding of the relationship between these two main methodologies of AW by testing the hypothesis that deprivation of highly preferred resources results in biological dysfunction. This fundamental research may assist in reducing the interpretative differences in AW science.

Objectives

To determine the relationships between the two main approaches to welfare assessment, the functioning approach and the preference approach. A sound understanding of these two methodologies is essential in the validation of welfare research methodology to establish welfare standards and develop tools to measure welfare in the field.

Program 2 Housing and husbandry effects on animal welfare

Importance of rearing environment, space and nests for laying hens in cages

Investigators: P. Hemsworth, A. Tilbrook, T. Widowski

Student: J. Engel (PhD)

Funding: Australian Egg Corporation Limited

11/12 Funding: \$ 91,000

Commencement date: September 2009

Completion date: April 2012

The two most contentious issues in relation to cage housing and hen welfare are space and the need for a nest. The literature on space allowance in cages shows that in general as floor space increases, within a range of 300 to 650 cm²/hen, welfare generally increases, based on decreased mortality and higher egg production and body weight. At the lower space there is also evidence of increased stress. A recent AECL project that included measures of stress showed that in cages with a space allowance of 750 and 1500 cm²/hen, while there were effects of group size there were no effects of space allowance on hen welfare. Similarly, a recent AECL project on nests in cages showed that about 30% of hens consistently chose to lay eggs on the cage floor and that the presence or absence of a nest had no effects on a number of stress-related measures indicative of a chronic stress response.

This project is using the 2 most common methodologies to assess animal welfare, measuring animal preferences and biological functioning. Preference tests are used by scientists to draw inferences on animal welfare on the basis that these preferences are influenced by the animal's emotions (or feelings), which are prime determinants of its welfare. Measuring biological functioning involves the integrated use of behavioural, physiological, health and fitness measures.

Determining how space allowance and nests in cages affect hen welfare will assist the egg industry both by demonstrating that cages may be an appropriate environment for laying hens and in any negotiations with Government on future space allowances and/or requirement for nests for laying hens.

Effects of aggressive characteristics of individual sows and mixing strategies on the productivity and welfare of group-housed gestating sows

Investigators: P. Hemsworth, R. Morrison, G. Cronin, A. Tilbrook, T. Widowski
Student: M. Verdon (PhD)
Funding: APL / Pork CRC
11/12 Funding: \$ 139,000
Commencement date: January 2010
Completion date: June 2012

High levels of aggression are commonly observed in newly formed groups of sows after mixing: this aggression, especially if intense and prolonged, may lead to injuries and stress. However, there are few rigorous recommendations in the scientific literature on the design features of sow group housing that reduce aggression. While the problem of pig aggression has received considerable attention, detailed studies of aggressive behaviour have generally used staged paired encounters or small group sizes. These research settings are very different from commercial settings.

While space, time of mixing and provision of feeding stalls may reliably reduce aggression and stress in group-housed sows, it is clear that a better understanding of the effects of the composition of the group, particularly aggressive behaviour of individual sows, may have important implications for both the welfare and reproductive performance of the group as a whole. For example, the opportunity arises to assemble groups that perform well in terms of overall welfare and reproductive performance based on the composition of the group if (1) the composition of the group in terms of aggressiveness of its individuals is related to the overall stress level in the group and (2) this behavioural characteristic is stable over time and/or is heritable.

Therefore, project is examining whether the composition of groups, particularly in terms of the aggressive behaviour of individual sows, is related to the welfare and reproductive performance of the group as a whole. Furthermore, this project will also examine the use of boars, straw enrichment and dietary supplements on aggression in sows at mixing.

This project will provide fundamental knowledge to the Australian pig industry on basic principles of mixing pregnant sows. Such knowledge is essential as the industry moves to more use of group housing systems for breeding females. Furthermore, such knowledge is required to develop and defend science-based recommendations on sow housing during gestation.

Effects of floor space on the welfare of group-housed sows

Investigators: P. Hemsworth, A. Tilbrook, J.L. Rault, S. Moeller, R. Morrison, P. Hughes
Funding: Pork CRC
11/12 Funding: \$13,000
Commencement date: January 2012
Completion date: July 2014

Housing gestating sows in stalls is being voluntarily phased out by the Australian pork industry by 2017, making the viability and logistics of group housing an important concern for the Australian Pork Industry, with the industry investigating several group housing options. Furthermore, and of critical importance, the Australian Model Code of Practice for the Welfare of Animals – Pigs is due for review by 2018.

The aim of this project is to provide the Australian pork industry and Government with scientifically-sound and scientifically-defensible recommendations on spatial requirements of group-housed gestating sows.

The knowledge gained through this project will be provided to the Australian pork industry and the wider community via a Pork CRC Final Report, industry publications, industry conferences and scientific publications.

Evaluation of sow and piglet behaviour and performance in individual follow-on lactation pens

Investigators: J. Skuse, P. Hemsworth, G. Charles
Student: C. Singh (MSc)
Funding: Australian Pork Limited and Pork CRC
11/12 Funding: \$ 25,000
Commencement date: March 2012
Completion date: January 2013

The development of alternate housing systems for farrowing sows has been identified as a key focus of the CRC for High Integrity Australian Pork due to consumer preference for confinement free housing of pigs and other intensively raised food animals.

Observations on maternal behaviour and piglet suckling behaviour will be recorded together with performance data. Knowledge gained through this project will be provided to the Australian pork industry and the wider community via an APL Final Report, industry publications, industry conferences and scientific publications.

Welfare of lambs in intensive finishing systems Part 2

Investigators: P. Hemsworth, A. Tilbrook, E. Jongman, A. Campbell, B. Leury
Student: M. Rice (MPhil)
Funding: Department of Primary Industries, Victoria
11/12 Funding: \$ 95,000
Commencement date: July 2010
Completion date: June 2012

This two year project will involve two main studies, one a preparatory study and one a major study. The first study will validate remote proximity sensors (radio frequency identification tags) to measure feeding behaviour and social interactions (e.g. displacements from feeders). The opportunity will also be taken in this study to examine relationships between feeding behaviour, and social interactions. The second study will examine the effects of floor and feeder trough space on lamb welfare in an 'industry best practice intensive finishing system'.

