



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. Email science@rspca.org.au to subscribe.

ANIMALS USED FOR SPORT, ENTERTAINMENT, RECREATION AND WORK

The force of forehand and backhand whip strikes by jockeys

It has been proposed that whipping tired horses in the name of sport is becoming increasingly difficult to justify. The Australian Racing Board has placed requirements around the use of the whip restricting the number of forehand strikes that jockeys can make with the whip prior to the final 100m of the race. The rules do not however, make distinctions on the use of the whip in a backhand manner, suggesting that the use of the whip in the backhand manner is less scrutinised which may have profound implications for horse welfare. Whether a strike is deemed to be forehand or backhand depends on the grip that the jockey takes on the whip. This study uses pressure-detection pads which were embedded in a static model horse to examine the force of both forehand and backhand whip strikes in a laboratory setting, delivered by licensed right handed jockeys.

Significant differences in force emerged between individual jockeys and in most interactions between jockey, hand and action. This highlights the problems the industry has in trying to enforce equity in whip use to satisfy punters while at the same time giving reassurances about horse welfare.

It was also found that backhand strikes with the dominant hand (right hand) were more forceful than forehand strikes, but this difference was not seen when the non-dominant hand (the left hand) was used.

This result challenges the current focus on welfare concerns around forehand whip strikes. It should inform any review of the rules around whip use because it may help to avoid any unjustified focus on either forehand whip use or backhand whip use. This would help to inform the debate around levels of impact on fatigued horses when they are being struck for a perceived sporting gain.



McGreevy PD, Hawson LA, Salvin H *et al* (2013) A note on the force of whip impacts delivered by jockeys using forehand and backhand strikes. *Journal of Veterinary Behavior* 8:395–399.

Assessing puppies for their potential as adult guide dogs

An early understanding of behavioural suitability for guiding work in domestic dogs (*Canis familiaris*) would be useful for organisations which train dogs, such as the Guide Dogs for the Blind Association. Testing puppies involves assessing the reactions of a puppy to a range of different stimuli and attributing a score according to the reactions observed. The Guide Dogs for the Blind Association (GDBA) in the United Kingdom is the largest breeder and trainer of working dogs in the world. It costs approximately £40,000 pounds to train a single guide dog from a puppy to a working adult so tests which could be applied to determine a puppy's potential suitability for a role would be highly advantageous.

This study explored the potential for a standardised test of behaviour in young dogs to reflect subsequent success in guide dog training. The test is called the Puppy Profiling Assessment (PPA). PPA measures the potential of puppies as guide dogs at 6–8 weeks of age, by assessing their responsiveness to a human assessor or environmental stimuli and by presenting puppies with eight different controlled stimuli which are (1) following when called, (2) retrieving a toy, (3) gentle restraint, (4) noise, (5) stroking, (6) a model moving 'squirrel', (7) a tunnel and (8) a ramp.



Five hundred and eighty-seven potential guide dogs were tested using the PPA. The responses of dogs were scored on a 7-point scale. Five of these stimuli showed some association with success in guide dog training, and three of these stimuli could be usefully combined in a logistic regression model of success in training. The authors suggest that there is potential for this test to be used to predict suitability for guiding work but adjustments to the scoring protocol are recommended.

Asher L, Blythe S, Roberts R *et al* (2013) A standardized behavior test for potential guide dog puppies: Methods and association with subsequent success in guide dog training. *Journal of Veterinary Behavior* **8**:431–438.

Genetic analysis of musculoskeletal conditions in Thoroughbred horses

Thoroughbred racehorses have been shown to develop a range of musculoskeletal conditions. The development of these conditions has both a negative impact on the welfare of the horses, as well as negative publicity and a financial cost to the industry. Identification of risk factors for horses developing musculoskeletal conditions has yielded much information, but, due to the different risk factors that have been examined under different circumstances, robust advice for stakeholders for avoiding the development of these conditions is not yet available. This study examined the potential for musculoskeletal conditions in thoroughbred racehorses to have a genetic basis, and therefore to be heritable. If this was the case, then this could be used as a basis for controlling the development of these conditions in future generations of horses.

The health records of 5062 horses that had been racing in Hong Kong and were retired for health reasons was obtained from the Hong Kong Jockey Club. The health records were examined to determine why the horses were retired and if the reason was related to a musculoskeletal condition. It was found that 13% of the examined horses suffered a fracture, 10% showed osteoarthritis, 10% showed suspensory ligament injury and 19% showed tendon injury. The data was analysed to determine if environmental risk factors may have had some effect and then examined to determine if the conditions may be hereditary and genetically linked.

It was found that all of the conditions examined have heritable components to them, and fracture was found to be positively genetically correlated with osteoarthritis and suspensory ligament injury, suggesting that selective breeding strategies may be successful in reducing genetic risk in future and a reduction in the occurrence of one of the correlated conditions may affect a decrease in the occurrence of the other condition.

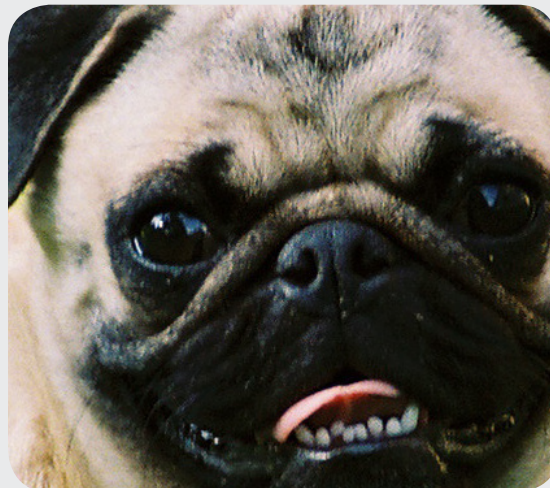
Welsh CE, Lewis TW, Blott SC *et al* (2013) Preliminary genetic analysis of important musculoskeletal conditions of Thoroughbred racehorses in Hong Kong. *The Veterinary Journal* **198**:611–615.

COMPANION ANIMALS

How does brachycephaly (flat head and face) affect dogs' lives

The deliberate, selective breeding of dogs by dog breeders to have a flat head and flat face such as that seen in the Pug and the French bulldog, causes severe breathing problems and other significant health problems. Brachycephalic syndrome (BS) is caused by inherited anatomical abnormalities. It is a progressive disease with symptoms commonly becoming severe by as young as 12 months of age. Affected dogs experience a variety of problems including serious difficulty breathing, regurgitation, vomiting, cyanosis (bluish discoloration of the skin due to poor circulation or inadequate oxygenation of the blood); exercise intolerance, stress intolerance and heat intolerance and sometimes syncope (loss of consciousness/fainting) and collapse. Significant sleeping difficulties are also reported in the literature.

