

# OIE Collaborating Centre Reports

## Activities in 2012

<b>Title of Collaborating Centre:</b>	<b>Animal Welfare Science and Bioethical Analysis</b>
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<b>Name of Director of Institute (Responsible Official):</b>	Dr Peter Thornber is the relevant responsible official. <i>(Refer to roles played by MAF New Zealand and DAFF Australia, regarding governance and management, as outlined in detail in approved application of May 2009).</i>  <b>Dr Peter Thornber: Chair July 2012 – July 2013</b>
<b>Name (including Title and Position) of Head of the Collaborating Centre (formally OIE Contact Point):</b>	<b>Dr Peter Thornber Chair, OIE Collaborating Centre Management Committee</b>
<b>Name (including Title and Position) of writer of this report (if different from above)</b>	<b>Dr Peter Thornber Director Australian Animal Welfare Strategy, DAFF</b>

## Summary of activities specifically related to the mandate of OIE Collaborating Centres

The OIE Collaborating Centre on Animal Welfare Science and Bioethical Analysis continues to pursue the following key activities under its current work program:

- Establishing a **“twinning”** programme in the Asia, Far East and Oceania region to enhance regional capacity building and develop collaborative links
  - A cooperation project with University Putra, Malaysia has been developed to increase animal welfare science capacity in the region
  - Training programs will be conducted in four countries - Malaysia, Thailand, Vietnam and People’s Republic of China
  - The \$A245,000 program **will be completely funded** by six funding partners (Australian Government, Malaysian Government, New Zealand Government, University Putra, The European Commission and the World Society for the Protection of Animals) – *currently awaiting OIE endorsement.*
- Developing a **residential animal welfare training course** for practitioners in the wider animal welfare arena. It will appeal to industry organisations, veterinarians and others in the diverse fields of animal welfare regulation, law, national and local management, science, practice, economics and ethics.
- Supporting the OIE Region for Asia, the Far East and Oceania hosting the third **OIE Global Conference on Animal Welfare.**
- Compiling **an authoritative publication** on the future directions of animal welfare.
- Actively working with stakeholders to **identify high-priority research, development and extension opportunities to advance animal welfare in our region.**

The Australian and New Zealand Governments are providing financial and administration support to the Collaborating Centre Management Committee and public policy advice to assist delivery of the collaborating centre work program.

### Collaborating Centre contributors

Australia	New Zealand
Dr Peter Thornber, <b>Chair of Collaborating Centre Management Committee</b> Australian Government Department of Agriculture, Fisheries and Forestry (DAFF)	Dr Mark Fisher, Ministry of Primary Industries New Zealand
Prof. Clive Phillips, Centre for Animal Welfare and Ethics, University of Queensland	Dr Jim Webster, AgResearch, Ruakura
Dr. Caroline Lee, CSIRO Animal, Food and Health Sciences	Prof. David Mellor, Massey University
Prof. Paul Hemsworth, Animal Welfare Science Centre, Melbourne, Victoria	

**1. Activities as a centre of research, expertise, standardisation and dissemination of techniques within the remit of the mandate given by the OIE**

**CSIRO Livestock Industries (Caroline Lee)**

- Selected key activities undertaken during 2012, by CSIRO Animal, Food and Health Sciences, Australia, included the following:
  - Caroline Lee: CSIRO Animal Welfare Research. Cognition and Emotion Group, University of Utrecht, 19 July 2012.
  - Caroline Lee: New Approaches to measuring animal welfare. Physiology Departmental Seminar Series. Monash University, 8 October, 2012.
  - Else Verbeek: Morphine induces an optimistic judgement bias after consumption of a palatable food reward in sheep. International Society of Applied Ethology Congress, Vienna, 3 August, 2012.
  - Carlos Hernandez: Welfare Assessment of Free Range Hens. Poultry CRC's Ideas Exchange "from project to product", 23-25 September 2012, Gold Coast.

**2. Proposal or development of any procedure that will facilitate harmonisation of international regulations applicable to the surveillance and control of animal diseases, food safety or animal welfare**

Nil during reporting period.

**3. Networking**

**a) Maintenance of a network with other OIE Collaborating Centres designated for the same specialty, and**

It is intended that a PhD student will be jointly supervised by Clive Phillips of this OIE Collaborating Centre and Dr Carmen Gallo of the Chilean OIE Collaborating Centre with the same purpose.

