RSPCA

for all creatures **great** & **small**

ANIMAL WELFARE SCIENCE UPDATE

ISSUE 66 – OCTOBER 2019

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.**

Observations on human safety and horse emotional state during grooming sessions

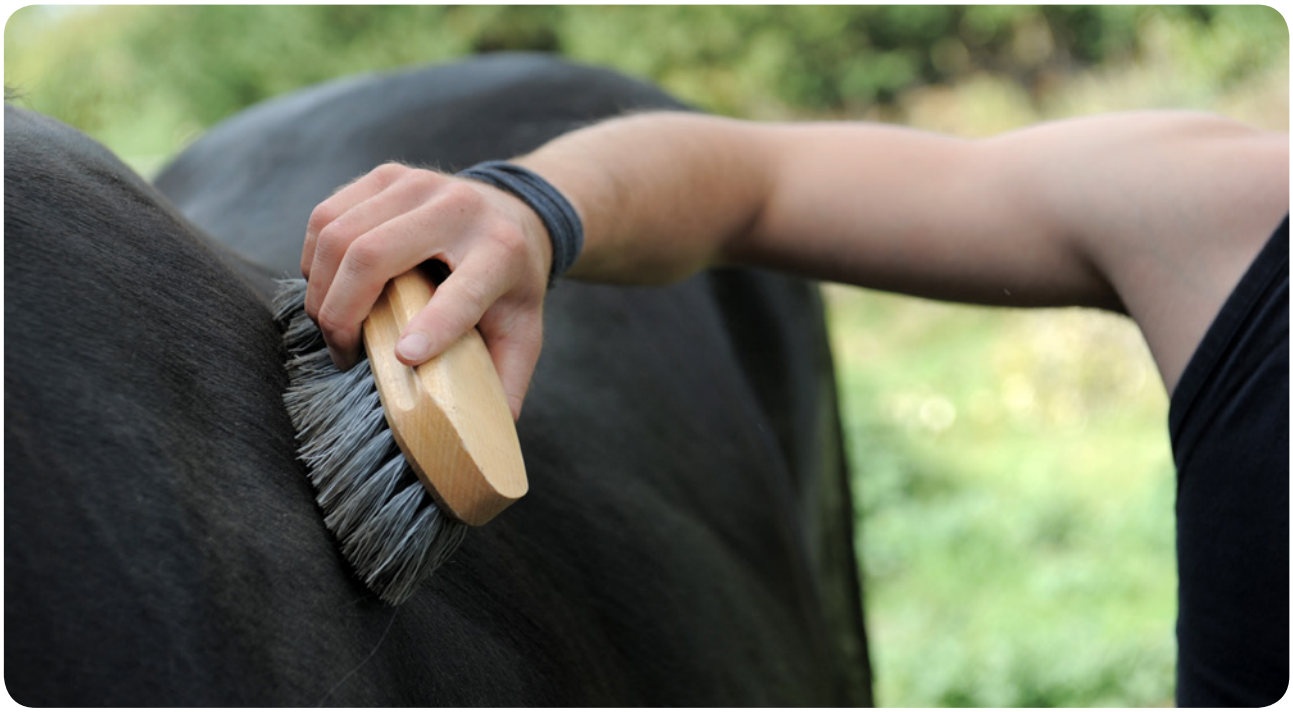
Grooming is a basic aspect of horse care, and when performed correctly can be a pleasant experience for the horse. However, when performed incorrectly it can lead to negative emotions in horses and these may lead to handling difficulties and potential safety issues. In fact, one quarter of injuries caused by horses that require hospital treatment occur while the rider is on foot, and children are substantially more likely to be seriously injured when they are on foot near a horse compared to when they are riding. This study examined the behaviours of both horse and rider during a grooming session to determine whether grooming procedures could be improved.

This study investigated 69 horse-rider pairs in 12 different riding establishments in France. Video footage was collected of the riders grooming their horse (approximately 12 mins) and analysed to determine the proportion of time that the horse demonstrated avoidance behaviour during grooming (indicative of negative emotional state), or approach / relaxed behaviours (indicative of a positive emotional state). The number of dangerous behaviours that the rider engaged in during grooming was also recorded, such as passing behind the horse without watching the horse, and squatting or kneeling next to the horse's foot.

During grooming, only 5% of the horses expressed mutual grooming, approach or relaxed behaviour, whereas avoidance and threatening behaviour were expressed by four times more horses. This behaviour was independent of the horse's gender or breed, suggesting that these behaviours are less related to the characteristics of the horses, and more related to the way they are groomed. During the observations there were 9 potentially dangerous incidents where a horse's teeth or hoof passed within 10cm of the rider's body, and the riders were often unaware of this behaviour in their horse. All riders performed risky behaviour while grooming. Surprisingly, the level of rider experience did not alter the types of behaviour shown by the rider or horse during grooming sessions.

In conclusion, riders generally pay little attention to their horses' threats and signs of discomfort, and thus sometimes put themselves in danger during grooming.

Lansade L et al (2019) Horses emotional state and rider safety during grooming practices, a field study. Applied Animal Behaviour Science 217:43-47.



The behavioural and physiological response of horses during equine assisted therapy

Equine-assisted therapy (EAT) involves the use of horses to improve the social, emotional and physical domains of human patients with a range of conditions, including anxiety, depression, autism spectrum disorder, multiple sclerosis and spinal cord injury. Animal welfare has become a major concern in all activities that involve animals, including EAT. Previous research has found that EAT activities that involve horseback riding appear to be no more stressful for horses than recreational horseback riding, although there is little research in this area. This study investigated whether EAT and intended patient outcome creates positive or negative emotions in horses.

Two equestrian facilities in France were used to source nine horses that participated in EAT. The emotional states of these horses during EAT was measured using behavioural observations and heart rate monitors. Behaviours that were considered indicative of negative emotion were the ears being pinned back, lateral head movements and defecation, while snorting was considered indicative of a positive emotional state. The horses were observed interacting with 51 human patients, and each therapy session consisted of three phases: a resting phase, where the horse was simply resting in a paddock prior to the EAT commencing; a preparation phase, where the patient performed maintenance activities such as grooming and saddling the horse; and a working phase, where the patient either rode the horse or handled the horse on foot. Each phase lasted for 20-30 mins.

Based on the behaviour of the horses and their heart rate variability, the present study suggests that EAT was neither a negative nor a positive event for the horses, and they may perceive this event as neutral. EATs with patients who were expecting to improve both physical and psychological outcomes from the sessions were more challenging than those who wanted to improve psychological outcomes only. Future research in this area could investigate the use of positive stimulation and rewards to improve the positive emotions experienced by horses during EAT.

Medonça T et al (2019) The impact of equine-assisted therapy on equine behavioural and pshyiological responses. Animals 9(7):409.

Factors associated with rehoming and time until rehoming for horses listed with an equine charity

The number of unwanted horses in the UK has risen considerably over the last decade. Horses can become unwanted due to owner-related factors, such as a lack of money or time, or due to horse-related factors, such as health issues or behavioural problems. Relinquishing unwanted horses to an equine charity is a pathway commonly taken by people in this situation, and many of these charities are nearing or exceeding capacity. Therefore, it is important to understand the factors that influence the likelihood of a horse being rehomed. This study investigated the horse and owner variables that influence whether a horse will be rehomed, and how long it takes to rehome that horse.

All horses that were listed for rehoming through a UK equine charity website over a 15 mth period were included in this study. The charity collects comprehensive information about the owners and their horses, including detailed information about the circumstances that led to the decision to rehome. The variables that were investigated were horse-level variables (e.g. size, gender), desired new home variables (e.g. permanent, temporary), new rider-specific variables, owner reported reasons for rehoming, and current location. The outcome variables were whether or not the horse was rehomed, and the number of days it took to rehome.