Objective/s:

1. Determine the validity of remote proximity sensors to measure feeding behaviour and displacements from feeders.
2. Identify the effects of floor and feeder trough space on lamb welfare in an 'industry best practice intensive finishing system'.

Optimising dairy cow behaviour and welfare within flexible feeding systems

Investigators: A. Fisher, E. Jongman, P. Mansell, M. Pyman, G. Auldist, W. Wales
Students: A. Dilrukshi (PhD), J. Coombe (PhD)
Funding: Department of Primary Industries, Victoria
11/12 Funding: \$ 199,000
Commencement date: February 2010
Completion date: June 2012

Dairy farmers in south eastern Australia are challenged by the need to feed their dairy cows profitably in the face of increased climate variability which directly impact on the availability of water for grazed forage production. More recently, that grazed pasture constitutes less than 50% of a cow's diet annually, with the remainder being made up of expensive, high-energy concentrates. By necessity this simple system is being replaced with flexible systems that integrate mixed rations, fed on feed pads with grazed pastures (Partial Mixed Rations-PMR), while optimizing cow behaviour and welfare.

This project will address specific questions relating to cow comfort and behaviour within PMR systems and the success of this project will enable dairy farmers to adopt strategies that optimize cow behaviour and welfare within flexible feeding systems.

The anticipated outcome of this large project is to facilitate the ability of dairy producers to adopt more flexible, more profitable feeding systems while achieving appropriate standards of cow health and welfare.

Metabolic Welfare of Calves

Investigators: E. Jongman, A. Fisher
Funding: Department of Primary Industries Victoria
11/12 Funding: \$ 160,000
Commencement date: January 2012
Completion date: June 2014

The recent development process for the Australian Standards and Guidelines for the Welfare of Animals highlighted that both management and transport of calves arising from the dairy industry remains a contentious area. Sources have indicated that welfare problems may arise in bobby calves arriving at abattoirs (eg Cave et al, 2005; Hides 2007). Certainly, it is generally acknowledged that bobby calves, because of their age and vulnerability, require special care during handling and transport. Each year, in Victoria, up to 860,000 calves are transported and slaughtered. Up to 300,000 heifer calves are separated from their dams immediately after birth and reared on farm to be available as replacements for Victoria's 1.02 million dairy cows. Calf management has become the focus of welfare attention on the dairy industry, and the industry itself has begun to address the need for research and farmer education.

Objective:

Determine the effect of feeding management of calves less than 10 days of age, in terms of feed allowance and feeding frequency, on metabolic state, growth and welfare as part of the bobby calf supply chain.

The influence of human-animal interactions on the behavioural and physiological responses of piglets to a stressor

Investigators: P. Hemsworth, R. Muns Vila
Student: R. Muns Vila
Funding: University of Melbourne
11/12 Funding: \$ 16,000
Commencement date: December 2009
Completion date: June 2013

Reducing stress in captive animals can be achieved by modifying the animal's environment through the identification and elimination of stressors, environmental enrichment or genetic selection that enhance stress resilience. Surprisingly there have been few attempts to examine strategies using positive classical conditioning to reduce stress, possibly through influencing emotional states.

This study examined the effects of providing piglets with the opportunity to associate humans with feeding during the first day of life on their response to subsequent stressors imposed by humans and was conducted to inform an ARC Discovery project application.

A paper from this research will be submitted at this year's International Society for Applied Ethology conference in Vienna. The paper is titled "A positive mindset in the face of stress" and the authors are Muns Vila, R., Farish, M., Rault, J.-L. and Hemsworth, P.H.

Identification of risk factors for racetrack injuries in greyhounds in Victoria

Investigators: A. Campbell, A. Fisher, K. Stafford
Student: L. Beer (MSc)
Funding: University of Melbourne, Greyhound Racing Victoria
11/12 Funding: n/a
Commencement date: December 2009
Completion date: June 2013

This project aims to analyse data collected at greyhound race tracks across Victoria to determine the prevalence of injuries sustained by greyhounds during racing, and to identify possible factors that may increase or decrease the likelihood of a greyhound sustaining a serious injury during a race.

Program 3 Attitudes to animals and animal welfare, and farmer, consumer and community behaviour

The relationships between human attitudes, human behaviour and the behaviour and welfare of dogs in shelters and veterinary clinics.

Investigators: P. Hemsworth, G. Coleman
Student: S. Haynes (PhD)
Funding: DAFF (AAWS), University of Melbourne (AWSC)
11/12 Funding: \$ 12,000
Commencement date: March 2009
Completion date: March 2012

Previous research has demonstrated the existence of a significant sequential relationship between stockperson attitudes, stockperson behaviour and animal behaviour and animal welfare in livestock settings. Routine stockperson behaviours used to inspect and handle animals may have profound effects on the behaviour and stress physiology of livestock, in turn affecting livestock productivity and welfare.

Despite more than 37% of Australian households owning one or more dogs, there is a limited understanding of the link between human attitudes and behaviour and canine behaviour and welfare. This project will study the human-canine relationship in several well-defined settings, each setting defined and differing in terms of the duration and nature of human contact. Veterinary clinics and animal shelters will be used to examine the relationships between the attitudes and behaviour of 'handlers' to dogs, for example shelter attendants and veterinarians, and the behavioural response of dogs to both the handler and to humans in general. The opportunity will also be taken to examine outcomes in these settings such as ease of handling and subsequent responses to the veterinary clinic as well as rehousing outcomes in animal shelters. The results of these studies will contribute to the handling recommendations for dogs in shelters and veterinary clinics to improve dog behaviour, ease of handling and outcomes as well as providing valuable scientific knowledge regarding the human-canine relationship.