**b) Should the need arise, maintenance of a network with Collaborating Centres in other disciplines**

Nil during reporting period.

**4. Placement of expert consultants at the disposal of the OIE**

Assoc. Professor Andrew Fisher, The University of Melbourne is a member of the OIE *Ad hoc Working Group on Animal Welfare in Beef Cattle Production* and he remains available to assist OIE further on this issue should the need arise.

**5. Provision of scientific and technical training, within the remit of the mandate given by the OIE, to personnel from OIE Member Countries**

- A two-week Animal Welfare Training program was designed, resource materials prepared and speakers recruited, but for logistical reasons it was not able to be mounted in July 2012. Currently, a strategy of mounting a more focused training program in South East Asia is actively being explored by the Collaborating Centre.

- The Cooperation/twinning project on 'Evaluating and enhancing stakeholder knowledge of OIE animal welfare standards in Southeast Asia' has been submitted to OIE and **awaits final approval**. This will provide six main outputs:
  1. A project leaders' meeting will be held to discuss the scope of the project, its activities and outcomes
  2. Publications will be prepared outlining OIE transport and slaughter standards in local languages
  3. International and national standards will be reviewed by the UQ project manager in conjunction with national veterinary services
  4. Trainers' workshops will be held with invited delegates from veterinary services, industry and universities. These will include presentations, group discussions and a short visit to a high quality example of good transport and slaughter.
  5. Local meetings for stakeholders will be organised and presented by the trainers with assistance from the national veterinary services.
  6. A survey of awareness of stakeholders to assess their knowledge of standards for slaughter and transport and beliefs about current methods utilised will be conducted.
  
- International students from the Netherlands and France have visited the AWSC to take part in training internships in major pig and poultry research projects.

Six international students from France have undertaken 3-6 month training internships as part of cattle and sheep welfare research projects during 2012

## 6. Organisation of scientific meetings on behalf of the OIE

Nil during reporting period.

## 7. Coordination of scientific and technical studies in collaboration with other laboratories, organisations or collaborating centres

### AgResearch DairyNZ Ltd

- Cow comfort on concrete and rubber matting
- Riverstones as a substrate for calf rearing
- Effect of body condition score on health and affective state

### Massey University New Zealand (David Mellor)

- Professor DJ Mellor is Chief Coordinating Editor and led the design, recommended authors and is managing the scientific content with other editors drawn from the five partners of OIE Collaborating Centre for Animal Welfare Science and Bioethical Analysis for a 35-paper issue of OIE Scientific and Technical Review Series, Volume 33, entitled *Animal Welfare: Focus on the Future*, to be published by the OIE in April 2014.
- Professors Paul Hemsworth (AWSC, Melbourne University) and David Mellor (AWSBC, Massey University) participated, together with 12 other authors, including Dr Stella Huertas, in a writing project initiated and led by Professor David Fraser (OIE AWWG) in which scientific support for the OIE Ten General Principles for the Welfare of Animals in Production Systems was outlined in a peer-reviewed article provisionally accepted for publication by The Veterinary Journal.

### CSIRO Livestock Industries (Caroline Lee)

- Dr Drewe Ferguson has led the completion of a 12 month project which was delivered under the National Animal Welfare Research and Development Strategy. The project, "Identify and integrate measures of animal welfare that meet the needs of animals and society", is a collaborative project, including researchers from University of Melbourne (AWSC), Murdoch University and AgResearch Ltd., NZ.
- Dr Caroline Lee spent 4 months on sabbatical at The University of Wageningen working with Dr Bas Rodenberg. They worked on a project investigating the influence of personality type on affective states in laying hens.

### Centre for Animal Welfare and Ethics (Clive Phillips)

- CAWE has continued to work towards providing the scientific underpinning of reliable standards for ammonia on ships transporting livestock.

Phillips, C.J.C., Pines, M.K., Latter, M., Muller, T., Petherick, J.C., Norman, S.T. and Gaughan, J.B. 2012. The physiological and behavioral responses of sheep to gaseous ammonia. *Journal of Animal Science* 90, 1562-1569

- In addition CAWE has developed methods for assessment of the welfare of captive great apes, elephants and is working towards the same for horses. These assessment methods are based on a survey of experts about their attitudes towards husbandry requirements.

Fernie, A.C., Tribe, A., Murray, P.J., Lisle, A. and Phillips, C.J.C. 2012. A survey of the attitudes of stakeholders in the zoo industry towards the husbandry requirements of captive great apes. *Animal Welfare* 21, 233-245.