In total, 791 horses were included in the study, and 410 (52%) were rehomed during the study period. Of the horses that were rehomed, only 40% were rehomed through the charity, indicating that horse owners use multiple methods to rehome their horses. The median time taken to rehome a horse was 39 days, and most were rehomed within 75 days. Horse owners that were willing to transfer ownership were nearly three times more likely to find a home for their horse than those who wanted to rehome their horse temporarily. Horses deemed suitable for 'beginners' were more likely to be rehomed, as were horses over 11 years of age, while horses that could not be ridden or transported more than 50 miles took longer to rehome. These findings can be used to inform rehoming strategies and identify horses that may be difficult to rehome.

Rosanowski S & Verheyen K (in press) Factors associated with rehoming and time until rehoming for horses listed with an equine charity. Veterinary Record. doi:10.1136/vr.105398.

Housing horses in stables is associated with poor welfare

Horses who are housed in stables are prevented from grazing, exercising and performing social interactions, all of which are known to be important for horse welfare. Despite these challenges, stable housing is still used for 32-90% of horses across many different countries, due to the safety and convenience of stables, and the value of the horses. However, the choice of certain facilities or management practices used in stables may potentially alleviate the detrimental effects of this housing system on animal welfare. This study investigated the relationships between stable facilities and horse management practices on horse welfare in stables.

Poor welfare in horses can be indicated by the following behaviours: stereotypies, aggressiveness toward humans, unresponsiveness to the environment, and stress-related behaviours. These behavioural indicators were monitored in a population of 187 Warmblood sport horses that were stabled in France without access to paddocks or pastures. The behavioural observations were conducted by a researcher who walked quietly through the stables and observed each horse for 3 seconds to determine whether the horse was performing one of the behavioural indicators of poor welfare. Each horse was observed five times per day for 50 non-consecutive days over a 9 month period. The physical features of each stable were recorded, as well as the feeding, management and exercise practices performed by the horse owner.

The majority of factors tested did not appear to influence the expression of the behavioural indicators of poor welfare in stabled horses, although three factors did have some benefit. Having access to a window and straw bedding were both associated with less aggression toward humans, and consuming less concentrated feed was associated with fewer oral stereotypies. However, these effects were limited, and in general the provision of any of the facilities or management practices was unable to ensure good welfare in stabled horses. Furthermore, the longer the horses spent in individual stables, the more likely they were to express unresponsiveness to the environment. In conclusion, living in individual stables is detrimental to horse welfare if the horses are not provided with pasture access, exercise and social contact.

Ruet A et al (2019) Housing horses in individual boxes is a challenge with regard to welfare. Animals 9(9):621.

COMPANION ANIMALS

The cumulative impact of different population control methods on preventable cat deaths over a 10-year period

Free-roaming cat populations must be managed for a variety of reasons, such as reducing predation on wildlife and mitigating nuisance behaviours. These populations can be controlled through trap-neuter-return (TNR) programs or culling, and the effectiveness of these programs is often measured using changes in the population size or number of sterilised cats. Culling and sterilisation impact cat population dynamics in different ways, consequently, the long-term impact of these methods will vary. For example, these different methods may impact the numbers of cat births, deaths, and immigrations and these may have more long term influence overall than the obvious shorter term management impact. This US study used population modelling to estimate the cumulative impact of different culling and TNR methods on a hypothetical cat population over a 10-year period.

Using a previously developed computer model, the population dynamics of the hypothetical population of cats was simulated under different control scenarios. The population size was initially 50 cats, and the following six management scenarios were simulated for a 10-year period: no action, culling 25% of cats every 6 mths, culling 50% of cats every 6 mths, sterilising 25% of cats every 6 mths, or sterilising 75% of cats every 6 mths. The simulation was run 1000 times for each scenario, and the average cat population and the cumulative number of deaths for each strategy was calculated. All kitten deaths and culled adult cats were considered preventable deaths, as they could have potentially been reduced through population management.

The cumulative number of preventable deaths over 10 years was highest when no management action was taken, as this method would allow populations to increase to the point where kitten survival was impacted. The lowest number of preventable deaths occurred when the high-intensity (75%) sterilisation program was implemented, as it quickly suppressed reproduction. In conclusion, with sufficient intensity, TNR programs offer significant advantages in terms of minimising preventable deaths and reducing population size in cats. Thoughtful choice of management strategies can ensure that suffering and preventable deaths are minimised in free-roaming cat populations.

Boone JD et al (2019) A long-term lens: Cumulative impacts of free-roaming cat management strategy and intensity on preventable cat mortalities. Frontiers in Veterinary Science 6:238.

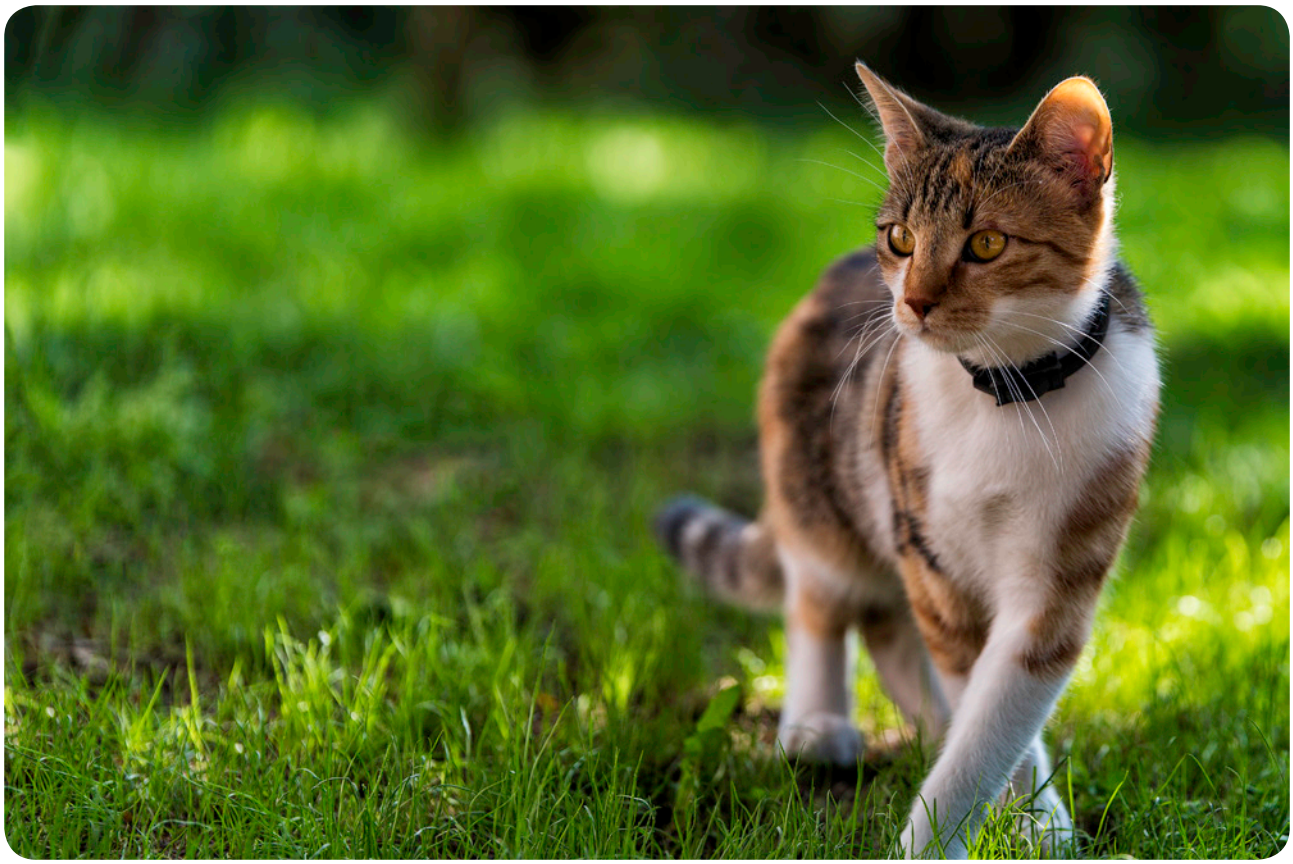
Using animal-borne cameras to monitor wildlife predation and risk behaviours in cats

'Owned' cats are defined as cats that cohabitate with humans and depend on humans for their welfare. While owned cats are a popular pet, they are also recognised as a potential threat to native wildlife due to their predatory behaviour. It has been theorised that cat owners may be more likely to manage their cat's behaviour, particularly outdoor roaming behaviour, if they are aware of the risks that outdoor roaming can entail. For example, cats that are allowed to roam are at higher risk of road traffic accidents and aggressive encounters with other cats. This study used video cameras to monitor the predation and risk behaviours of owned cats in Auckland, New Zealand.

