



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.

COMPANION ANIMALS

Desexing female cats - effect of age and surgical approach

The management of unowned domestic cat (*Felis catus*) populations is a global problem that raises animal welfare issues. The onset of puberty in females can be as early as 12 weeks of age and a single female cat can produce 40 kittens per year. It is estimated that between 75% and 97% of cats in a population need to be desexed to stabilise population numbers. Shelter organisations began desexing cats prior to puberty >30 years ago. Early-age desexing removes the responsibility for desexing from owners who, despite financial incentives, frequently fail to return the cat for surgery, while still allowing rehoming at a young age to optimise socialisation. There is increasing evidence that early-age desexing is not only safe in the short and long term, but also offers advantages, including reduced surgical time and rapid recovery, compared to the traditional age of 6 months or older. Many national and international shelter, welfare and veterinary organisations now endorse early-age desexing, including the Royal Society of the Prevention of Cruelty to Animals, the International Society of Feline Medicine and the American Veterinary Medical Association. Despite these factors, recent surveys indicate that attitudes within the veterinary profession towards early-age desexing are variable.

This study aimed to investigate the effects of age and/or surgical approach on wound complications following desexing, otherwise known as ovariohysterectomy (OHE), of female cats. A retrospective search of perioperative monitoring records from a shelter desexing program was conducted to identify cats that underwent OHE between 1 June 2010 and 31 December 2012 inclusive. A wound complication was defined as gross observation of inflammation or wound breakdown at the surgical site in the 5 day postoperative period. Cases were grouped according to age (≤ 12 weeks or >12 weeks) and surgical approach (flank or midline). Stratified analyses were conducted to evaluate the association between surgical approach and wound complications, after adjusting for age.

A total of 312 cases met the study criteria. The overall wound complication risk was low (6.09%). Age at desexing was not a risk factor for wound complication; there was no significant difference in the development of wound complications in cats up to 12 weeks of age compared with older cats. Considering all cases, regardless of age, a midline approach was associated with 2.95-fold increased risk of wound complication compared with a flank approach. The authors concluded that these findings support the practice of prepubertal desexing for cats and that these findings add to the evidence base supporting a cultural change to embrace the practice of early-age desexing as standard for feline patients.

Roberts ML, Beatty JA, Dhand NK *et al.* (2015) Effect of age and surgical approach on perioperative wound complication following ovariohysterectomy in shelter-housed cats in Australia, *Journal of Feline Medicine and Surgery*, Open Reports 1-4.



Hemivertebrae in French bulldogs

Hemivertebrae (wedge-shaped vertebrae) are the most common malformation of the vertebral column in chondrodystrophic breeds of dog (breeds with cartilage maldevelopment) such as the French bulldog and Pug. The familial occurrence of this condition suggests it is a heritable trait. Selection for 'screwed tail' in dogs is believed to increase the risk of hemivertebrae developing in the spine. Neurological signs, resulting from spinal cord compression, usually manifest around 3-4 months of age in affected dogs. Clinical signs include pelvic limb incoordination and weakness, loss of reflexes, curvature of the spine, incontinence and wasting of the pelvic limb muscles. The aims of the present study were to quantify significant effects on the number and grade of hemivertebrae in a sample of French bulldogs and to estimate the heritability.

105 French bulldogs from Germany were included in the study. The dogs were born between 1994 and 2011 and were screened for hemivertebrae by veterinarians using radiography. Hemivertebrae were found to be present in 89/105 of the dogs examined. The prevalence of hemivertebrae was 0.85 with a

slightly higher prevalence in females compared with males. Heritability estimates for the number and grade of hemivertebrae were 0.58 and 0.53, respectively. The number of coccygeal vertebrae showed a heritability estimate of 0.35. In addition, the number of coccygeal vertebrae was negatively correlated with the number and grade of hemivertebrae.

The study findings support a hereditary component to the development of hemivertebrae in French bulldogs and a high prevalence of this condition. The authors state that the prevalence of hemivertebrae could increase if dogs with shorter tails are preferentially selected for breeding purposes. The authors suggest that dogs with an extreme phenotype (i.e. screwed tails) should not be rewarded in competitive dog shows, nor preferentially selected for breeding purposes.

Schlenker E and Distl O (2016) Heritability of hemivertebrae in the French bulldog using an animal threshold model, *The Veterinary Journal*, **207**:188-189.



The impact of online photo traits on the speed of dog adoption

The overcrowding of companion animals in shelters has been an ongoing problem for many decades, with 2 to 6 million dogs being euthanased annually in the United States. Increasing adoption rates for these animals is therefore vital to improve animal welfare outcomes. Previous research has shown that certain traits of dogs such as their breed, colour, age and behaviour affects the speed at which they are adopted. In recent times, the use of the internet has become another tool that is used to present adoptable dogs to the public, with websites such as petfinder.com offering more than 300,000 companion animals for adoption across the United States. To date, little is known about how the quality of the advertisements on sites such as petfinder affect the adoption of the animals. This study aimed to assess the quality of online photos of adopted dogs to determine if any traits in the photos had an impact on the speed of adoption.