### **Animal Welfare Science Centre (Paul Hemsworth)**

Selected key activities undertaken during 2012, by the Animal Welfare Science Centre (AWSC), University of Melbourne, Victoria, included the following:

- The AWSC continues to support the national animal welfare RD&E capability and provides the Executive function to the National AW RD&E Strategy.
- The new Research Fellow at UoM has been successful in attracting funding from pork and egg industry funding which will maintain and build the AWSC capability in these industries.
- The AWSC has been successful in working with Dairy Australia to deliver an innovative stockperson training program (ProHand Dairy). 13 trainers will roll out the program in early 2013.
- AWSC scientists sit on 22 national and international committees (including Australian Animal Welfare Strategy subcommittees, OIE Working Group on Animal Welfare in Beef Cattle Production and American Veterinary Medicine Association Animal Welfare Curriculum Planning Group) and provide technical advice to inform policy and management decisions of Governments and industry.
- AWSC has conducted 4 seminars in the last 6 months. The seminar conducted in March featuring Peter Sandøe from the University of Copenhagen attracted over 120 registrations.
- Professor Grahame Coleman will join the University of Melbourne from January 2013 as Professor of human - animal relationships. This new position will ensure that the AWSC continues to be at the forefront of research in this area.
- Dr. Ellen Jongman has joined the University of Melbourne as Research Fellow on a 3 year contract funded by the Department of Primary Industries, Victoria.
- AWSC jointly organised and presented the International Society for Applied Ethology Regional Meeting in October in Melbourne. <http://www.animalwelfare.net.au/node/107d>
- Monash University has withdrawn from the AWSC effective 1 July 2012.
- Livestock Systems Alliance (a partnership of The University of Adelaide and SA Research and Development Institute) has indicated its intention to join the Centre as a full partner.
- International students from the Netherlands and France have visited the AWSC to take part in training internships in major pig and poultry research projects

### **AgResearch, Ruakura, New Zealand (Jim Webster)**

#### ***Conference presentations***

Fisher, A.D., Webster, J. R. (2012) Animal welfare - how can R+D help producers in the face of increasing scrutiny? In Australasian Dairy Science Symposium 2012 Melbourne, Australia.

Schütz, K.C., N., and Tucker, C. (2012) Shade use by dairy cattle: behavioral and physiological responses to the amount of shade in pasture-based systems. In 46th Congress of the International Society for Applied Ethology Vienna, Austria.

Stewart, M., Worth, G., Webster, J., and Schütz, K. (2012) Effects of daily handling during calf rearing on behavioural and physiological responses of 1-year-old dairy heifers. In 46th Congress of the International Society for Applied Ethology Vienna, Austria.

Sutherland, M. & Huddart, F. (2012) The effect of training and milking familiarity on heifer behavioural reactivity to humans. In 46th Congress of the International Society for Applied Ethology Vienna, Austria.

Millman, S., Sadler, L., Johnson, A., Karriker, L., Shearer, J., Dewell, G., Dewell, R., Xin, H., O'Connor, A., Sutherland, M., Coetzee, J., Anthony, R. (2012). An examination of argon gas for on-farm anaesthesia and euthanasia of livestock. In the proceedings of the USDA National Institute of Food and Agriculture Animal Health and Welfare Project Director Meeting, Chicago, Illinois, USA.

Stewart, M., Webster, J.R., Schaefer, A.L. Automated assessment of animal health and welfare using infrared thermography: early detection of disease. Australian Dairy Science Symposium, Melbourne, Australia, November 2012, p 258-260.

Stewart, M., Webster, J.R., Schaefer, A.L. Automated assessment of animal health and welfare using infrared thermography. Dairy Cattle Welfare Symposium, Guelph, Ontario, Canada, October 2012.

Stewart, M., Sutherland, M.A., Schütz, K.E. The effects of rearing calves on two different bedding materials: A comparison between river stones and sawdust. Dairy Cattle Welfare Symposium, Guelph, Ontario, Canada, October 2012.

Schaefer, A.L., Scott, S., Colyn, J., Tong, A., Basarab, J., Cook, N., Webster, J. Stewart, M., Christopherson, O., Bench, C., Kennedy, A., Ominski, K. Farm Based Infrared Technology: Early Disease Detection and Metabolic Efficiency. Gentec Conference: Turning Local Production into Global Advantage and the Fundamentals of Residual Feed Intake, Edmonton, Alberta, Canada, October, 2012.