Cat owners were recruited for this study via email and social media platforms, and a total of 41 adult cats were selected to participate. These cats were fitted with collars that held a small video camera underneath the cat's chin (the KittyCam) and a small GPS unit on the back of the cat's neck. The video camera had infrared capabilities to allow filming at night. To allow recharging of the batteries in the video camera, each cat wore one collar for 24 hrs, after which the cat's owner would remove the collar and replace it with a freshly charged one. Each cat was monitored for a maximum of three days, although due to technical issues and collar refusal 22 cats were observed for 3 days, 9 cats were observed for 2 days, and 15 cats were observed for one day only. The video footage was then analysed to quantify the range of predatory and risk behaviours.

During the observation period, 23 cats were observed to engage in predatory behaviour. Of the 121 observed predation events, 40 resulted in successful prey capture, with the majority of these events involving insects and skinks. No mammals, birds or amphibians were captured, and no cats took prey back to their residence. Risk behaviours were commonly observed and included cats venturing on to the road, ingesting potentially hazardous plants and water, altercations with other cats, and climbing onto high places. Given the high frequency of predation and risky behaviours in free-roaming owned cats, cat owners should be encouraged to contain their cats to minimise risks.

Bruce SJ et al (2019) Predation and risk behaviors of free-roaming owned cats in Auckland, New Zealand via the use of animal-borne cameras. Frontiers in Veterinary Science 6:205.



Owner perceptions and management of fear of fireworks in their pets

Fireworks are known to be frightening for animals due to their unpredictable nature and loud noise. Exposure to fireworks can be stressful, and can elicit behavioural responses that range from mild vocalising and trembling through to extreme panic and escape behaviour. A previous 2006 survey of fireworks-related behavioural problems in New Zealand found that 46% of surveyed pets displayed signs of fear during fireworks displays, and 6% had received a physical injury while trying to escape. Despite the range in fear responses shown, only 16% of respondents had sought professional help for their pets. This study repeated the 2006 survey to provide up-to-date information relating to fear of fireworks in companion animals to veterinarians, researchers and policy-makers.

An online survey was distributed through the Facebook pages of various animal health and welfare organisations in New Zealand to recruit pet owners. The survey period included the annual Guy Fawkes celebrations, when fireworks were legally available for purchase and use in New Zealand. A total of 4293 pet owners completed valid responses, representing a total of 15,647 companion animals. The survey collected demographic information about the owners and their animals, as well as the behavioural response of the animals toward fireworks and the strategies that owners used to manage these behaviours.

Over half of the companion animals surveyed exhibited fear behaviour during fireworks displays (63% of dogs and 56% of cats). The most commonly observed fear behaviours were hiding, shivering and cowering. Escape behaviour was commonly reported in free-roaming animals such as cats and horses. The most common management techniques used by pet owners was to confine their animals, and to provide comforting support for the animal. The majority of owners (70%) did not seek help for managing firework-induced behaviours, although those with extremely scared pets or pets that had previously injured themselves during a fireworks display were more likely to seek help. The findings of this study suggest that fireworks are a welfare concern for many owners and their pets across New Zealand.

Gates MC et al (in press) Owner perceptions and management of the adverse behavioural effects of fireworks on companion animals: an update. New Zealand Veterinary Journal. doi:10.1080/00480169.2019.1638845.

Measurement of chronic pain in companion animals

Chronic pain refers to a pain condition that occurs over a long period (months) and can be considered maladaptive. It has been increasingly recognised that chronic pain is a condition that can affect companion animals, but there is a lack of reliable and accurate methods for detecting it in pets. This review article from the USA summarises the current state of knowledge surrounding the measurement of chronic pain, and its impact, in cats and dogs.

Animals cannot verbalise the magnitude of their pain, consequently, researchers must rely on direct and indirect indicators of pain to assess its severity. Direct indicators of pain can include changes in physical activity levels. Indirect indicators can include central sensitisation of the pain response; meaning that chronic pain can increase the pain response that an animal shows to other sources of pain, such as electrical stimulation. All measures of chronic pain should be scientifically validated to ensure reliability.

Some common sources of chronic pain in cats and dogs include joint pain, cancer pain and neuropathic pain. Chronic joint pain can be indicated by changes in activity levels, and these changes can be objectively measured using wearable activity trackers. However, these results will vary with the size and shape of the animal, and the degree of change in activity that is needed to indicate a clinically relevant change in pain severity has not yet been determined. Measuring the pain response of animals to additional painful stimulation, such as a mild electric shock, is a possible avenue of research for identifying chronic pain, but there is no standard methodology for this measure that allows comparison between studies. Cancer pain is a poorly studied and unique pain state that can result from the growth of the primary tumour, the associated changes in immune function, or the side-effects of treatments such as radiation. Neuropathic (nerve) pain is recognised as a chronic condition, but very little research has been conducted on measuring this state in pets. In conclusion, while some progress has been made in assessing chronic pain in companion animals, there is considerable interest in improving this aspect of veterinary science.

Lascelles BDX et al (2019) Measurement of chronic pain in companion animals: Discussions from the Pain in Animals Workshop (PAW) 2017. The Veterinary Journal 250:71-78.

Evaluation of an immunocastration vaccine for male cats

Feral cats are a threat to native wildlife, and so it is often necessary to manage their populations to mitigate this threat. One method of controlling feral cat numbers is by using trap-neuter-release programs, but surgical sterilisation methods are invasive and require a long recovery period. One promising alternative is the development of a vaccine that induces infertility, as this method is non-invasive, low cost, and reduces the risks of side effects in treated cats. One method of causing infertility through vaccination is to inject high doses of gonadotropic-releasing hormone (GnRH). This causes the formation of anti-GnRH antibodies that suppress the secretion of GnRH, resulting in testicular atrophy and a reduction in sperm production. This study examined the efficacy of an immunocastration vaccine (STF2-GnRH) in male cats.

This experiment was conducted in Korea on 17 male cats, at 4-6 mths of age. The cats were randomly divided into the following groups: a control group that was injected with saline (n = 3), a group that received a low-dose of the STF2-GnRH vaccine (100µg, n = 7), and a group that received a high-dose of the vaccine (400 µg, n = 7). All cats received the same vaccination treatment again one month later to act as a booster. Each cat was blood sampled at monthly intervals for 6 mths to determine changes in anti-GnRH and testosterone concentration. After 6 mths the cats were surgically castrated and the testicles were examined for signs of atrophy and sperm production.

Cats that received STF2-GnRH vaccine showed dose-dependent infertility effects, with the low-dose causing weak effects and the high-dose causing moderate effects. Vaccination resulted in an increase in anti-GnRH antibodies and a reduction in testicle development and sperm production after one month. The vaccinated cats tended to have less testosterone than the control group, although there was substantial individual variation for this measure. The cats that received the high-dose of the STF2-GnRH vaccine were considered to be satisfactorily sterilised during the 6 mth trial period, indicating that this vaccine could be developed further for the population management of feral cats.

Lee YJ et al (2019) Evaluation of infertility efficacy of the *E. coli* expressed STF2-GnRH vaccine in male cats. Journal of Veterinary Science 20:e30.