The study analysed the first images of 468 adopted black Labrador Retriever mixed breed dogs in the United States by accessing data from Rescugroups.org about dogs that had been available for adoption

Human behaviour preceding dog bites to the face

The human dog relationship is an important one spanning many centuries, but can sometimes be overshadowed by dog bites. Possible injuries as a result of dog bites can range from minor lacerations to fatal wounds. The most serious dog bite injuries are those that occur on the face, which commonly happens to children, whereas adults are more likely to be bitten on a limb. In order to develop an effective program to prevent dog bites, it is necessary to recognise which interactions between humans and dogs are likely to result in a dog bite. This study aimed to determine the human behaviour occurring immediately preceding a dog bite to the face. The effect of victim age and gender, dog sex and size and the location of the bite on the face was also assessed.

Potential participants in the Czech Republic were recruited using fliers posted in local veterinary practices and those recruited for the study were those cases where the victim had been bitten on the face (but not other parts of the body). 132 participants were asked to complete a questionnaire that asked a number of questions related to 1) the victim and dog characteristics and 2) victim and dog behaviour.

from the time period January 2011 until June 2012. The number of days that these dogs were held in the shelter was also calculated.

It was found that the quality of the photo had the largest impact on the time to adoption of the dog, but other photo traits that also impacted adoption time were direct canine eye contact with the camera, showing the dog standing up, having the photo being appropriately sized, showing the dog photographed outdoors and showing the dog in a clear non-blurry image. Photographs that showed dogs in a cage, wearing a bandana or having the tongue visible had no effect on how quickly the dogs were adopted. It is anticipated that the information presented in this study can be used to help shelters increase the impact of their online advertising of dogs and decrease the amount of time that the dogs spend in shelters before being adopted into their new home.

Lampe R, Witte TH (2015) Speed of dog adoption: Impact of online photo traits. *Journal of Applied Animal Welfare Science* **18**(4):343-354.

It was found that a human bending over a dog, putting the face close to the dog's face and gazing closely between victim and dog preceded the bite to the face in 76%, 19% and 5% of the cases respectively. More than half of the bites were directed towards the nose and lips of the face and more than two thirds of the victims were children. None of the victims were the adult owner of the dog and only adult dogs bit the face. Victims in this study only sustained soft tissue facial wounds and in more than half of cases, medical treatment was not sought but people who were bitten by large dogs sought medical treatment more often than people bitten by small dogs. To decrease the risk of a bite to the face, people should be warned about the risks of bending over a dog, putting their face close to a dog's face and gazing closely, and children should be carefully and constantly supervised around dogs.

Rezac P, Rezac K, Slama P (2015) Human behaviour preceding dog bites to the face. *The Veterinary Journal* DOI <http://dx.doi.org/doi:10.1016/j.tvjl.2015.10.021>.

The role of coat colour and other characteristics on adoptability of shelter dogs

Many anecdotal reports have stated that black domestic dogs are subject to 'black dog syndrome' in animal shelters. This has been portrayed in the media as black dogs having a lower rate of adoptability from animal shelters than dogs with other coat colours, staying for longer periods in shelters before being adopted, or being euthanased. It has been suggested that people may have a preconceived idea about the temperament of a black dog, that people may find them less interesting than other coat colours or there may be a difficulty in photographing black animals to promote potential adopters.

This study aimed to determine if coat colour actually has a negative impact on a dog's length of availability for adoption (LOA) in a shelter and on a dog's potential for euthanasia. In addition, the authors examined dog related factors to determine how these affected the length of time before the dog was adopted and risk of euthanasia. This study used four years of shelter data collected from two animal shelters in the Pacific Northwestern United States; one shelter having 'selective intake' of dogs, where staff at the shelter were able to decide whether they wanted to take in any individual dog, and the second shelter being an 'open admission' shelter, meaning that the shelter staff took in the dog regardless of what type of dog it was, its behaviour or medical condition.



It was found that the average length of time that black dogs were available for adoption was no longer than that for other coat colours, nor was the rate of euthanasia higher for black dogs. In fact, it was found that brindle coloured dogs were associated with longer stays at the shelter and higher rates of euthanasia. Age and breed groups were more consistent predictors of shelter outcomes than coat colour across the two shelters, with older dogs spending longer in the shelter and having a higher rate of euthanasia. Bully breeds had significantly longer LOA in both shelters and, compared to other breeds, were euthanased at higher than expected rates. The authors suggest that the results of this study may provide shelters with insight regarding how best to use limited resources to market animals whose physical characteristics may place them at risk for euthanasia to potentially increase chances of adoption. Shelters may also wish to use some of the methods adopted in this study to look at their own adoption and euthanasia trends.