If these are significant relationships between the attitudes and behaviour of 'handlers' in these settings to dogs and the behavioural response of dogs to both the handler and to humans in general, the opportunity arises to utilise training programs to target attitudes and behaviours to improve human-animal interactions in these settings and thus some behavioural and perhaps welfare outcomes for the dogs.

Assessing public metrics to benchmark stock handling

Investigators: G. Coleman, P. Hemsworth, S. Toukhsati
Student: L. Roberts (PhD)
Funding: Australian Pork Limited
11/12 Funding: \$ 54,000
Commencement date: September 2010
Completion date: December 2012

Research has shown that stockpeople have a major impact on the welfare of their livestock, however the topic of 'stockmanship' has received relatively little attention. While welfare monitoring schemes are likely to improve animal welfare, the impact of such schemes will only be realised by recognising the limitations of stockpeople and including stockperson benchmarking in welfare audits. Monitoring the stockperson is a key component of any welfare monitoring scheme.

The ability to benchmark stockhandling through the development of tools which reliably measure stockperson attitudes, knowledge and beliefs will enable the industry to demonstrate a clear commitment to animal welfare and will also enable the industry to demonstrate improvements in stockperson attitudes and behaviour.

Objectives

1. Development of a supervisor questionnaire for assessing stockperson handling and general work performance
2. Development of a self report questionnaire to assess stockperson attitudes and knowledge

ProHand® Pigs in US

Investigators: S. Moeller, N. Botheras, P. Hemsworth, G. Coleman

Student: S. Crawford (PhD)

Funding: The Ohio State University (AWSC) Funded

11/12 Funding: \$ n/a

Commencement date: March 2010

Completion date: December 2012

Today in the United States there are more pigs being raised under contract production than ever. In a study completed by the USDA, it was reported that the total number of hogs raised under contract increased from five percent in 1992 to 67 percent in 2004 (USDA). However, little information is known about contract producers with regard to their attitudes, behaviours, gender, or previous swine production experience, to name a few characteristics.

This project will study the contract producers with two primary objectives in mind:

1. To assess baseline stockperson/contract grower beliefs and attitudes toward grower-finisher pigs and assess the subsequent behaviours toward pigs as they influence pig fear responses, and
2. Assess the efficacy of ProHand Pigs stockperson training in modifying existing attitudes, beliefs and behaviours of stockperson toward pigs, with the ultimate goal of developing a version directed toward contract grower-finisher production settings.

Data collection will be beginning in the second quarter of 2010 on 32 Ohio farms and will continue into 2011

Human-animal relationships in zoos: understanding the impact of visitors on the welfare of non-human primates in Australian zoos

Investigators: P. Hemsworth, C. Phillips, M. Magrath, S. Sherwen
Student: S. Sherwen (PhD)
Funding: Zoos Victoria, DAFF (AAWS)
11/12 Funding: \$5,000
Commencement date: June 2011
Completion date: October 2011

Zoo visitors are an integral part of life for zoo animals but we have limited understanding of how visitor numbers and behaviour influence their welfare. This project will fill a major gap in our knowledge and be the first to thoroughly investigate visitor effect on animal welfare using preference testing, behavioural observations, physiological assessment and replication.

In this preliminary study, five target zoos across Australia will be visited to define enclosure characteristics and create an ethogram of animal behaviours (with visitors present and absent).

Program 4 Tertiary and post-graduate education and training

Review of registered ProHand[®] Pigs facilitators

Investigators: J. Skuse
Funding: Australian Pork Limited
11/12 Funding: \$ 9,000
Commencement date: February 2012
Completion date: January 2013

This project will audit ProHand[®] Pigs facilitators to ensure the program is being delivered to an acceptable standard. Future training needs will also be identified and a refresher course will be provided for facilitators.

Design and delivery of a Day 2 Powerpoint Presentation for ProHand[®] Dairy

Investigators: J. Skuse
Funding: Dairy Australia
11/12 Funding: \$ 6,000
Commencement date: February 2012
Completion date: January 2013

This project will develop a multimedia presentation to deliver Day 2 ProHand Dairy content.

Mapping ProHand® stockperson training packages against current livestock industry competencies and establishing recommendations for future accreditation

Investigators: J. Skuse, M. Edge, R. Brown

Funding: DAFF (AAWS)

11/12 Funding: n/a

Commencement date: June 2010

Completion date: May 2012

This project will address the above by first, mapping in detail, all of the available ProHand program(s) to all of the relevant livestock industry competency units (within several different diplomas), including the core assessment requirements. This exercise will also provide insight into future revisions of ProHand that may include specific assessment tools required to fulfil the applicable competency requirements of the mapped units.

The project will also examine options for accrediting the ProHand packages. There are several ways this may be examined – first, as part of quality assurance certification, where the package may be accredited in relation to specific standards, and second – registration of the packages as a formal course in accordance with the policies specified by the National Training Information Service and State Training Authorities. Depending on the mapping exercise, ProHand may be more suitable for the latter option, especially as it is likely that the program may only meet part of the guidelines of existing Training Package(s) or accredited course(s). The objective of the project will be to produce a report with two parts: 1) the mapping of ProHand against the core competency assessment requirements for relevant livestock units and 2) discussion on the options for accreditation of the ProHand packages based on the findings for part 1.

Delivery of “Animals in society” as part of the “Human and animal interactions” cluster at The Ohio State University.

Investigator: P. Bennett, J. Osborne

Funding: The Ohio State University

11/12 Funding: n/a

Commencement date: July 2007

Completion date: ongoing

“Animals in Society” (AIS) is an introductory course designed to introduce students to the social, cultural, economic and legal frameworks within which current human-animal relationships exist. The course was developed by the Animal Welfare Science Centre in collaboration with the Department of Animal Sciences at OSU. AIS fulfils a Social Science elective and was offered for the first time during the Autumn 2007 quarter.