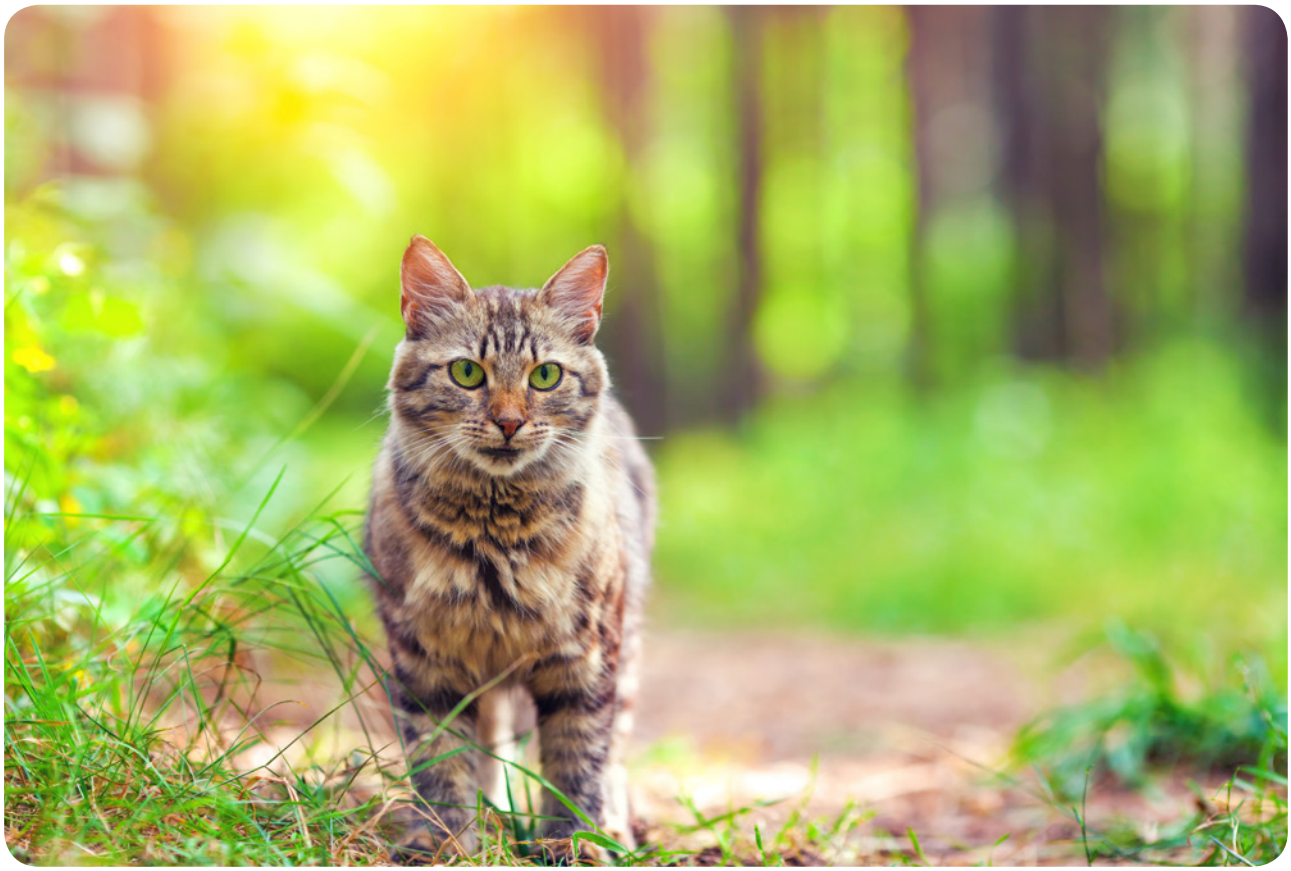
Change the humans first: Principles for improving the management of free-roaming cats

Cat populations must be managed to reduce wildlife predation and nuisance behaviours. Because humans can control the movements of the owned cat population, it is important to focus on changing human behaviour in order to manage cat behaviour (e.g. free-roaming behaviour). The community holds a wide variety of disparate views toward cat management, due to its role as both a valued companion and an invasive species. This Australian article reviews the behavioural science literature to determine the best approach for changing cat management behaviour in a range of stakeholders.

An important first step in this process is to understand the reasons why different groups of people manage their cats differently. This paper draws on multiple theories of human behaviour to create a specific framework for initiating effective behavioural change in relation to cat management. This framework consists of three steps: 1. Selecting which human behaviours to target; 2. Identifying the main drivers and barriers for these behaviours, and 3. Developing intervention techniques that match the primary cause of cat management behaviours.

To select the appropriate behaviours to target, it is important to meet with the different stakeholder groups and determine which stakeholders are affected by the issue (cat management), where their priorities lie, and which outcomes are collectively desirable. This will help to identify which human behaviours contribute to the problem and how it can be resolved. Once the target behaviours have been selected, the primary causes of these behaviours can be identified. The drivers and barriers will vary between the different stakeholder groups, but can generally be categorised as whether the stakeholders have the capability, opportunity and motivation (COM) to perform the desired behaviours. This COM model can then be used to select the most appropriate intervention technique to change the primary stakeholder behaviour. During this stage, a good communication strategy is vital, and it is also important to monitor the impact of the intervention to determine its effectiveness. Employing this knowledge of human behaviour change to free-roaming cat management programs has the potential to improve the outcomes of these programs.

McLeod LJ et al (2019) Change the humans first: Principles for improving the management of free-roaming cats. Animals 9(8):555.



A survey of veterinarian attitudes toward prepubertal desexing of dogs and cats

Prepubertal desexing (PD) refers to desexing an animal before it reaches sexual maturity, which is considered to be 4 mths of age in cats and 7 mths in dogs. PD eliminates the risk of cats and dogs becoming pregnant prior to the desexing procedure, and is a legal requirement in the Australian Capital Territory (ACT). This study investigated whether ACT residents and veterinarians were complying with this legislation.

The attitudes of veterinarians to PD was assessed using an online survey that was emailed to all registered veterinarians in the ACT. The survey consisted of questions relating to the demographics of the veterinarian, as well as their specific desexing practices relating to dogs and cats. To estimate the prevalence of desexing in the dog and cat population of the ACT, the shelter records from the RSPCA ACT were examined to determine how many adult dogs and cats had been desexed at the time of admission. The number of infringements recorded by the local government was also collected to determine the level of enforcement that was being applied to mandatory PD in dogs and cats in the ACT.

The survey received a low response rate of 15.9% (52/350). The overwhelming majority (90%) of vets did not recommend that cats be desexed at 3 mths of age, despite almost half (40%) of them agreeing that PD is a good management strategy to prevent cat overpopulation. Most veterinarians did not recommend PD in dogs by 6 mths of age, although there was less concern for dogs due to their older age at puberty. Almost half of the respondents thought that desexing should not be mandatory, and over one third were unaware that PD was mandatory in the ACT, suggesting that veterinarians may be unintentionally limiting the rates of PD in cats and dogs in the ACT. This is supported by the finding that less than half of the cats and dogs admitted to the RSPCA ACT shelter were desexed, and that infringement rates were relatively low. For mandatory PD to be an effective policy, the engagement and support of veterinarians is crucial.

Orr B & Jones B (2019) A survey of veterinarian attitudes toward prepubertal desexing of dogs and cats in the Australian Capital Territory. Frontiers in Veterinary Science 6:272.

Positive human interaction can decrease fear-induced aggression and improve adoptability in shelter dogs

Admittance to an animal shelter is a stressful experience for dogs, as it includes exposure to many novel stimuli combined with a loss of control. Stress can exacerbate fear and fear-related aggression in dogs, which in turn can lead to these dogs failing behavioural tests performed in shelters that determine their suitability for adoption. Reducing the stressfulness of the shelter experience for fearful dogs may reduce their aggressiveness. Anecdotal observations suggest that enrichment with positive human contact may improve adoptability in shelter dogs, indicated by the dogs passing the behavioural tests used by animal shelters. This study investigated whether positive human contact could improve the adoptability of shelter dogs, based on their performance in behavioural tests.

