

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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If you have recently had an article or book published that would be of interest to other readers of the Science Update, please send us the reference so we can include it in the next issue. We like to encourage and promote animal welfare research whenever possible but don't always get to see every relevant paper.

companion animals

Inherited disorders related to dog breeding standards

In recent years, there has been growing concern among pet owners and veterinary professionals that many of the physical traits for dogs recommended by kennel clubs as being 'desirable' for purely aesthetic reasons may, in fact, be quite detrimental to the dogs' welfare. Among the most well-known examples are hip dysplasia among large breeds (such as Great Danes and German Shepherds), breathing difficulties among breeds with short muzzles (such as Pugs and Bulldogs) and skin problems in breeds where excessive skin folds are considered attractive (such as the Shar Pei). The colour of a dog's coat may be genetically linked to certain conditions, such as deafness in Dalmatians, and breeds with large heads relative to their body size may experience difficulties during delivery.

The authors of this paper first surveyed the literature on the relationship between inherited disorders and particular breeds, and ranked these disorders according to a 'severity scale', which took into account the likelihood of a dog's recovery, the level of treatment required, possible complications, and the level of behavioural disturbance a dog might experience. The authors found that in the top 50 UK Kennel Club registered breeds, 84 inherited disorders had been linked by other researchers as resulting from conformation to the formal breed standards of those species. Miniature Poodles were found to be the most predisposed to breed-standard related disorders, followed by the Pug, Bulldog and Basset hound. Shetland sheepdogs, Siberian huskies, Staffordshire bull terriers and Dogue de Bordeaux were associated with the fewest disorders of this type, while Great Danes, German Shepherds and Dobermans had the most disorders that were exacerbated by conforming to a breed standard. The authors stress the need for the collection of prevalence data across all breeds, in order to get a better picture of the relationship between breed standards and inherited conditions.

Asher, L. *et al.* (2009) Inherited defects in pedigree dogs. Part 1: Disorders related to breed standards, *The Veterinary Journal*, **182**: 402-411.

Inherited disorders not related to dog breeding standards

Many of today's popular dog breeds have been developed from very small breeding populations. Pedigree dogs are bred to conform to particular aesthetic standards using closed stud books, selective breeding and the repeated use of popular sires. Such breeding practices may increase the expression of inherited defects and thus compromise the health and welfare of many breeds.

Following an extensive literature search, the authors of this paper found that among the top 50 breeds, there were 312 inherited disorders which could not be directly ascribed to formal breed standards (not linked to conformation). Of the 50 most popular pedigree dogs in the UK, German Shepherd dogs were predisposed to the greatest number of D disorders (58 different disorders), followed by the Golden retriever (50), Boxer (45), Labrador retriever (44) and English Springer spaniel (42).

Dogue de Bordeaux had the fewest reported number of these disorders (3). The four disorders affecting the greatest number of breeds were hypothyroidism (reported in 43/50 breeds considered), which affects weight gain and general well-being, hereditary adult-onset cataract (38 breeds), progressive retinal atrophy (35 breeds), and Von Willebrand's disease (26 breeds), which results in abnormal blood clotting.

The authors stress the need for the collection of more disease prevalence data - in their experience, prevalence data were reported for only 21 of the inherited disorders investigated here.

Summers, J. *et al.* (2010) Inherited defects in pedigree dogs. Part 2: Disorders that are not related to breed standards, *The Veterinary Journal*, 183: 39-45.

Dog Appeasement Pheromone (DAP) collars for anxious dogs

A chemical known as Dog Appeasement Pheromone (DAP) has been shown to be effective in calming anxious dogs. In Australia, DAP is currently only available in the form of a spray, which may not be an ideal solution for dogs that spend much of their time outdoors. The authors of this paper prescribed DAP collars to some dog owners in Sydney, and asked them to rate their effectiveness in calming their dogs over a four week period. The collars were used in conjunction with behavioural modification therapy and medication, where appropriate. The main problems affecting the dogs were generalised anxiety (56%), separation anxiety (15%), and noise phobia (18%).

At the end of the study, 78% of owners reported an improvement in their dogs' behaviour. However, the results may not be conclusive, as behavioural therapy and medications may also have played a role in modifying the dogs' behaviour. Nevertheless, a DAP collar might be a useful alternative to a DAP spray, especially in the Australian context.

Ley, J. *et al.* (2010) Results on the use of Dog Appeasement Pheromone (DAP) collars in a selection of Australian dogs with anxiety disorders, *Journal of Veterinary Behavior: Clinical Applications and Research*, 5(1): 45-46.