Svoboda HJ, Hoffman CL (2015) Investigating the role of coat colour, age, sex, and breed on outcomes for dogs at two animal shelters in the United States. *Animal Welfare* **24**:497-506.

The role of the internet site Petfinder in cat adoptions

Millions of cats enter animal shelters each year in the United States, and 71% of these cats are euthanased. Previous studies have shown that the physical features and age of the shelter animals can influence the length of stay and their likelihood of being adopted. It is important that the length of stay of cats in shelters is minimised as the longer they remain in the shelter the more likely they are to develop disease or lose their appetite as a result of the stressful environment they are in, and as a result are more likely to be euthanised. Some shelters in the U.S promote their adoptable animals by sharing photographs and written descriptions of the available animals on the internet on sites such as Petfinder (Petfinder.com) which advertises to the online community the animals that are available for adoption.

This study involved 892 cats and aimed to explore the connection between the popularity of photos on the internet (determined by the number of clicks to access the photo which was obtained directly from the company running Petfinder) and the length of time that the cat was made available in the Western New York animal shelter prior to adoption. In addition, the

study examined the features from the photographs that could influence a cat's popularity on Petfinder.

Approximately one third of adopters reported visiting Petfinder prior to adoption and half of those reported viewing their adopted cats' profiles on Petfinder. It was found that the larger the number of clicks per day that the cat received on Petfinder, the shorter the length of time that the cat was available in the shelter prior to being adopted. The older the cat was, the longer time that it took for that cat to be adopted and the younger a cat was, the more clicks it received on Petfinder per day. Coat colour also affected the cat's likelihood to be adopted, with black or smoke coloured cats receiving fewer clicks and taking longer until adoption. It was found that those photos that contained a picture of a toy with the cat was positively associated with receiving more clicks. The authors suggest that strategic use of toys in cat's photos may promote adoptions of shelter cats who are typically overlooked.

Workman MK, Hoffman CL (2015) An evaluation of the role the internet site Petfinder plays in cat adoptions. *Journal of Applied Animal Welfare Science* **18**:388-397.

FARM ANIMALS

The influence of soft or hard floors before and after calving on dairy heifer activity, claw and leg health

The dairy cow's hoof claws are best suited to pasture which provides a balance between the claw horn wear and growth and exerts good pressure loading on the claw. During gestation, dairy cows may be kept outside and provided with the ability to graze, or kept inside in straw bedded yards. In contrast, following the birth of the calves and when the cows are lactating, housed cows are forced to walk on hard concrete and manure-contaminated floors. The stress of the removal of the calf, the environment and the long time periods standing on the hard flooring in this system can also increase the risk of claw and leg disorders developing and resulting in lameness in dairy cows. It would not be unreasonable to assume that the feet and leg strains sustained by replacement heifers before calving could also have a significant effect on the feet and leg health of the cow following calving. The aim of this study performed in Sweden, was to determine the effect of the management system and the flooring provided for heifers and how it affected their legs,

claw conformation and lameness, both during the gestation period and, after the animals have been moved to a new housing system for lactation.



Pregnant heifers were provided with either deep straw bedding (soft) or cubicles (hard) during the gestation period. Following the birth of the calves the cows were re-housed in the cubicle system either on slatted concrete (hard) or on slatted rubber (soft) for the lactation period. Measurements of the claw were taken, together with the pressure distribution, claw disorders and leg lesions at the start and end of every housing season. Locomotion and leg lesions were also scored monthly after calving.

It was found that there was a higher prevalence of sole haemorrhages in those heifers housed in the cubicles (hard) than those housed on deep straw (soft) during gestation. After calving, those cows

housed on the slatted concrete (hard floor) had more leg lameness and lesions (hock ulcers) than those housed on the soft rubber floor, probably due to a higher prevalence of sole and white-line disorders in the former system. It was also found that there was a higher prevalence of sole and white-line disorders on those heifers reared on a soft and then going to a hard floor than vice versa. The study suggests that the provision of soft flooring for gestating and lactating cows is important for healthy legs and feet.

Bergsten C, Telezhenko E, Ventorp M (2015) Influence of soft or hard floors before and after first calving on dairy heifer locomotion, claw and leg health. *Animals* 5:662-686.

Effect of locomotion on sow's ability to access food

Since January 2013, the European Union requires that gestating sows are group housed from 4 weeks after insemination to 1 week prior to farrowing. Group housing allows sows to express more natural behaviours than does housing in stalls, but to be able to express these behaviours, the sow needs to be able to walk and move around the group pen effectively. Lameness in group housed sows can be quite common and it is estimated that 8 – 15% have some level of lameness, with the associated welfare implications. Sows can exhibit different levels of lameness, from hardly noticeable to severe. If a sow is severely lame, this is likely to inhibit her ability to move and it is thought that this may impact her ability to access resources such as feed and an appropriate place to rest. The aim of this study was to evaluate the relationship between gait score (how lame the pig is) and its ability to move around a pen.