Schaefer, A.L., Bench, C., Galbraith, Stewart, M. Webster, J.R. The Impact of Animal Welfare on the Meats Industry. Canadian Meat Science Association Technical Symposium, Quebec City, Quebec, May, 2012.

## **8. Publication and dissemination of any information within the remit of the mandate given by the OIE that may be useful to Member Countries of the OIE**

### ***Selected publications:***

Reviews, full conference papers, chapters

Green, T.C. and Mellor, D.J. (2011). Extending ideas about animal welfare assessment to include 'quality of life' and related concepts. *New Zealand Veterinary Journal* 59, 263-271.

Beausoleil, N.J., Mellor, D.J. 2012. Complementary roles for systematic analytical evaluation and qualitative whole animal profiling in welfare assessment for Three Rs application. *ALTEX Proceedings of WC8 1(1): 455-460.*

Beausoleil, N.J., Fisher, P., Mellor, D.J., Warburton, B. 2012. Ranking the negative impacts of wildlife control methods may help to advance the Three Rs. *ALTEX Proceedings of WC8 1(1): 481-485.*

Impey S, N Beausoleil, VSR Dukkupati, K Kongara and CB Johnson (2012). Effect of early post-natal castration on subsequent EEG response to tail docking in lambs. *Proceedings of the 11th World Congress of Veterinary Anaesthesia, Cape Town.*

Johnson CB, TJ Gibson, KJ Stafford and DJ Mellor (2011). Pain perception at slaughter. *Humane Slaughter Association Centenary International Symposium. Portsmouth, UK.*

Johnson CB, Gibson TJ, Stafford KJ and Mellor DJ. (2012). Pain perception at slaughter. *Animal Welfare* 21, 113-122

Kells NJ, NJ Beausoleil, CB Johnson and MA Sutherland (2011). Assessment of the relative welfare impacts of three gas treatments for the euthanasia of suckling piglets. . *Humane Slaughter Association Centenary International Symposium. Portsmouth, UK.*

Mellor, D.J. (2012). Animal emotions, behaviour and the promotion of positive welfare states. *New Zealand Veterinary Journal* 60, 1-8.

Mellor, D.J. (2012). Affective states and the assessment of laboratory-induced animal welfare impacts. *ALTEX Proceedings 1 (WC8), 445-449.*

Mellor, D.J., Hemsworth, P.H., Barnett, J.L. and Young, I.R. (2012). Species-specific approaches are needed for effective implementation of the Three Rs in farm animal research. *ALTEX Proceedings 1 (WC8), 469-476.*

### **Specific studies**

Ambrisko TD, CB Johnson and JP Chambers (2011). Effect of alfaxalone infusion on canine electroencephalogram under halothane anaesthesia. *Veterinary Anaesthesia and Analgesia* 38, 529–535.

Beausoleil NG and Stafford KJ. (2012). Is a non-steroidal anti-inflammatory drug required to alleviate pain behaviour associated with liver biopsy in cattle? *Journal of Veterinary Behaviour* 7, 245-251.

Farnworth, M.J, Beausoleil, N.J., Adams, N.J., Barrett, L.A., Stevenson, M., Thomas, D.G., Waterland, M.R., Waran, N.K., Stafford, K.J. (2012). Validating the use of a carbon dioxide laser for assessing nociceptive thresholds in adult domestic cats (*Felis catus*). *Applied Animal Behaviour Science* (In press). <http://dx.doi.org/10.1016/j.applanim.2012.10.008>

Guesgen, M.J., Beausoleil, N.J., Minot, E., Stewart, M., Jones, G., Stafford, K.J. (2011). The effects of age and sex on pain sensitivity in young lambs. *Applied Animal Behaviour Science* 135, 51-56. Doi: 10.1016/j.applanim.2011.09.008

Guesgen, M.J., Beausoleil, N.J., Stewart, M. (2012). Effects of early human handling on the pain sensitivity of young lambs. *Veterinary Anaesthesia and Analgesia* Doi:10.1111/j.1467-2995.2012.00746.x

Kongara K, JP Chambers and CB Johnson (2012). Effects of tramadol, morphine or their combination in dogs undergoing ovariohysterectomy on peri-operative electroencephalography and post-operative analgesia. *New Zealand Veterinary Journal* 60, 129-135

Singh P, CB Johnson, B Gartrell, S Mitchinson and PJ Chambers, and (2011). Pharmacokinetics of butorphanol in broiler chickens. *Veterinary Record* 168, 588.

