animal welfare science update

The aim of the animal welfare science update is to keep you informed of developments in animal welfare science relating to the work of the RSPCA. The update provides summaries of the most relevant scientific papers and reports received by the RSPCA Australia office in the past quarter.

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review

The Welfare of Animals: The Silent Majority

The Welfare of Animals is the eighth volume in a comprehensive series of reference texts that have hitherto discussed the welfare of horses, laboratory animals, cats, dogs, cattle, sheep and pigs. This book was written by the series editor, Clive Phillips, Professor of Animal Welfare at the University of Queensland's Centre for Animal Welfare and Ethics. Professor Phillips draws on a distinguished career in animal welfare science to explore the social, economic and political factors that influence animal welfare globally. Comprehensive reviews of the literature are punctuated by engrossing accounts of Professor Phillips' own travels, ranging from his observations of the difficulties facing Malaysian wildlife to the welfare of traditionally-slaughtered sheep in remote Bedouin communities. The *Silent Majority* to which the book title refers are the millions of animals that have their welfare compromised by human activity each year. Phillips estimates that each of us affects approximately 18 animals each year and asks us to consider not just those animals that we eat, but also the animals whose habitats are destroyed and those animals that are used in scientific research or for entertainment. Accordingly, the major themes of the book are discussed in the context of all of these animal groups.

Chapters one to four of *The Welfare of Animals* introduce the concepts and definitions of animal welfare and reviews mankind's historic relationship with animals, discussing shifting attitudes from the Palaeolithic period onwards and the evolution of empathy towards animals. Phillips then addresses the process of assessing welfare, from the extrapolation of welfare status to auditing welfare in practical settings. Chapter six offers a compelling analysis of various attitudes towards managing animal welfare, comparing several religious perspectives, highlighting recent developments and touching on the attitudes in some indigenous societies and the general public. Chapters seven and eight discuss teaching animal welfare, particularly within the context of veterinary education, and the evolution of animal welfare science. Here Phillips discusses the impact of animal welfare science on animal welfare in practice and stresses the importance of independence in research and the problems associated with sourcing funding from industry. The final chapters of the book cover the use of animals in various industries throughout the world, examining the scale of each industry (e.g. agricultural, companion, research animals, etc.) separately and discussing the intensification of animal production for the food industry and the associated consequences for animal health and welfare. In chapter ten, Phillips turns to the welfare of animals in research where husbandry practices tend to be hidden from public view and stringent auditing procedures threaten to drive research involving animals to developing countries where legislation is more relaxed. He explores the areas of genetic modification and xenotransplantation in some detail as examples of two new areas of animal research that are likely to increasingly impact animal welfare.

The book concludes with a discussion of the future of farm, companion and wild animal welfare. Phillips predicts that concern for animal welfare will evolve from the current, fairly limited emphasis on those animals that are seen as useful to humans, towards a more generalised concern for all animals. He forecasts an increase in legislative control of animal welfare in both developed and developing countries. Finally, Professor Phillips emphasises the importance of integrating progress in the field of animal welfare with improvements in human and environmental health.

The broad scope of *The Welfare of Animals* provides the reader with a sound background in animal welfare, making it a valuable reference text for students and teachers. However Phillips' holistic approach, with segues into science, art, history and politics, makes *The Welfare of Animals* an engaging read for those from disciplines as diverse as veterinary science and philosophy.

Phillips, C. (2009) The Welfare of Animals: The Silent Majority. Springer.

companion animals

The first international canine science forum

This issue of the *Journal of Veterinary Behavior* (JVB) is comprised of abstracts from the first Canine Science Forum, held in Budapest in July 2008. The symposium covered diverse topics including cognition, communication, wild canids, ethology, genetics, shelter and working dog welfare and interactions between dogs and humans. This broad scope is reflected in the 106 short abstracts of interest to those in veterinary practice or working directly with dogs, as well as those in basic canine research. Of particular interest are several abstracts relating to the welfare of working dogs. Several studies examine behavioural and physiological stress parameters in search and rescue dogs, providing a valuable foundation for monitoring welfare in these working animals. Similarly, an investigation of the stress responses of dogs involved in animal-assisted therapy represents one of the first studies concerned with the welfare of the animals participating in these programs and elucidates the demands placed on those animals during work. Another study highlights the importance of being able to objectively evaluate canine indicators of stress in response to handling, particularly in working situations such as animal-assisted therapy. The authors of this study intend to compare the physiological and behavioural reactions to human gestures in order to determine the reliability of the behavioural indicators that are commonly evaluated in welfare research. These applied welfare studies are well complemented by an extensive collection of abstracts investigating canine cognitive function, canine genetics and wild canid behaviour. The compilation of the Canine Science Forum abstracts in this issue of JVB provides a survey of the wealth of research being undertaken in the areas of canine welfare, behaviour and basic biology and demonstrates how these diverse research areas complement one another.