Students in this course, explore a wide range of current animal roles with a view to broadening their understanding of how integral our relationships with animals are in maintaining human physical, social and psychological health and well-being. Currently, there is a wide range of views about animals, often based on misinformation and poorly informed value-based judgments. AIS is designed to equip students with the knowledge and critical thinking skills necessary to address questions concerning how animals can best co-exist with human societies.

Students learn to appreciate the physical, social and psychological interdependence between species and be able to use the knowledge acquired to objectively, critically, and sensitively evaluate and comment on emerging issues regarding animals in society.

Delivery of “Animals in Society” as a breadth subject at the University of Melbourne.

Investigator: P. Hemsworth, JL. Rault, B. Stevens, T. Chamberlain

Funding: The University of Melbourne

11/12 Funding: n/a

Commencement date: July 2008

Completion date: ongoing

This course is offered as a breadth subject throughout the University and is designed to encourage students to begin to think about how and why animals are so integral to human society.

The course investigates the human-animal relationships, where they originated, during domestication, and where they are now. Also examined in detail are some key relationships between humans and animals, including animals as pets, in agriculture, as research subjects, in educational roles and as pests.

A key topic is a study of the changing attitudes of humans towards animals throughout time and humankind's moral and ethical obligation to animal wellbeing. The course animal welfare science and discusses some of the current animal welfare issues in livestock industries around the world. The course looks to the future and where the relationship between humans and animals may be headed.

Other

Research Fellow (pigs and poultry) at the University of Melbourne.

Investigator: JL. Rault

Funding: Australian Pork Limited, Australian Egg Corporation Limited, Rural Industries Research and Development Corporation (Chickenmeat)

11/12 Funding: \$ 120,000

Commencement date: October 2011

Completion date: September 2014

Centre RD&E Communications

1. Books / book chapters

Hemsworth, P.H. and Boivin, X. (2011). Human contact. In "Animal Welfare", edited by M. C. Appleby, J. A. Mench, I. A. S. Olsson and B. O. Hughes. CAB International, Oxon UK. pp 246-262.

2.a Research publications in refereed journals

Betts, K.S., Moeller, S.J., Zerby, H.N. DeRouchey, J.M., Cressman, M.D., Bishop, M.J., Gress, A.I. and Fluharty, F.L. (2011). Effects of ractopamine on performance, carcass and meat quality in purebred Berkshire swine. *Journal of Animal Science*, Volume 89, E-Supplement 1: 460.

Bland, I. (2011). Dog Obesity: Keeping the weight off. *The Veterinary Journal* 192:3

Coleman, G.J., Rice, M. and Hemsworth, P.H. (2012). Human-animal relationships at sheep and cattle abattoirs. *Animal Welfare*, 21 (S2), 15-21.

Crawford, S.M., Moeller, S.J., Hemsworth, P.H., Croney, C.C. Botheras, N.A. and Zerby, H.N. (2011). Characteristics of the work habits and demographics of caretakers on swine finishing facilities in Ohio. *Journal of Animal Science*, Volume 89, E-Supplement 1: 463.

Cronin, G.M., the late Barnett, J.L. and Hemsworth, P.H. (2012). The importance of pre-laying behaviour and nest boxes for laying hen welfare: a review. *Animal Production Science*, published on-line 1 May 2012. <http://www.publish.csiro.au/paper/AN11258.htm>

Dunshen, F.R., Cronin, G.M., Barnett, J.L., Hemsworth, P.H., Hennessy, D.P., Campbell, R.G., Luxford, B., Smits, J., Tilbrook, A.J., King, R.H. and McCauley, I. (2011). Immunisation against gonadotrophin-releasing hormone (GnRH) increases growth and reduces variability in group housed boars. *Animal Production Science* 51, 695–701.

Fisher, A.D. (2011). Addressing pain caused by mulesing in sheep. *Applied Animal Behaviour Science*, Volume 135, pp. 232-240.

Hemsworth, P.H., Rice, M., Karlen, M.G., Calleja, L., Barnett, J.L., Nash, J. and Coleman, G.J. (2011). Human- animal relationships at abattoirs: relationships between handling and animal stress in sheep and cattle. *Applied Animal Behaviour Science* 135, pp. 24-33

Howell, T.J., Conduit, R., Toukhsati, S. and Bennett, P.C. (2011). Development of a minimally-invasive protocol for recording mismatch negativity, (MMN), in the dog, (*Canis Familiaris*) using electroencephalography (EEG). *Journal of Neuroscience Methods*, Volume 201, pp. 377-380.

Howell, T.J. and Bennett, P.C. (2011). Puppy power! Using social cognition research tasks to improve socialization practices for domestic dogs, (*Canis Familiaris*). *Journal of Veterinary Behaviour*, Volume 6, pp. 195-204.

Howell, T. J. and Bennett, P.C. (2011). Can dogs (*Canis familiaris*) use a mirror to solve a problem? *Journal of Veterinary Behaviour: Clinical Applications and Research*, Volume 6, pp. 306-312.

Howell, T., Conduit, R., Toukhsati, S., and Bennett, P.C. (2012). Auditory stimulus discrimination recorded in dogs, as indicated by mismatch negativity (MMN). *Behavioural Processes*, 89 (1): p. 8-13.

King, T., Marston, L. C. and Bennett, P. C. (2012). Breeding dogs for beauty and behaviour: Why scientists need to do more to develop valid and reliable behaviour assessments for dogs kept as companions. *Applied Animal Behaviour Science*. 137, 1-12.

Lauber, M. Nash, J.A., Gatt, A. and Hemsworth, P. H. (2012). Prevalence and incidence of abnormal behaviours in individually housed sheep. *Animals* 2, 27-37.

