

# OIE Collaborating Centres Reports Activities

## *Activities in 2018*

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<b>Title of collaborating centre:</b>	Animal Welfare Science and Bioethical Analysis; the David Bayvel Consortium comprises:
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<b>Name of Director of Institute (Responsible Official):</b>	Australian Government
<b>Name (including Title and Position) of Head of the Collaborating Centre (formally OIE Contact Point):</b>	Dr Emily Orchard-Mills (chair), Australian OIE Animal Welfare Focal Point
<b>Name of writer:</b>	Emily Orchard-Mills

**ToR: To provide services to the OIE, in particular within the region, in the designated specialty, in support of the implementation of OIE policies and, where required, seek for collaboration with OIE Reference Laboratories**

**ToR: To identify and maintain existing expertise, in particular within its region**

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

Animal welfare	
Title of activity	Scope
RAWS support	The Collaborating Centre provided the Chair and several members for the RAWS Advisory Group.
Technical expertise provided to the Australian Government Heat Stress Risk Assessment Framework	Work on a new approach to heat stress risk assessment for the live export of sheep from Australia to the Middle East during the northern hemisphere summer

**ToR : To propose or develop methods and procedures that facilitate harmonisation of international standards and guidelines applicable to the designated specialty**

**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**

Proposal title	Scope/Content	Applicable area
None	None	<input type="checkbox"/> Surveillance and control of animal diseases <input type="checkbox"/> Food safety <input type="checkbox"/> Animal welfare

**ToR: To establish and maintain a network with other OIE Collaborating Centres designated for the same specialty, and should the need arise, with Collaborating Centres in other disciplines**

**ToR: To carry out and/or coordinate scientific and technical studies in collaboration with other centres, laboratories or organisations**

**3. Did your Collaborating Centre maintain a network with other OIE Collaborating Centres (CC), Reference Laboratories (RL), or organisations designated for the same specialty, to coordinate scientific and technical studies?**

Yes

Name of OIE CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
University of Peradeniya	Sri Lanka	<input type="checkbox"/> Africa <input type="checkbox"/> Americas <input checked="" type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East	Craig Johnson visited University of Peradeniya, Sri Lanka as part of the OIE-endorsed (not funded) Veterinary School Twinning Project to enhance veterinary training in a range of aspects, including animal welfare.

**4. Did your Collaborating Centre maintain a network with other OIE Collaborating Centres, Reference laboratories, or organisations in other disciplines, to coordinate scientific and technical studies?**

Yes

Name of OIE CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
OIE CC for Veterinary Epidemiology and Public Health	New Zealand	<input type="checkbox"/> Africa <input type="checkbox"/> Americas <input checked="" type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East	One of the institutes in the Collaborating Centre (Animal Welfare Science and Bioethics Centre) collaborated with the Massey University EpiCentre (OIE CC for Veterinary Epidemiology and Public Health) on bobby calf welfare research.

**ToR: To place expert consultants at the disposal of the OIE.**

**5. Did your Collaborating Centre place expert consultants at the disposal of the OIE?**

Yes

Name of expert	Kind of consultancy	Subject
Paul Hemsworth	Member of the OIE ad hoc Group on animal welfare and pig production systems.	Animal welfare and pig production systems.
Leisha Hewitt	Member of the OIE ad hoc Group on killing methods for reptiles commercially processed for their skins, meat and other products.	Animal welfare and reptiles.
Craig Johnson	Member of the OIE ad hoc Group on Chapters 7.5(slaughter) and 7.6 (killing for disease purposes).	Animal welfare and slaughter and killing for disease purposes.

**ToR: To provide, within the designated specialty, scientific and technical training to personnel from OIE Member Countries**

**6. Did your Collaborating Centre provide scientific and technical training, within the remit of the mandate given by the OIE, to personnel from OIE Member Countries?**

Yes

- a) Technical visits: 0
- b) Seminars: 5
- c) Hands-on training courses: 5
- d) Internships (>1 month): 0

Type of technical training provided (a, b, c or d)	Content	Country of origin of the expert(s) provided with training	No. participants from the corresponding country
b	Course in Animal Pain for Postgraduate Students	Denmark	5
c	Animal Welfare Standards Train the Trainer Roadshow	China	5

**ToR: To organise and participate in scientific meetings and other activities on behalf of the OIE**

**7. Did your Collaborating Centre organise or participate in the organisation of scientific meetings on behalf of the OIE?**

Yes

National/International	Title of event	Co-organiser	Date (mm/yy)	Location	No. Participants
International	OIE Animal Welfare Forum, "Supporting implementation of OIE Standards".	OIE	03/18	Paris	1

**ToR: To collect, process, analyse, publish and disseminate data and information relevant to the designated specialty**

**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**

- a) Articles published in peer-reviewed journals: 103

Alison Small, Danila Marini, Maxime le Floch, David Paull, and Caroline Lee. 2018. A pen study evaluation of buccal meloxicam and topical anaesthetic at improving welfare of lambs undergoing surgical mulesing and hot knife tail docking. Research in Veterinary Science, 118: 270-277. <https://doi.org/10.1016/j.rvsc.2018.02.011>