Journal of Veterinary Behaviour, **4**(2), March/April 2009.

farm animals

Intensive livestock farming – environmental issues and moral responsibility

Global demand for meat and animal products continues to grow and by 2050 global livestock production is expected to double. Currently livestock production generates 18% of greenhouse gases and directly or indirectly uses 30% of the earth's surface. As meat is increasingly produced by intensive farming practices it is likely that the environmental concerns surrounding livestock production will only increase. In this paper, Ilea makes an argument for reducing meat consumption, not based on welfare grounds but on the moral responsibility we have to mitigate the environmental impacts of livestock production. She argues that legislation and community mobilisation will not be enough to successfully reduce production and that decreased meat consumption is key. Ilea warns that by tightening regulations in order to curb emissions, the increased cost of farming will drive intensive meat production to countries where regulation is lax and the cost of production is cheaper. She asserts that rallying communities to prevent the construction of intensive industries in their area is unlikely to be successful as the industry will simply move to other, less mobilised communities. Ilea concludes that the most effective method of reducing production is by reducing demand. She does not suggest that we should all become vegan but that those of us in a position to eat less meat have a moral responsibility to do so. This paper raises some important issues but the author falls short of proposing potential solutions.

Ilea, R.C. (2009) Intensive livestock farming: Global trends, increased environmental concerns and ethical solutions. *Journal of Agriculture and Environmental Ethics* **22**: 153-167.

Alternatives to mulesing

Mulesing is a surgical procedure involving the removal of the skin adjacent to the tail and perineum of lambs, usually without anaesthesia. The objective of mulesing is to reduce the risk of flystrike by creating a wool-free patch of un-wrinkled skin as a result of wound contraction. Mulesing is a common management practice in the Australian wool industry with approximately 35 million lambs mulesed in 2006-2007; about 40% of our national flock. There is widespread concern regarding the welfare implications of the practice and in 2004 the Australian wool industry committed to phasing out mulesing by 2010. Less invasive management strategies such as insecticide use, crutching and breeding (e.g. for less wrinkly skin) have been inadequate in areas

where flystrike is prevalent. This paper assesses the behavioural and physiological effects of two mulesing alternatives: an intradermal sodium lauryl sulphate injection and plastic clips. Both procedures cause a gradual loss of skin in the perineal region due to necrosis (tissue death). This report demonstrates that, as previously described, mulesing adversely affects lamb welfare. The authors found that the behavioural and physiological effects of mulesing were significantly more pronounced and longer lasting than the effects produced by the two alternative procedures. Feeding and lying behaviour were disrupted for up to two weeks following mulesing; gait and growth for up to three weeks. Cortisol, haptoglobin and white blood cell ratios were abnormal, indicating physiological stress. By contrast, the lambs that received the intradermal injections and clips exhibited behavioural and physiological responses comparable with the control group (receiving no treatment). Behavioural differences were minimal and gait and weight gain were similar in the control and alternative treatment groups. Physiological parameters were mildly elevated in the sodium lauryl sulphate group and less so in the clip group, indicating moderate, short-term stress. Based on these results the authors conclude that the two alternative treatments present significant welfare advantages over surgical mulesing.

Hemsworth, P.H. *et al* (2009) Effects of mulesing and alternative procedures to mulesing on the behaviour and physiology of lambs. *Applied Animal Behaviour Science* **117**: 20-27.

A review of pain and stress in crustaceans

The ability of crustaceans to experience pain remains contentious, despite the considerable body of work on crustacean welfare, behaviour and physiology. The authors of this review collate this data to provide a convincing argument for the presence of pain and stress responses in crustaceans. They suggest that the welfare indicators used in vertebrates have analogies in crustaceans and can therefore be used to test for the presence of pain or stress. Criteria include a central nervous system, physiological responses to noxious stimuli (e.g. elevated levels of crustacean hyperglycaemic hormone, a cortisol analogue), the presence of opioid receptors and demonstrated cognitive ability (e.g. the ability of a hermit crab to choose between two shells). Behavioural indices include protective motor responses (e.g. grooming an injury) and exhibited trade-offs that indicate behaviour is voluntary and not reflex (i.e. a response to a noxious stimulus is influenced by other factors such as the presence of food).