Li, J., Wijffels, G., Yu, Y., Nielsen, L.K., Niemeyer, D.O., Fisher, A.D., Ferguson, D.M. and Schirra, H.J. (2011). Altered fatty acid metabolism in long duration road transport: An NMR-based metabolomics study in sheep. *Journal of Proteome Research* 10: 1073-1087.

McGreevy, P.D, Starling, M., Branson, N.J., Cobb, M.L. and Calnon, D. (2012) An overview of the dog-human dyad and ethograms within it. *Journal of Veterinary Behavior: Clinical Applications and Research*.7(2): pp.103-117.

Papargiris, M. M., Rivalland, Hemsworth, P.H., Morrissey, A. D. and Tilbrook, A. J. (2011). Acute and chronic stress-like levels of cortisol inhibit the oestradiol stimulus to induce sexual receptivity but have no effect on sexual attractivity or proceptivity in female sheep. *Horm Behav.* 2011 Sep;60(4):336-45. Epub 2011 Jun 29.

Papargiris, M. M., Rivalland, E. T., Clarke, I. J., Smith, J. T., Pereira, A. and Tilbrook, A. J. (2011). Evidence that RF-amide related peptide-3 is not a mediator of the inhibitory effects of psychosocial stress on gonadotrophin secretion in ovariectomised ewes. *J Neuroendocrinol.* 2011 23(3):208-15. doi: 10.1111/j.1365-2826.2010.02094.x.

Pempek, J., Eastridge, M., Botheras, N.A., Croney, C.C. and Bowen, W. (2011). Effects of alternative housing and feeding systems on the performance of dairy heifer calves. *J. Dairy Sci.* 94 (E. Suppl. 1):8.

Rault, J-L. (2012). Friends with benefits: Social support and its implications for farm animal welfare. *Applied Animal Behaviour Science.* *Applied Animal Behaviour Science* 136(1): 1-14.

Rohlf, V. I., Bennett, P. C., Toukhsati, S. & Coleman, G. (2012) Beliefs Underlying Dog Owners' Health Care Behaviors: Results from a Large, Self-Selected, Internet Sample. *Anthrozoos*, 25(4) 171-185.

Toukhsati, S.R, Young, E., Bennett, P.C. and Coleman, G.J. (2012). Wandering cats: Attitudes and behaviours towards cat containment in Australia. *Anthrozoos*, 25, 61-74.

2.b Research papers in press

Gunaseelan, S., Coleman, G.J., & Toukhsati, S.R. (in press). Attitudes towards responsible pet ownership behaviors in Singaporean cat owners. *Anthrozoos*.

Hemsworth, P.H., Cronin, G.M., Barnett, J.L., Butler, K.L., Jongman, E.C., Karlen, G.A., Coffey, A., and Arnold, N.A. (2012). Behavioural responses of lambs to an alternative procedure to mulesing. *Australian Veterinary Journal* (accepted for publication 11 January 2012).

Kerswell, K.J., Bennett, P.C, Butler, K.L and Hemsworth, PH. (in press). Self-Reported Comprehension Ratings of Dog Behavior by Owners of Adult Dogs. *Anthrozoos*.

3.a Refereed Conference publications

Betts, K.S., Moeller, S.J., Zerby, H.N., Crwaford, S.M., Bishop, M.J. and Cressman, M.D. (2011). Effects of ractopamine on behavior of purebred Berkshire swine. *Proceedings of the 45th Congress of the International Society for Applied Ethology*, 1-4 August 2011, Indianapolis, USA, p. 134.

Botheras, N.A., Pempek, J., Enigk, D. and Hemsworth, P.H.H. (2011). Relationship between amount of human contact and fear of humans in turkeys. *Proceedings of the 45th Congress of the International Society for Applied Ethology*, 1-4 August 2011, Indianapolis, USA, p. 88

Brown, J. S., Telbisz, R.M., & Toukhsati, S.R. (2011) When A Shelter Becomes A Home: The Ethical Considerations Surrounding Environmental Enrichment. *Proceedings of The Australasian Society for the Study of Animal Behaviour*, Australia, Adelaide, April 11th – 13th 2011.

- Chamberlain, T.S., Hughes, P.E., Dunshea, F.R. and Hemsworth, P.H. (2011). The influence of boar sexual behaviour at the time of exposure on the induction of puberty in gilts. *Manipulating Pig Production XIII. Proceedings of the 13th Biennial Conference of the Australasian Pig Science Association*, p. 78.
- Coombe, J.E., Pyman, M., Mansell, P.D., Auld, M.J., Anderson, G.A., Wales, W.J., Malmo, J. and Fisher, A.D. (2012). The effects of feeding systems on the hoof health of dairy cows in South Eastern Australia. *Proceedings of XXVII World Buiatrics Congress, 3-8 June 2012, Lisbon, Portugal*.
- Crawford, S.M., Moeller, S.J. and Hemsworth, P.H.H. (2011). Characteristics of stockperson interactions with pigs in swine finishing facilities. *Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA*, p. 89.
- Cronin, G.M., Barnett, J.L., Storey, T.H., Thomson, P.C and Hemsworth, P.H. (2012). The relationship between pre-laying activity and corticosterone concentrations and the interpretation for laying hen welfare. *Proceedings, Australian Poultry Science Symposium 23*, pp. 168-171.
- Engel, J., Bont, Y. and Hemsworth, P.H.H. (2011). Effect of cage design on consistency of orientation and location during oviposition of laying hens. *Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA*, p. 118.
- Hemsworth, L. M., Jongman, E. J. and Coleman, G. J (2011). Factors predicting horse welfare outcomes from a recreational horse owner's performance of key horse husbandry practices. In: *Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA*, p. 147.
- Jongman, E. J., Hemsworth, P.H. and Borg, S. (2011). The effects of space allowance and exercise for greyhounds on welfare. *Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA*, p. 108.
- Karlen, G.M., Lee, Z.Z., Nash, J.A. and Hemsworth, P.H. (2011). The relationships between agonistic behaviour, injuries and stress in group-housed sows. *Manipulating Pig Production XIII. Proceedings of the 13th Biennial Conference of the Australasian Pig Science Association*, p. 97.
- King, T., Marston, L.M. and Bennett, P. (2011). The development of a behavior assessment to identify "amicable" dogs. *Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA*, p. 25.
- Mellor, D. J., Hemsworth, P. H., Barnett, J. L. and Young, I. R.1. (2011). Species-specific Approaches Aid Effective Implementation of the Three Rs in Farm Animal Research. *Proceedings of the 8th World Congress on Alternatives and Animal Use in the Life Sciences, Montreal, Canada, 21-25 August 2011, Session IV-1*.
- Mornement, K., Coleman, G., Toukhsati, S., Bennett, P. 'A new perspective on assessing shelter dogs'. *National G2Z Summit to End Companion Animal Overpopulation. September 2011. Gold Coast QLD Australia*.
- Morrison, R.M., Cronin, G.M. and Hemsworth, P.H. (2011). Sow housing in Australia – current Australian welfare research and future directions. *Manipulating Pig Production XIII. Proceedings of the 13th Biennial Conference of the Australasian Pig Science Association*, pp. 219 - 238.
- O'Keefe, L., Rice, M. and Hemsworth, P.H. (2011). A study of the relationships between social and feeding behaviour and injuries in group-housed gestating gilts. *Manipulating Pig Production XIII. Proceedings of the 13th Biennial Conference of the Australasian Pig Science Association*, p. 101.