This study used a questionnaire to investigate how owners perceived the frequency and severity of a broad spectrum of welfare-relevant impairments caused by this hereditary disease. One hundred owners of brachycephalic dogs (Pugs and French bulldogs) referred for surgical treatment of BS completed the questionnaire. As a basis for comparison, 20 owners of mesocephalic dogs (dogs with normal head proportions) also completed part of the questionnaire. Most brachycephalic dog owners (91%) reported that their dogs breathed loudly while sleeping, and all dogs (100%) were noted to have loud breathing during physical exercise. Even at rest, two-thirds of the dogs (66%) frequently had loud/harsh breathing noises indicating breathing difficulty. Sixty-eight owners (68%) observed that their dogs had inspiratory effort during physical exercise. Almost half of the dogs (45%) showed inspiratory effort at rest. 70% of owners said that their dogs had choking fits, and 40% had choking fits at least once weekly. Additionally, 36% of dogs had collapsed because of dyspnoea (difficulty breathing) at least once in their life.



Brachycephalic dogs also experienced severe exercise intolerance and prolonged recovery time after physical exercise (88%). One third of dogs (33%) could only walk for a maximum of 10 min during summer. 15% said their dog was unable to play with other dogs. Brachycephalic dogs also experienced significant heat sensitivity. 46% of dogs were reported to have problems with feeding and 56% had sleep problems including: only able to sleep with the chin in an elevated position (31%); sleep apnoea (27%); attempting to sleep in a sitting position (24%); choking fits during sleep (11%); only being able to sleep with the mouth open (6%), and being almost unable to sleep or not sleeping at all (6%). In contrast, none of the owners of the mesocephalic dogs reported problems with sleeping, feeding, choking fits, breathing noises or effort, exercise intolerance or cyanosis.

Selective breeding for brachycephaly causes a broad range of health problems. The authors stated that the extent and severity of clinical signs and their impact on quality of life greatly exceeded their expectations. This study emphasises the major impact that selective breeding for extreme brachycephalic features has on animal welfare.

Roedler FS, Pohl S, Oechtering GU (2013) How does severe brachycephaly affect dog's lives? Results of a structured preoperative owner questionnaire. *The Veterinary Journal* **198**:606–610.

High prevalence of inherited malignant cancer in Bernese mountain dogs and Flat-coated retrievers

Inherited (genetic) disorders in purebred dogs is a significant welfare problem. The Bernese mountain dog and the Flat-coated retriever experience significant welfare problems as a result of hereditary disorders. They are predisposed to hereditary malignant cancer particularly, Histiocytic sarcoma (HS). HS is one of the most aggressive, incurable and fatal tumours, it can manifest itself as a single mass (localised) but may also be widespread throughout one or several organs (disseminated).

Although previous reports have suggested that the prevalence of Histiocytic sarcoma is particularly high in both the Bernese mountain dog and the Flat-coated retriever, this study aimed to assess this scientifically and determine whether the tumour prevalence and impact on life expectancy in these two breeds is as severe as some believe. The Dutch Bernese mountain dog and Flat coated retriever breed societies both use a reporting system where incidences of disease and deaths of dogs are reported. In order to obtain data on the deaths of the two breeds, the records were accessed and information about 1092 Bernese mountain dogs and 536 Flat-coated retrievers analysed.

This study found that the death of at least 55.1% of Bernese mountain dogs and 63.8% of Flat-coated retrievers is associated with malignant tumours. In addition, it appears that over one seventh of all Bernese mountain dogs and Flat-coated retrievers die because of HS. The Bernese mountain dogs died on average, at age 8 years; 3.2 years earlier than the average British dog. The Flat coated retriever died, on average, aged at 9.5; 1.7 years earlier than the average British dog. Cancer appears to be the main reason for the low median age at death in the two breeds. These results emphasise the need for rapid intervention and implementation of further research on malignant tumours, especially HS such as identification of causative genes.

Erich SA, Rutteman GR, Teske E (2013) Causes of death and the impact of histiocytic sarcoma on the life expectancy of the Dutch population of Bernese mountain dogs and Flat-coated retrievers. *The Veterinary Journal* **198**:678–683.



VetCompass Australia

VetCompass Australia stands for Veterinary Companion Animal Surveillance System Australia.

There is currently limited information on the frequency of disease in companion animals in Australia. VetCompass Australia aims to collect this baseline disease information by collecting information from everyday veterinary consultations. VetCompass Australia will also monitor ongoing trends in disease prevalence and the success of control programs over time.

It aims to improve the health and welfare of Australian dogs and cats by increasing our understanding of the frequency and risk factors of disorders seen in general veterinary practice.

For more information please visit <http://sydney.edu.au/vetscience/vetcompass/index.shtml>

Longevity and mortality of dogs in England

An improved understanding of the factors that influence longevity in dogs leads to significant welfare opportunities. The domestic dog exhibits a huge morphological diversity, with dogs differing significantly in bodyweight between breeds from, for example, the 1kg Chihuahua to the 85kg Mastiff. There exists a large amount of variation in the longevity and mortality of the different breeds and purebred status, bodyweight and neuter status have all previously been associated with influencing longevity in dogs. This study analysed a database of 5095 dogs that had died in veterinary practices across England to determine how long the different dogs had lived, their reason for mortality and to assess the data for demographic risk factors and longevity. It was thought that crossbreeds would live longer on average than purebreds due to 'hybrid vigour'.

Analysis of the data showed that increasing dog bodyweight was associated with a decreased average lifespan. Entire female dogs were also shown to live shorter lives than neutered females, and entire and neutered males. The purebred dogs that lived the longest lives were the Miniature Poodle (14.2 years), the Bearded Collie (13.7 years) and the Border Collie (13.5 years). The purebred dogs with the shortest lives were the Dogue de Bordeaux (5.5 years), Great Dane (6.0 years) and Mastiff (7.1 years) indicating worryingly short lifespans for some breeds. Deaths at <3 years of age were predominantly associated with behavioural abnormalities, gastrointestinal disorders and road traffic accidents, whereas deaths in dogs >3 years of age were predominantly because of neoplastic (cancer) (16.6%), musculoskeletal (11.4%) and neurological disease (11.2%).



Overall, crossbred dogs had significantly greater median longevity than purebred dogs, independent of bodyweight suggesting that hybrid vigour has a substantial positive effect on the lifespan of dogs, which may be due to the fact that crossbreeds are less likely to be homozygous for detrimental genes.

The current findings highlight major breed differences for longevity and support the concept of hybrid vigour in dogs. Using these findings to tailor breed selection and veterinary health management decisions could increase the quantity and quality of life for dogs in England and improve canine welfare.

O'Neill DG, Church DB, McGreevy PD *et al* (2013) Longevity and mortality of owned dogs in England. *The Veterinary Journal* **198**:638–643.