In light of the body of work available to suggest that crustaceans do experience pain and stress, many husbandry practices in the commercial crustacean food industry are highly questionable. The authors briefly touch on practices such as trawling, claw immobilisation during transport, live boiling and claw removal. In the latter procedure, claws are twisted off and the crabs are returned to the sea. This practice is touted as sustainable since crabs are known to autotomise (cast off) limbs in some circumstances. However, the sustainability of this practice is questionable as the fitness of the declawed crabs is considerably compromised. Declawing has been shown to elicit a stress response that is even higher when the crabs are returned to the sea to compete with fitter conspecifics.

The authors conclude that analogous physiological systems and behavioural responses in crustaceans demonstrate their ability to experience pain and stress. While more research is needed, our current understanding suggests that commercial husbandry practices may pose welfare concerns.

Elwood, R.W, Barr, S. and Patterson, L. (2009) Pain and stress in crustaceans? *Applied Animal Behaviour Science* In Press.

Chicken health in Switzerland 12 years after the ban on battery cages

Battery cages were banned from Swiss egg production systems in 1992. At the time of the ban opponents predicted a rise in the prevalence of parasitism and diseases such as coccidiosis, *E. coli* and Salmonella. This was not the case and there has been no economic disadvantage to the cage-free system. This paper summarises the post mortem findings of over 10,000 chicks and laying hens submitted to the Swiss national reference laboratory in the 12 years following the ban. The authors discuss their data in the context of other management changes made in addition to the transition to alternative housing.

The study revealed that there was a significant decrease in the incidence of viral diseases from 1992-2003, as well as a progressive decrease in the incidence of parasites. The sharp decrease in viral disease is attributed to increased vaccination against Marek's disease, the most common viral cause of death in layers. There was a significant increase in bacterial diseases over the study period, largely due to an increased prevalence of colibacillosis in young layers. Factors such as stocking density are thought to play a role in colibacillosis outbreaks and the stress of shifting husbandry systems was also thought to be of importance in the years following the ban. The incidence of non-infectious diseases varied from year to year with

cannibalism and feather pecking representing the most important behavioural problems. The incidence of osteoporosis and fatty liver were shown to have decreased since 1992.

The authors acknowledge that their data set is not complete, as not every dead chicken was presented to the laboratory for examination. Regardless, the paper describes the broad trends in infectious disease prevalence in Switzerland after the ban on battery cages. Since 1992 egg production has not decreased significantly and due to sound biosecurity practices Swiss flocks are free of many of the infectious diseases frequently found in other European layers.

Kaufmann-Bart, M. and Hoop, R.K. (2009) Disease in chicks and laying hens during the first 12 years after battery cages were banned in Switzerland. *The Veterinary Record* **164**: 203-207.

Light intensity in broiler chicken husbandry

Broiler chickens are commonly reared in low light intensity environments with little contrast between light and dark photophases. Hitherto, most investigations into the effects of light intensity on chickens have focused on production traits. Low light intensity environments improve broiler production as demonstrated by increased growth rates and body weight, and improved feed conversion ratios. These parameters are likely improved due to decreased daily activity resulting in reduced energy expenditure. These productivity gains come at a cost to welfare, however, with low lighting contributing to legs problems, eye pathology and adversely affecting behaviour. This paper sought to clarify the behavioural effects of increased contrast between light and dark photoperiods and in doing so determine the welfare implications of different lighting systems.

Three groups of broiler chickens were housed in environments and subjected to low, medium or high degrees of light contrast between light and dark periods. The behaviour of the birds was recorded and analysed to determine how birds in each environment allocated their time. Alvino *et al* found that broilers reared in low contrast light intensities exhibited a more even dispersal of behaviours compared with birds reared in the medium and high contrast environments. That is, birds that did not experience a profound contrast between light and dark periods did not exhibit distinct behaviours for each period. Those birds in the medium and high contrast groups spent comparatively more time foraging and preening during the light phase and more time sleeping during the dark phase. The results of this study suggest that providing broiler chickens with a more distinct photoperiod by increasing light/dark contrast may improve welfare by encouraging distinct behavioural rhythms.