A pheromone for anxious cats in a rescue shelter

F4 is a synthetic cat pheromone, which has been shown to reduce aggressive behaviour in cats, make them more social, and make them more cooperative during clinical examinations. Cats are often most stressed when they are brought to a new environment, such as an animal shelter, and may become aggressive when handled, as during a clinical examination. The authors of this study tested the F4 pheromone on cats newly admitted to the National Cat Centre in the UK, during two successive veterinary examinations. The pheromone was applied to the handler's gloves prior to handling a cat, and the animal's behaviour and stress levels were scored by an independent observer. The researchers found an improvement in the cats' behaviour during the first veterinary examination, suggesting that F4 may improve cat welfare in the initial phase of acclimatisation to a new environment.

Patel, G. *et al.* (2010) Pilot study to investigate whether a feline pheromone analogue reduces anxiety-related behaviour during clinical examination of cats in a rescue shelter, *Journal of Veterinary Behavior: Clinical Applications and Research*, 5(1): 33.

farm animals

Footrests for rabbits on commercial farms

Rabbits farmed commercially are normally housed in cages with wire mesh floors, as this is meant to improve hygiene, and reduce the incidence of infections such as coccidiosis. However, prolonged housing on wire mesh can in itself lead to other conditions like ulcerative pododermatitis (sore hocks) and callus formation on the feet. Sore hocks are a common condition in adult rabbits housed on wire mesh floors. Sore hocks impact on rabbit health and welfare, restricting movement and causing chronic pain and suffering. This makes them a useful indicator of animal welfare. Sore hocks can be production-limiting, causing increased infertility, pre-weaning mortality and the culling of afflicted does. Meat quality can also be affected due to popliteal ganglion lymphadenopathy and weight loss, necessitating carcass condemnation.

In rabbit farms, animals are often provided with footrests - a variety of differing materials are available (wood, metal, plastic), but plastic footrests or plastic mats tend to be the most common. The authors of this study investigated the effect of providing footrests on the incidence of sore hocks and callus formation in a newly-opened rabbit farm in Spain.

Over 200 female rabbits were divided into 2 groups - half were housed in normal wire mesh cages, while the other half were provided with slatted plastic footrests. The rabbits were monitored for one year. At the end of the study period, the researchers found that over 70% of normally-housed rabbits showed signs of sore hocks, compared to only 15% of rabbits from the footrest cages. Calluses were found in all

normally-caged rabbits, but only 65% of footrest-cage rabbits. Moreover, providing a footrest to rabbit diagnosed with sore hock cured this condition in over 80% of cases. The researchers recommend providing slatted footrests to rabbits housed in wire mesh cages.

Rosell, J & de la Fuente, L. (2009) Effect of footrests on the incidence of ulcerative pododermatitis in domestic rabbit does, *Animal Welfare*, 18: 199-204.

Spacing sheep during transport

There are currently two conflicting theories regarding the densities at which live sheep can be safely shipped: one says that sheep that are transported with less space can brace themselves against each other, and prevent themselves from falling, while the other states that transporting sheep with more space is better for welfare, as the animals have more room to adopt strategies to keep themselves comfortable. In this paper, the authors tested these two hypotheses, by transporting sheep under different conditions on a standard 6h road trip over good and bad roads.

The results showed that sheep transported at high spacing (in some cases, as high as 1m² per animal) suffered fewer losses of balance and slips than sheep transported at low and medium-low spacing, especially on rough roads. Sheep transported at high spacing were seen to stand close to, but not touching (independent) their pen mates, bracing themselves against the motion of the vehicle by spreading their feet, not by leaning on their pen-mates. They were also seen to lie in transit at higher space allowances, usually after about 4 hours of standing. Sheep fell to the pen floor mainly in low space allowance conditions, and only in these groups were they forced to the pen floor by their pen mates, taking some considerable time to regain their footing. Once on the floor, sheep were often trampled by their neighbours. The authors recommend minimum space requirements of 0.44 m² for a 67 kg shorn ewe, 0.56 m² for a 65 kg fleeced ewe, 0.4 m² for a 40.5 kg fleeced lamb and 0.3 m² for a 32.5 kg shorn lamb.

Jones, T. *et al.* (2010) Sheep lose balance, slip and fall less when loosely packed in transit where they stand close to but not touching their neighbours, *Applied Animal Behaviour Science*, 123: 16-23.

Anaesthesia following castration and tail-docking in lambs

In Australia, 31-34 million lambs undergo tail docking and/or castration, often in the absence of any form of pain relief. In this study, the researchers tested the effectiveness of Tri-Solfen, a spray-on topical anaesthetic formulation of lignocaine and bupivacaine, in alleviating pain-related symptoms associated with hot-iron tail docking and castration carried out by knife. Over 130 Merino lambs were investigated in this study, and subjected to a series of pain-response tests, as well as behavioural observations.