Acquired proximal renal tubulopathy (kidney disease) in dogs exposed to a dried chicken treat

Numerous pet food-associated diseases have been reported worldwide, some of which have resulted in death. Acquired proximal renal tubulopathy (a type of kidney disease) is rarely recognised in dogs and few cases had been reported in Australia prior to September 2007, when a marked increase in this condition in dogs was noted. It was found that all dogs reporting symptoms of this condition had been fed KraMar Supa Naturals Chicken Breast Strips, which were made in China and had been introduced to the Australian market a few weeks before the first reported case. A nationwide call was made in the *Australian Veterinary Journal* for veterinarians to report cases with dogs displaying glucosuria (abnormally high level of glucose in the urine) with a level of blood glucose 10mmol/L or above. 108 cases were identified and all dogs had been fed the chicken strips for a length of time prior to being taken to the veterinarian. Veterinarians reporting cases of acquired proximal renal tubulopathy were required to complete a questionnaire detailing the history of the dog, the presenting symptoms, history of treat feeding and associated clinical signs.

A range symptoms were identified in dogs which had developed acquired proximal renal tubulopathy with polyuria (excretion of an abnormally large quantity of urine)/polydipsia (excessive thirst) (76%), lethargy (73%) and inappetance (65%) being the most common. Small breeds of dog (<10kg) accounted for 88% of the cases, which is thought to be due to the small body size of these dogs and hence the larger ratio of treat to body weight, and possibly to the fact that the owners may feed smaller dogs more of these types of treats. Six dogs died as a result of their condition or were required to be euthanased. The treats likely contained a toxin targeting the proximal renal tubules. This outbreak highlights the increased risk that outsourcing raw materials, manufacturing and distribution processes can pose if they are undertaken in a poorly regulated market as the products can then be transported abroad and used in manufacturing processed for numerous products. The authors note that a steadily declining number of new cases of proximal renal tubulopathy related to additional brands of treats continue to be diagnosed in Australian dogs since the data reported here were compiled.

Toxicoses are identified generally only when a large number of people or animals are affected. Veterinarians must remain alert to the possibility of outbreaks of toxicosis in dogs and cats which are linked to certain foodstuffs and report any cases to the appropriate regulatory authorities. In Australia, a new surveillance system which is a joint initiative of the Australian Veterinary Association and the Pet food Industry Association of Australia (Pet Food Adverse event system of tracking – PetFAST: <http://www.ava.com.au/petfast>) provides an alert system to enable rapid identification of outbreaks of adverse events in dogs or cats with an aim to minimise the occurrence of these cases in future.

Thompson MF, Fleeman LM, Kessell AE *et al* (2013) Acquired proximal renal tubulopathy in dogs exposed to a common dried chicken treat: retrospective study of 108 cases (2007–2009). *Australian Veterinary Journal* 91(9):368–373.



PetFAST - Pet Food Adverse Event System of Tracking

PetFAST is a system to track health problems in dogs and cats that are suspected of being associated with pet food, treats and pet meat. It is designed to identify possible patterns that might point to a cause.

PetFAST is a voluntary joint initiative of the Australian Veterinary Association (AVA) and the Pet Food Industry Association of Australia (PFIAA). For more information visit <http://www.ava.com.au/petfast>

A comparison of food-related aggression in shelter dogs and after adoption

Food related aggression is a commonly reported behaviour for dog owners and those who treat dog behaviour problems. This type of aggression involves the dog showing teeth, growling, snapping or biting at people when approached while it is near a food item. In shelters, the occurrence of food related aggression can be noted by staff members, or observed as part of an evaluation process which evaluates the dog's suitability to be adopted to a new home. Dogs that are labelled as exhibiting food related aggression may be harder to adopt as shelters may place restrictions about what types of homes these dogs can be adopted into (e.g. to experienced owners only or those without children) and in extreme conditions, they may be considered unsuitable for adoption and be euthanased. However, it has never been established if occurrences of food related aggression in a shelter under the stressful conditions that the dog is experiencing in the shelter context, persist into the home environment. This study aimed to examine if this is the case, and to gain more information on whether the dog owners actually perceive food related aggression as an unmanageable or dangerous behaviour in the home.

Records for 376 dogs of any breed were retrieved from the Animal Rescue League in Boston and information related to food and chew tests analysed. The new owners of these dogs were asked to complete a

questionnaire about their adopted dog and food related aggression. A response rate of 43% was achieved. It was found that there was a statistically significant association between the occurrence of food related aggression in the shelter and after adoption to the new home, but this association was weak (only 55% showed food aggression in both the shelter and adoptive home). Of the dogs that didn't show food related aggression in the shelter environment, 78% also didn't show this type of aggression in the home. It was also found that adopters didn't find this behaviour to be a significant problem or challenge to keeping a pet. Labelling a dog as showing food related aggression in a shelter should be treated with caution as many dogs will not continue to exhibit this behaviour in the home environment and in addition, most adopters do not perceive food related aggression as problematic. Each dog should be treated as an individual and all behavioural and owner-related factors considered when adopting dogs out from shelters to ensure the best match between dog and owner.

Marder AR, Shabelansky A, Patronek GJ *et al* (2013) Food-related aggression in shelter dogs: A comparison of behavior identified by a behavior evaluation in the shelter and owner reports after adoption. *Applied Animal Behaviour Science* 148:150–156.

Timing of behavioural assessments for shelter cats

Cats are often relinquished to shelters due to behavioural problems such as aggression. One of the primary roles of shelters is to maximise the number of cats that are successfully adopted but approximately 70% of all cats admitted to shelters in the United States are required to be euthanased. Many shelters use behavioural assessments to determine if a cat may be suitable to be adopted from the shelter to a new home and to assess what environmental or behavioural modifications can be undertaken to reduce stress in individual cats. Shelters are often required to make quick decisions about a newly relinquished cat's suitability for adoption, sometimes within the first 72 hours (3 days). It is unclear whether such quick decisions are valid, and whether the cat's behaviour changes as it acclimates to the shelter or if simple husbandry and management could positively affect adoption.

This study used behavioural assessments to determine how quickly a cat's behaviour changes after being relinquished to a shelter, and whether the addition of a hiding box and a ping pong ball toy affects the cat's behaviour. Twenty five cats (>6 months of age)



at 2 municipal shelters were evaluated with 2 separate standardised behavioural assessments at 3 separate times, beginning the day after entering the shelter. One behavioural assessment included an in-cage evaluation, whereas the other assessment involved a stepwise combined in- and out-of-cage evaluation.