Alvino, G.M., Archer, G.S. and Mench, J.A. (2009) Behavioural time budgets of broiler chickens reared in varying light intensities. *Applied Animal Behaviour Science* In Press.

The effects of slaughter technique on the presence of blood in bovine respiratory tracts

Animals intended for the secular market are routinely stunned by captive bolt prior to slaughter. The religious practices of shechita (kosher) and halal require animals to be slaughtered by a single cut to the underside of the neck, without stunning. This study inspected carcasses for the presence of blood in the respiratory tract of animals slaughtered with stunning and by shechita and halal. The authors aimed to determine whether bleeding into the respiratory tract constituted a welfare concern by causing airway irritation. Coughing could not be used as an indicator of airway irritation as the vagus and laryngeal nerves are severed during shechita and halal slaughter, disabling the cough response.

The study demonstrated that blood entered the trachea and bronchi of all animals regardless of the slaughter method used. Contamination of the surface of the glottis was highest in the halal group. Bright red foam was present in the respiratory tracts of religiously slaughtered cows whereas none was observed in those slaughtered with a captive bolt. It is not clear whether this is due to agonal respiration of animals that do not lose consciousness immediately. The distribution of blood in the respiratory tract of slaughtered animals would suggest that irritation would be perceptible in those animals that were not rendered immediately insensible upon slaughter, thus posing a welfare concern.

Gregory, N.G., von Wenzlawowicz, M. and von Holleben, K. (2009) Blood in the respiratory tract during slaughter with and without stunning in cattle. *Meat Science* **82**: 13-16.

animals used for sport and entertainment

The effect of dietary grain on the behaviour and physiology of intensively managed horses

Previous studies have suggested that in horses, diet may affect the onset of some stereotypic behaviours, with a higher incidence of crib-biting observed in horses fed concentrated feed. It is thought that high-grain diets reduce hindgut pH and induce adverse oral behaviours in order to relieve the associated discomfort.

Freire *et al* tested the behavioural and physiological effects of switching from a moderate to a high grain diet in adult cribbing and weaving horses, as well as non-stereotypic thoroughbreds. They found that the dietary change led to a distinct change in feeding behaviour with all horses consuming the high grain diet at a slower rate than the moderate grain diet. All horses also drank less and spent less time exhibiting foraging behaviour when fed the more concentrated diet. These behaviours were interpreted by the authors as an attempt to reduce transit of high concentrate feed to the hind-gut, thereby reducing lactic acid build up. It is not clear whether the reduced motivation to eat was due to satiety or abdominal discomfort. The dietary change had no effect on physiological parameters such as plasma cortisol, heart rate or oro-caecal transit time.

The authors had anticipated an increase in stereotypic behaviours after the increase in feed concentrate however none were observed. It is unclear whether the changes in feeding behaviour mitigated any other potential behavioural or physiological effects associated with switching to a high grain diet, or whether the dietary change was not profound enough to elicit a response. The authors also note that equine stereotypies tend to become fixed over time and may be unaffected by management aimed at correcting them. The authors suggest that future study should compare diets with a greater concentrate disparity so that simple changes in feeding behaviour cannot mask other diet-induced behavioural effects.

Freire, R. *et al* (2009) The effects of two different amounts of dietary grain on the digestibility of the diet and behaviour of intensively managed horses. *Applied Animal Behaviour Science* **117**: 69-73.

research animals

The ethics of using animals in pain research

Laboratory research involving animals continues to take a central role in pain research and investigations for new methods of pain control. Much of this research, however, necessitates that pain is induced in research subjects, so that it might be measured or alleviated. This paper examines the ethical dilemma central to the use of animals in pain research; that potentially valuable research can only be undertaken at the cost to the welfare of some animals. The authors review the use of animals in pain research, assessing the various animal models and tests frequently used. Each model or test is scored based on its invasiveness, the severity of injury caused and the intensity of the pain induced by each test or model. The authors cover pain (algesiometric) tests, which are used to measure the subject's response to pain, and are distinct from pain models which involve inducing pain to mimic the different types of pain in humans (e.g. acute pain, inflammatory pain, pain associated with cancer). Algesiometric tests are mostly non-invasive and the end-point of these experiments are often determined by the animal when its behaviour permits removal of the painful stimulus. Pain models, by contrast, may cause significant distress and the results presented here emphasises the spectrum of the welfare impact of such experiments. The results of this analysis are presented in a table but are not the focal point of the paper, which focuses discussion on the ethical acceptability of such practices and strategies to minimise the welfare cost to research animals.