The researchers found that both procedures resulted in instant signs of pain in lambs, but for the animals treated with Tri-Solfen, pain was absent in the castration wounds, and significantly reduced in the tail-docking wounds. There was also a significant reduction in pain-related behaviours in lambs treated with anaesthetic - following treatment, lambs behaved in much the same way as animals that had not been tail-docked or castrated. Finally, the researchers add a related observation that in one group of experimental animals which were castrated by tight rubber rings, the visible signs of pain and distress were far greater than in animals that were knife castrated. Lambs undergoing ring castration and docking exhibited agitation, bleating, lip curling, kneeling, knee walking, writhing and other abnormal postures, such as lying on their sides or on their bellies. These behaviours persisted beyond 2 hours after the application of the rings, and as there was no actual wound, could not be treated with Tri-Solfen. The authors suggest that the spray-on anaesthetic technique is a suitable alternative to surgery without pain relief, and to the use of rubber rings for castration.

Lomax, S. *et al.* (2010) Topical anaesthesia alleviates short-term pain of castration and tail docking in lambs, *Australian Veterinary Journal*, 88: 67-74.

Wall-hugging broiler chickens

From an evolutionary point of view, animals that live in groups should prefer to remain in the middle of the group, as this position provides the greatest level of protection from predators. However, it is often reported that broiler chickens tend to stay close to the pen walls, but that they can be drawn to the more central parts of the pen by placing extra partitions in this area. In this experimental study, the researchers attempted to determine if stocking density was the main driving force behind this unusual behaviour.

Day-old broiler chicks were placed into pens in groups of 8 to 72 birds (densities of 2.4 to 21.8 birds per m²). The researchers found that birds kept in higher densities preened and sat still less than birds from lower density pens. At higher densities, birds also walked less and adjusted their sitting or lying posture more frequently. Most importantly, it was found that in pens with densities higher than 12.1 birds per m², the birds preferred to be near the wall area. The authors suggest that the preference for the wall area at higher densities is more likely to be the result of birds avoiding being disturbed by other birds. Thus, increased use of the wall area may be an indicator that birds are experiencing crowding.

Buijs, S. *et al.* (in press) Resting or hiding? Why broiler chickens stay near walls and how density affects this, *Applied Animal Behaviour Science*.

Animal growth and meat quality

Animals have been domesticated by humans for thousands of years, to meet ever increasing demands for food. The authors of this paper note several major shifts in attitudes towards animal domestication that have punctuated human history. First came the shift from a hunting gathering lifestyle to agriculture, with the simple aim of providing food. This was followed by the selective breeding of 'desirable' animals to maximise food production, and then the more sophisticated selection of animals to maximise production efficiency. More recently, genetic techniques have been used to manipulate even the physiology and biochemistry of domesticated animals. However, consumers are becoming increasingly aware of the possibility that certain breeding and rearing practices can adversely affect animal and human welfare, and also lead to a loss of meat quality.

The use of transgenic technologies, such as the development of pigs with human growth hormone can cause serious health issues for the animals, if the level of hormone production is not controlled. However, even traditional selective breeding can have unwanted effects - animals selected for fast growth may have muscle tissue that breaks down much faster than normal after slaughter. The most common defects include "pale soft exudate" meat (PSE) and "dark firm dry" meat (DFD). The PSE condition is quite common in pigs and chickens, while the DFD condition is more common in cattle. Broiler chickens intensely selected for rapid growth and feed efficiency coupled to environmental stressors like high temperatures also suffer a condition known as ascites, which is characterised by low blood oxygen, increased pressure on the cardio-pulmonary system, central venous congestion, fluid collecting in the abdomen, and death. A striking example of selection for growth in cattle is the double-muscling condition in certain beef cattle breeds like the Belgian blue, Piedmontese and occasionally in a number of other improved beef breeds. These animals often suffer from leg problems, enlarged tongues, weak bones, blood disorders, altered hormone regulation, higher susceptibility to heat stress and lower reproductive capacity. Double-muscling animals also yield beef that tends to be dry, pale and which reacts differently to cooking compared to beef from normal animals, due to the differences in background toughness. The authors recommend that while increased production efficiency remains important in the livestock industry, the available genetic resources and acceptable technologies need to be used to the benefit of the livestock industry and consumers alike.

Webb, E. & Casey, N. (in press) Physiological limits to growth and the related effects on meat quality, *Livestock Science*.