11 of these cats were provided with a hiding box and toy while 14 were not given these objects (control group). It was found that the addition of the enrichment toys did not have an effect on the cat's behaviour; however the authors suggest that this may be due to the very high levels of stress that the cats were experiencing. Some



concern is currently expressed by some shelter staff that the addition of a hiding box in the cage reduces a cat's chances of being adopted if it is out of view, but the authors do recommend that a hiding box is added wherever possible to the cat's cage to allow the cat to hide from, and become accustomed to, its new and stressful environment. The cat's behaviour did change during the time it was housed at the shelter and based on the results the authors suggest that cats need at least 72 hours (3 days) to achieve optimum behavioural scores and a decrease in stress levels based on the 2 separate evaluations.

Moore AM, Bain MJ (2013) Evaluation of the addition of in-cage hiding structures and toys and timing of administration of behavioural assessments with newly relinquished shelter cats. *Journal of Veterinary Behavior* 8:450–457.

Support for staff performing euthanasia in animal shelters

While care and adoption are the primary goals of every animal shelter, it is estimated that three to four million cats and dogs are euthanased by shelters each year. This procedure can be very stressful for shelter staff, as they generally choose this line of work in order to provide care to animals, and euthanasia creates a 'caring-killing paradox' in staff. The stress experienced by shelter staff as a result of performing euthanasia can compound over time and has been linked to emotions such as sadness, anxiety, guilt, anger and dissatisfaction with life as well as physical problems such as high blood pressure, ulcers and sleep difficulties. These problems can lead to lower levels of job satisfaction and, ultimately, staff leaving their jobs. Researchers have begun to explore the use of support programmes for staff who perform euthanasia. An exploratory study was performed using a questionnaire which sought to gain information from management staff at animal shelters about a) the reactions of animal shelter personnel in response to euthanasing animals, b) policies and programmes that currently exist to support staff, c) the types of policies or programmes that might be most beneficial and d) the barriers and challenges that shelters face in providing support programmes.

54 management personnel completed and returned the questionnaire. It was found, as expected, that euthanasia was a common practice in animal shelters, averaging 869 dogs and cats annually per shelter. Sadness (83.3%), crying (68.5%), anger (57.4%), and depression (57.4%) were the most commonly reported staff reactions in response to performing euthanasia. 74.0% of shelter managers felt that euthanasia led to burnout in their staff, but only 26.0% felt that it led to turnover. Shelter managers indicated that support programmes were important for their staff but 74% identified funding as the primary barrier to implementing programmes. The support programmes most commonly offered were training and education (48.1% of shelters), staff rotation (38.9%), informal peer support (38.9%) and breaks after euthanasia (35.1%). The study confirms that performing euthanasia can have significant effects on shelter staff, and support programmes would be beneficial in helping shelter staff cope, but at present, they are not widely implemented due to funding restrictions.

Anderson KA, Brandt JC, Lord LK *et al* (2013) Euthanasia in animal shelters: Management's perspective on staff reactions and support programs. *Anthrozoös* 26(4):569–578.

FARM ANIMALS

Injurious pecking in domestic turkeys

Injurious pecking is a significant welfare concern for turkeys kept in commercial facilities, and is the leading cause for mortalities and necessary culls of turkeys resulting from injuries sustained. Substantial research has been performed into the cause of injurious pecking in laying hens, and this knowledge has been applied to other domestic poultry. However, the reason for why injurious pecking begins is largely unknown and attempts to reduce this behaviour in a commercial situation can have only limited success until we determine its causation. There are three different types of feather pecking exhibited in turkeys; severe feather pecking (forceful pecking at the plumage of another turkey which can include the removal of feathers), head pecking (a form of aggression directed at the head area of another turkey in an attempt to retain social dominance usually following a social disturbance) and cannibalism (pecking at the exposed skin of another bird following feather removal, often with resulting removal of blood and tissue). All these types of injurious pecking have a significant welfare impact on the turkeys and a financial impact on the production system.



This paper reviews the available evidence in relation to the development, causes and control of the different types of injurious pecking. The role of the surrounding environment in early life and social facilitation in the development of injurious pecking is discussed. Current hypotheses for why different types of injurious pecking occur are outlined and the role of genetics, different nutritional aspects of the diet and the influence of the surrounding environment such as stocking densities and the use of appropriate lighting intensities are discussed. Management strategies that are currently used to control the problem in turkeys are reviewed and the welfare impact that these different strategies have are outlined. The current research suggests that head pecking is primarily driven by social aspects and environmental disturbance, whereas severe feather pecking and cannibalism appear to be a product of genetics, environment and nutrition and future strategies to facilitate the control of injurious pecking needs to take these different aspects into account.

Dalton HA, Wood BJ, Torrey S (2013) Injurious pecking in domestic turkeys: development, causes, and potential solutions. *World's Poultry Science Journal* 69:865–875.

Effects of group size and space allowance on aggression and reproductive performance in sows

As society becomes increasingly aware and concerned with the treatment of intensively housed farm animals, one of the main focuses of concern is the housing of gestating sows. Societal pressure has raised awareness of the practice of housing sows individually in confined stalls, and the potential welfare benefits of housing sows in groups instead. Problems exist in housing sows in groups however as pigs tend to show high levels of aggression towards conspecifics, in particular when mixing new groups, which leads to injury and stress. To date, there are few recommendations in the scientific literature about what can be done to reduce

this aggression. There has been some suggestion that reducing the amount of floor space each sow has to move around increases aggression, injuries and cortisol concentrations in group housed sows. This study aimed to examine this suggestion in more detail and looked at the effect of floor space allowance and group size on aggression, stress, skin injuries and reproductive performance in sows housed in groups following insemination.

3120 sows were observed in this study in four time replicates, and were placed in three different group

sizes (10,30 or 80 sows/pen) at six different space allowances (1.4, 1.8, 2.0, 2.2, 2.4, or 3.0m²/sow) and their behaviour observed, skin injuries monitored and cortisol levels measured. It was found that increased space per sow led to a reduction in aggression in cortisol on day two after mixing when space was increased from 1.4 to 1.8m² and above. The presence of this effect soon after grouping suggests that the effects of space on aggression and stress are most pronounced early after grouping, suggesting that sows in static groups may adapt, either behaviourally or physiologically, over time to reduced space. The percentage of inseminated sows that farrowed was also found to increase from 60% to 75% as space increased from 1.4 to 3.0m²/sow. Group size was found to affect the number of skin injuries, with

groups of 10 sows consistently having the lowest number of injuries over the time period examined. Based on the results, within the range of floor space allowances studied, sow welfare improves with increased space. This study, although determining that 1.4m² per sow is inadequate, did not have the ability to determine what would be an adequate space for sows and suggests that future research should examine the effects of increasing space allowance between 1.8m² to 2.4m² in more detail.

Hemsworth PH, Rice M, Nash J *et al* (2013) Effects of group size and floor space allowance on grouped sows: Aggression, stress, skin injuries, and reproductive performance. *Journal of Animal Science* **91**:4953–4964.