- Alison Small, Danila Marini, Tim Dyall, David Paul, and Caroline Lee. 2018. A randomised field study evaluating the effectiveness of buccal meloxicam and topical local anaesthetic formulations administered singly or in combination at improving welfare of female Merino lambs undergoing surgical mulesing and hot knife tail docking. *Research in Veterinary Science*, 118: 305-311. <https://doi.org/10.1016/j.rvsc.2018.03.006>
- Alison Small, Jim Lea, Dominic Niemeyer, Joanne Hughes, David McLean, Joel McLean and James Ralph (2019) Development of a microwave stunning system for cattle 2: Preliminary observations on behavioural responses and EEG. *Research in Veterinary Science* 122: 72-80. DOI: 10.1016/j.rvsc.2018.11.010
- Amira A. Goma, Gareth P. Pearce, Jashim Uddin, Eloise Rimon, Harriet Davies, Clive J.C. Phillips. 2018. A forced lateralisation test for dairy cows and its relation to their behaviour. *Applied Animal Behaviour Science*, 207, 8-19.
- Angela Lees, Jim Lea, Hannah Salvin, Linda Cafe, Ian Colditz and Caroline Lee. 2018. Relationship between rectal temperature and vaginal temperature in grazing *Bos taurus* heifers. *Animals*, 8, 156; doi:10.3390/ani8090156.
- Bates AJ, Sutherland MA, Chapple F, Dowling SK, Johnson AP, Saldias B, Singh J. A new method of administering local anesthesia for calf disbudding: findings from a comparative on farm study in New Zealand. *Journal of Dairy Science*: In press.
- Beausoleil, N.J., Mellor, D.J., Baker, L., Baker, S.E., Bellio, M., Clarke, A.S., Dale, A., Garlick, S., Jones, B., Harvey, A., Pitcher, B.J., Sherwen, S., Stockin, K., Zito, S. 2018. 'Feelings and Fitness' not 'Feelings or Fitness' - the raison d'être of Conservation Welfare, which aligns conservation and animal welfare objectives. *Frontiers in Veterinary Science (Wild Animal Welfare special issue)*. Volume 5, Article 296. doi:10.3389/fvets.2018.00296
- Beggs, D.S., Jongman, E.C., Hemsworth, P.H. and Fisher, A.D. (2018). Implications of prolonged milking time on time budgets and lying behavior of cows in large pasture-based dairy herds. *J. Dairy Sci.* 101: 10391-10397. <https://doi.org/10.3168/jds.2018-15049>
- Bliss AE, C Chylinski, D Luo, KE Schütz, K Lowe, SW Peterson, D Stevens, T MacDonald, and SA McCoard. 2018. The impact of different management systems on behaviour and milk production of dairy ewes in different stages of lactation; a case study. *Proceedings of the NZ Society for Animal Production* 78: 78: 116-121.
- Booty S, Harding D, Gater M, Whitby C, Chambers P, Singh P (2018) Sustained released injectable gel formulations for administration of sodium salicylate in broiler chickens. *Journal of Avian Medicine and Surgery*. (Accepted)
- Caroline Lee Ian Colditz, and Dana Campbell 2018. A framework to assess the impact of new animal management technologies on welfare: a case study of virtual fencing. *Frontiers in Veterinary Science*, <https://www.frontiersin.org/articles/10.3389/fvets.2018.00187/full>.
- Caroline Lee, Linda Cafe, Samantha Robinson, Rebecca Doyle, Jim Lea, Alison Small and Ian Colditz. 2018. Anxiety influences attention bias but not flight speed and crush score in beef cattle. *Applied Animal Behaviour Science*. 205: 210-215. <https://doi.org/10.1016/j.applanim.2017.11.003>.
- Christine Morton, Geoffrey Hinch, Alison Small and Paul McDonald (2019) Flawed mothering or infant signaling? The effects of deficient acoustic cues on ovine maternal response. *Developmental Psychobiology* DOI: 10.1002/dev.21769
- Coleman, G.J. (2018). Public animal welfare discussions and outlooks in Australia. *Animal Frontiers*, 8:1 1, 14-19, <https://doi.org/10.1093/af/vfx004>
- Corner-Thomas, R.A., Cranston, L.M., Kemp, P.D., Morris, S.T., Kenyon, P.R. 2018. The performance of single-rearing ewes and their lambs offered ryegrass pasture or herb-clover mix during lactation. *New Zealand Journal of Agricultural Research*, 61, 67-80.
- Corner-Thomas, R.A., Ferguson, M.B., Kenyon, P.R., Stafford, K.J., Pomroy, W.E. 2018. Lamb castration and tailing practices in New Zealand: results of a questionnaire. *New Zealand Journal of Animal Science and Production*, 78, 96-99.
- Cronin, G.M., Hopcroft, R.L., Groves, P.J., Hall, E.J.S., Phalen, D.N. and Hemsworth, P.H. (2018). Why did severe feather pecking and cannibalism outbreaks occur? An unintended case study while investigating the effects of forage and stress on pullets during rearing. *Poultry Science*, pey022, <https://doi.org/10.3382/ps/pey022>
- Dana Campbell, Andrew Talk, Ziyang Loh, Tim Dyall and Caroline Lee. 2018. Spatial cognition and range use in free-range laying hens. *Animals*, 8, 26; doi:10.3390/ani8020026
- Dana Campbell, Brian Horton, and Geoff Hinch. 2018. Using radio-frequency identification technology to measure synchronised ranging of free-range laying hens. *Animals*, 8(11), 210; <https://doi.org/10.3390/ani8110210>
- Dana Campbell, Elske de Haas and Caroline Lee. 2018. A review of environmental enrichment for laying hens during rearing in relation to their behavioral and physiological development. *Poultry Science*, <https://doi.org/10.3382/ps/pey319>.
- Danila Marini, Dennis Meuleman, Sue Belson, Bas Rodenburg, Rick Llewellyn and Caroline Lee. 2018. Developing an ethically acceptable virtual fencing system for sheep. *Animals*, 8, 33; doi:10.3390/ani8030033.
- Danila Marini, Rick Llewellyn, Sue Belson, and Caroline Lee. 2018. Controlling within-field sheep movement using virtual fencing. *Animals*, 8, 31; doi:10.3390/ani8030031
- Deeming LE, Beausoleil NJ, Stafford KJ, Webster JR, Zobel G. 2018. Technical note: The development of a reliable 5-point gait scoring system for use in dairy goats. *Journal of Dairy Science* 101(5): 4491-4497.
- Deeming, L.E., Beausoleil, N.J., Stafford, K.J., Webster, J.R., Zobel, G. 2018. The development and use of a five-point gait scoring system to reliably assess the lameness status of dairy goats. *Journal of Dairy Science* 101: 1-7.