The authors highlight the importance of experimental design in minimising animal suffering for pain research. They emphasise that before projects are undertaken, the likelihood of achieving useful results must be thoroughly considered. They question the relevance of some animal models to human clinical situations, particularly those forms of pain that are not associated with any tissue damage but are reproduced in the laboratory by causing injury. The basis of ethical decision-making is reviewed; harm-benefit assessment and the 3 Rs of *replacement* (use of alternatives where possible), *reduction* (in the number of animals used) and *refinement* (of experimental approach). They suggest that pain-related research design should be based on the additional principles of *equality* (assuming pain is equally aversive for all species) and *fairness*. The latter concept emphasises that *reduction* may not be desirable when it unacceptably increases the pain burden of

the remaining animals. The discussion focuses on opportunities for refinement in experimentation with animal models, highlighting some of the special considerations made in the context of pain research such as simple husbandry; excessive handling, bedding type, and availability of food and water. The capacity for replacement is considered with brief references to *in vitro* alternatives and the use of data from human clinical interventions. One point of discussion of particular interest is the difficulty in reproducing results in the pain field. In most experiments the experience of pain can only be inferred from physiological or behavioural parameters and measurements of the onset and intensity of pain are problematic. It is of some concern that results may vary widely between laboratories, despite the standardisation of animal husbandry and experimental technique. The authors conclude with a discussion of the opportunities to mitigate the ethical dilemma associated with pain research. They highlight the role of journals in this area, suggesting that the brief statement required by most publications, attesting to the authors' compliance with animal welfare legislation, could be expanded to a more involved ethical requirement for submission. They refer to the journal *Molecular Pain* that states that manuscripts will be rejected if they cannot justify the experiment by the value of the knowledge gained.

The use of animals in research continues to be a reality and is particularly ethically problematic in the field of pain research. This paper provides a thorough review of the welfare implications of some pain tests and models and discusses the potential to limit the impact on animal welfare through experimental design.

Magalhães-Sant'Ana, M., Sandøe, P. and Olsson, I.A.S. (2009) Painful dilemmas: the ethics of animal-based pain research. *Animal Welfare* **18**: 49-63.

The effect of handling on body weight and behaviour in laboratory rabbits

Rabbits are widely used in laboratory research, particularly in vaccine development and testing, as is discussed in this paper. In this context, the welfare of laboratory rabbits is of paramount importance, as compromised welfare may manifest as physiological alterations that affect research results. This paper investigates the effects of early handling on the behaviour and physiology of male rabbits in a laboratory setting. The authors define the concept of 'coping' as the behavioural and physiological processes that maintain homeostasis. The coping styles of the rabbits in this study were categorised as either proactive or reactive, based on their responses to four tests; a tonic immobility test, a human-approach test, an open-field test and a novel object test. Proactive copers were defined as rabbits that were less susceptible to tonic immobility, quick to approach a novel object and moved rapidly through open fields. Reactive copers, by contrast, were characterised as highly susceptible to tonic immobility (short inductions and longer durations of immobility), slow to approaching novel objects and moved cautiously through open areas. The effects of handling on social behaviour were also monitored to determine whether aggressiveness and social rank are correlated with coping strategy.

The authors concluded that handling had no effect on the growth and body weight of laboratory rabbits. The coping tests indicated that handled rabbits tended to be proactive copers when compared with non-handled rabbits. From their behavioural observations the authors deduced that handling had a stabilising effect on social hierarchy with fewer aggressive interactions between handled rabbits. Previous studies have characterised aggressive, dominant animals as proactive copers which seems to be at odds with these results as the handled group performed well in the coping tests, yet were less aggressive and had a more stable social structure than their non-handled counterparts. Nevertheless, this research demonstrates the value of handling from an early age. The effects of handling appear to benefit the rabbits themselves by reducing stress-related behaviours, and are important to the robustness of laboratory investigations. One aspect of this research that the authors did not adequately address was the effect of neutering on both study groups. All rabbits were castrated at 12 weeks of age after which the authors noted changes in social interactions and hierarchy. Although the authors were able to separate the effects of castration from handling, neutering was evidently an important factor in social stability and could have been further discussed.