Ascites syndrome in broiler chickens

The intense selection of broiler chickens for fast growth and a high meat yield has been successful in producing highly efficient modern broiler strains. Increases in knowledge of nutritional physiology has also led to the development of diets which enable rapid growth, and a greater understanding of housing that produces optimal conditions for growth have resulted in high-yielding modern broiler birds. The intense selection pressure and modern rearing techniques which have enhanced production rate and efficiency in broiler strains however, have also coincided with an increased mortality and the incidence of metabolic disease, including broiler ascites syndrome, or pulmonary hypertension induced ascites. Broiler ascites syndrome is a metabolic syndrome resulting from an imbalance between oxygen requirement and oxygen supply. Symptoms displayed by the chickens affected with this syndrome include dullness and depression, an irregular heartbeat, open beak breathing, a distended abdomen and reluctance to move. The syndrome usually results in heart failure and death late in the rearing period or even during transport to the slaughterhouse.

Management practices in recent years have lowered the overall incidence of ascites compared to its incidence in its peak years, but it is still present in modern lines. This paper reviews the pathogenesis and pathology of ascites and outlines those strategies that are currently used to reduce its incidence. The most common strategy used today is the manipulation of feed and lighting regimes; however there are disadvantages in their implementation including unwanted changes in growth rates of the birds and extra costs to the farmer. Selective breeding for ascites resistant strains is considered the best permanent solution to the problem, however, until resistant strains are developed and implemented on a global scale, alternative measures need to be used and incorporated into modern day broiler facilities. Ideally these interventions need to have a low economic cost, and preserve optimal performance and the quality of the final product whilst also maintaining animal health and welfare.

Kalmar ID, Vanrompay D, Janssens GPJ (2013) Broiler ascites syndrome: Collateral damage from efficient feed to meat conversion. *The Veterinary Journal* **197**:169–174.



The prevention and control of feather pecking in laying hens

Feather pecking in commercial laying hen systems remains a welfare concern, especially in those systems in which birds have access to a large number of other birds. The occurrence of feather pecking can be highly variable between farms and is thought to be a problem that is multifactorial in nature. A large number of studies have been performed aiming to determine those risk factors that make flocks of birds at a higher risk for feather pecking. This paper reviews the current understanding and scientific evidence that is available on the manifestation of the different types of feather and injurious pecking. At present, feather pecking is commonly controlled by beak trimming or by manipulation of lighting levels; however these management strategies both have disadvantages as beak trimming can cause pain and the removal of the tip of the beak causes changes in beak sensitivity and function. Manipulation of lighting levels and the use of low levels of lighting and light of specific wavelengths can have negative effects and affect the normal development of the bird's eye as well as impairing the bird's ability to move around its enclosure.

The potential for other methods to be effective in reducing feather pecking in commercial laying flocks are discussed. Genetic selection of laying hens in the

past has been performed by breeding companies with the focus being on egg laying performance. However, a promising alternative route to reduce feather pecking is to select for those birds which have a reduced tendency to peck or be pecked. A considerable difference in the tendency of birds to develop feather pecking has been found between different strains and by selecting those birds that are less inclined to feather peck, it may be possible to reduce mortality from this problem and improve overall group productivity. In addition, this paper discusses a range of management factors that may influence the development of feather pecking during the rearing and laying phases (such as diet, feeder type, drinker type, stocking density and perch access, use of litter) and their use and effectiveness are discussed here. It is clear that feather pecking is a multifactorial problem in commercial situations, and any management strategies used to reduce feather pecking need to take a holistic view.

Nicol CJ, Bestman M, Gilani AM *et al* (2013) The prevention and control of feather pecking: application to commercial systems. *World's Poultry Science Journal* **69**:775–788.

The use of topical anaesthesia to minimise pain during castration of calves

Castration of male calves is commonly performed on-farm to improve meat quality and management of the calves. It is well established that this procedure is painful for the calves, but the use of analgesics to reduce pain is not often used as the application of the currently available analgesics is costly for the farmer and there has yet to be a practical and affordable option made available. The growing public concern about animal welfare makes it important to find more welfare friendly methods of performing routine husbandry procedures. This study examined the use of a commercially available spray-on topical anaesthetic, currently used to relieve pain during the mulesing of sheep, and investigated whether it could also be used to reduce pain during the castration of calves.

Angus bull calves aged 3-4 months were allocated to one of three groups; those undergoing surgical castration, castration and the topical application of analgesia, or uncastrated controls. Pain following castration was assessed firstly using behavioural observation for 4 hours after castration (n=18), and then in a second trial, sensory testing of the skin was performed using a pressure transducer to assess the pain threshold at the point of contact (n=27). It was found that the calves treated with topical anaesthesia exhibited significantly less pain-related behaviours up to 3.5 hours following castration than untreated calves, and they did not differ from uncastrated controls. They also showed a greater pain threshold of the wound and surrounding skin than the untreated calves within one minute of castration. This study showed that the topical application of analgesia can alleviate the amount of pain that calves experience for up to 24 hours following castration and this analgesic, which can be simply applied on-farm by the farmer, has the potential to improve the welfare of livestock undergoing surgical castration, with little cost to the farmer.

Lomax S, Windsor PA (2013) Topical anesthesia mitigates the pain of castration of beef calves. *Journal of Animal Science* **91**:4945–4952.

Farm and management characteristics associated with boar taint

It is anticipated that the castration of male piglets in the European Union will be banned from 2018 onwards to reduce the occurrence of animal welfare issues associated with the performance of this procedure. However, uncastrated male pigs can develop a strong odour called boar taint, which is perceptible in the meat and can render the meat unfavourable for consumers sensitive to this odour. The occurrence of boar taint therefore can have a negative economic impact on producers. Producers that cease castrating their male pigs must therefore find ways to reduce the occurrence of boar taint in these pigs. The Netherlands has recently adopted a system to detect boar taint which is based on sensory evaluation of the carcass by a human nose at the slaughter line. It has been found that boar taint can vary in prevalence from 0% to 8% between individual farms which suggests that the different management characteristics used on different farms can influence the occurrence of boar taint. This study used a questionnaire to examine the different management characteristics used on 90 farms in The Netherlands and relate these characteristics to the prevalence of boar taint at the slaughter line using sensory evaluation of the carcass with the nose.

The study found that a number of characteristics were associated with boar taint on farms. A lower number of boars per pen (≤ 10) were associated with lower boar taint prevalence, as was a smaller pen surface (0.7 and 0.8m² compared with 1.0m²). Newer housing equipment of <5 years of age was also associated with lower levels of boar taint, as was feeding ad libitum compared with restricted feeding in the last period before delivery. In addition, the study showed that boars that were fasted for more than 6h prior to delivery were less likely to have boar taint than those that were fasted for a shorter period of time. Those kept at higher stocking densities also had lower levels of boar taint (however, the study noted that this would conflict with animal welfare). Genetics may also play a part as purebred dam line sows and terminal boars of the Pietrain breed showed a higher prevalence of boar taint than other boars. Although further research is needed, this information can be used to develop farm-level management strategies to reduce boar taint in uncastrated male pigs.

van Wagenberg CPA, Snoek HM, van der Fels JB *et al* (2013) Farm and management characteristics associated with boar taint. *Animal* 7(11):1841–1848.