- Ekanayake L.J., Corner-Thomas R.A., Cranston L.M., Kenyon P.R., Morris S.T. 2018. A comparison of liveweight gain of lambs weaned early onto a herb-clover mixed sward and weaned conventionally onto a ryegrass-clover pasture. *Asian-Australasian Journal of Animal Science*, 0.
- Elizabeth Riddle, Ahmed Ali, Dana Campbell, and Janice Siegford. Space use by 4 strains of laying hens to perch, wing flap, dust bathe, stand and lie down. *PLoS ONE* 13(1): e0190532. <https://doi.org/10.1371/journal.pone.0190532>
- Engel, J.M, Widowski, T.M., Tilbrook, A.J., Butler, K.L. and Hemsworth, P.H. (2018). The effects of floor space and nest box access on the physiology and behavior of caged laying hens. *Poultry Science*, , pey378, <https://doi.org/10.3382/ps/pey378>
- Griffiths KJ, Ridler AL, Heuer C, Corner-Thomas RA, Kenyon PR. 2018. Associations between liveweight, body condition score and previous reproductive outcomes, and the risk of ewes bred at 18-months of age being dry at docking. *New Zealand Veterinary Journal*, 1-8
- Gronqvist, G.V., Corner-Thomas, R.A., Kenyon, P.R., Stafford, K.J., Morris, S.T., Hickson, R.E. 2018. The effect of nutrition and body condition of triplet-bearing ewes during late pregnancy on the behaviour of ewes and lambs. *Asian-Australasian Journal of Animal Science*, 0, 0-0.
- Hall, B.A., Melfi, V., Burns, A., McGill, D.M. and Doyle, R.E. (2018) Curious creatures: a multi-taxa investigation of responses to novelty in a zoo environment. *PeerJ* 6:e4454 <https://doi.org/10.7717/peerj.4454>
- Hempstead MN, Waas JR, Stewart M, Cave VM, Sutherland MA. 2018. Evaluation of alternatives to cautery disbudding of dairy goat kids using physiological measures of immediate and longer-term pain. *Journal of Dairy Science* 101(6): 5374-5387.
- Hempstead MN, Waas JR, Stewart M, Cave VM, Sutherland MA. 2018. Evaluation of alternatives to cautery disbudding of dairy goat kids using behavioural measures of post-treatment pain. *Applied Animal Behaviour Science* 206: 32-38.
- Hempstead MN, Waas JR, Stewart M, Cave VM, Turner AR, Sutherland MA. 2018. The effectiveness of clove oil and two different cautery disbudding methods on preventing horn growth in dairy goat kids. *PLoS ONE* 13(11), e0198229.
- Hempstead MN, Waas JR, Stewart M, Dowling SK, Cave VM, Lowe GL, Sutherland MA. 2018. Effect of isoflurane alone or in combination with meloxicam on the behavior and physiology of goat kids following cautery disbudding. *Journal of Dairy Science* 101(4): 3193-3204.
- Hempstead MN, Waas JR, Stewart M, Zobel G, Cave VM, Julian AF, Sutherland MA. 2018. Pain sensitivity and injury associated with three methods of disbudding goat kids: Cautery, cryosurgical and caustic paste. *Veterinary Journal* 239: 42-47.
- Hemsworth, P.H. (2018). Key determinants of pig welfare: implications of animal management and housing design on livestock welfare. *Animal Production Science*, <https://doi.org/10.1071/AN17897>
- Hemsworth, P.H., Rice, M., Borg, S., Edwards, L.E., Ponnampalam, E.N. and Coleman, G.J. (2018). Relationship between handling, behaviour and stress in lambs at abattoirs. *Animal*. <https://doi.org/10.1017/S1751731118002744>
- Isabelle Ruhnke, Camille Normant, Dana Campbell, Zafar Iqbal, Caroline Lee, Geoff Hinch, and Julie Roberts. 2018. The impact of choice feeding with black soldier fly larvae (*Hermetia illucens*) on flock performance, egg quality and ranging activity of free-range laying hens. *Animal Nutrition*. <https://doi.org/10.1016/j.aninu.2018.03.005>
- Jalil NSA, Tawde AV, Zito S, Sinclair M, Fryer C, Idrus Z, et al. (2018) Attitudes of the public towards halal food and associated animal welfare issues in two countries with predominantly Muslim and non-Muslim populations. *PLoS ONE* 13(10): e0204094. <https://doi.org/10.1371/journal.pone.0204094>
- Jessica Monk Rebecca Doyle, Ian Colditz, Sue Belson, Greg Cronin, and Caroline Lee. 2018. Towards a more practical attention bias test to assess affective state in sheep. *PLoS ONE* 13(1): e0190404. <https://doi.org/10.1371/journal.pone.0190404>
- Jessica Monk, Brad Hine, Ian Colditz and Caroline Lee. 2018. A novel protocol to assess acclimation rate in *Bos taurus* heifers during yard weaning. *Animals*. 8, 51; doi:10.3390/ani8040051.
- Jessica Monk, Ian Colditz, Sue Belson, and Caroline Lee, 2018. Attention bias test differentiates anxiety and depression in sheep. *Frontiers in Behavioral Neuroscience*. 12:246. doi: 10.3389/fnbeh.2018.00246
- Jongman, E.C., Butler, K.L. and Hemsworth, P.H. (2018). The effects of kennel size and exercise on the behaviour and stress physiology of individually-housed greyhounds. <https://doi.org/10.1016/j.applanim.2017.11.002>
- Kells N, Beausoleil N, Johnson CB, Sutherland MA. 2018. Evaluation of different gases and gas combinations for on-farm euthanasia of pre-weaned pigs. *Animals* 8: 40.
- Kells NJ, Beausoleil NJ, Sutherland MA, Johnson CB. 2018. Electroencephalographic responses of anaesthetised pigs to intraperitoneal injection of sodium pentobarbital. *Animal Welfare* 27(3): 205-214.
- Kells, N.J., Beausoleil, N.J., Johnson, C.B., Sutherland, M. 2018. Evaluation of different gases and gas combinations for on-farm euthanasia of pre-weaned pigs. *Animals*, 8(3), E40 doi: 10.3390/ani8030040.
- Kells, N.J., Beausoleil, N.J., McIlhone, A.E., Johnson, C.B. 2018. Electroencephalographic responses of anaesthetised rats to carbon dioxide inhalation. *Animal Welfare*, 27: 215-223. doi: 10.7120/09627286.27.3.215.
- Kells, N.J., Beausoleil, N.J., Sutherland, M.A., Johnson, C.B. 2018. Electroencephalographic responses of anaesthetised pigs to intraperitoneal injection of sodium pentobarbital. *Animal Welfare* 27(3): 205-214.