Pempek, J., Eastridge, M., Botheras, N.A., Croney, C.C. and Bowen, W. (2011). Effects of alternative housing and feeding systems on the performance and behavior of dairy heifer calves. Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA, p. 130.

Rice, M., Chow, J. and Hemsworth, P.H.H. (2011). Changes in aggression over time in pregnant sows post-mixing. Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA, p. 140.

Stella, J., Croney, C.C. and Buffington, T. (2011). Behavior and Physiologic Measures in Domestic Cats in Enriched and Stressed Environments. Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA, p. 128.

Verdon, M. and Hemsworth, P.H.H. (2011). The relationship between aggression, feeding time and injuries in pregnant group-housed sows. Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA, p. 139.

Verdon, M., Madrange, P., Nash, J.A. and Hemsworth, P.H. (2011). Changes in aggression in groups of sows within and between days two and eight post-mating. Manipulating Pig Production XIII. Proceedings of the 13th Biennial Conference of the Australasian Pig Science Association, p. 244.

3.b Other Conference publications

Pempek, J.A., Eastridge, M.L., Botheras, N.A., Croney, C.C. and Bowen, W.S. (2011). Effects of alternative housing and feeding systems on the performance of dairy heifer calves. Proc. Tri-State Dairy Nutrition Conference, The Ohio State University, pg. 167.

King, T. (2011). Can we accurately identify 'amicable' dogs? Australian Institute of Animal Management Inc. Annual Conference. Townsville, Queensland. 12th- 14th October, 2011.

King, T. (2011). Comparing the ideal dog in Japan and Australia. International Society for Anthrozoology. Indianapolis, Indiana, USA. 4th-6th August, 2011.

King, T. (2011). The importance of breeding dogs for behavior rather than beauty. Joint meeting of the International Ethological Conference & Animal Behavior Society, Bloomington, Indiana, USA. 25th-30th July, 2011.

3.c Industry presentations and invited presentations

Coleman, G.J. (2012). The role of stockmanship and attitudes in animal-human interactions. Crane Seminar, 1st – 5th April, Swedish University of Agricultural Sciences, Uppsala, Sweden.

Coleman, G.J. and Hemsworth, P.H. (2011). The attitudes and behaviour of stockpeople at Australian sheep and cattle abattoirs. HSA International Symposium: Recent advances in the welfare of livestock at slaughter.

Hemsworth, P.H. (2012). Current and future animal welfare research. DPIV Meat and Wool Showcase, 8th May, The Mercure Melbourne Treasury Gardens, Melbourne.

Fisher, A.D. (2012). Handling and Stress. Lowline beef society conference, 29th April, Coldstream. Hemsworth, P.H. (2012). Panel discussion, Victorian Farmers Federation conference, 20th April, Bendigo.

Rault, J-L. (2012) "Australian laying hens' welfare - Past, present, future". AECL Hen welfare forum, April 2012, Sydney.

Verdon, M. (2012). The science of sow housing. SA Pig Industry Day, 17th February, Roseworthy, South Australia.

4. Research Reports

Beggs, D.S., Pyman, M.F., Mansell, P.D. and Fisher, A.D. (2012). A review of disbudding and dehorning in the dairy industry. Technical Report to Dairy Australia, June 2012.

Fisher, A.D., Auldist, M., Jongman, E.J., Mansell, P., Pyman, M., Wales, W., Coombe, J. and Dilrukshi, A. (2012). Welfare of dairy cows in new semi-intensive farming systems. Final report to Department of Primary Industries, Victoria, May, 2012.

Hemsworth, P.H., Rice, M. and Jongman, E.J. (2011). Welfare of lambs in intensive finishing systems – Study 1. Final report to Department of Primary Industries, Victoria, August, 2011.

Skuse, J.M., Edge, M. and Brown, R. (2012). Mapping ProHand stockperson training packages. Final report to Australian Animal Welfare Strategy, May 2012.

5. Theses

Betts, K.S. (2011). The effect of feeding ractopamine on growth performance, carcass composition, meat quality and cortisol concentration in purebred Berkshire swine. M.S. Thesis, The Ohio State University, Columbus.

Crawford, S.M. (2012). Improving the attitudes and behavior of stockpersons toward pigs and the subsequent influence on animal behavior and production characteristics of commercial finishing pigs in Ohio. Ph.D. Thesis, The Ohio State University, Columbus.