This research was conducted at a large animal shelter in the US. Fearful dogs were identified within 24hrs of admission based on their behaviour in the kennel, resulting in 124 fearful adult dogs included in the study. These fearful dogs received positive interactions with a calm, non-threatening human who provided toys and treats during two 15 min sessions each day for 5-7 days. The dogs were then tested for aggression and adoptability using a standard behavioural testing procedure. The results of this behavioural test were then compared to the results of a control group of fearful dogs that did not receive the positive human enrichment (Experiment 1). During Experiment 2, the impact of the enrichment on the test results was compared between fearful and non-fearful dogs that both received positive human contact.

Most fearful dogs that did not receive the positive human enrichment treatment failed the aggression test, whereas most fearful dogs that received the enrichment passed the test. Nearly all non-fearful dogs passed the aggression test regardless of enrichment, supporting the idea that the aggression shown by fearful dogs was a stimulus-specific response to the shelter environment rather than a permanent trait. In conclusion, fear in shelter dogs may result in euthanasia due to aggression, but this impact could be mitigated by providing positive human enrichment designed to reduce fear in these animals.

Willen RM et al (2019) Enrichment centred on human interaction moderates fear-induced aggression and increases positive expectancy in fearful shelter dogs. Applied Animal Behaviour Science 217:57-62.

Estimating the most efficient method for sampling broiler chicken welfare

Broiler welfare is assessed on farm to ensure that the birds are cared for appropriately, and to provide evidence of this care for consumers. Due to the large flock sizes, any welfare assessment must use a sample of birds rather than examining each individual bird. A commonly used method of sampling broilers involves an inspector walking along transects, or lines, between the rows of feeders and drinkers within the shed and observing the birds. One disadvantage with the transect method is that the broilers are free to move and all look very similar, and thus a bird may be accidentally repeatedly sampled. This could interfere with the estimate of total flock welfare. This study investigated the probability of repeat sampling birds during the transect method on commercial broiler farms.

Eleven commercial broiler flocks were studied at three farms in Spain. Within each flock, 80 birds were caught and labelled with a number from 1-80 written on the back of their head using permanent marker. These birds were then released back into the flock, and the flock was inspected using the transect method over the following two days. The researchers walked along each row between the feeders and drinkers, recording every tagged bird that they encountered in each transect. Each shed was inspected in the morning and afternoon by two researchers. The dimensions of the shed and the number of transects walked were recorded, and the probability of repeatedly encountering the same labelled bird was calculated.

Almost 24% of the labelled birds were repeat sampled during the transect method inspection. Most birds tended to move away laterally from the inspectors, resulting in the birds entering the adjacent transect and being repeat sampled when the researcher walked that transect. The repetition rates were also higher for the morning inspections, when the birds were more active, and in narrower sheds where the birds had less room to move away from the researchers. In conclusion, optimal transect sampling that minimises the risk of repeat sampling can be achieved by walking one transect along the wall and another transect through the middle of the shed, separated by three transects between the two samples.

BenSassi N et al (2019) Broiler chickens on-farm welfare assessment: estimating the robustness of the transect sampling method. Frontiers in Veterinary Science 6:236.

How farm animal welfare issues are framed in the Australian media

Media framing can be described as the repeated use of particular ways to present information to help the audience interpret the significance and meaning of that information. Media framing is a powerful way for the media to influence how consumers generate meaning about an issue, particularly for issues with which they have little direct experience. One issue that is a popular topic in the media is farm animal welfare. While previous analyses have focused on how the media frames individual issues, such as outbreaks of disease or the use of antibiotics in agriculture, there are few studies that have examined framing across different farm animal welfare related issues. This study investigated how the news media is framing farm animal welfare issues for the Australian public.

Newspapers were selected as the source of media articles, as 65% of Australians read news content both in print and online regularly. All news articles that contained the term 'animal welfare' were collected from the period January 2014 – December 2016 using the Factiva database. Only the news articles that related to farm animal welfare were selected for analysis, resulting in 216 articles. Each article was read closely to identify the key issue, how different actors were portrayed, and the salience of the actors' voices.

During the study period the live export industry was the most widely discussed topic, with 52% of articles covering this topic. The continued media interest in live export demonstrates its significance as a farm animal welfare issue in Australia. The second most common topic was the establishment of a standard definition of free-range egg farming for labelling purposes, with 18% of articles covering this topic. The article analysis identified seven dominant themes, and two dominant media frames: that governments and the farm animal production industries cannot be trusted to ensure good farm animal welfare, and that consumers can act to improve animal welfare through ethical consumption. The findings also demonstrate that supermarkets are portrayed as champions for the consumers and for animal welfare. These frames have implications for how the Australian public may come to understand the role and responsibilities of different actors in the food production system.

Buddle EA & Bray HJ (2019) How farm animal welfare issues are framed in the Australian media. Journal of Agricultural and Environmental Ethics 32:357-376.

Edible enrichment for weaned pigs

Weaning is a stressful period for commercial piglets, as they must adapt to a change in diet, the absence of the sow, and social mixing with other litters. One of the negative consequences of weaning is piglets' decrease in food consumption due to the sudden change in environment and diet, which can lead to increased susceptibility to disease, mortality and productivity losses. This study investigated the use of edible enrichment objects (EOs) as a means of both enrichment and weight gain in recently weaned piglets.

This experiment was conducted at a research facility in Chile, using 30 male piglets that had been weaned at 21 days of age. The piglets were housed in pairs, and each pair received either the control treatment (no enrichment), an enrichment treatment using cookie shaped EOs, or an enrichment treatment using donut shaped EOs. The edible EOs were created from whey protein, which is highly palatable to pigs. The cookie shaped EOs were placed inside a plastic bottle that had to be rolled to allow the EOs to fall out. The donut shaped EOs were hung from string at eyesight level. The edible EOs were provided to each pair daily, and the behaviour of the pigs was filmed from 10am – 1pm for three days to observe their interactions with the EOs. The piglets were also weighed before and after the experiment to determine whether the EOs resulted in weight gain.

The piglets quickly became used to the EOs, and consumed 100% of the cookie shaped EOs and 60% of the donut shaped EOs by the end of the first day. The interactions with the cookie shaped EOs remained relatively constant, while interest in the donut shaped EOs declined on Day 2. This may be due to the cookie shapes being housed in a bottle that required the piglets to play with the bottle, which may have kept their attention for longer. There was no effect of EO on weight gain. In conclusion, the piglets chose to readily interact with and consumed the edible EOs, indicating that edible EOs could provide a source of enrichment and nutrition for pigs in the future.

Durán E et al (in press) Development of edible environmental enrichment objects for weaned pigs. Journal of Veterinary Behavior. doi:10.1016/j.jveb.2019.06.010.

Positive welfare for fishes

Historically, animal welfare research has focused on alleviating negative experiences for animals, however it is becoming increasingly recognised that positive experiences are a crucial component of good animal welfare. There has also been a concurrent interest in understanding the welfare of captive fish. This article from the US reviews what is known about positive welfare in relation to captive fish welfare.

Animals have evolved to want things that benefit their survival, and understanding what an animal wants is important in understanding their requirements for good welfare. Animal wants, or motivations, can be looked at through a human psychology model of motivation research which involves three domains. The first domain is value effectiveness, which is the motivation to have or avoid specific material outcomes. This domain can be explored to determine what types of housing environments and husbandry conditions that fish prefer, such as their preferred types of substrate or shelter. The second domain is control effectiveness, which is the motivation to be in control and bring about a desired outcome. Providing fish with control and agency over important decisions in their life, such as allowing them to decide when to access food, may confer welfare benefits. The final domain is truth effectiveness, which is the motivation to learn, explore and engage in cognitively stimulating activities. Fish are known to explore novel objects, and providing species-appropriate environmental enrichment may offer a means of encouraging exploration and curiosity to improve their welfare.