- Kells, N.J., Beausoleil, N.J., Sutherland, M.A., Johnson, C.B. In Press. Postnatal development of EEG responses to noxious stimulation in pigs (*Sus scrofa*) aged 1–15 days. *Animal Welfare*.
- Kennedy, U., Sharma, A. and Phillips, C.J.C. 2018. The sheltering of unwanted cattle, experiences in India and implications for cattle industries elsewhere. *Animals*, 8(5), 64; <https://doi.org/10.3390/ani8050064>
- Kongara, K., & Chambers, JP. (2018). Robenacoxib in the treatment of pain in cats and dogs: safety, efficacy, and place in therapy. *Veterinary Medicine: Research and Reports*. 9, 53-61.
- Learmonth, M.J., Sherwen, S. and Hemsworth, P.H. (2018). The effects of zoo visitors on Quokka (*Setonix brachyurus*) avoidance behavior in a wall-through exhibit. *Zoo Biology* 37, 223-228. <https://doi.org/10.1002/zoo.21433>
- Ledger, R.A. and Mellor, D.J. (2018). Forensic use of the Five Domains Model for assessing suffering in cases of animal cruelty. *Animals* 8(7), 101; doi:10.3390/ani8070101
- Li, X.F., Zito, S., Sinclair, M., and Phillips, C.J.C 2018. Perceptions of animal welfare issues during Chinese transport and slaughter of livestock by a sample of stakeholders in the industry. *PLoS One* 13 Issue: 6 Article Number: e0197028
- Littlewood, KE., Beausoleil, N.J., Stafford, K.J., Stephens, C., Collins, T., Fawcett, A., Hazel, S., Lloyd, JKF., Mallia, C., Richards, L., Wedler, NK., Zito, S. 2018. Exploring how end-of-life management is taught to Australasian veterinary students. Part 1: technical euthanasia *Veterinary Record* doi: 10.1136/vr.104775
- Mancera Alarcon, K.F., Besson, M., Lisle, A, Allavena, R.; Phillips, C.J.C. 2018. The effects of mining machinery noise of different amplitude on tissue morphology and fecal corticosterone of wild mice (*Mus musculus*). *Applied Animal Behaviour Science* 203, 81-91.
- Mathurkar, S., Singh, P., Kongara, K., & Chambers, P. (2018). Pharmacokinetics of salicylic acid following intravenous and oral administration of sodium salicylate in sheep. *Animals*. 8(7).
- McIlhone, A.E., Beausoleil, N.J., Kells, N.J., Johnson, C.B. and Mellor, D.J. (2018). Effects of halothane on the electroencephalogram of the chicken. *Veterinary Medicine and Science* 4, 98-105. doi:10.1002/vms3.91
- McIlhone, A.E., Beausoleil, N.J., Kells, N.J., Mellor, D.J., Johnson, C.B. 2018. Effects of noxious stimuli on the electroencephalogram of anaesthetised chickens (*Gallus gallus domesticus*) *PLOS ONE* 13(4): e0196454. <https://doi.org/10.1371/journal.pone.0196454>.
- Mellor, D.J. (2018). Tail docking of canine puppies: Reassessment of the tail's role in communication, the acute pain caused by docking and interpretation of behavioural responses. *Animals* 8(6) 82; doi:10.3390/ani8060082
- Monk JE, Doyle RE, Colditz IG, Belson S, Cronin GM, Lee C (2018) Towards a more practical attention bias test to assess affective state in sheep. *PLoS ONE* 13(1): e0190404. <https://doi.org/10.1371/journal.pone.0190404>
- Munoz, C.A., Campbell, A.J.D., Barber, S., Hemsworth, P.H. and Doyle, R.E. (2018). Using Longitudinal Assessment on Extensively Managed Ewes to Quantify Welfare Compromise and Risks. *Animals* 2018, 8(1), 8; doi: 10.3390/ani8010008
- Munoz, C.A., Campbell, A.J.D., Hemsworth, P.H. and Doyle, R.E. (2018). Animal-Based Measures to Assess the Welfare of Extensively Managed Ewes. *Animals* 2018, 8(1), 2; doi:10.3390/ani8010002
- Navarro, G., Col, R. and Phillips, C.J.C. 2018. Effects of space allowance and simulated sea transport motion on behavioural and physiological responses of sheep. *Applied Animal Behaviour Science*, in press.
- Neave HW, von Keyserlingk MAG, Weary DM, Zobel G. 2018. Feed intake and behavior of dairy goats when offered an elevated feed bunk. *Journal of Dairy Science* 101(4): 3303-3310.
- Nikolett Czipa; Lorand Alexa; Clive Phillips; Béla Kovács. Macroelement ratios provide improved identification of the botanical origin of mono-floral honeys. 2018. *European Food Research and Technology* 244, 1439-1445 . <https://doi.org/10.1007/s00217-018-3057>.
- Phillips, C. J.C., Col, R., Izmirli, S., and Verrinder J. Comparison of the moral sensitivity, judgment and actions of Australian and Turkish veterinary students in relation to animal ethics issues. *Journal of Veterinary Medical Education*, in press
- Robbins, A., Ahmed, A., Ouine, L. and Phillips, C.J.C. 2018. The eyes have it: lateralized coping strategies in cattle herds responding to human approach. *Animal Cognition*, 21, 685-702. <https://doi.org/10.1007/s10071-018-1203-1>
- Ross, T. and Phillips, C.J.C. 2018. Relationships between knowledge of chicken production systems and advocacy by animal protection workers. *Society and Animals* 26: 73-92.
- Santurtun, E. and Phillips, C.J.C. 2018. The effects of regularity of simulated ship motions on the behaviour and physiology of sheep. *Applied Animal Behaviour Science*, 204, 43-52.
- Santurtun, E., Broom, D.M. and Phillips, C.J.C. 2018. A review of factors affecting the welfare of Atlantic salmon. *Animal Welfare* 27, 193-204.
- Schütz K. 2018. Effects of summer conditions on the welfare of ruminants in New Zealand. *The Journal: In press* (December issue).
- Schütz KE, E Rajapaksha, EM Mintline, NR Cox, and CB Tucker. 2018. Stepping behavior and muscle activity of dairy cattle standing on concrete or rubber flooring for 1 or 3 hours. *Journal of Dairy Science*, 101(10): 9472-9482.
- Schütz KE, VM Cave, NR Cox, FJ Huddart, and CB Tucker. 2018. Effects of three types of bedding surface on dairy cattle behavior, preference, and hygiene. *Journal of Dairy Science: In press*.
- Sherwen, S. L., Hemsworth, L. M., Beausoleil, N. J., Embury, A., & Mellor, D. J. (2018). An Animal Welfare Risk Assessment Process for Zoos. *Animals* 2018, 8(8), 130; <https://doi.org/10.3390/ani8080130>