Hemsworth, L.M. (2012). The welfare of recreational horses in Victoria: the occurrence of and factors involved with horse welfare. PhD Thesis, Monash University.

Pempek, J.A. (2011). Effects of alternative housing and feeding systems on the behavior and performance of dairy heifer calves. M.S. Thesis, The Ohio State University, Columbus.

Animal Welfare Science Centre Seminars

<http://www.animalwelfare.net.au/article/scientific-seminars>

July '11

Theme: *Animal welfare - Drivers and assessment.*

Speakers: Jackie Healing, Head of Quality, Policy and Governance, Coles Supermarkets: "Customer insights - how customers make purchasing decisions and what that has meant for Coles in terms of animal welfare initiatives and how we communicate them"

Grahame Coleman, Animal Welfare Science Centre, School of Psychology and Psychiatry, Monash University: "Monitoring stockpeople attitudes and their relationship with animal welfare"

Ellen Jongman, Animal Welfare Science Centre, Department of Primary Industries, Victoria: "Welfare assessment of dairy cows and how it may be used to benchmark their welfare"

Kirsty Richards, Chris Richards & Associates, Bendigo, Victoria: "Welfare QA (PigCare) in the Australian pig industry - Does it deliver?"

November '11

Theme: *Public trust*

Speakers: Siobhan O'Sullivan, Research Fellow in the School of Social & Political Sciences, the University of Melbourne: "Economically Productive Animals and the Community's right to Know"

Charlie Arnot, CEO Center for Food Integrity: "Lost in translation – Learning to speak 'consumer' in a way that builds trust in agriculture"

March '12

Speaker: Professor David J Mellor, Animal Welfare Science and Bioethics Centre, Massey University, NZ: "Broadening Our Perspectives on Negative and Positive Animal Welfare Impacts"

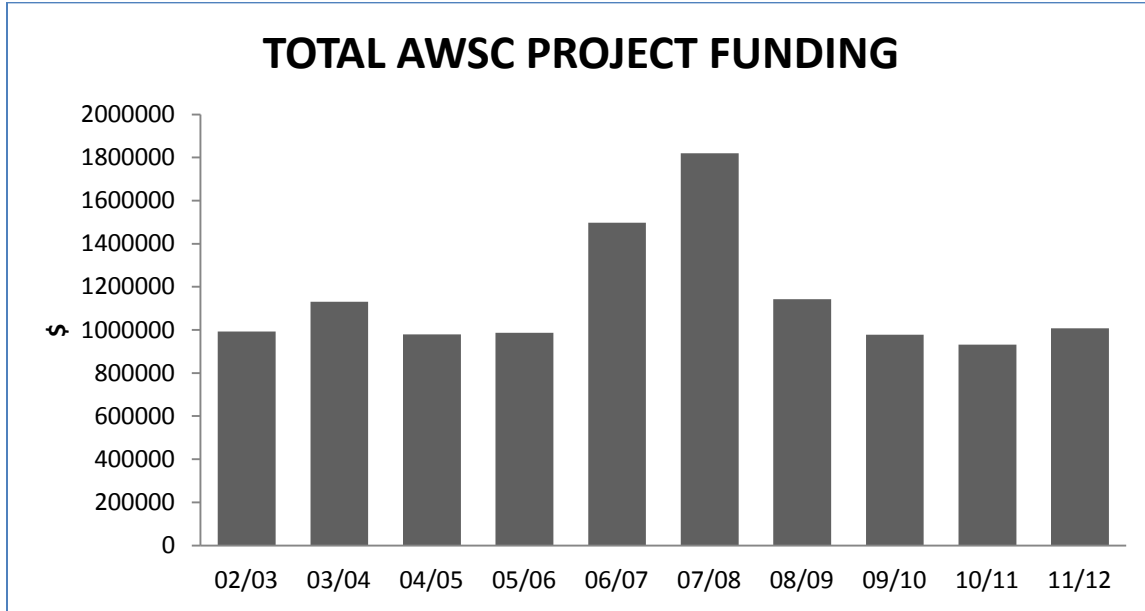
Speaker: Peter Sandøe, Professor of Bioethics, University of Copenhagen, Denmark: "Animal Welfare – where does science end and ethics begin?"

June '12

Speaker: Paul B. Thompson, W. K. Kellogg Chair in Agricultural, Food and Community Ethics, Michigan State University, USA: "Animal ethics and the evolution of standards for laying hens in the US."

Addendum – AWSC KPIs

- Increase funding by 10% annually
8% increase achieved in 2011/2012. Note - funding does not include DPI salaries associated with DPI project funding



- Increase conference presentations
37% increase achieved in 2011/2012 (biennial APSA Conference)

Refereed	2009/2010	2010/2011	2011/2012	TOTAL
Congress of ISAE	15	6	11	32
Australian Poultry Science Symposium	2	5	1	8
Australasian Pig Science Association (Biennial)	3	-	5	8
American Dairy Science Association	3	-	-	3
Australian Society of Animal Production	1	-	-	1
Society for the Study of Reproduction	1	1	-	2
Australasian Society for the Study of Animal Behaviour	-	1	1	2
ENDO 2011	-	1	-	1
International Society of Anthrozoology	-	1	-	1
Australasian Dairy Science Symposium	-	1	-	1
Humane Slaughter Association International Symposium	-	-	1	1
World Buiatrics Congress	-	-	1	1
World Congress on Alternatives and Animal Use in the Life Sciences	-	-	1	1
National Summit to end companion animal overpopulation	-	-	1	1
TOTAL	25	16	22	63