Fish possess the necessary anatomical and chemical structures to experience emotion, and show similar physiological responses to stressors as other vertebrates. Possible sources of positive emotions in fish may include communication and affiliative behaviour in social species, as well as anticipating a positive event in the future. One novel area of investigation is the presence of play behaviour, and several studies have documented possible play behaviour in a number of fish species. Play behaviour may provide positive experiences for fish. In conclusion, there is a knowledge gap in relation to positive welfare in fish, and this review can be used as a guide for future fish welfare research.

Fife-Cook I & Franks B (2019) Positive welfare for fishes: Rationale and areas for future study. Fishes 4:31.

The effect of the hen's age and egg storage times on physical defects in turkey poults

In commercial turkey production, eggs are produced by breeding stock and hatched in incubators to produce turkey poults for meat production. Due to the variation in seasonal demand for turkey, the eggs may be stored for varying periods prior to incubation to coordinate the number of poults hatching. Previous research has shown that storing turkey eggs for longer than 7 days can negatively affect hatchability, and prolonged storage can result in physical defects in poults. However, there is currently no research investigating the impact of hen age on the rate of physical defects in turkey poults. This study examined the effects of hen age and egg storage time on the rates of physical defects in turkey poults.

This experiment was conducted in Poland. The Turkey hens started laying eggs at 30 wks of age, and a sample of 1512 eggs was collected from the experimental hens at 6 weekly intervals (32, 38, 46 and 51 wks of age). At each sampling date, the eggs were randomly divided into 4 treatment groups (378 eggs per group) and stored at 15°C for either 7, 10, 13 or 17 days before being incubated. After hatching, the turkey poults were weighed and examined for physical defects, to assess the impacts of hen age and egg storage time.

The hatch weight of the poults increased with hen age and egg storage time, and the percentage of poults with structural deformities increased significantly when eggs were stored for 13 or 17 days. Structural deformities included poor motor activity, dirty feathers, eye and leg abnormalities, unabsorbed yolk sac, umbilical abnormalities and late hatching. The most common physical defect recorded was umbilical deformities. There was no clear relationship between hen age and this defect, but the rate of umbilical defects increased with egg storage time, from 25% at 7 days to 35% at 17 days. The second most common defect was delayed hatch, which increased with hen age and when the eggs were stored for periods longer than 13 days. In conclusion, the incidence of physical defects in poults was increased by both hen age and egg storage time.

Mróz E et al (2019) The effects of hen's age and egg storage time on the frequency of occurrence of physical defects in turkey poults. Poultry Science 0:1-4.

Providing pregnant sows with straw alters the stress response and behaviour of their piglets

During gestation, the experiences of the mother can alter the womb environment, which in turn can alter the behaviour of the offspring after birth. It is thought that this prenatal programming can prepare the offspring for the likely environment that they will experience after birth. For example, pregnant sows that experience hunger will give birth to more aggressive piglets. Under natural conditions, a hungry sow is likely to indicate that the piglet will be born into an environment with few feed resources, and an aggressive phenotype would be more successful in this scenario for survival. This study investigated the stress-relieving effect of providing environmental enrichment to pregnant sows on the behaviour and stress responsiveness of their offspring.

An experiment was conducted on a Brazilian pig farm, where 18 group-housed sows were provided straw as enrichment during the last third of their gestation. A control group of 18 sows received no enrichment during gestation. Following weaning at 28 days of age, one male and one female piglet from each litter were moved to group pens and observed for aggression and nosing behaviour for six consecutive days. These piglets were fear tested at 41 days of age using a novel environment test and novel object test, and their stress levels were measured at 28, 29, 35 and 36 days old using saliva samples for cortisol analysis. The behaviour and stress physiology of piglets from the enriched sows were then compared to the piglets from the non-enriched sows.

Providing straw enrichment for gestating sows successfully altered the behaviour and stress physiology of piglets. The piglets from sows kept in barren housing environments displayed more aggression and nosing behaviour, and had higher concentrations of cortisol in their saliva. The piglets from the enriched sows had higher salivary cortisol on the day of weaning only, and the female piglets from enriched sows showed less fear and more exploration than the male piglets. In conclusion, the provision of straw enrichment to gestating sows can improve the stress response and overall welfare of their offspring.

Tatemoto P et al (in press) Environmental enrichment for pregnant sows modulates HPA-axis and behaviour in the offspring. Applied Animal Behaviour Science. doi:10.1016/j.applanim.2019.104854.

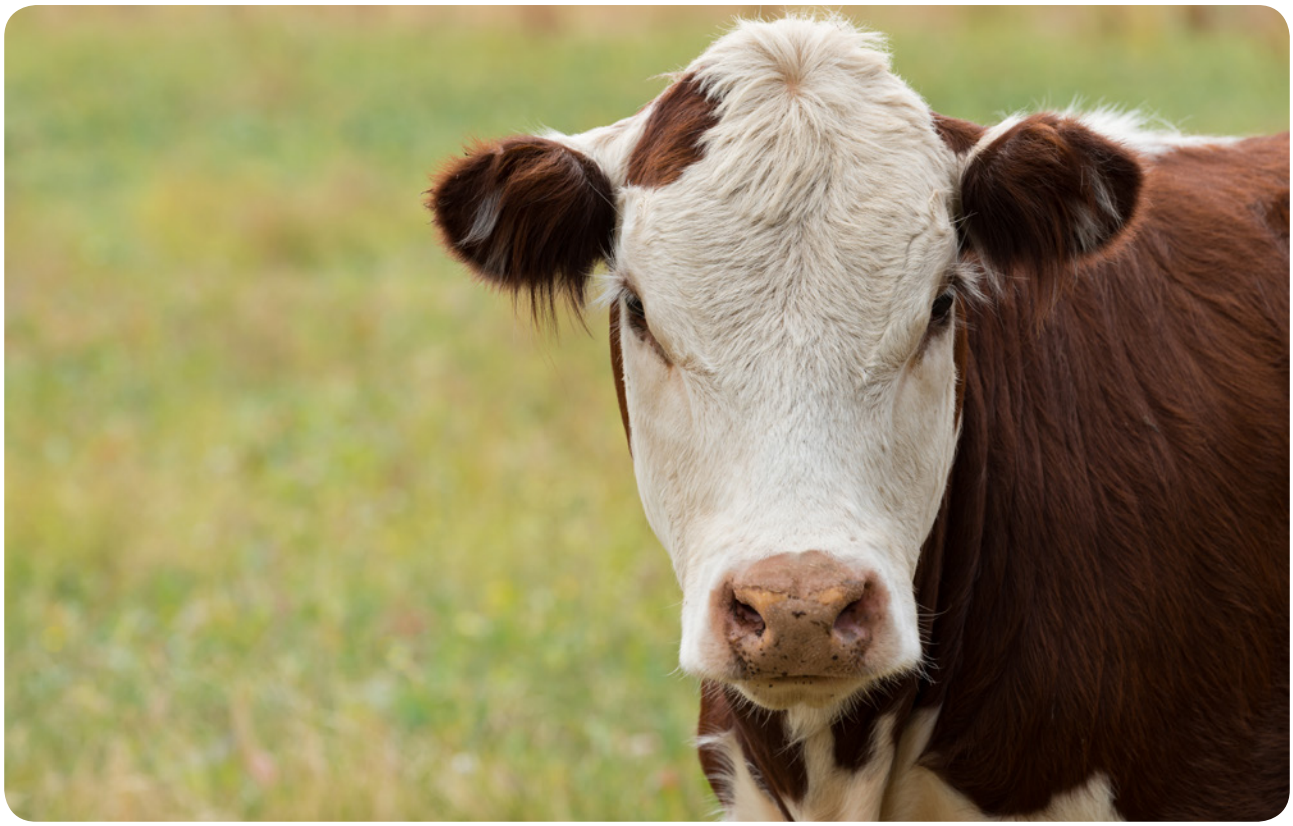
Examination of cattle heads that required multiple stuns can indicate the reasons for multiple stuns

Under European legislation it is a legal requirement that cattle are stunned prior to slaughter to minimise their suffering. The majority of cattle in the UK are stunned using a penetrative captive bolt gun, which acts by inducing a concussed state due to the force of the bolt hitting the skull, as well as damage to the brainstem as the penetrating bolt enters and withdraws from the brain. While it is technically possible to achieve a 100% successful stun rate, there is a small percentage of cattle that are not stunned effectively in the first instance and must receive multiple shots. This study investigated whether the causes of multiple shots can be determined by examining the stunning injuries delivered to cattle heads during the slaughter process.