- Sherwen, S.L., Hemsworth, L.M., Beausoteil, N.J., Embury, A., Mellor, D.J. 2018. An animal welfare risk assessment process for zoos. *Animals* 8, 130; doi:10.3390/ani8080130
- Sinclair, M. and Phillips, C.J.C. 2018. International animal protection society leadership: the right people for the right issues. *Animals* 8, 89; doi:10.3390/ani8060089
- Sinclair, M. and Phillips, C.J.C. 2018. Key tenets of operational success in international animal welfare initiatives. *Animals*, 8(6):92. <http://www.mdpi.com/2076-2615/8/6/92>
- Sinclair, M., Derkley, T., Fryer, C., Phillips, C.J.C. 2018. Australian public opinions regarding the live export trade before and after an animal welfare media exposé. *Animals*, 8 (7), 106; <https://doi.org/10.3390/ani8070106>
- Singh P, Scott I, Jacob A, Storillo V, Pomroy B (2018) Pharmacokinetics of Abamectin in sheep, goats and deer. *Small Ruminant Research* 165: 30-33.
- Singh, P. B Gartrell, CB Johnson, JP Chambers (2018). Plasma concentration of butorphanol in Northern Royal Albatross undergoing fracture repair. *SOJ Vet Sci* 4 1-3.
- Singh, P., Kongara, K., Harding, D., Ward, N., Dukkipati, VSR. Johnson, C., Chambers, P. (2018). Comparison of electroencephalographic changes in response to acute electrical and thermal stimuli with the tail flick and hot plate test in rats administered with opiorphin. *BMC Neurology*. 18(1).
- Sutherland MA, AL Bright, and KE Schütz. 2018. Effect of a buccal meloxicam formulation on the behavioural response to ring castration of calves. *Animal Production Science*: <http://www.publish.csiro.au/an/AN17641>
- Sutherland MA, Huddart FJ, Stewart M. 2018. Short communication: Evaluation of the efficacy of novel disbudding methods for dairy calves. *Journal of Dairy Science*. In Press.
- Sutherland MA, Lowe GL, Huddart FJ, Waas JR & Stewart, M. 2018. Measurement of dairy calf behavior prior to onset of clinical disease and in response to disbudding using automated calf feeders and accelerometers *Journal of Dairy Science* 101(9): 8208-8216.
- Sutherland MA, White T, Chen L, Hempstead M, Huddart F. 2018. To train or not to train heifers to the milking parlour prior to calving? That is the question for New Zealand dairy farmers. *New Zealand Journal of Animal Science and Production* 78: 177-182.
- Sutherland, Mhairi A, Larive, J., Cave, V., & Zobel, G. 2018. Behavioural and physiological responses to clove oil injected under the horn bud of calves. *Applied Animal Behaviour Science* 204: 29-36.
- Swinbourne Alyce M., Clive J.C. Phillips, Tina Janssen, Allan Lisle, Tamara Keeley, and Stephen D. Johnston. Reproductive biology of the captive female southern hairy-nosed wombat (*Lasiorninus latifrons*). Part 2: Oestrous behaviour. *Reproduction, Fertility and Development* 30: 1424-1433.
- Tayeri, V; Seidavi, A; Asadpour, L; Phillips, CJC. 2018. A comparison of the effects of antibiotics, probiotics, synbiotics and prebiotics on the performance and carcass characteristics of broilers. *Veterinary Research Communications* 42:195-207.
- Teresa Collins, Amelia Cornish, Jennifer Hood, Chris Degeling, Andrew Fisher, Rafael Freire, Susan Hazel, Jane Johnson, Janice Lloyd, Clive Phillips, Vicky Tzioumis, Paul McGreevy. 2018. Importance of welfare and ethics competence regarding animals kept for scientific purposes to veterinary students in Australia and New Zealand. *Veterinary Sciences*, 5, 65, doi 10.3390/vetsci5030065
- Tresoldi G, KE Schütz, CB Tucker. 2018. Cooling cows with sprinklers: Spray duration affects physiological responses to heat load. *Journal of Dairy Science* 101(5): 4412-4423.
- Tresoldi G, Schütz KE, Tucker CB. 2018 Cooling cows with sprinklers: Timing strategy affects physiological responses to heat load. *Journal of Dairy Science* 101(12): 11237-11246.
- Tresoldi G, Schütz KE, Tucker CB. 2018. Cooling cows with sprinklers: Effects of soaker flow rate and timing on behavioral and physiological responses to heat load and production. *Journal of Dairy Science*: In Press. <https://doi.org/10.3168/jds.2018-14962>
- Venkatachalam, D., Chambers, JP. Kongara, K., & Singh, P. (2018). Pharmacokinetics of articaine hydrochloride and its metabolite articainic acid after subcutaneous administration in red deer (*Cervus elaphus*). *New Zealand Veterinary Journal*. 66(1), 16-20.
- Venkatachalam, D., Chambers, P., Kongara, K., & Singh, P. (2018). Toxicity and pharmacokinetic studies of lidocaine and its active metabolite, monoethylglycinexylidide, in goat kids. *Animals* 8(8).
- Verrinder J, Ostini R, Phillips CJC. 2018. Assessing veterinary students' ethical sensitivity to animal welfare issues. *Journal of Veterinary Medical Education*, in press
- Verrinder, J.M. and Phillips, C.J.C. 2018. The relationship between intuitive action choices and moral reasoning on animal ethics issues in students of veterinary medicine and other relevant professions. *Journal of Veterinary Medical Education*, 45, 269-292. <https://doi.org/10.3138/jvme.0117-016>.
- Wong, H. X., Schreurs, N. M., Corner-Thomas, R. A., Ekanayake, W. E. M. L. J., Cranston, L. M., Morris, S. T., & Kenyon, P. R. (2018). Effects of early weaning onto herb-clover mixes on lamb carcass characteristics. *New Zealand Journal of Animal Science and Production*, 78, 189-193.
- Zhang, Y., Guinnefolau, L., Sullivan, M. and Phillips, C.J.C. Behaviour and physiology of sheep exposed to ammonia at a similar concentration to those experienced by sheep during export by sea. *Applied Animal Behaviour Science*, in press.
- Zhang, Y., Guinnefolau, L., Sullivan, M. and Phillips, C.J.C. Climatic influences on the mortality of sheep during long-distance sea transport. *Animal*, 205, 34-43.