Vertical structures influence the distribution of laying hens in an outdoor range

When provided with access to the outdoors, laying hens show varied use of the range, with only 10-30% accessing the range at any one time and some hens never use the range at all. When hens do access the range, they tend to stay close to the shed, walls and fences and do not move far into the range. This can cause problems with destruction of grass cover and the increased stocking density increases the risk of feather pecking and parasite contamination. It is not clear why hens use the range in this restricted manner, but it is thought to be related to fear of novelty and of predators. Previous studies have shown that the introduction of artificial structures to the range can attract hens to the range more widely, but it is, as yet, unclear what particular features encourage the hens to use the range most. This study aimed to add to the available knowledge by constructing two parallel fences which extended away from the shed and wintergarden into the range which was constructed of 5m of heavy shade cloth (zone 1), followed by 5m of moderate shade cloth (zone 2), then 5m of chicken wire (zone 3). The hens were monitored to see what effect the addition of these structures with a gradual reduction in the visual continuity had on their behaviour.

It was found that the structures attracted more hens to use the range, and that they moved further into the range. In addition, the hens also pecked at the structures, suggesting that they also provided a form of environmental enrichment. It was found that the first zone, the heavy shade cloth, was more attractive than zone 2, the light shade cloth, which in turn was more attractive than zone 3, the chicken wire. The addition of these structures resulted in the hens moving up to 18m from the shed and increases the knowledge available on encouraging laying hens to use outdoor ranges.

Rault JL, van de Wouw A, Hemsworth P (2013) Fly the coop! Vertical structures influence the distribution and behaviour of laying hens in an outdoor range. *Australian Veterinary Journal* 91(10):423–426.

HUMANE KILLING

Use of a nonpenetrating captive bolt for euthanasia of piglets

Little research has been performed to assess the animal welfare impact of on-farm euthanasia. Commonly, physical methods that involve hard impact of a solid object with the skull are used to euthanase piglets on-farm. To cause rapid death without causing pain and distress, the technique used for euthanasia should target the cerebral cortex of the brain, which is responsible for consciousness, and the brainstem, which is responsible for other aspects of consciousness, respiratory and cardiac function. Death is confirmed on-farm by the absence of reflexes. This study examined the effectiveness of a nonpenetrating captive bolt gun, the Zephyr-E, which has been designed specifically for euthanasia purposes. This gun has a conical nylon bolt head which protrudes 1.9cm from the end of the gun barrel when fired. This study assessed the effectiveness of the Zephyr-E for euthanasia by monitoring latencies to insensibility and cardiac arrest following use of the gun on piglets. Post-mortem assessments were performed to determine the degree of brain injury that the gun caused.

The gun was used on 100 neonatal piglets aged <72 hours by stockpeople who had previous experience in performing euthanasia and who had been trained in the use of the Zephyr-E. It was found that all piglets were rendered immediately insensible following the use of the gun, without showing signs of returning to sensibility. Brain death was determined as being the point when all convulsions ceased and all breathing and reflexes were absent. This point occurred within 5 minutes of using the gun in 80% of piglets and



<9 minutes in all 100 piglets. Moderate to severe haemorrhages and skull fractures were found in all piglets and post-mortem cases confirmed that moderate to widespread brain damage was caused by the Zephyr-E. The design of the bolt head and length was important in ensuring that the gun was effective in causing insensibility and ensuring that the animals did not regain consciousness. The stockpersons using the gun rated the Zephyr-E as a very good euthanasia technique, which was easy to use, maintained the welfare of the piglets during euthanasia and caused death with fewer objectionable aesthetical effects than using blunt force trauma. It can be concluded that the Zephyr-E is an effective tool for euthanasia of neonatal piglets on farm.

Casey-Trott TM, Millman ST, Turner PV *et al* (2013). Effectiveness of a nonpenetrating captive bolt for euthanasia of piglets less than 3d of age. *Journal of Animal Science* 91:5477–5484.

The efficacy of pulse ultrahigh current for stunning of cattle

When performing Halal slaughter in a commercial situation, to meet religious requirements it is essential that cattle are slaughtered by jugulation (having a knife cut across the animal's throat) and the death occur from being bled out via this wound. For welfare reasons, in many countries, cattle are stunned prior to jugulation, but the stun must be reversible to be considered acceptable for the Halal process and the death deemed as resulting from the throat cut and bleed out. Percussive stunning (a captive bolt gunshot to the head) and electrical stunning systems that are currently in place in different countries for the slaughter of cattle have inherent problems. The percussive stunning system has variable effectiveness and can lead to the animal regaining consciousness prior to death or may also cause fracturing of the skull, in which case the carcass may not be deemed acceptable to the Halal community as it is deemed to have died from this injury, rather than jugulation. The conventional electric stun is short acting, and again has the potential for the animal to regain consciousness prior to death. In addition, this stun produces an epileptic seizure, and the limb convulsions of the cattle can pose a danger to slaughter floor workers, as well as reduce the value of the meat.

This study examined the effectiveness of an alternative electrical stunning method for stunning cattle using a single pulse, ultrahigh electrical current. This technique works by causing depolarisation of the cells and changes in the cell membranes, which causes insensibility in the cattle which has the potential to last for longer than conventional stunning methods.

It was found that the ultrahigh electric current, although producing variable results, had the potential to be used as an effective reversible stun for Halal slaughter of cattle as the stun was found to be longer than that obtained by conventional electric stunning. The stun also did not produce an epileptic seizure in the cattle, which suggests advantages in terms of the quality of the meat obtained using this method and for the safety of workers on the slaughter house floor. In some animals, reflexes were noted to occur following stun, but no behavioural evidence of recovery was seen. The authors make suggestions for additional research to further improve this system, as it has the potential to be used in a commercial setting for stunning prior to Halal slaughter of cattle.

Robins A, Pleiter H, Latter *et al* (2014) The efficacy of pulsed ultrahigh current for the stunning of cattle prior to slaughter. *Meat Science* 96:1201–1209.