This Belgian study used a design where feed restricted sows (n=29) were gait scored as non-lame, mildly

lame, moderately lame or severely lame and then were asked to move back and forth between two locations in a pen where they received food rewards. It was found that moderately and severely lame sows collected fewer food rewards than non-lame and mildly lame sows, however no difference was found between non-lame and mildly lame sows or between moderately and severely lame sows.

The results suggest that both moderately and severely lame sows are restricted in their ability and willingness to cover distances and so may be at risk of behavioural restriction in group housing systems. This is likely to result in sows performing limited social interactions, having reduced feed intake and resting in inappropriate places in the pen, all of which are likely to reduce their welfare within the group.

Bos EJ, Nalon E, Maes D *et al* (2015) Effect of locomotion score on sows' performances in a feed reward collection test. *Animal* 9(10):1698-1703.



Methods for assessing keel bone damage in poultry

Keel bone damage is a major problem for commercial laying hens as it causes the birds pain and therefore has animal welfare implications. There is also some evidence that keel bone damage can affect productivity and therefore have financial implications for the farmer. This paper provides a comprehensive review of methods used to assess keel bone damage. The authors first define the different types of keel bone damage, fractures and deviations that are commonly seen in birds in a commercial setting, and then review the different methodologies that can be used to assess keel bone damage.

Palpation and observation with the eye is the most commonly used technique to assess keel bone damage, as a result of the low cost and ease of adoption of this technique, and this method has been well-validated. However, information about alternative methods including x-rays and ultrasonography are also provided within the paper, as these alternative techniques can offer additional insight into keel bone

damage that is not possible with palpation and visual observation alone.

The authors provide a review of how to assess keel bone damage by palpation and make recommendations for improvement by ensuring that assessors develop a clear understanding of the structure and function of the keel bone and are provided with the opportunity to palpate a wide variety of keels with a variety of injury. The authors also recommend that observers should practice palpation scoring following by visual assessment during dissection. It is thought that the information provided and recommendations made in this paper can be used to improve the ability of keel bone assessors to accurately detect keel bone damage.

Casey-Trott T, Heerkens JLT, Petrik M *et al* (2015) Methods for assessment of keel bone damage in poultry. *Poultry Science* **94**:2339-2350.

Heart rate variability as a biomarker of dairy calf welfare

The management of young dairy calves is inherently stressful and involves early weaning (both nutritional and separation), isolation and routine surgical procedures such as disbudding, all of which compromise the welfare of the calf. The aim of this study was to explore dairy calf welfare by using heart rate variability (HRV) as a potentially accurate biomarker of stress levels and therefore welfare.

Twenty five young dairy calves in the UK were studied over a 4-week period. Heart rate was measured using heart rate monitors which were attached to the calves for two hours each day. It was found that the longer the calves spent on the cow prior to separation, the higher levels of stress they exhibited, as measured by the HRV, and a large disadvantage was noted in leaving the calves on the cow beyond 2 days. The calf stress levels, measured by HRV, still remained significantly affected by weaning age 3 days following separation, indicating that weaning has a lasting stressful effect. The study also showed that the longer the calves spent individually housed in single pens following weaning, the more stressed they were after joining a group pen. The calves were provided with a dummy teat in the single pens so that they were able to suckle, and a drop in HRV showed

that the calves became stressed when the teat was removed from their pen, thus identifying the addictive nature of suckling in calves. The use of meloxicam, a non-steroidal anti-inflammatory drug, following disbudding, only partially relieved post-disbudding stress.

This study suggests that the use of HRV as a biomarker for stress is effective as it provided objective measures for a normal biological process (separation and isolation stress), a pathogenic process (disbudding and the associated tissue damage) and pharmacological response to a pain-inducing process (meloxicam administration). The results also showed that calf welfare would be improved by reducing the time between birth and separation of the calf from the cow and also the amount of time the calves spend in single pens. Providing dummy teats for individually housed calves was not detrimental to the calves or their management and may have the potential to be used as environmental enrichment.

Clapp JB, Croarkin S, Dolphin C *et al* (2015) Heart rate variability: a biomarker of dairy calf welfare. *Animal Production Science* **55**:1289-1294.