Zilong Du, Stephen Johnston, Tina Janssen, Clive Phillips, Allan Lisle, Tamara Keeley. 2018. Behavioral and endocrine responses to season and social dynamics of captive male southern hairy-nosed wombats (*Lasiurus latifrons*) General and Comparative Endocrinology, in press

Zito, S., Paterson, M., Morton, J., Vankan, D., Bennett, P., Rand, J. and Phillips, C. 2018. Surrenderers' Relationships with Cats Surrendered to Four Australian Animal Shelters. *Animals*, 8 (2): 23. doi: 10.3390/ani8020023

Zobel G, Neave H, and Webster J. 2018. Understanding natural behavior to improve dairy goat (*Capra hircus*) management systems. *Translational Animal Science: In Press*

b) International conferences: 33

Acharya, R., Hemsworth, L.M. and Hemsworth, P.H. (2018). Examining the relationship between feeding behaviour and sham chewing in nulliparous group-housed gestating sows. *Proceedings of the 52nd Congress of the International Society for Applied Ethology*. 30 July-3 August 2018, Prince Edward Island, Canada. 235.

Caroline Lee and Dana Campbell. Keynote address: A framework to assess the impact of new animal management technologies on welfare. *International Society of Applied Ethology Congress*, August, 2018. Prince Edward Island, Canada.

Caroline Lee. *Animal Welfare Research at CSIRO*. Seminar at the University of California, Davis, 2018.

Chiew, S.J., Butler, K.L., Sherwen, S.L., Coleman, G.J., Fanson, K.V. and Hemsworth, P.H. (2018). Effects of manipulating visitor proximity and intensity of visitor behaviours on little penguins (*Eudyptula minor*).

*Proceedings of the 52nd Congress of the International Society for Applied Ethology*. 30 July-3 August 2018, Prince Edward Island, Canada. 205.

Coleman, G.J., McLeod, E., Howell, T. and Hemsworth, L.M. (2018). Examining relationships between cat owner attitudes and cat owner reported management behaviour. *Proceedings of the 52nd Congress of the International Society for Applied Ethology*. 30 July-3 August 2018, Prince Edward Island, Canada. 130.

Deeming L, Beausoleil N, Stafford K, Webster J and Zobel G. 2018. The importance of hoof trimming in maintaining normal joint angles in the hooves of dairy goats. *Universities Federation of Animal Welfare (UFAW) Animal Welfare Across Borders Conference*, Hong Kong, 25-26 October.

Deeming L, Beausoleil N, Stafford K, Webster J and Zobel G. 2018. Hoof trimming maintains normal joint angles in the hooves of dairy goats. *The Goat Veterinary Society Meeting*, UK, 9th November.

Deeming L, Neave H, Beausoleil N, Stafford K, Webster J and Zobel G. 2018. Changes in lying time after hoof-trimming in dairy goats. *Proceedings of the International Society for Applied Ethology*, Canada, July 2018. Pp. 228. (Poster).

Doyle, R.E, Wieland, B., Roesel, K. and Grace, D. (2018). Production animal welfare and the sustainable development goals. *UFAW: Animal welfare across borders*. Hong Kong, October 2018

Fisher, A.D., Van Oostveen, C., Conley, M. and Jongman, E.C. (2018). The effect of concrete feedpad feeding periods on oestrous behaviour in dairy cows in a pasture-based farming system. *Proceedings of the 52nd Congress of the International Society for Applied Ethology*. 30 July-3 August 2018, Prince Edward Island, Canada. 82.

Freeman HBR, Webster J, Charlton G, Lehner K and Zobel G. 2018. The effect of outdoor space provision on lying behaviour in lactating dairy goats. *Proceedings of the International Society for Applied Ethology*, Canada, July 2018. pp. 225.