Loss of consciousness in cattle slaughtered without stunning

Cattle are slaughtered without stunning for religious reasons, but there is uncertainty among scientists about the amount of time it might take for a cow to lose consciousness after its throat is cut. Previous studies on the brain-wave patterns of cows undergoing slaughter have produced inconclusive results; therefore, the authors of this study decided to investigate the time it took for standing cattle to collapse after the arteries in their neck were severed.

After observing the responses of 174 cattle, the researchers found that the average time to collapse was about 20 seconds. Although half the cattle collapsed within 10 seconds, fourteen animals (8%) took 60 seconds or more to achieve their final collapse. Surprisingly, 14% of the cattle collapsed and stood up again before finally collapsing. Most of the cattle that took the longest to collapse had false aneurysms in their severed neck arteries (blockages caused by the collection of blood in the arterial wall). The authors point out that there is a big range in the duration of consciousness following the neck cut, and that more needs to be done to manage this problem in religious slaughter.

Gregory, N. *et al.* (2010) Time to collapse following slaughter without stunning in cattle, *Meat Science*, **85**: 66-69.

The behaviour of weaned calves

When milk-fed calves are raised separately from their mothers, they sometimes cross-suck one another. Considerable research has shown that this behaviour occurs most often when calves cannot suck for their milk, and is closely related to the non-nutritive sucking they show on inanimate objects. In this study, the researchers subjected 32 Holstein calves in groups of four to one of the following weaning procedures: either abrupt at 41 d of age or gradual, taking place over 22 d, 10 d or 4 d so that weaning was completed at 41 d of age.

The results showed that before weaning began and the calves were drinking their full allowance of milk, very little cross-sucking occurred. After the weaning process had begun, the calves in the present study began to cross-suck and the calves that began to be weaned at 19 d of age showed the most cross-sucking. Once the calves were fully weaned off milk, however, the occurrence of cross-sucking increased, and this remained high for the remainder of the observation period of 8 days. The authors conclude that gradual weaning helps to improve energy intake after weaning but does not reduce cross-sucking, although this may reflect the fact that weaning at this age is too early to allow the calves to obtain sufficient energy from solid food.

De Passilé, A. *et al.* (2010). Cross-sucking and gradual weaning of dairy calves, *Applied Animal Behaviour Science*, 124: 11-15.

animals used for sport, entertainment, recreation and work

Wild animals in circuses

Circuses often make use of wild animals for the purpose of entertainment, and tend to keep, train and transport them in ways that are far removed from natural conditions. It has been estimated that in the period 1975-2005, the total number of animals officially exported globally for circus and travelling exhibition purposes was about 25,500. Of these, the most traded species are tigers with 3,003 individuals, brown bears with 1,866, pythons with 1,808, macaques with 1,547, lions with 1,473, lovebirds with 1,283 and Asian elephants with 1,168.

Often, there are limited data on various issues concerning the welfare of wild animals in circuses. However, there is little doubt that circus animals are allowed far less space - in circus cages, pens or 'beast wagons' during transport - than even zoo enclosures. The housing of wild animals in barren conditions, the limited opportunities for exercise and social interaction that are available to them, and also the fact that they are often exchanged between circuses, all have the potential to negatively impact on an animal's physical and psychological welfare. Inappropriate training, transport and feeding practices may also lead to stress and illness. Finally, animals will often not exhibit normal reproductive behaviours in captivity, or, if breeding does occur, may not be able to provide proper maternal care to their young, because they themselves have been inadequately socialised. The authors of this paper argue that the animals most commonly kept in circuses appear to be the least suited to life in captivity. They call for more physiological and behavioural studies on the effects of the various aspects of captivity on an animal's welfare.

Iossa, G. *et al.* (2009) Are wild animals suited to a travelling circus life? *Animal Welfare*, 18: 129-140.

Handling foals prior to training

Handling young horses as an early life experience seems to influence the horse's behaviour later during adulthood. Early handling also has beneficial effects in the horse's relationship with man. The authors of this paper attempted to determine whether there were specific time windows within which the handling of a foal had the greatest impact on later behaviour. Forty Lusitanian foals were assigned to four groups - some were handled at birth, some at weaning, some during the first month, and some were not handled at all. The foals were all trained at the age of one month after weaning, and their behaviour was tested. The foals handled at birth and at weaning reacted less, tolerated human approaches, and moved less in the handler's presence than foals from the other groups. The foals handled at weaning were easier to lead during all training sessions, and they were the only group that passed all aims at the final test.

Inês, F. *et al.* (2010) The effects of handling foals at "optimal periods" for behaviour and training, *Journal of Veterinary Behavior: Clinical Applications and Research*, 5(1): 24.