The effect of ammonia on layer hens in alternative housing systems

Since 2012, the use of conventional cages for housing laying hens has been banned in the European Union. Other systems that are available for intensive commercial egg production may have other potential welfare challenges, one of these being the increased risk of high levels of ammonia that can be present in these systems that house hens on litter, such as floor housing and aviary systems. This Norwegian review paper examines ammonia and its potential effects on the welfare of the birds. Ammonia originates when the manure of the bird breaks down and causes a pungent smell that is irritating to the eyes and the respiratory system. Concentrations of ammonia are affected by the type of litter used, bird activity, stocking density, frequency of manure removal, ventilation in the building and ambient temperature, as well as the pH, humidity and the surface area of the manure.

It is important that levels of ammonia are kept within an acceptable level in alternative systems as high concentrations can have adverse effects on the health

of the hens and cause lesions in the respiratory tract and have damaging effects on the conjunctiva of the eye. High ammonia concentrations also predispose the hens to respiratory disease and secondary infections. In order to safeguard the intended welfare benefits of the recent ban on conventional cages, it is important that both immediate and long-term actions are taken to contribute to the reduction of ammonia in alternative systems. The authors suggest that steps may include the development and implementation of systems that ensure effective manure removal and adequate ventilation. Close collaboration between experts in the fields of technology and biology should be encouraged to develop good technical solutions and management processes to reduce ammonia levels in alternative layer hen housing systems.

David B, Mejdell C, Michel V *et al* (2015) Air quality in alternative housing systems may have an impact on laying hen welfare. Part II – Ammonia. *Animals* **5**:886-896.

Genetic factors influencing breech cover, wrinkle and wool coverage in Merino sheep breeding programmes

Wrinkles around the breech of Merino sheep increase the risk of flystrike, which can cause pain and distress and be fatal for the sheep. In the past, this has been managed by mulesing the sheep to remove the wrinkled skin around the breech. However, mulesing is a significantly painful procedure and so, there is an increased focus within the Australian sheep industry to find a genetic solution to increase the bare area around the breech of the sheep to reduce the risk of flystrike. Breeding programs that aim to increase the bare skin or decrease wrinkling can be undertaken to gradually decrease the risk of the sheep to be predisposed to develop flystrike. These programs require that genetic parameters for breech cover, wrinkle and wool coverage traits are assessed and individuals with the best genes selected for. This study aims to assess the genetic and physical characteristics within the Australian Merino flock with a view to making recommendations around breeding programs to breed sheep with phenotypes (physical appearance) less at risk of flystrike.

Data for this analysis was obtained from the Cooperative Research Centre for Sheep Industry Innovation (Sheep CRC) Information Nucleus (IN) flock in Australia and presents data collected from 6469 Merino sheep born from 183 different Merino sires into the IN between 2007 and 2011. The data was assessed at marking (7-43 days), yearling (300-400

days) or adult (>540 days) for breech cover and breech wrinkle, and at both the yearling and adult ages for body wrinkle and neck wrinkle.

Analysis of this data showed that the breech cover and wool coverage traits were lowly heritable ($h^2 < 0.16$) while breech, body and neck wrinkle traits were moderately heritable (h^2 range 0.26-0.34) suggesting that while all traits will respond to selection, genetic improvement of breech cover and wool coverage are likely to be slower and potentially more difficult due to their low heritability estimates. The results highlighted that a single assessment of the breech cover or wrinkle traits, preferably at the yearling stage, may be sufficient for genetic improvement programs seeking to decrease the extent of wool coverage around the breech or the degree of wrinkling on the breech or body of the sheep. There is potential for the variation in breech cover and wrinkle traits of sheep to be observed by sheep farmers to support on-farm decisions to select against or cull individuals with high breech cover or wrinkle scores, as well as farmers potentially separating the flock into 'easy care' versus normal management mobs.

Hatcher S, Preston JWV (2015) Genetic parameters for breech cover, wrinkle and wool coverage scores and their implications for Merino sheep breeding programs and flock management. *Small Ruminant Research* **130**:36-46.

Effects of catching and transportation versus pre-slaughter handling at the abattoir on the prevalence of wing fractures in broiler chickens

Wing fractures are a common injury in meat (broiler) chickens and many are sustained during the catching and transport process or during pre-slaughter handling at the abattoir. Wing fractures are therefore a significant welfare issue within the meat chicken industry, and more information about when these fractures are sustained during the production process would be beneficial.



This Norwegian study investigated the effects of pre-slaughter handling procedures on wing fractures in broiler chickens in two abattoirs, one using bi-phasic CO₂ stunning (CS), and the other using electric water bath stunning (ES). 11,609 broiler chickens from two flocks were examined for evidence of wing fractures

1) in lairage (representing fractures sustained during manual catching and transportation, 2) after being taken from the transport containers (both CS and ES) and following shackling (only ES), and 3) post-stunning. It was found that 0.8% of wing fractures happened while the birds were in lairage, 2.9% were sustained after shackling prior to stunning and 2.35% were sustained after stunning. There was no difference in the number of fractures sustained between the CS and ES slaughter methods.