Twelve heads were obtained from cattle that had received multiple shots with a penetrative captive bolt gun prior to slaughter. Each head was frozen to ensure that the soft tissues did not distort when the head was sectioned with a band saw to reveal the brain. The location and trajectory of each shot was measured by examining the head and brain wounds, and the thickness of the frontal sinus in the skull was measured for anatomical differences between animals. This macroscopic examination was used to estimate the likely cause of the ineffective stuns in these animals.

Incorrect shot placement was the determining factor in requiring multiple stuns for 10 of the 12 heads. One cow had abnormal head anatomy that was the likely cause of an ineffective stun. This skull had a thick fibrous layer that likely muffled the force of the stun, and the brain was in an unusual position that made aiming difficult. The final animal may have required multiple stuns due to gun malfunction, as the bolt did not penetrate sufficiently deeply into the skull. In conclusion, this pilot study determined that macroscopic examination of cattle heads can be used to determine the reasons for ineffective stuns. This information can then be used to address stunning issues and train stunning operators to improve the welfare of animals requiring stunning.

Grist A et al (2019) Macroscopic examination of multiple-shot cattle heads – An animal welfare due diligence tool for abattoirs using penetrating captive bolt devices? Animals 9:328.



MISCELLANEOUS

The use of facial expressions to assess pain in mammals

Understanding, recognising and managing pain in animals is of critical importance to their welfare, however our understanding of animal pain is limited by its complex and subjective nature. The inability of animals to articulate the severity of their pain requires it to be inferred, based on behavioural and physiological indicators. Pain may be either acute or chronic in nature, and has both sensory and emotional components, and thus its assessment is varied and complex. One method of assessing pain that has been successfully used in humans and animals is the assessment of facial expressions. This UK article reviews how facial expressions provide an opportunity to improve our assessment and management of pain in animals.

There is good evidence that facial expression can be a useful, valid and reliable tool for recognising pain in animals. Both the sensory and emotional component of pain have been demonstrated to affect facial expressions, providing a true representation of pain experienced. Facial pain or grimace scales have already been developed for several species, including mice, rats, horses, rabbits, sheep and pigs. These scales are developed by examining the changes in different muscle groups in the face of the animals during painful experiences. The rat grimace scale was developed after researchers tried unsuccessfully to apply the mouse grimace scale in this species. This highlights the importance of developing species-specific grimace scales, although further research is needed to determine how facial expressions vary with factors such as the source of pain, the acute or chronic nature of the pain, and life stage of the animal.

The use of facial expression scales shows promise for the future understanding and management of pain in animals. Many of the scales created so far have been developed in a research setting, and thus require refinement in terms of their practicality in a clinical setting. However, once refined, facial pain scales should be relatively simple to adopt in clinical practice. After training staff to recognise and interpret the changes in facial expression caused by pain, these scales can provide a rapid and low-cost method of monitoring pain in animals.

McLennan KM et al (2019) Conceptual and methodological issues relating to pain assessment in mammals: The development and utilisation of pain facial expression scales. Applied Animal Behaviour Science 217:1-15.

Welfare aligned sentience: Enhanced capacities to experience, interact, anticipate, choose and survive

Formal recognition that some animals are sentient beings is now widespread and continues to increase internationally. Sentience is the capacity of animals to consciously perceive by their senses, allowing them to consciously feel or experience subjectively. The scientific understanding of animal sentience has increased dramatically over the last 15 years, and while vertebrates have received the majority of research attention there is also mounting evidence for sentience in at least some species of invertebrates. This article from New Zealand reviews the current knowledge of animal sentience, and how this relates to animal welfare.

Animals exhibit a capacity to respond behaviourally to a range of sensory inputs. The structure of the nervous system that elicits these behaviours can vary between species in terms of complexity, from basic nerve cords in earthworms through to spinal cords and brains in vertebrates. The more sophisticated nervous systems, such as those found in mammals, birds and fish, can use these sensory inputs to generate subjective experiences. Sentient animals are those who are conscious and aware of these sensations, feelings, emotions and other subjective inputs, and an animal may be inferred to be conscious when it exhibits behavioural flexibility.

Sentient animals also have the ability to communicate with others. Affective states can be generated by both the internal conditions of the body, such as hunger, and the external conditions of the environment, such as loneliness. The capacity of sentient animals to differentiate between positive and negative affective experiences means that these experiences are important determinants of their welfare.

The inherent difficulties in interpreting how an animal is actually feeling, without projecting human-centric interpretations, is aided by an improved scientific understanding of the neurophysiological mechanisms associated with particular affective experiences. This includes an understanding of the sentient capacities of some invertebrates, such as cephalopods and crayfish. In conclusion, the author has used this review to coin a new term: ‘welfare-aligned sentience’. Welfare-aligned sentience confers a capacity to consciously perceive negative and positive affective states that matter to the animal.

Mellor D (2019) Welfare-aligned sentience: Enhanced capacities to experience, interact, anticipate, choose and survive. Animals 9:440.

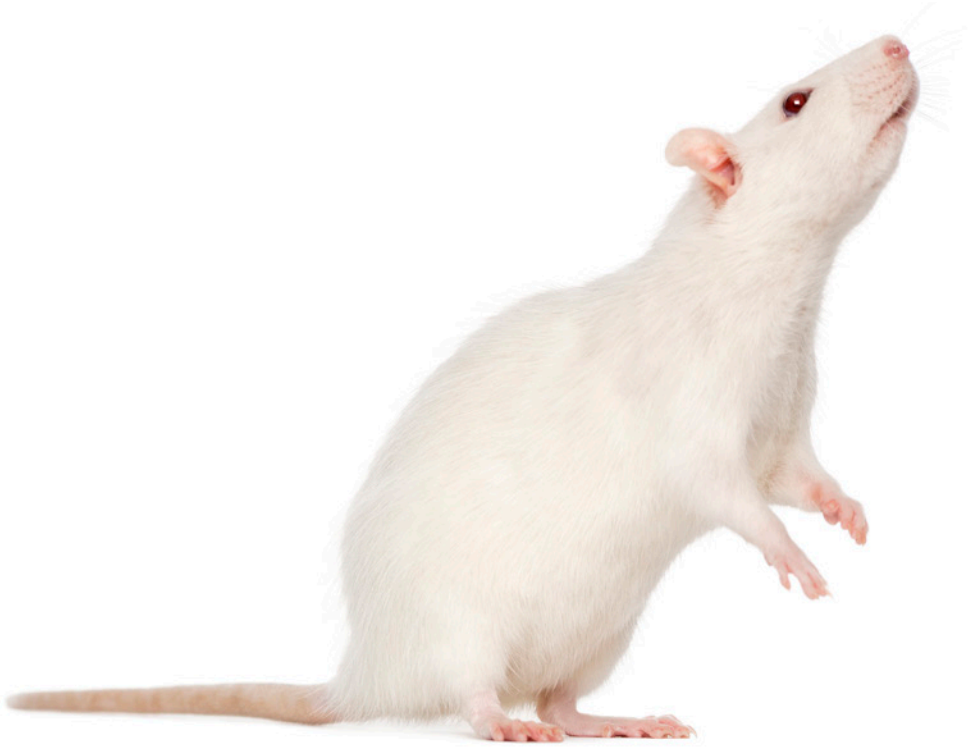
Alternatives to carbon dioxide: Taking responsibility for humanely ending the life of animals

Exposure to carbon dioxide gas (CO_2) renders animals unconscious and causes death from brain acidosis. CO_2 has long been considered one of the better methods for euthanasing laboratory rodents because it allows termination of several animals at one time, does not require handling of the animal, is easy to use, is inexpensive, and is environmentally friendly. However, it is now well established that CO_2 is aversive for rodents, and is likely to cause pain at high concentrations, and fear or panic at low concentrations. Thus CO_2 cannot be considered a humane method of killing rodents, and an alternative is sought. This article summarises a multidisciplinary symposium that was held in Switzerland to discuss the drawbacks and alternatives to CO_2 euthanasia for laboratory animals.