3. Increase the publication of papers in high quality journals
Average impact factor reduced in 2011/2012

Journal	5 yr Impact factor	2009/2010	2010/2011	2011/2012	TOTAL
Journal of Dairy Science	2.942	1	1	1	3
Journal of Animal Science	2.760	1	-	2	3
Preventative Veterinary Medicine	2.339	2	-	-	2
Applied Animal Behaviour Science	2.093	2	1	3	6
Behavioural Processes	1.781	3	2	1	6
Animal Welfare	1.364	1	-	1	2
Anthrozoos	1.195	2	2	4	8
Animal Production Science	1.072	1	3	2	6
Journal of Veterinary Medical Education	0.913	3	-	-	3
Journal of Veterinary Behaviour	1.143	-	-	3	3
Journal of Applied Animal Welfare Science	0.712	1	3	-	4
Endocrinology	5.103	5	1	-	6
Neuroendocrinology	3.164	1	-	-	1
Domestic Animal Endocrinology	2.009	1	-	-	1
Biology of Reproduction	3.613	3	1	-	4
Journal of Neuroendocrinology	3.281	1	1	1	3
Hormones and Behavior	4.142	-	1	1	2
Australian Veterinary Journal	1.011	-	1	1	2
Stress	3.789	-	1	-	1
Asia-Pacific Journal of Endocrinology	Not cited	-	1	-	1
Hypertension	6.857	-	1	-	1
Neuropsychopharmacology	6.813	-	1	-	1
Psychoneuroendocrinology	4.959	-	1	-	1
Physiology and Behavior	3.339	-	1	-	1
CAB Reviews	Not cited	-	1	-	1
Journal of Proteome Research	5.460	-	-	1	1
Animals	1.461	-	-	1	1
Journal of Neuroscience Methods	2.262	-	-	1	1
The Veterinary Journal	2.644	-	-	1	1
nb – published or in press					
TOTAL		28	24	24	76
AV Impact Factor		2.576	2.693	2.021	2.438

4. AWSC Representation on committees in a technical/advisory capacity

Grahame Coleman, Monash University
Animal Welfare Advisory Committee Victoria, (AWAC)
AWAC Responsible Pet Ownership Advisory Committee
AUSAWAC Education and training Working Group

Andrew Fisher, The University of Melbourne
World Organisation for Animal Health, (OIE) Working Group on Animal Welfare in Beef Cattle Production
American Veterinary Medicine Association Animal Welfare Curriculum Planning Group
Sheep Welfare Standards Writing Group
DPI Victoria Livestock Industry Consultative Committee
Cattle Welfare Standards Reference Group

Paul Hemsworth, The University of Melbourne
Animal Welfare Advisory Committee Victoria (AWAC)
OIE Collaborating Centre for Animal Welfare Science and Bioethical Analysis Management Committee
Dairy Australia Animal Welfare Reference Group
Hassad-Australia Animal Welfare Committee
National Animal Welfare R,D&E Strategy Steering Committee
Australian Egg Corporation Limited Hen Welfare Advisory Group
AUSAWAC Animals in research and teaching Working Group
AUSAWAC Research and development Working Group

Ron Kensinger, The Ohio State University
Ohio Livestock Coalition Board

Ellen Jongman, Department of Primary Industries, Victoria
Consultative Forum on the Livestock Export Industry

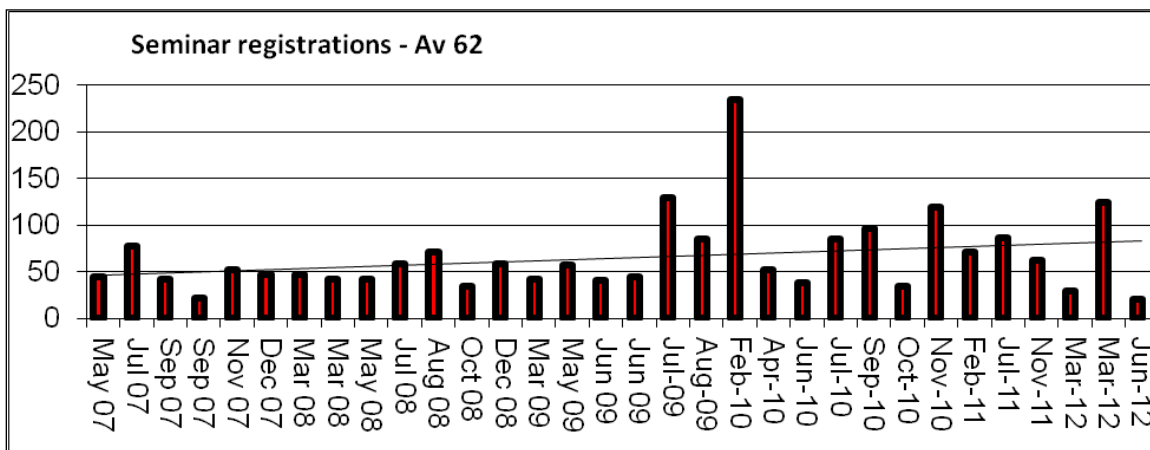
Steve Moeller, The Ohio State University
National Pork Board Animal Science Committee

Bobby Moser, The Ohio State University
Ohio Livestock Care Standards Board

Jean-Loup Rault, The University of Melbourne
Australian Pork Limited Specialist Group 2 (Genetics, reproduction and welfare)

Jeremy Skuse, Animal Welfare Science Centre
Australian Pork Limited Specialist Group (Industry capability and technology transfer)
Executive Officer National Animal Welfare R,D&E Strategy Steering Committee

5. Measure seminar attendance



6. Increase number of post-graduate students

2011/2012	22
2010/2011	25
2009/2010	20
2008/2009	19
2007/2008	13
2006/2007	14

**Copies of the Animal Welfare Science Centre Annual Report
2011 – 2012 are available on request from:**

**Executive Officer
Animal Welfare Science Centre
Melbourne School of Land and Environment
The University of Melbourne
Parkville
Victoria 3010**

For more information phone 03 8344 8933



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