Verwer, C.M. *et al* (2009) Handling effects on body weight and behaviour of group-housed male rabbits in a laboratory setting. *Applied Animal Behaviour Science* **117**: 93-102.

other articles of interest

Alvarez, L., Nava, R.A., Ramírez, A., Ramírez, E. & Gutiérrez, J. (2009) Physiological and behavioural alterations in disbudded goat kids with and without local anaesthesia, *Applied Animal Behaviour Science*, **117**(3-4): 190-196.

Brown, J.A., Dewey, C., Delange, C.F.M., Mandell, I.B., Purslow, P.P., Robinson, J.A., Squires, E.J. & Widowski T.M. (In press) Reliability of temperament tests on finishing pigs in group-housing and comparison to social tests, *Applied Animal Behaviour Science*.

Cafazzo, E.N. (2009) The social function of tail up in the domestic cat (*Felis silvestris catus*), *Behavioural Processes*, **80**(1): 1-108.

Dalle Zotte, A., Princz, Z., Matics, Z., Gerencsér, Z., Metzger, S., Szendrő, Z. (2009) Rabbit preference for cages and pens with or without mirrors, *Applied Animal Behaviour Science*, **116**(2-4): 273-278.

Elwood, R.W. & Appel, M. (In press) Pain experience in hermit crabs?, *Animal Behaviour*.

Fraser, D. (2009) Understanding Animal Welfare, UFAW Series. Wiley-Blackwell, Oxford. 324 pp., ISBN 978-1-4051-3695-2.

Friedmann, E. & Son, H. (2009) The Human–Companion Animal Bond: How Humans Benefit, *Veterinary Clinics of North America: Small Animal Practice,* **39**(2): 215-394.

Fröberg, S. & Lidfors, L. (2009) Behaviour of dairy calves suckling the dam in a barn with automatic milking or being fed milk substitute from an automatic feeder in a group pen, *Applied Animal Behaviour Science*, **117**(3-4): 150-158.

Gouveia, K.G., Vaz-Pires, P. & Martins da Costa, P. (2009) Welfare assessment of broilers through examination of haematomas, foot-pad dermatitis, scratches and breast blisters at processing, *Animal Welfare*, **18**: 43-48.

Hänsch, F., Nowak, B. & Hartung, J. (2009) Behavioural and clinical responses of turkeys stunned in a V-shaped, carbon dioxide tunnel, *Animal Welfare*, **18**: 81-86

Harlander-Matauschek, A. & Häusler, K. (2009) Understanding feather eating behaviour in laying hens, *Applied Animal Behaviour Science*, **117**(1-2): 35-41.

Haslam, S.M., Knowles, T.G., Brown, S.N., Wilkins, L.J., Kestin, S.C., Warriss, P.D. & Nicol, C.J. (2008) Prevalence and factors associated with it, of birds dead on arrival at the slaughterhouse and other rejection conditions in broiler chickens, *British Poultry Science*, **49**(6): 685-696.

Haufe, H.G., Gygax, L., Steiner, B., Friedli, K., Stauffacher, M. & Wechsler, B. (2009) Influence of floor type in the walking area of cubicle housing systems on the behaviour of dairy cows, *Applied Animal Behaviour Science*, **116**(1): 21-27.

Heinrich, A., Duffield, T.F., Lissemore, K.D., Squires, E.J. & Millman, S.T. (2009) The impact of meloxicam on postsurgical stress associated with cautery dehorning, *J. Dairy Sci.*, **92**: 540-547.

Hötzel, M.J., Lopes, E.J.C., de Oliveira, P.A.V. & Guidoni, A.L. (2009) Behaviour and performance of pigs finished on deep bedding with wood shavings or rice husks in summer, *Animal Welfare*, **18**: 65-71.

Kay, R. & Hall, C. (2009) The use of a mirror reduces isolation stress in horses being transported by trailer, *Applied Animal Behaviour Science*, **116**(2-4): 101-308.

Krebs, N. & McGlone, J.J. (2009) Effects of exposing pigs to moving and odors in a simulated slaughter chute, *Applied Animal Behaviour Science*, **116**(2-4): 179-185.

Leidig, M.S., Hertrampf, B., Failing K., Schumann, A. & Reiner, G. (2009) Pain and discomfort in male piglets during surgical castration with and without local anaesthesia as determined by vocalisation and defence behaviour, *Applied Animal Behaviour Science*, **116**(2-4): 174-178.