Ballou, M.A., Sutherland, M.A., Brooks, T.A., Hulbert, L.E., Davis, B.L., Cobb, C.J. Administration of anaesthetic and analgesic prevent the suppression of many leukocyte responses following surgical castration and physical dehorning. *Veterinary Immunology and Immunopathology* (in press)

Dowling, S.K. & Sutherland, M.A. (2012) The Effect of Training to the Milking Parlour on the Behavioural Response to Milking and Milk production in First Lactation Heifers. *Proceedings of the New Zealand Society of Animal Production* 72, 134-138

Guesgen, M.J., Beausoleil, N.J., E.O. Minot, E.O., Stewart, M., Stafford, K.J. 2012. The effects of age and sex on pain sensitivity in newborn lambs. *Applied Animal Behaviour Science* 135, 51-56.

Guesgen, M.J., Beausoleil, N.J., Stewart, M. Effects of early human handling on the pain sensitivity of young lambs. *Veterinary Anaesthesia and Analgesia* (In Press).

Matthews, L.R., Cameron, C., Sheahan, A.J., Kolver, E.S. & Roche, J.R. (2012) Associations among dairy cow body condition and welfare-associated behavioural traits. *Journal of Dairy Science* 95(5), 2595-2601.

Mintline, E.M., Stewart, M., Rogers, A.R., Cox, N.R., Verkerk, G.A., Stookey, J.M., Webster, J.R., Tucker, C.B. 2012. Play behaviour as an indicator of animal welfare: disbudding in dairy calves. *Applied Animal Behaviour Science* (In Press).

Schaefer, A.L. Cook, N.J. Bench, C. Chabot J., Colyn, B, J. Liu, T. Okine, E. Stewart M. and Webster. 2012. J. The non-Invasive and automated detection of bovine respiratory disease onset in receiver calves using infrared thermography *Research in Veterinary Science* 93, 928-935.

Schütz, K.C., N. R.; MacDonald, K.; Roche, J. R.; Verkerk, G. A.; Rogers, A. R.; Tucker, C. B.; Matthews, L. R.; Meier, S.; Webster, J. R. (2012) Behavioural and physiological effects of a short-term feed deprivation by lactating dairy cattle with different body condition scores at calving. *Journal of Dairy Science*.



Schütz, K.E., Hawke, M., Waas, J.R., McLeay, L.M., Bokkers, E.A.M., Van Reenen, C.G., Webster, J.R. & Stewart, M. (2012) Effects of human handling during early rearing on the behaviour of dairy calves. *Animal Welfare* 21(1), 19-26.

Stewart M, Shepherd, H.M., Webster, J.R., Waas, J.R., McLeay, L.M., Schütz, K.E. Effect of previous handling experiences on responses of dairy calves to routine husbandry procedures. *Animal* (In Press).

Sutherland, M., Ballou, M.A., Davis, B. L. and Brooks, T. A. (2012) The effect of castration and dehorning singularly or combined on the behaviour and physiology of Holstein calves. *Journal of Dairy Science* (in press).

Sutherland, M.A. & Huddart, F.J. (2012) The effect of training first-lactation heifers to the milking parlor on the behavioural reactivity to humans and the physiological and behavioural responses to milking and productivity. *Journal of Dairy Science* 95, 6983-6993.

Sutherland, M.A., Rogers, A.R. & Verkerk, G.A. (2012) The effect of temperament and responsiveness towards humans on the behaviour, physiology and milk production of multi-parous dairy cows in a familiar and novel milking environment. *Physiology and Behaviour* 107(3), 329-337.

Sutherland, M.A., Davis, B.L., Brooks, T.A., Coetzee, J.F. (2012) The physiological and behavioural response of pigs castrated with and without anaesthesia and/or analgesia. *Journal of Animal Science* 90, 2211-2221.

Sutherland, M.A., Bryer, P.J., Davis, B.L., Smith, J.F., McGlone, J.J. (2012) The combined effects of transport and food and water deprivation on the physiology of breeding age gilts. *Livestock Science* 144, 124-131.