The ethics of pest management

The control of rat and mice as pests is routinely carried out when their presence is considered detrimental to human wellbeing. However, there is little or no legislation that determines ethical principles for pest control. In contrast, the use of laboratory animals for scientific purposes is tightly regulated, with the aim of ensuring that all procedures are carried out humanely. In this paper, the author applies the principles currently in use in laboratory animal welfare practices, and applies them to the domain of pest research, to propose a new framework for ethical pest control.

The author suggests a list of questions that need to be answered before deciding to carry out a pest control procedure. First, a 'legitimate purpose' needs to be determined, to ensure that pest control is indeed necessary - this includes objectives such as protecting humans or livestock from diseases carried by rats and mice, or protecting food stocks. Second, pest controllers need to ensure that the benefit from their action outweighs the risk - this may be risk to other animals present in the area, or to the environment. The type of harm that will be inflicted on a target animal, and that animal's capacity to suffer, also need to be considered. Third, a method of pest control needs to be chosen so as to minimise the suffering inflicted on target and non-target species. In particular, controllers need to find ways to refine their control techniques, reduce them to the minimum level required, and replace lethal control techniques with less harmful ones, whenever possible. Finally, recognition of personal and legal responsibility should be built into the system, e.g. by requiring that people involved in pest control have a license to do so, and are adequately trained.

Yeates, J. (2009) What can pest management learn from laboratory animal ethics? *Pest Management Science*, DOI 10.1002/ps.1870.

The ethics of rodent control

The authors of this paper discuss what they see as an apparent inconsistency in public opinion towards the treatment of rats and mice in two different contexts. When these animals are used in scientific experimentation, the public is normally very concerned about their welfare - this has resulted in a mass of legislation and guidelines, which prescribe humane ways in which to treat them in a laboratory setting. When it comes to pest control, however, the public's main concern seems to be the effectiveness of the control procedure, with the result that there are few, if any, policies governing humane pest control.

Traditionally, pest control practices have not been driven by animal welfare concerns - this has led to the liberal use of chemical and mechanical control techniques that have the potential to cause great suffering to target (and non-target) animals. For instance, anticoagulant poisons take several days to kill an animal, during which time it probably experiences great distress due to haemorrhaging in multiple internal organs. In the US, people can freely purchase glue boards, which trap animals, and cause them to die of starvation and dehydration. The authors suggest raising public awareness of existing legislation, and encouraging the use of the least invasive and most humane control methods available. Professional pest controllers should be warned that some methods can cause animal suffering. Consumers should also be made aware that a welfare-friendly trap design does not guarantee that animals will not suffer. Finally, the authors suggest that prevention and monitoring should always be a first resort in rodent management, as keeping rodents from becoming a pest in the first place will remove the need for any pest control.

Meerburg, B. *et al.* (2008) The ethics of rodent control, *Pest Management Science*, **64**: 1205-1211.

Managing feral camels

CSIRO Publishing has published a special issue of *The Rangeland Journal* on managing the impacts of feral camels in Australia which includes papers on the following topics:

- Distribution and abundance of the feral camel (*Camelus dromedarius*) in Australia
- Demography of feral camels in central Australia and its relevance to population control
- Modelling the distribution and relative abundance of feral camels in the Northern Territory using count data
- Movements and landscape use of camels in central Australia revealed by GPS satellite
- Camel usage and impacts at a permanent spring in central Australia: a case study
- Perceptions of pastoralists and conservation reserve managers on managing feral camels and their impacts
- Changes in Aboriginal perceptions of feral camels and of their impacts and management

- Who owns feral camels? Implications for managers of land and resources in central Australia
- A review of chemical, biological and fertility control options for the camel in Australia
- Economics of camel control in central Australia
- A GIS-based decision-making structure for managing the impacts of feral camels in Australia

Various authors (2010) Managing the impacts of feral camels. Eds GP Edwards & M McGregor. *The Rangeland Journal* 32(1), <http://www.publish.csiro.au/nid/204/issue/5481.htm>.