Lexer, D., Hagen, K., Palme, R., Troxler, J. & Waiblinger, S. (2009) Time budgets and adrenocortical activity of cows milked in a robot or a milking parlour: interrelationships and influence of social rank, *Animal Welfare*, **18**: 73-80.

Manteuffel, G., Langbein, J. & Puppe, B. (2009) From operant learning to cognitive enrichment in farm animal housing: bases and applicability, *Animal Welfare*, **18**: 87-95

Manteuffel, G., Langbein, J. & Puppe, B. (In press) Increasing farm animal welfare by positively motivated instrumental behaviour, *Applied Animal Behaviour Science*.

Mason, G. & Rushen, J. (Eds), 2008, Stereotypic Animal Behaviour: Fundamentals and Applications to Welfare, CAB International, Wallingford. 384 pp., ISBN 9781845934651.

Meisfjord Jørgensen, G.H., Andersen, I.L., Berg, S. & Bøe, K.E. (2009) Feeding, resting and social behaviour in ewes housed in two different group sizes, *Applied Animal Behaviour Science*, **116**(2-4): 198-203.

Morris, M.C. (2008) The Ethics and Politics of Animal Welfare in New Zealand: Broiler Chicken Production as a Case Study, *Journal of Agricultural and Environmental Ethics*, DOI 10.1007/s10806-008-9128-3.

Munsterhjelm, C., Peltoniemi, O.A.T., Heinonen, M., Hälli, O., Karhapää, M. & Valros, A. (In press) Experience of moderate bedding affects behaviour of growing pigs, *Applied Animal Behaviour Science*.

Petherick, J.C. & Phillips, C.J.C. (2009) Space allowances for confined livestock and their determination from allometric principles, *Applied Animal Behaviour Science*, **117**(1-2): 1-12 .

Reid, P.J. (2009) Adapting to the human world: Dogs' responsiveness to our social cues, *Behavioural Processes*, **80**(3): 207-344.
Rutherford, K.M.D., Langford, F.M., Mhairi, C.J., Sherwood, L., Lawrence, A.B., Haskell, M.J. (2009) Lameness prevalence and risk factors in organic and non-organic dairy herds in the United Kingdom, *The Veterinary Journal*, **180**(1): 95-105.
Schütz, K.E., Rogers, A.R., Cox, N.R. & Tucker, C.B. (2009) Dairy cows prefer shade that offers greater protection against solar radiation in summer: Shade use, behaviour, and body temperature, *Applied Animal Behaviour Science*, **116**(1): 28-34.
Scott, K., Taylor, L., Gill, B.P. & Edwards, S.A. (2009) Influence of different types of environmental enrichment on the behaviour of finishing pigs in two different housing systems: 3. Hanging toy versus rootable toy of the same material, *Applied Animal Behaviour Science*, **116**(2-4): 186-190.
Shergold, A. (2009) Reducing weaning distress in dairy cattle: welfare considerations for cow and calf, *The Veterinarian*, March 2009: 21, Essay selected for *The Veterinarian* magazine Prize for Written Communications for Sydney University third-year veterinary science students.
Stilwell, G., Campos de Carvalho, R., Lima, M.S. & Broom, D.M. (2009) Effect of caustic paste disbudding, using local anaesthesia with and without analgesia, on behaviour and cortisol of calves, *Applied Animal Behaviour Science*, **116**(1): 35-44.
Trickett, S.L., Guy, J.H. & Edwards, S.A. (2009) The role of novelty in environmental enrichment for the weaned pig, *Applied Animal Behaviour Science*, **116**(1): 45-51.
Uitdehaag, K.A., Bas Rodenburg, T., Bolhuis, J.E., Decuypere, E. & Komen, H. (2009) Mixed housing of different genetic lines of laying hens negatively affects feather pecking and fear related behaviour, *Applied Animal Behaviour Science*, **116**(1): 58-66.
van de Weerd, H.A. & Day, J.E.L. (2009) A review of environmental enrichment for pigs housed in intensive housing systems, *Applied Animal Behaviour Science*, **116**(1): 1-20.
Weber, R., Keil, N.M., Fehr, M. & Horat, R. (In press) Factors affecting piglet mortality in loose farrowing systems on commercial farms, *Livestock Science*.
Wells, D.L. (2009) Sensory stimulation as environmental enrichment for captive animals: A review, *Applied Animal Behaviour Science*, 118(1-2): 1-104.
Wemmer, C. & Christen, C.A. (Eds), 2008 Elephants and Ethics: Towards a Morality of Coexistence, Baltimore, Maryland: Johns Hopkins University Press. xvii+483 pp.
Würbel, H. (In press) Ethology applied to animal ethics, *Applied Animal Behaviour Science*.