Verbeek, E., Oliver, M.H., Waas, J.R., McLeay, L.M., Blache, D. & Matthews, L.R. (2012) Reduced cortisol and metabolic responses of thin ewes to an acute cold challenge in mid-pregnancy: Implications for animal physiology and welfare. *PLoS ONE* 7(5).

Verbeek, E., Waas, J.R., Oliver, M.H., McLeay, L.M., Ferguson, D.M. & Matthews, L.R. (2012) Motivation to obtain a food reward of pregnant ewes in negative energy balance: Behavioural, metabolic and endocrine considerations. *Hormones and Behaviour* 62(2), 162-172.

Verbeek, E., Ferguson, D.M. and Lee, C. 2012. Opioid control of the arousal and valence components of affective states in sheep: effects of morphine and naloxone on food intake, behaviour and activity. *Applied Animal Behaviour Science*, <http://dx.doi.org/10.1016/j.applanim.2012.09.001>.

I.G. Colditz, D.R. Paull, C. Lee. 2012. Social transmission of physiological and behavioural responses to castration in suckling Merino lambs. *Applied Animal Behaviour Science*, 136: 136– 145.

David R. Paull, Ali Small, Caroline Lee, Pierre Palladin and Ian G. Colditz (2012) Evaluating novel analgesic strategies for ring castration of ram lambs. *Veterinary Anaesthesia and Analgesia* 39: 539-549

Alexandra Destrez, Véronique Deiss, Catherine Belzung, Caroline Lee, Alain Boissy. 2012. Does reduction of fearfulness tend to reduce pessimistic-like judgment in lambs? *Applied Animal Behaviour Science*. 139: 233-241.

Slocombe, L.L. and Colditz, I.G. 2012. A method for determining the concentration of haptoglobin in cattle blood following haemolysis caused at collection. *Research in Veterinary Science*: 93: 190-194 preprint available online 12 June 2011. <http://dx.doi.org/10.1016/j.rvsc.2011.05.012>

Alexandra Destrez, Véronique Deiss, Frédéric Levy, Ludovic Calandreau, Caroline Lee, Elodie Chaillou, Alain Boissy. 2012. Chronic stress induces a pessimistic-like judgment and learning deficits in sheep, *Animal Cognition*, submitted.

A.H. Small, I. Jenson, A. Kiermeier and J. Sumner (2012) Vacuum-packed beef primals with extremely long shelf-life have unusual microbiological profile. *Journal of Food Protection* 75(8): 1524-1527

Thompson-Crispi, KA; Hine, B; Quinton, M; Miglior, F; Mallard, BA. 2012. Short communication: Association of disease incidence and adaptive immune response in Holstein dairy cows. *Journal of dairy Science*. 95: 3888-3893.

Hine, BC; Cartwright, SL; Mallard, BA. 2012. Analysis of leukocyte populations in Canadian Holsteins classified as high or low immune responders for antibody- or cell-mediated immune response. *Canadian Journal of Veterinary Research*. 76: 149-156.

Verbeek, E; Waas, JR; Oliver, MN; McLeay, LM; Ferguson, DM; Matthews, LR. 2012. Motivation to obtain a food reward of pregnant ewes in negative energy balance: Behavioural, metabolic and endocrine considerations. *Hormones and Behaviour*, 62: 162-172.

Verbeek, Else; Oliver, Mark Hope; Waas, Joseph Rupert; McLeay, Lance Maxwell; Blache, Dominique; Matthews, Lindsay Ross. 2012. Reduced cortisol and metabolic responses of thin ewes to an acute cold challenge in mid-pregnancy: implications for animal physiology and welfare. *Plos One*, 7: Pages: e37315.

Verbeek, E, Oliver, MH, Waas, JR; McLeay, LM; Blache, D, Matthews, LR. 2012. Reduced Cortisol and Metabolic Responses of Thin Ewes to an Acute Cold Challenge in Mid-Pregnancy: Implications for Animal Physiology and Welfare .*Plos One*, Volume: 7, Article Number: e37315.

Colditz, I.G. What is the value of an animal's life, *The Conversation*. Published on-line 12/12/2011: <https://theconversation.edu.au/what-is-the-value-of-an-animals-life-4412>

Lee, C., Fisher, Colditz, Lea, Ferguson. 2012. Preference of beef cattle for feedlot or pasture environments. *Applied Animal Behaviour Science*. Submitted.

Verbeek, E., Ferguson, D.M., Patrick, Lee, C. 2012. Opioid regulation of judgement bias in sheep: morphine induces a positive bias after palatable food consumption. Submitted, *Physiology and Behaviour*.