other articles and publications of interest

- Alvarez, L. & Gutierrez, J. (2009) A first description of the physiological and behavioural responses to disbudding in goat kids, *Animal Welfare*, 19(1): 55-59.
- Amat, M. *et al.* (2010) Differences in serotonin levels between aggressive English Cocker Spaniels and aggressive dogs of other breeds, *Journal of Veterinary Behavior: Clinical Applications and Research*, 5(1): 46-46.
- Artelle, K. A., Dumoulin, L.K., & Reimchen T. E. (2010) Behavioural responses of dogs to asymmetrical tail wagging of a robotic dog replica, *Lateralitas: Asymmetries of Body, Brain and Cognition*, <http://dx.doi.org/10.1080/13576500903386700>.
- Bak Jensen, M. & Pedersen, L.J. (2010) Effects of feeding level and access to rooting material on behaviour of growing pigs in situations with reduced feeding space and delayed feeding, *Applied Animal Behaviour Science*, 123(1-2): 1-6.
- Bak Jensen, M., Studnitz, M. & Pedersen, L.J. (2010) The effect of type of rooting material and space allowance on exploration and abnormal behaviour in growing pigs, *Applied Animal Behaviour Science*, 123(3-4): 87-92.
- Baumgartner, J. *et al.* (2010) The behaviour of male fattening pigs following either surgical castration or vaccination with a GnRF vaccine, *Applied Animal Behaviour Science*, 124(1-2): 28-34.
- Bewley, J.M. *et al.* (2010) Comparison of two methods of assessing dairy cow body condition score, *Journal of Dairy Research*, 77(01): 95 - 98.
- Boggia, A. Paolotti, L. & Castellini, C. (2010) Environmental impact evaluation of conventional, organic and organic-plus poultry production systems using life cycle assessment, *World's Poultry Science Journal*, 66(01): 95 - 114.
- Chai, J. *et al.* (2010) Effect of pre-slaughter transport plant on blood constituents and meat quality in halothane genotype of NN Large White x Landrace pigs, *Livestock Science*, 127(2-3): 211-217.
- Chapinal, N. *et al.* (2010) Evaluation of welfare and productivity in pregnant sows kept in stalls or in 2 different group housing systems, *Journal of Veterinary Behavior: Clinical Applications and Research*, 5(2): 82-93.
- Creighton, E. & Hockenull, J. (2010) Feeding routine risk factors associated with pre-feeding behaviour problems in UK leisure horses, *Journal of Veterinary Behavior: Clinical Applications and Research*, 5(1): 48.
- D'Eath, R.B. *et al.* (2010) Pigs' aggressive temperament affects pre-slaughter mixing aggression, stress and meat quality, *animal*, 4(04): 604 - 616.
- de Haas, E.N. (in press) Selection on feather pecking affects response to novelty and foraging behaviour in laying hens, *Applied Animal Behaviour Science*.
- DeGaris, P.J. *et al.* (2010) Effects of increasing days of exposure to prepartum transition diets on reproduction and health in dairy cows, *Australian Veterinary Journal*, 88(3): 84-92.
- Dixon, L.M., Hardiman J.R., & Cooper J.J. (2010) Floor area and the behaviour of pet rabbits (*Oryctolagus Cuniculus*), *Journal of Veterinary Behavior: Clinical Applications and Research*, 5(1): 40-41.
- Doyle, R.E. *et al.* (2010) The effect of repeated testing on judgement biases in sheep, *Behavioural Processes*, 83(3): 349-352.
- Eckard, R.J., Grainger, C. & de Klein, C.A.M. (in press) Options for the abatement of methane and nitrous oxide from ruminant production: A review, *Livestock Science*.
- Ellis, S.L.H. & Wells, D. L. (2010) The influence of olfactory stimulation on the behaviour of cats housed in a rescue shelter, *Applied Animal Behaviour Science*, 123, 56-62.
- Elmorea, M.R.P. *et al.* (2010) A flooring comparison: The impact of rubber mats on the health, behavior, and welfare of group-housed sows at breeding, *Applied Animal Behaviour Science*, 123(1-2): 7-15.
- Estienne, M.J. & Harper, A.F. (2010) Type of accommodation during gestation affects growth performance and reproductive characteristics of gilt offspring, *Journal of Animal Science*, 88(1): 400-407.
- Faucitano, L., Chevillon, P. & Ellis, M. (2010) Effects of feed withdrawal prior to slaughter and nutrition on stomach weight, and carcass and meat quality in pigs, *Livestock Science*, 127 (2-3): 110-114.
- Giannenas, I. *et al.* (in press) Influence of dietary mushroom *Agaricus bisporus* on intestinal morphology and microflora composition in broiler chickens, *Research in Veterinary Science*.
- Goetsch, A.L. *et al.* (2010) Invited review: Feeding behavior of goats, *Journal of Animal Science*, 88(1): 361-373.
- Gouveia, K.G. *et al.* (2009) Assessment of the efficiency of captive-bolt stunning in cattle and feasibility of associated behaviour signs, *Animal Welfare*, 18(2): 171-175.
- Greger, M. *et al.* (2010) Disease and transport: A costly ticket around the world, In: Handbook of Disease Outbreaks: Prevention, Detection and Control, Holmgren, A. & Borg, G. (eds), pp. 211-227.
- Gregory, N.G. (2010) Exercise restriction and the laying hen: A welfare issue and no bones about it, *The Veterinary Journal*, 183(2): 123.
- Gruber, S.L. *et al.* (2010) Relationships of behavioral and physiological symptoms of prelaughter stress to beef longissimus muscle tenderness, *Journal of Animal Science*, 88(3): 1148-1159.
- Gummow, B. (in press) Challenges posed by new and re-emerging infectious diseases in livestock production, wildlife