upcoming events

43rd Congress of the International Society for Applied Ethology (ISAE) 6-10 July 2009

"The program is still under development, but there will be plenary sessions, short oral and poster presentations on the sub-themes:

- Welfare assessment and enhancement
  Methods and techniques to assess and improve animal welfare in livestock, companion, captive and laboratory animals, including "on-farm assessment", epidemiological approaches and environmental enrichment.
- Management of unwanted animals
  The application of ethology to the management, control and humane killing of pest, feral and companion animals, and the humane killing of unwanted farm and laboratory animals. Topics may include managing reproductive behaviour; improving our understanding of animal movement; using behaviour to target particular species; using behaviour to exclude animals from specific areas; and assessment of methods of humane killing.
- Animal emotion and cognition
  Topics may include methods for studying emotion and cognition, such as the role of neuroscience; demonstration of cognitive abilities of species; positive emotions, such as pleasure, satiety and satisfaction; and enhancing our scientific understanding of emotional states in animals.
- Animals in extensive and natural environments
  Topics may include technologies for behavioural data logging/capture from animals; the role of ethology in the conservation of native species and harvesting/culling of wildlife; remote management and control of livestock; and the challenges of monitoring behaviour of animals in extensive areas (including aquatic environments).
- Animal-human interactions

How animals and humans interact and the effect of these interactions on behaviour and welfare of companion, livestock, captive or laboratory species."

Visit http://www.isae2009.com for more information.

International Society for Equitation Science Annual Conference 12-14 July 2009

Many equine scientists, veterinarians, ethologists and behaviour therapists share the view that the historic lack of science in equitation contributes to the prevalence of undesirable equine behaviours with human-related causes. There is a large and growing number of horses worldwide. As a consequence, there is an increasing number of horse owners, many of whom are new to horse-keeping, with little knowledge of how to train their animal. This has led to a rise in the number of associated horse welfare problems culminating in high wastage rates. Such problems are reflective of uninformed practices, poor training techniques, inappropriate use of training equipment and, in some cases, inhumane handling of horses. In addition, horse-related injuries are a major public health concern, with most occurring while the rider is mounted. Death rates from horse related injuries are in the vicinity of one death per million head of population and in terms of injuries, horse riding is more dangerous than motorcycle sports and equally as dangerous as rugby. Improving riders' understanding of horse behaviour and subsequently reducing the number of "conflict behaviours" will reduce the prevalence of such accidents. Furthermore, the increasing profile of "natural horsemanship" and "horse whisperers" has made horse industry personnel question some traditional practices, prompted them to consider how novel techniques operate and to question how the language relating to horse training and riding relates to what is known through psychology, ethology and veterinary science. Equitation science helps them in all of these three endeavours by provide an understanding of the behavioural mechanisms that underpin the human-horse interface. Equitation science is the measurement and interpretation of interactions between horses and their riders. Most importantly, it also explores the welfare consequences of training and competing horses under different disciplines.

In contrast to the latest generation of horse whisperers, advocates of equitation science are not commercial purveyors of techniques, training certificates or merchandise. Equitation science has an extremely promising future since it is more humble, global, accessible and accurate, and less denominational, commercial, open to interpretation and misinterpretation than any formulaic approach. It has the potential to be the most enduring of all approaches used to train the horse.

Visit http://www.equitationscience.com/Sydney2009.html for more information.

Minding Animals 13 - 18 July 2009

"The conference has six major themes and objectives:

- To reassess the relationship between the animal and environmental movements in light of climate change and other jointly-held threats and concerns
- To examine how humans identify and represent nonhuman animals in art, literature, music, science, and in the media and on film
- How, throughout history, the objectification of nonhuman animals and nature in science and society, religion and philosophy, has led to the abuse of nonhuman animals and how this has since been interpreted and evaluated
- To examine how the lives of humans and companion and domesticated nonhuman animals are intertwined, and how science, human and veterinary medicine utilise these important connections
- How the study of animals and society can better inform both the scientific study of animals and community activism and advocacy
- How science and community activism and advocacy can inform the study of nonhuman animals and society"

Visit http://www.mindinganimals.com for more information.