Hempstead M, Waas J, Stewart M, cave VM, Sutherland MA. 2018. Evaluation of alternatives to cautery disbudding of dairy goat kids using behavioural measures of post-operative pain. *Proceedings of the International Society for Applied Ethology*, Canada, July 2018. pp. 227.

Hemsworth, L.M., Acharya, R. and Hemsworth, P.H. (2018). Sham chewing and sow welfare and productivity in nulliparous group-housed gestating sows. *Proceedings of the 52nd Congress of the International Society for Applied Ethology*. 30 July-3 August 2018, Prince Edward Island, Canada. 248.

Hemsworth, P.H., Rice, M., Jongman, E.C., Hemsworth, L.M. and Coleman, G.J. (2018) Improving our understanding of assessing fear in sheep. *Proceedings of the 52nd Congress of the International Society for Applied Ethology*. 30 July-3 August 2018, Prince Edward Island, Canada. 223.

Hunter L, Langford F, Haskell M, O'Connor C, Webster J, Stafford K. 2018. Sleep and resting behaviour in dairy cattle and implications for cow welfare. *Presentation - SRUC Postgraduate Research Conference February 2018*.

Hunter L, Langford F, Haskell M, O'Connor C, Webster J, Stafford K. 2018. Presentations given at *Let Sleeping Cows Lie*, Edinburgh Science Festival - Science of Food. Invited speaker.

Hunter L, Langford F, Haskell M, O'Connor C, Webster J, Stafford K. 2018. The importance of sleep and resting behaviour for dairy cow welfare, *Walks and Talks Animal Welfare Student Conference*, Boggle Hole, Yorkshire, UK, September 10th-12th.

Lowe G, Stewart M, Sutherland M, Waas J. 2018. Behavioural and physiological responses as early indicators of disease in New Zealand dairy calves. *Proceedings of the International Society for Applied Ethology*, Canada, July 2018. pp. 142.

McGee M, Parsons RL, Sutherland MA, Hurtadi-Terminel A, Plummer PJ and Millman ST. 2018. Goat kids display minimal aversion to relatively high concentrations of carbon dioxide gas. *Proceedings of the International Society*

for Applied Ethology, Canada, July 2018. pp. 242.

Munoz, C.A., Hemsworth, P.H., Coleman, G.J, Abrie, L. and Doyle, R.E. (2018). Using qualitative behaviour assessment and flight distance to examine the farmer-ewe relationship in extensive systems. Proceedings of the 52nd Congress of the International Society for Applied Ethology. 30 July-3 August 2018, Prince Edward Island, Canada. 230.

Neave H, Webster J, von Keyserlingk MAG, Weary DM, and Zobel G. 2018. Raising the bar: Feed intake and competitive behavior of dairy goats when offered different feed bunk heights. Proceedings American Society of Animal Science and Canadian Society of Animal Science - Vancouver, Canada, July 8 - 12.

Neave H, Webster J, Zobel G. 2018. Do dairy calves anticipate the opportunity to access an alternative environment? Proceedings American Dairy Science Association (ADSA) - Knoxville, TN, June 25.

Rice, M., Acharya, R., Abrie, L. and Hemsworth, L.M. (2018). A preliminary examination of sham chewing across first and second gestation in group-housed sows. Proceedings of the 52nd Congress of the International Society for Applied Ethology. 30 July-3 August 2018, Prince Edward Island, Canada. 239.

Schütz K. 2018. Effects of summer and winter conditions on dairy cattle welfare in a pasture based system.

Proceedings of the Chile Animal Production Science Symposiums, Valdivia 17-19 October, Chile. Invited speaker.

Schütz K. 2018. Natural behaviour in dairy cattle. Invited speaker at the National Animal Welfare Forum for RD & E (NAWRDE), Melbourne, 7 November.

Schütz K. 2018. The expression of natural behaviour - How important is it to the welfare of the animal in the livestock production sector? Keynote presentation at the National Animal Welfare Forum for RD & E (NAWRDE), Melbourne, 7 November.

Schütz KE, E Rajapaksha, EM Mintline, NR Cox, and CB Tucker. 2018. Stepping behavior and muscle activity of dairy cattle standing on concrete or rubber flooring for 1 or 3 hours. Proceedings of the International Society for Applied Ethology, Canada, July 2018. Pp. 105.

Schütz KE, VM Cave, NR Cox, FJ Huddart, and CB Tucker. 2018. Effects of three types of bedding surface on dairy cattle behavior, preference, and hygiene. Proceedings of the International Society for Applied Ethology, Canada, July 2018. Pp.83.

Sutherland MA, GL Lowe, and KE Schütz. 2018. Effects of flooring surface and a supplemental heat source on dairy goat kids: growth rates, lying times and preferred location. Proceedings of the International Society for Applied Ethology, Canada, July 2018. Pp. 224.

Sutherland MA. 2018. Overview of the use of non-penetrating captive bolts to euthanise neonatal goats. Humane Endings Symposium, Chicago, Illinois, USA.

Webster J, Neave H, and Zobel, G. 2018. Lessons from the past: Refocusing on the individual within a group. Universities Federation of Animal Welfare (UFAW) Animal Welfare Across Borders Conference, Hong Kong, 25-26 October.

Zobel G, and Webster J. 2018. Invited talk: Improving dairy goat management systems: We need to start with natural behaviour. Proceedings American Society of Animal Science and Canadian Society of Animal Science - Vancouver, Canada, July 8 - 12.

Zobel G, Freeman H, Schneider D, Henderson H, Johnstone P, and Webster J. 2018. Behaviour of dairy goats in a natural alpine environment. Proceedings of the International Society for Applied Ethology, Canada, July 2018. Pp.229 (poster).

#### c) National conferences: 22

Alison Small. Diathermic Syncope® - a new technology for pre-slaughter induction of insensibility. RSPCA Animal Welfare Seminar, Canberra, Australia, February 2018.