The study showed that a larger number of wing fractures are attributed to pre-slaughter handling at the abattoir, rather than during catching and transportation, and are sustained in both conscious and unconscious birds. The authors suggest that more large-scale research should be performed to assess the prevalence and risk factors associated with wing fractures. Training should also be provided for staff involved both in catching and handling the chickens and to staff handling the birds at the abattoir with the aim of reducing harm to the birds during this process.

Kittelsen KE, Granquist EG, Vasdal G *et al.* (2015) Effects of catching and transportation versus pre-slaughter handling at the abattoir on the prevalence of wing fractures in broilers. *Animal Welfare* **24**(4):387-389.

Behavioural assessment of pain in commercial turkeys

Food pad dermatitis (FPD) is commonly seen in commercially reared turkeys. In turkeys displaying FPD, the pads of the feet become swollen and hard and lesions form, which increase in size as the condition progresses. In severe cases, secondary infections may also occur, which will cause the birds further pain. A high moisture content in the litter on which the birds stand is known to be the main factor causing FPD in poultry and birds with FPD have been shown to display reduced activity and disrupted behaviour. The onset of FPD can be rapid; an inflammation response can be seen within 48 h with fully developed lesions developing within 2-4 days. It has been demonstrated that some breeds of bird are more susceptible to FPD than others under the same conditions. This study, performed in the UK, aimed to assess differences in susceptibility of two different lines of medium-heavy birds to FPD, and if turkeys that have developed FPD exhibit behaviours indicative of pain.

Using randomised tests, birds were housed on either wet or dry litter and provided with analgesic

(betamethasone) or saline solution (control) and the behaviour of the birds recorded and analysed. The results of the studies showed that birds housed on wet litter had different behavioural repertoires to those housed on dry litter. The provision of the analgesic also changed the behaviour of the birds in some cases, indicating that FPD is likely to cause the birds pain. There was no difference between the two tested lines of birds in susceptibility to FPD.

The results of the studies outlined here emphasise again that wet litter is associated with the development of FPD and birds exhibiting FPD exhibit behavioural changes that suggest compromised welfare. The study emphasises the importance of providing a dry environment for commercially reared turkeys to reduce the development of FPD.

Sinclair A, Weber Wyneken C, T, Veldkamp T *et al.* (2015) Behavioural assessment of pain in commercial turkeys (*Meleagris gallopavo*) with foot pad dermatitis. *British Poultry Science* **56**(5):511-521.

Breeding for polledness in Holstein cattle

The Holstein Friesian cow is the largest dairy breed worldwide. In North West Europe, the majority of cattle are dehorned to reduce injuries between group mates and to increase handler safety. However, as dehorning is a painful process, alternatives are being sought. One option is to breed polled cattle that do not develop horns and so do not need to be dehorned. Although the polledness gene is dominant over the horned gene, the frequency of polledness varies between breeds of cattle and in the Holstein breed, it is low. Farmers are therefore faced with a limited choice of bulls and a breeding program to increase the frequency of the polled allele is desirable.

This paper describes the genetic aspects for a breeding program to increase polledness in the Dutch Holstein population. When considering a breeding program, other factors need to also be taken into account such as that if selecting for polled cattle, other hereditary factors that make the cattle healthy or highly productive also need to be taken into account (i.e. they also need to have a high breeding value). In addition, if the polled locus is present only in a small group of

bulls, this may lead to inbreeding and the negative effects associated with this.

In 2009, there were 33 polled bulls available for artificial insemination, 2 of them being homozygous for polledness. In 2014, more than 150 bulls were available, 31 of them being homozygous. When examining the steps that have been taken in recent years to achieve polled bulls that also have a high breeding value, the authors consider that breeding for a higher frequency of polledness together with a high genetic merit with a relatively low amount of relatedness is very possible. Although the breeding values of polled bulls are lower than those of horned bulls, the gap between polled and horned bulls is decreasing and more polled bulls with high genetic merit are becoming available. However the authors suggest caution to ensure that the degree of inbreeding is not increased too far.

Windig JJ, Hoving-Bolink RA, Veerkamp RF (2015) Breeding for polledness in Holstein cattle. *Livestock Science* **179**:96-101.



HUMANE KILLING

Assessment of non-penetrating captive bolt stunning followed by electrical induction of cardiac arrest in veal calves

Veal slaughter premises may collect tissue from the central nervous system of calves for human consumption which cannot be typically harvested from cattle over 30 months of age due to the risk of bovine spongiform encephalopathy transmission. Mature cattle are commonly stunned with a penetrating captive bolt gun which causes extensive damage to the brain and skull, but is also associated with contamination of the brain tissue with hair, bone and other matter. To prevent this contamination, a non-penetrating captive bolt may be used instead. This type of captive bolt gun is generally effective in rendering animals unconscious with a single blow, but does increase the potential for recovery prior to exsanguination (bleeding out) if this procedure is not performed rapidly. In addition, some veal slaughter facilities collect exsanguination blood from the jugular veins of calves following stunning, which reduces the rate of blood loss when compared with exsanguination that doesn't involve taking blood directly from the veins, the former process again increasing the time in which the calf may regain consciousness.