Current practices when performing religious slaughter in selected countries

Within the European Union, animals killed in slaughterhouses must be stunned to cause immediate loss of consciousness which is sustained until death is caused by bleeding. This is a requirement to ensure that the animals suffer no pain, anxiety or distress. There are exceptions to this requirement however, for certain religious faiths. Religious slaughter (Halal or Shechita slaughter) is carried out legally in the European Union in licensed slaughterhouses by authorised slaughter-men of the Islamic and Jewish faith. In these cases, the law still requires that slaughter is carried out without causing unnecessary suffering to the animals, but for the Muslim and Jewish communities, to comply with their religious beliefs, animals are required to be alive, healthy and suffer no injury at the time of slaughter. For this reason, in many cases the animals cannot be stunned prior to slaughter and the animals are killed by a knife cut to the throat only. In some cases, stunning is allowed if the stun is reversible, depending on the religious requirements.

This study aimed to assess the different practices used for slaughtering cattle, sheep and poultry in Belgium, Germany, Italy, The Netherlands, Spain, the United Kingdom, Australia and Turkey during Halal and Shechita slaughter. Data was obtained by a questionnaire and by performing spot checks on a number of slaughterhouses in the different countries. An assessment was made of the techniques used to handle, restrain, stun and slaughter animals and any behavioural indicators of pain and distress displayed by the animals were recorded. The paper discusses the techniques used in the different countries and showed large variations in times taken from restraint

to stun and neck cut procedures, and in the time of neck cut to death. There were also differences in behavioural indicators of pain, fear and distress between the different methods observed. This could have large implications for the welfare of many of the animals slaughtered using Halal or Shechita methods. The authors discuss the findings and the requirement that religious slaughter methods, whilst maintaining integrity in religious practices, should not prejudice the requirement to perform religious slaughter in a manner that upholds animal welfare at the highest level possible.



Velarde A, Rodriguez P, Dalmau A *et al* (2014) Religious slaughter: Evaluation of current practices in selected countries. *Meat Science* 96:278–287.

MISCELLANEOUS

Do fish have emotions?

It can be difficult for humans to see fish as creatures with emotions, but recent scientific evidence has shown that fish have increasingly complex behavioural and physiological responses to a number of diverse situations than was previously thought. The scientific debate around emotions in fish to date has focussed mainly on brain anatomy and function, physiological and behavioural responses and the cognitive abilities that fish possess, however little attention has been given to the emotional capabilities of fish.

This review paper examines the evidence collected so far in relation to emotions in animals, and in particular, fish. It explores the background of what we know about emotions in animals, how they are defined, and what the experience of an emotion actually involves from a scientific point of view. The paper then examines available evidence in relation to the existence of emotions in fish. Although fish have significant differences in brain structure and size compared to higher vertebrates, previous studies have shown that they show physiological stress responses that are similar to those observed in higher vertebrates. There is also some suggestion that fish feel pain and there is evidence that they retain memories of both negative and positive experiences. The review of these and other studies reveal that fish possess far more complex cognitive abilities than previously thought



and they may perceive emotions in a conscious or subjective manner. The available evidence suggests that differences between fish and higher vertebrates in the functional aspects of emotions are a matter of degree, rather than kind. Emotions experienced in fish may serve many of the same functions as they do in the higher vertebrates and in humans, in inducing and motivating different types of behaviour. The performance of research such as this is important, in particular to increase awareness of the welfare and humane treatment of fish.

Kittilsen S (2013) Functional aspects of emotions in fish. *Behavioural Processes* 100:153–159.

Existence of animal sentience in literature

The existence of animal sentience is fundamental to the advancement of animal welfare. However, the emotional lives of animals are often doubted and questioned. Due to the subjective nature of animal emotions, sentience in animals is sometimes dismissed as unmeasurable, but others disagree and state that even though it is complex, this should be no reason for its dismissal. Scientific interest in the subjective experience of animals has increased in the last 10 to 20 years and, in more recent years, scientists have begun to place more emphasis on the existence of positive emotions in animals, as well as negative. This study aimed to review what is assumed and what is being explored in the scientific literature in relation to positive and negative aspects of animal sentience, and the impact that this has on animal welfare.



The study explored the current understanding of animal sentience by reviewing the scientific literature published between 1990 and 2012. Twenty-two key words related to animals and animal sentience were identified and the 2562 papers that were returned containing these words were analysed. It was determined whether the identified papers assumed that animals were sentient or were exploring the existence of sentience (e.g. a study could investigate whether rats feel pain, or measure the pain felt by rats following analgesia). It was found that 99.34% of all research being performed within the 22 years examined already assumed the existence of animal sentience, and very few studies were exploratory studies investigating the existence of sentience.

Accepting the existence of affective states in animals is important as accepting that animals have the ability to feel pain is often essential to animal model research as well as the foundation of animal welfare science and the future in this area. The authors suggest that more research be performed examining the experience of positive emotions in animals as knowing what animals experience, what is important to them, and what they need to live a good life, is the key to improving their welfare.

Proctor HS, Carder G and Cornish AR (2013) Searching for animal sentience: A systematic review of the scientific literature. *Animals* 3:882–906.

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RESEARCH ANIMALS

Assessing the emotions of laboratory rats

Rats are one of the most commonly used species in research and are used as a model for many human disorders. It is anticipated that the number of rats used in medical research will continue to rise in future. Rodents used in research are also used in greater numbers than other animals due to their small size, lower purchase and maintenance costs and high reproductive rate. They also tend to be chosen as models in studies that involve invasive techniques and are less likely to receive post-operative analgesia when used in research that will cause them pain. This is likely due to a perception that rats are less able to experience emotions associated with suffering as a result of experimental procedures. Previous research on people's attitudes to rats have shown that people's support for experimentation is higher when rats or mice are used, than when other mammals are used, probably because people tend to think of the rat as a pest species and therefore show less empathy toward this species. Knowledge of a rat's ability to experience emotions, including pain, is important as it helps to inform concerns for their welfare and safeguard their welfare.

This paper examines the current understanding of emotional states in animals, including rats, and aims to bring together information on rat emotion from across a number of different disciplines over the last few decades, making this information easily accessible to those working with rats. The paper provides strong evidence for the existence of both positive and negative emotions in rats suggesting that any differential treatment afforded to rats, when compared to other laboratory animals, is not justified. Current practice in many laboratories where rats are held without social companions and without access to a shelter is likely to substantially compromise their welfare, and researchers using rats in experimentation should take a rat's behavioural and social needs into consideration.

Makowska IJ, Weary DM (2013) Assessing the emotions of laboratory rats. *Applied Animal Behaviour Science* **148**:1–12.

The effect of enclosure size on aggression during the mixing of rabbits

In recent years, recommendations for increasing the welfare of laboratory rabbits have increasingly focused on social enrichment. Laboratory rabbits are highly motivated to gain access to social companions but can be difficult to house together due to the high levels of aggression that can occur between unfamiliar rabbits. The reasons why rabbits show aggressive behaviour towards each other upon mixing is not well understood. Most animals have a minimum distance that they will allow a conspecific to approach before they show aggressive behaviour and so this study was performed to examine if the size of the enclosure could affect the amount of aggression that two rabbits show towards each other upon introduction.