Alison Small, David McLean, Jeffrey Stewart Owen, James Ralph (2012) Electromagnetic induction of insensibility in animals: a review. *Animal Welfare*, submitted.

Alison Small, David McLean, Helen Keates, Jeffrey Stewart Owen, James Ralph (2012) Preliminary investigations into the use of microwave energy for reversible stunning of sheep. *Animal Welfare*, submitted.

Zulkifli, Y.M. Goh, B. Norbaiyah, A.Q. Sazili, M. Lotfi, A.H. Small (2012) Changes in blood parameters and electroencephalogram as affected by different stunning methods in cattle. *Animal Production Science*, submitted.

A.Q. Sazili, B. Norbaiyah, I. Zulkifli, Y.M. Goh, M. Lotfi, A.H. Small (2012) Quality assessment of Longissimus dorsi and Semitendinosus muscles from beef cattle subjected to non-penetrative and penetrative percussive stunning methods. *Asian-Australasian Journal of Animal Sciences*, submitted.

Fernie, A.C., Tribe, A., Murray, P.J., Lisle, A. and Phillips, C.J.C. 2012. A survey of the attitudes of stakeholders in the zoo industry towards the husbandry requirements of captive great apes. *Animal Welfare* 21, 233-245.

McGowan, T.W., Phillips, C.J.C., Perkins, N., Hodgson, D.R. and McGowan, C.M. The effect of owners' personality on opinions and experience of euthanasia in aged horses. *Anthrozoos*, 25, 261-275.

Descovich, K.A., Reints Bok, T.E., Lisle A. and Phillips, C.J.C. 2012. Auditory laterality in a nocturnal, fossorial marsupial (*Lasiornis latifrons*) in response to bilateral stimuli. *Laterality* DOI: 10.1080/1357650X.2011.626562.

Phillips, C.J.C., Pines, M.K., Latter, M., Muller, T., Petherick, J.C., Norman, S.T. and Gaughan, J.B. 2012. The physiological and behavioral responses of sheep to gaseous ammonia. *Journal of Animal Science* 90, 1562-1569

Descovich, K. A., Lisle, A.T., Johnston, S., Nicolson, V. and Phillips, C.J.C. 2012. Differential responses of captive southern hairy-nosed wombats (*Lasiorhinus latifrons*) to the presence of faeces from different species and male and female conspecifics. *Applied Animal Behaviour Science* 138, 110-117.

Descovich, K.A., Lisle, A.T., Johnston, S. and Phillips, C.J.C. 2012. Space allowance and the behaviour of captive southern hairy-nosed wombats (*Lasiorhinus latifrons*). *Applied Animal Behaviour Science* 140, 92-98.

Phillips, C.J.C. and Izmirlı, S. 2012. The effects of levels of support for animal protection organisations on attitudes to the use of animals and other social issues. *Animal Welfare* 21, 583-592.

Izmirlı, S. and Phillips, C.J.C. 2012. Invited review: Attitudes to animal welfare and rights throughout the world in the modern era: a review. *Eurasian Journal of Veterinary Sciences* 28, 65-68.

Phillips, C.J.C. 2012. Humans and other animals – future friends or foe? Editorial. *Animals*, 2, 361-362.

Descovich, K.A., Lisle, A.T., Johnston, S., Keeley, T. and Phillips, C.J.C. 2012. Intra-sample variation and the effect of storage delay on faecal metabolite concentrations in the southern hairy-nosed wombat (*Lasiorhinus latifrons*). *Australian Mammalogy*, DOI <http://dx.doi.org/10.1071/AM11047>

Tiplady, C., Walsh D.B. and Phillips, C.J.C. 2012. Cruelty to Australian cattle in Indonesian abattoirs - how the public responded to media coverage. *Journal of Agricultural and Environmental Ethics*. DOI 10.1007/s10806-012-9412-0.

Phillips, C.J.C., Lisle, A. and Davies, E. 2012. Housing systems to meet the behavioural needs of a solitary mammal with an extensive home range: the Julia Creek dunnart (*Sminthopsis douglasi*). *Applied Animal Behaviour Science*, DOI <http://dx.doi.org/10.1016/j.applanim.2012.07.007>

McGrath, N., Walker, J., Nilsson, D. and Phillips, C.J.C. Public attitudes towards grief in animals. *Animal Welfare*, in press.

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