This study, performed in Wisconsin aimed to assess the animal welfare impact of using 1) a 'head/heart' stunning method which uses a non-penetrating captive bolt stun followed by a 1 second application

of an electrical stun to the ventral region (n=45 calves) to cause cardiac arrest of the stunned calf, or 2) a 'control' which is the application of a non-penetrating captive bolt gun alone (n=45 calves) when stunning and killing calves in a commercial setting. A range of factors relating to the quality of the meat produced using the two techniques was examined as well as the potential for the calf to return to sensibility.

It was found that all calves were instantly rendered insensible by the initial stun with the non-penetrating captive bolt gun and did not display indicators of return to consciousness. The meat colour and the blood yield were negatively impacted in the head/heart group when compared with the control group. The data showed that there was no difference between the control and head/heart groups regarding animal welfare as the initial stun was effective in all calves and that secondary induction with cardiac arrest is not necessary with correct non-penetrating captive bolt stunning in veal calves.

Bartz B, Collins M, Stoddard G *et al* (2015) Assessment of non-penetrating captive bolt stunning followed by electrical induction of cardiac arrest in veal calves. *Journal of Animal Science* **93**:4557-4563.

MISCELLANEOUS

Animal welfare and bird-window collisions

Sheet plastic and glass windows annually kill billions of free-flying birds worldwide. Windows deceive the perception of birds (and humans), leading to potential injury and embarrassment in humans, but in birds, the strikes are almost always fatal. The birds see habitat or sky reflected in the windows and fly straight into them in an effort to reach this perceived new habitat. The number of birds killed by collision with windows in the United States alone is estimated at 1 billion annual fatalities, which far exceeds the number of birds killed by hunting, by striking communication towers, vehicle roadkill or by pesticides and poisons.

The author of this paper reviews the available literature around bird casualties at windows and provides a summary of the topic, discusses initiatives on how to protect birds from this unintended hazard, and provides recommendations as to how those committed to improving animal welfare are able to contribute to saving birds lives due to window strikes. Short-term solutions could include retrofitting existing window panes with various proven materials such as tapes, strings or netting to cover the outside of windows. Long-term solutions include the use of current and proposed bird-safe sheet glass and plastic for remodelling, and new constructions having patterns that transform

windows into barriers that birds can see and avoid, the most elegant of these being a system that uses ultraviolet signals that birds can see and humans do not.

To date, the issue of bird-window collision has been largely ignored as a welfare issue for wild birds. However, it is a lethal hazard and the author suggests that changes should be implemented to reduce the number of bird fatalities each year. The author offers the option for those who wish to influence changes to encourage the U.S Green Building Council to adopt their Pilot 55 Credit of their Leadership in Energy and Environmental Design (LEED) evaluation to include bird-safe windows, as the author reasons that these buildings cannot be considered green if birds are being killed after hitting them. Preventing bird-window collisions is justified for ethical, moral, architectural, biological, economic, legal and psychological reasons and saving birds lives is an obligation for humans as a race, who have developed these structures on this planet.

Klem D (2015) Bird-window collisions: A critical animal welfare and conservation issue. *Journal of Applied Animal Welfare Science* **18**(Sup 1):S11-S17.



WILD ANIMALS

Welfare assessment of the methods used for the control of kangaroos and wallabies

In Australia, four kangaroo and three wallaby species are killed or subjected to population management reasons for reasons such as commercial harvesting, protection of crops or population reduction, recreational hunting and killing of joeys or young-at-foot and the euthanasia of sick or injured animals for welfare reasons. A number of different methods are used for these different types of population control of kangaroos and wallabies including shooting with a firearm, poisoning, or non-lethal methods such as fertility control and relocation. Some methods, such as reproductive control and relocation, are more widely accepted by the general public than other methods, but these also have their associated welfare issues. This review paper examines the welfare implications of the current, legal methods of harvesting these animals for different purposes within Australia, taking into account the number of animals affected, the likelihood of exposure to harm, the nature and extent of the harm and capacity of the animal to suffer.

The paper concludes that the killing of kangaroos and wallabies by an accurate head-shot is likely to be the most humane method of killing and inflict the least amount of pain and distress when compared to other methods such as poisoning (and the associated pain and distress during time to death) or relocation (and associated welfare implications associated with the capture, transport and release of the animals), but

this is only the case if best practice and an accurate shot is made, which may not represent the reality of field conditions. Shooting of females with dependant young should be avoided wherever possible, and the young killed by a blow to the head should this scenario occur. Non-lethal methods, such as fertility control and relocation, are alternatives when dealing with abundant or endangered populations, respectively, but also have their associated welfare issues. Relocation is only likely to be a useful macropod management tool under specific circumstances, and potential welfare issues should not be underestimated.