- and humans, *Livestock Science*.
- Higgins, J.P. *et al.* (2010) Effect of lactic acid bacteria probiotic culture treatment timing on Salmonella Enteritidis in neonatal broilers, *Poultry Science*, **89**(2): 243-247.
- Hockenfull, J. & Creighton, E. (2010) Equipment and training risk factors associated with ridden behaviour problems in UK leisure horses, *Journal of Veterinary Behavior: Clinical Applications and Research*, **5**(1): 52.
- Hockenfull, J. & Creighton, E. (2010) Management routine risk factors associated with handling and stabled-related behaviour problems in UK leisure horses, *Journal of Veterinary Behavior: Clinical Applications and Research*, **5**(1): 57-58.
- Ison, S. *et al.* (2010) 'Subordination style' in pigs? The response of pregnant sows to mixing stress affects their offspring's behaviour and stress reactivity, *Applied Animal Behaviour Science*, **124**: 16-27.
- Juska, A. (in press) "Profits to the Danes, for us - Hog stench?" The campaign against Danish swine CAFOs in rural Lithuania, *Journal of Rural Studies*.
- Kasanen, I.H.E. *et al.* (2009) Ethics of feeding: the omnivore dilemma, *Animal Welfare*, **19**(1): 37-44.
- Krachun, C., Rushen, J. & de Passillé, A.M. (2010) Play behaviour in dairy calves is reduced by weaning and by a low energy intake, *Applied Animal Behaviour Science*, **122**(2-4): 71-76.
- Krömker, V. *et al.* (2010) Evaluation of increased milking frequency as an additional treatment for cows with clinical mastitis, *Journal of Dairy Research*, **77**(01): 90 - 94.
- Lambtona, S.L. *et al.* (2010) The risk factors affecting the development of gentle and severe feather pecking in loose housed laying hens, *Applied Animal Behaviour Science*, **123**(1-2): 32-42.
- Le Cozler, Y., Peccatte, J.R. & Delaby, L. (2010) A comparative study of three growth profiles during rearing in dairy heifers: Effect of feeding intensity during two successive winters on performances and longevity, *Livestock Science*, **127**(2-3): 238-247.
- Ledger, R.A. (2010) The relinquishment of rabbits to rescue shelters in Canada, *Journal of Veterinary Behavior: Clinical Applications and Research*, **5**(1): 36-37.
- Lewis, P.D., Danisman, R. & Gous, R.M. (2010) Photoperiods for broiler breeder females during the laying period, *Poultry Science*, **89**(1): 108-114.
- Limon, G., Guitiana, J. & Gregory, N.G. (2010) An evaluation of the humaneness of puntilla in cattle, *Meat Science*, **84**(3): 352-355.
- Lua, C.D., Gangyib, X. & Kawas, J.R. (in press) Organic goat production, processing and marketing: Opportunities, challenges and outlook, *Small Ruminant Research*.
- Martelli, G. *et al.* (2009) Assessment of welfare and productive performance in dairy cows organically reared in plains or hilly areas, *Animal Welfare*, **19**(1): 17-23.
- Matsui, K., Khalil, A. & Takedaa, K. (2009) Do horses prefer certain substrates for rolling in grazing pasture?, *Journal of Equine Veterinary Science*, **29**(7): 590-594.
- McBride, E.A., Lamb, D. & Lewis, R. (2010) The pedigree dog - Aesthetics versus ethics and law, *Journal of Veterinary Behavior: Clinical Applications and Research*, **5**(1): 51.
- Merrigan, K.A., Bailey, M.R. & Lockeretz, W. (2009) Strengthening US organic standards on animal health and welfare, *Animal Welfare*, **19**(1): 45-54.
- Mountzouris, K.C. *et al.* (2010) Effects of probiotic inclusion levels in broiler nutrition on growth performance, nutrient digestibility, plasma immunoglobulins, and cecal microflora composition, *Poultry Science*, **89**(1): 58-67.
- Nicholas, F.W., Wade C. M. & Williamson P. (2010) Disorders in pedigree dogs: Assembling the evidence, *The Veterinary Journal*, **183**(1): 8-9.
- O'Driscoll, K. *et al.* (2010) Effect of milking frequency and nutritional level on hoof health, locomotion score and lying behaviour of dairy cows, *Livestock Science*, **127**(2-3): 248-256.
- Olesen, I. *et al.* (2010) Eliciting consumers' willingness to pay for organic and welfare-labelled salmon in a non-hypothetical choice experiment, *Livestock Science*, **127**(2-3): 218-226.
- Pageat, P. *et al.* (2010) Chemical communication in birds: Recent findings, *Journal of Veterinary Behavior: Clinical Applications and Research*, **5**(1): 36.
- Petraccia, M., Bianchia, M. & Cavani, C. (2010) Pre-slaughter handling and slaughtering factors influencing poultry product quality, *World's Poultry Science Journal*, **66**:17-26.
- Phillips, C.J.C. (2009) A review of mulesing and other methods to control flystrike (cutaneous myiasis) in sheep, *Animal Welfare*, **18**(2): 113-121.
- Pond, R. L. *et al.* (2010) Characterization of equine vocalization, *Journal of Veterinary Behavior: Clinical Applications and Research*, **5**(1): 7-12.
- Provenza, F.D. & Villalba, J.J. (in press) The role of natural plant products in modulating the immune system: An adaptable approach for combating disease in grazing animals, *Small Ruminant Research*.
- Riber, A.B. (2010) Development with age of nest box use and gregarious nesting in laying hens, *Applied Animal Behaviour Science*, **123**(1-2): 24-31.
- Riggs, C.M. (2010) Clinical problems in dressage horses: Identifying the issues and comparing them with knowledge from racing, *The Veterinary Journal*, **184**(1): 1-2.
- Rosell, J.M. & de la Fuente, L.F. (2009) Effect of footrests on the incidence of ulcerative pododermatitis in domestic rabbit does, *Animal Welfare*, **18**(2): 199-204
- Schemann, A.K. *et al.* (2010) Assessment of current disease surveillance activities for pigs post-farmgate in New South Wales, *Australian Veterinary Journal*, **88**(3): 75-83.
- Shimmura, T. *et al.* (2009) Effects of social rank and familiarity on dustbathin in domestic fowl, *Animal Welfare*, **19**(1): 67-73.
- Simsek, U.G. *et al.* (2009) Effect of improved housing design and sexing on carcass traits and fatty acid composition of meat in broiler chicken, *Journal of Applied Animal Research*, **36**(2): 219-222.
- Thompson, K.F., McBride, E.A. & Redhead, E. (2010) Training engagement and the development of behaviour