Do female rabbits were paired in either a larger enclosure (1.44m² floor space) or a smaller enclosure (0.91m² floor space) with a PVC barrier between them that allowed contact between the rabbits, but prevented injury. Each pair of rabbits was tested in both the larger enclosure and in the smaller enclosure for an hour at a time, and aggressive and affiliative behaviours monitored. It was found that there was no effect of enclosure size on aggressive or affiliative behaviour, but it was found that those does that were tested first in the large enclosure showed relatively high levels of affiliative behaviour and relatively low levels of aggression, and this pattern continued during the second trial in the smaller enclosure. Conversely, those does tested first in the smaller enclosure were more aggressive and showed less affiliative behaviour towards their partners, which continued when they were tested in the larger enclosure. In total, there were 47 bites observed among does first introduced in the small enclosure, as compared to only one in the pairs first introduced in the large enclosure.

The study demonstrated that introducing pairs of unfamiliar adult does in a larger enclosure significantly reduced aggression and increased affiliation compared to introductions in a smaller enclosure the size of a double cage. These findings suggest that introducing does in a large, neutral arena could initiate an affiliative relationship between the does that would be maintained even when the does are moved to their smaller home cage. Future work should evaluate the utility of these methods for facilitating long-term pairing success.

Valuska AJ, Mench JA (2013) Size does matter: The effect of enclosure size on aggression and affiliation between female New Zealand White rabbits during mixing. *Applied Animal Behaviour Science* **149**:72–76.

TRANSPORTATION OF ANIMALS

Heat stress and live export of animals

Heat stress has been shown to be a significant factor affecting the welfare of animals during live export by sea, contributing to high levels of mortality on some voyages. Recent investigations by the Australian Department of Agriculture into high mortalities on shipments from Australia to the Middle East during the Northern hemisphere summer suggest that animal welfare may be compromised by the heat. The authors of this paper argue that the heat stress risk assessment (HSRA) computer model that is routinely used as part of the requirements of the Australian Standards for the Export of Livestock (as required by law) during live export voyages from Australia is not assessing the risk accurately and could have detrimental effects on the welfare of exported livestock. This review supports this suggestion by examining the available literature on heat stress in sheep and cattle, including laboratory studies which are designed to mimic the conditions that are encountered on-board ship, and discusses the mechanism of thermoregulation and how to make appropriate measurements of heat load, including practical indicators that livestock are experiencing heat stress. The paper also discusses the current monitoring and reporting systems for live export voyages, and the effect of stocking density and ventilation on the predisposition of livestock to develop heat stress.

The authors express concern that the currently used model does not take into account the impact of high temperatures on animals shipped from Australia to the Middle East during the Northern hemisphere summer and may not accurately protect the animals from poor welfare. The authors call for data from all voyages to be published so that the risk assessment model can be assessed by an independent scientific body.



Caulfield MP, Cambridge H, Foster SF *et al* (2013) Heat stress: A major contributor to poor animal welfare associated with long-haul live export voyages. *The Veterinary Journal* (In press).

WILD ANIMALS

A survey of foot problems, stereotypic behaviour and floor type in captive elephants

Foot problems such as nail splitting and arthritis, are some of the most common health issues seen in Asian elephants (*Elephas maximus*) in captivity in the western world and prevention of these problems is of great importance for maintaining elephant welfare. Currently these problems are treated as they occur, but it would be beneficial to know what factors influence the development of these problems to enable zoos to prevent them. Elephants held in captivity commonly show stereotypic behaviour; repetitive behaviour that is performed for no obvious reason. Stereotypic behaviour in elephants is often manifested as a weaving behaviour, in which the elephant repetitively transfers its weight from one leg to the other. As pressure is placed on the foot, the foot



expands and the repetitive nature of this stereotypic behaviour can cause strain on the limbs and on the nails of the foot, resulting in cracks in the toenails and uneven and excess wear on the toes. It has also been suggested that this repetitive behaviour may also contribute to the development of osteoarthritis. Previous work has shown that the design of the facilities in which the elephant lives may influence the performance of stereotypic behaviour, in particular, the type of substrate that is placed on the floor in the elephant's enclosure. This study used a survey to obtain information from European institutions housing elephants to determine if there is any association between stereotypic behaviour in elephants and the substrate type used in the enclosure, and if these factors also have any effect on the development of foot problems.

Information was collected from 32 zoos housing 87 Asian elephants (of at least 12 years of age). The majority of the institutions (84.2%) had at least one elephant with some degree of foot pathology. On an individual basis, most of the elephants (67.8%) had been diagnosed with one or more foot problems at the time of the survey. 72.4% of the elephants showed more than one stereotypic pattern at the time of the questionnaire. Data analysis showed that elephants with access to sand flooring had a significantly greater

chance of displaying stereotypic behaviour. Displaying this behaviour was also age-dependent with older elephants being more likely to do so. Furthermore, elephants that displayed stereotypic behaviour or that were being kept in an environment with sand or concrete flooring were more likely to have foot problems than others. With regards to concrete, these results could intuitively be expected and a bare concrete flooring should be avoided in elephant housing. In contrast with other studies where sand was found to improve captive elephant welfare, our study indicated the opposite. However, sand surfaces can differ considerably and research into the different types of sand substrates and the way they are implemented is needed, prior to adopting the conclusion of the current study in practice.

Future research should focus therefore not only on investigating the causal relationship between stereotypic behaviour and foot problems but also on how different use of sand substrates can influence the presence of foot problems, stereotypic behaviour and general elephant welfare.

Haspeslagh M, Stevens JMG, De Groot E *et al* (2013) A survey of foot problems, stereotypic behaviour and floor type in Asian elephants (*Elephas maximus*) in European Zoos. *Animal Welfare* 22:437–443.

RSPCA Scholarships

Every year, RSPCA Australia offers two scholarships to encourage students to take an active interest in animal welfare issues, to support animal welfare research that might not otherwise attract funding, and to promote the objectives of the RSPCA within the research community.

The **RSPCA Australia Alan White Scholarship** is offered to students for the funding of original research aimed at improving the welfare of animals in Australia. In November 2013, the Alan White Scholarship, was presented to Cybele May for her project titled "Understanding the knowledge and attitudes of veterinarians regarding issues in cat overpopulation and how these impact on recommendations to clients in clinical practice".

The **RSPCA Australia Scholarship for Humane Animal Production Research** is for specific projects aimed at improving the welfare of production animals. Unfortunately, this scholarship was not awarded in 2013.

For more information on RSPCA scholarships, previous recipients and progress reports, visit our website.

ARTICLES OF INTEREST

ANIMALS USED FOR SPORT, ENTERTAINMENT, RECREATION AND WORK

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