The authors provide recommendations for future research, including the collection of accurate statistics for pouch young and young-at-foot mortality or morbidity; the collection of information around compliance with National Codes of Practice for the Humane Shooting of Killing of Kangaroos and Wallabies (for both commercial and non-commercial shooters); use of safe and remote reproductive control techniques; use of alternatives to the use of 1080 poison; and the impact of using dogs and trapping in wallaby destruction and hunting.

Descovich KA, McDonald IJ, Tribe A *et al* (2015) A welfare assessment of methods used for harvesting, hunting and population control of kangaroos and wallabies. *Animal Welfare* **24**:255-265.



Welfare evaluation of using a novel rodenticide for fatal methaemoglobinaemia in adult rats

Following the withdrawal of several rodenticide products from the U.K market, there is now a reliance on the use of anticoagulants used as rodenticides to kill rats and mice. A number of welfare issues have been associated with this use of anticoagulants. Rodents ingesting these types of poisons experience pain and distress until the time of death, which can take days, with the animals remaining conscious and responsive during the sickness period until immediately prior to death. As a result, effective novel pesticides are being developed, with the aim of increasing humaneness while minimising risk to non-target species.

Para-aminopropiophenone (PAPP) is a methaemoglobin (MetHb) inducing compound that has been shown to be effective in reducing the capacity of blood to carry oxygen to the tissues causing hypoxia, causing death in a number of species of animal. Para-aminovalerophenone (PAVP) is an analogue of PAPP; is also a MetHb compound and has shown some evidence of being more effective in causing toxicity in rats than does PAPP, but to date, this has not been comprehensively tested.

This study, performed in the UK, in collaboration with a New Zealand author, aimed to examine the behaviours and welfare of 20 adult laboratory rats (*Rattus norvegicus*) following oral gavage with either PAVP (test animals) or the vehicle alone (control). Female and male test rats received doses of approximately 263 and 199 kg⁻¹ respectively and the average time to death was 67 and 354 minutes for females and males, which was shorter than that reported using anticoagulants. Control rats showed no signs of intoxications. Test rats showed no obvious signs of pain and distress following ingestion of PAVP, and death was also reported to occur by hypoxia, leading to unconsciousness and death, which is thought to be less aversive than the method by which anticoagulants exert their effects. The results obtained in this study suggest that this class of compound may be useful when developing humane rodenticides in the future.

Gibson TJ, Quy RJ, Eason CT *et al* (2015) Evaluation of a novel rodenticide: welfare assessment of fatal methaemoglobinaemia in adult rats *Rattus norvegicus*). *Animal Welfare* **24**:417-425.

Welfare evaluation of using a novel rodenticide and the effect of a sub-lethal dose

Para-aminovalerophenone (PAVP) is a methaemoglobin (MetHb) inducing compound and has recently shown some potential as a useful rodenticide, causing fewer signs of pain and distress in this species following ingestion than do anticoagulants. This study builds on the previously outlined study and is performed by the same research groups in the U.K and New Zealand. This study examined the effect of PAVP, and monitors the recovery of rats from acute sub-lethal (less than the amount of poison to kill the animal) dose as part of a general assessment of the humaneness of this rodenticide. 20 rats were gavaged with a single dose of 40 mg kg⁻¹ PAVP (test), and 10 rats were treated with the vehicle alone (control). 11 surviving PAVP-treated rats and the control rats were then used for the next part of the study and were observed over a two week period.

It was found that the rats showed signs of recovery 3-6 hours after being dosed, with all animals showing no outward signs of poisoning within 48 hours. All rats gained weight and increased food consumption

over the 2 week test period. No overall difference was seen between the PAVP-treated rats and control rats in three neurological tests. When asked to remain in place (not slip) on a gradually inclined plane, the performance of the sub-lethally poisoned PAVP rats appeared to be temporarily impaired with treated animals slipping at a lower angle than controls on day 2. During a tape removal test where a piece of adhesive surgical tape was wrapped around the toes of the left forepaw of the rats, four PAVP-treated rats failed to remove the tape within the allotted time of 3 minutes on one occasion (four of 77 occasions) up to seven days post-dosing.

These results suggest that the effects of sub-lethal PAVP poisoning are less severe and prolonged than those reported for anticoagulants.

Quy RJ, Gibson TJ, Lambert MS *et al* (2015) Evaluation of a novel rodenticide: acute sub-lethal effects of a methaemoglobin-inducing agent. *Animal Welfare* **24**:427-436.

ARTICLES OF INTEREST

FARM ANIMALS

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