- problems in the dog: a longitudinal study, *Journal of Veterinary Behavior: Clinical Applications and Research*, **5**(1): 57.
- Underwood, S.L. *et al.* (2010) Birth of offspring after artificial insemination of heifers with frozen-thawed, sex-sorted, re-frozen-thawed bull sperm, *Animal Reproduction Science*, **118**(2-4): 171-175.
- Vanderhaeghe, C. (in press) Longitudinal field study to assess sow level Risk Factors Associated with stillborn piglets, *Animal Reproduction Science*.
- Villagra, A. *et al.* (2009) Stocking density and stress induction affect production and stress parameters in broiler chickens, *Animal Welfare*, **18**(2): 189-197.
- Webster, A.J.F. (2009) The Virtuous Bicycle: a delivery vehicle for improved farm animal welfare, *Animal Welfare*, **18**(2): 141-147.
- Wedlock, D.N. *et al.* (2010) Development of a vaccine to mitigate greenhouse gas emissions in agriculture: Vaccination of sheep with methanogen fractions induces antibodies that block methane production in vitro, *New Zealand Veterinary Journal*, **58**(1): 29-36.
- White, P.J. (in press) The association between congenital chondrodystrophy of unknown origin (CCUO) in beef cattle and drought in south-eastern Australia, *Preventive Veterinary Medicine*.
- Wichman, A. & Keeling, L.J. (2009) The influence of losing or gaining access to peat on the dustbathing behaviour of laying hens, *Animal Welfare*, **18**(2): 149-157.
- Yang, W.Z. *et al.* (2010) Cinnamaldehyde in feedlot cattle diets: Intake, growth performance, carcass characteristics, and blood metabolites, *Journal of Animal Science*, **88**(3): 1082-1092.
- Yegani, M. & Korver D.R., (2010) Application of egg yolk antibodies as replacement for antibiotics in poultry, *World's Poultry Science Journal*, **66**(01): 27 - 38.
- Zander, K. & Hamm, U. (in press) Consumer preferences for additional ethical attributes of organic food, *Food Quality and Preference*.
- Zonderland, J.J. *et al.* (2010) Gender effects on tail damage development in single- or mixed-sex groups of weaned piglets, *Livestock Science*, **129**(1-3): 151-158.

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