Alison Small. New developments in humane slaughter. ANZCVS Science Week, Surfers Paradise, July 2018.

Alison Small. New strategies in pain relief for farm animals. RSPCA Animals in Focus Conference, October 2018, Brisbane.

Alison Small. Welfare and public health aspects of the transport, saleyard and lairage phases. ANZCVS Science Week, Surfers Paradise, July 2018.

Bates AJ, Sutherland MA, Saldias B, Chapple F. 2018. Local anaesthetic for calf disbudding: what works? New Zealand Veterinary Association conference, Hamilton, New Zealand.

Caroline Lee and Dana Campbell. Keynote address: Welfare assessment of new technologies in livestock, Animals in Focus Conference, October 2018, Brisbane.

Caroline Lee and Jessica Monk. New ways of assessing emotions in animals. Animals in Focus Conference, October 2018, Brisbane.

Caroline Lee. The importance of natural behaviour to cattle housed in beef feedlots. National Animal Welfare Strategy Forum, November 2018, Melbourne.

Dana Campbell and Caroline Lee. A review of environmental enrichment for laying hens during rearing in relation to their behavioral and physiological development. Australian Poultry Science Symposium, February 2018, Sydney.

Dana Campbell and Caroline Lee. Development of a virtual fencing system for cattle. Burdekin Bowen Integrated Floodplain management Advisory Committee Inc. June 2018, Ayr.

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Dana Campbell, Caroline Lee and Peta Taylor. Assessing the impact of rearing enrichments on free-range layer behaviour, welfare, and production. PoultryHub Ideas Exchange, September 2018, Brisbane.

Dana Campbell. Environmental enrichment during rearing –influences on layer behaviour. Poultry Information Exchange, June 2018, Gold Coast.

Dana Campbell. Satisfying natural behaviour in laying hens: Effects on welfare and production. National Animal Welfare Strategy Forum, November 2018, Melbourne.

Hempstead MN, Waas JR, Stewart M, Zobel G, Cave VM, Julian AF, Sutherland MA. 2018. Comparison of disbudding methods in goats: pain and skull injury. New Zealand Veterinary Association conference, Hamilton, New Zealand.

Lea Labeur, Guillaume Villiers, Alison Small, Geoffrey Hinch and Sabine Schmoelzl. Impact of mid-pregnancy shearing on lamb neonatal body surface temperature in cold conditions. ASAP, Wagga Wagga July 2018.

Leisha Hewitt and Alison Small. The influence of human factors on the effectiveness of stunning. Australian Veterinary Congress, Brisbane May 2018.

McGowan J and K Schütz. 2018. Defining and getting into the thermozone. Proceedings of NZVA conference, Hamilton, 19-22 June (short paper).

Saunders K, O'Connor C, Webster J. 2018. A method for determining a farm system's impact on cow quality of life. NZVA Conference. Hamilton, 19-22 June (short paper).

Sutherland MA, Hempstead MN. 2018. Understanding goat welfare: Goats are not small cows. New Zealand Veterinary Association conference, Hamilton, New Zealand.

Sutherland MA, Huddart FJ. 2018. The efficacy of alternative methods of disbudding in calves. New Zealand Veterinary Association conference, Hamilton, New Zealand.

Webster, J.R. (2018). What can we learn from Agriculture. Zoo and Aquarium Association Australasia Animal Welfare Workshop, May 25-26, Wellington Zoo, New Zealand.

Zobel G, Neave H, Roche J. 2018. Keynote: Potential solutions to major animal welfare issues facing dairy farming in the next 10+ years. Proceedings of the Australasian Dairy Science Symposium, Palmerston North, Nov 21 – 23.

#### d) Other

(Provide website address or link to appropriate information): 12

##### Books

Phillips, C.J.C. 2018. Principles of Cattle Production. Third Edition. CAB International, Wallingford

##### Book Chapters

Phillips, C.J.C. and Wilks, M. 2018. Is there a future for cattle farming? In: Diana Bogueva, Dora Marinova, Talia Raphaely and Kurt Schmidinger (eds). Environmental, Health, and Business Opportunities in the New Meat Alternatives Market. IGI Global, in press.

Schultz, KE, Lee, C and De Vries TJ. (2018). Behavioral priorities: Feed and water selection, ability to move freely and to access pasture. In Advances in Cattle Welfare. Woodhead Publishing. In Production.

##### Industry Reports

O'Connor C, Dowling, S, and Roberts K. 2018. On-farm assessment of lying time calculator predictions for off-paddock facilities. DairyNZ Contract report 7867. 17 pp.

O'Connor C, Webster J, Dowling S, and Thoday H. 2018. Caring for your cows on stand-off pads. DairyNZ Technical Series. March issue: 1-4.

O'Connor C and Webster J. 2018. An Experience Framework for Assessment of New Zealand Dairy Cow Needs. DairyNZ contract report 8112. 26 pp.

Schütz K. 2018. Effects of warm and cold environmental conditions on dairy cattle health, production, and welfare. Report prepared for DairyNZ, 31 May.

Schütz K, Thompson B, Ward J, O'Neill K, and Asher G. 2018. The relationship between behaviour, stress and productivity in farmed red deer (*Cervus elaphus*): Interim report to year-end 2017/18. Report prepared for DEEResearch, 30 June.

Schütz K. 2018. The welfare, health and productivity of dairy cattle in muddy conditions. Report prepared for DairyNZ, 26 September.

Sutherland M and Schütz K. 2018. Lying behaviour of dairy cattle with subclinical facial eczema. Part of SFF report (E Cuttance).

Zobel G, and M. Sutherland. 2018. Bedding options for dairy goats: Literature Review. Finalized Summary for DGC. July 2018.

Zobel G, Murney R, Cameron C, Turner A, Deeming L, Bruce B. 2018. Kid rearing study. Client summary interim report for DGC. March 2018.