The multidisciplinary symposium was hosted by the Swiss Federal Food Safety and Veterinary Office, and 117 stakeholders from a range of organisations and professions participated. The symposium facilitated group discussions around the topic of what made a 'good death' for animals, with experts concluding that an immediate death that was free of suffering, using reliable and safe methods, could be considered 'good'. The participants then received two presentations demonstrating the aversiveness of CO_2 exposure to rodents. This research found that all rats will abandon highly palatable food items, or will leave a secure retreat, to avoid exposure to CO_2 at concentrations as low as 12%. In comparison, one third to two thirds of rats would voluntarily remain exposed to anaesthetic gas until they became unconscious.

The participants then brainstormed possible alternatives to CO_2 euthanasia. These included physical methods such as decapitation, inhalant anaesthetics, or a combination of the two, as well as novel methods such as opioid overdose, microwave heating of the brain, ultra-high current stunning, low atmospheric pressure stunning, freezing in liquid nitrogen, captive bolt, macerations, and cervical dislocation. Other proposals included researching better ways to measure the events occurring around death, refining the available killing methods, and reducing the need to kill large numbers of laboratory animals. In conclusion, alternatives to CO_2 are urgently required, and a research strategy to address this will be developed.

Flammer SA et al (2019) Alternatives to carbon dioxide – Taking responsibility for humanely ending the life of animals. Animals 9:482.



WILD ANIMALS

The harmful effects of captivity and chronic stress on the well-being of orcas

Orcas are the third most commonly confined cetacean species after the bottlenose dolphin and beluga whale, and there are currently 63 orcas held in captivity globally. These include 21 that were recently captured in Russian waters. Orcas have complex needs that make them especially vulnerable to the negative effects of the captive environment, and by every appropriate metric, captive orcas do not fare as well as their free-ranging counterparts. This article reviews the capacities and needs of orcas, and how these needs are unable to be met in the captive environment.

Orcas possess complex cognitive abilities and the capacity for deep emotions and strong social attachments that are associated with living in a complex social network. This requires a prolonged period of maternal investment and care of the young, and extremely strong social bonds develop between mothers and their offspring. Free-roaming orcas will routinely travel tens of kms in a straight line daily, and have been recorded travelling over 200kms per day. Orcas also have cultural traditions that are passed on from one generation to the next that include hunting skills and vocal dialects.

Captive orcas experience shorter lifespans than their free-ranging counterparts. The primary cause of death in captive orcas is infectious disease, such as pneumonia and encephalitis. Many of these are opportunistic infections that are usually harmless but can cause diseases under situations of chronic stress and reduced immune function. Captive orcas also display a range of abnormal behaviours, such as hyper-aggression, attacking and killing of human trainers, self-injury, and oral stereotypies that result in tooth damage and infection from biting the enclosure fixtures. In addition to the small and barren tank environment, captive orcas are subjected to significant social stress due to the artificial social groupings and the early separation of calves from their mothers. They may also experience distress due to excessive anthropogenic noise from which they cannot escape, an ongoing lack of choice in their lives, and boredom. In conclusion, orcas are poor candidates for maintenance in captivity, and a radical shift is required in their treatment in order to meet their complex needs.

Marino L et al (in press) The harmful effects of captivity and chronic stress on the well-being of orcas (*Orcinus orca*). Journal of Veterinary Behavior. doi:10.1016/j.jveb.2019.05.005.

Habitat destruction and bushfires are the greatest source of stress for wild koalas

Land clearance in Australia is substantial and is one of the most significant threats to wild koala populations. Other threats include climate change, droughts, disease, vehicle collisions and bushfires. The large number of threats that koalas face in their environment are likely to lead to chronic stress, which is in turn deleterious for population survival due to the increased risk of disease and reduced reproduction. This study compared the physiological stress levels of koalas that had been exposed to known types of stressors.

The focal populations of koalas were located in Queensland (QLD), New South Wales (NSW) and South Australia (SA), and were studied between 2012-2018. The Queensland population consisted of healthy breeding adults inhabiting a conserved eucalypt forest, which was presumed to be a low stress environment. The NSW population lived within the disturbance zone of the largest road infrastructure project in the state, and were exposed to land clearance and construction work. The SA population consisted of wild koalas who had been rescued by the local wildlife hospital within the Adelaide region, with medical records that described the injury and illness status of each koala. Faecal samples were collected from the ground beneath trees bearing koalas in the QLD and NSW populations, and directly from the animals at the time of rescue in the SA population. The faecal samples were analysed for faecal glucocorticoid metabolites (FGM) as an indicator of physiological stress. The FGM concentrations were then compared between subpopulations and types of stressor to determine which conditions were most stressful.

Koalas exposed to land clearance and bushfires showed the highest FGM values, followed by vehicle collision, dog-attack and chlamydia. Wild healthy males and females showed the lowest FGM values. These results highlight that anthropogenic-induced stressors tend to increase physiological stress in wild koalas. Large-scale stressors such as habitat clearance and bushfires are also associated with secondary stressors such as food shortages, dog attacks, vehicle collisions and increased risks of disease due to immune suppression. There is an urgent need for action by local and state governments to minimise negative impacts on koalas.

Narayan E (2019) Physiological stress levels in wild koala sub-populations facing anthropogenic induced environmental trauma and disease. Scientific Reports 9:6031.

The impact of human activities on Australian wildlife

Effective conservation management strategies should be guided by an understanding of the relationship between human-factors and the decline in wildlife populations. One source of information about these threats are the records kept by wildlife rehabilitation centres (WRC). This data can be used to conduct general wildlife monitoring and quantify the contribution of human factors to wildlife illness and injury. This study examined WRC records to identify the major causes and patterns of WRC admissions and outcomes for Australian wildlife.

The Australian Zoo Wildlife Hospital is one of the largest WRCs in the world and receives up to 8000 wildlife admissions annually. The records for all wildlife admitted between 2006–2017 were obtained, and any records that were incomplete or unclear were excluded from further analysis. This resulted in a total data set of 31,626 individual admissions comprising 83 species. Each wildlife record was categorised in terms of the type of animal admitted, the reason for admission (e.g. hit by car, orphaned etc), and the outcome of admission (alive or dead). The data were then examined for relationships between these variables and over time.

Over the 12-year observation period the number of wildlife admissions increased steadily, and anthropogenic causes were the main reason for admission. This was believed to be due to the increasing human population size in the surrounding area. Car strikes were the most common reason for admission (35%) followed by dog attacks (9%), entanglements (7%) and cat attacks (5%), and the average mortality rate of these four anthropogenic factors combined was 61% due to the severity of trauma. There was a clear link between urban encroachment and anthropogenic impacts on koalas and other iconic species, and koala admissions were high and constant during the study period. The highest mortality rates of all species was for lorikeets, which was in part due to Clostridial gastro-intestinal disease thought to be related to consuming feed from garden bird-feeders, which can cause dietary upset. In conclusion, WRC records provide a rich data set which are invaluable for monitoring anthropogenic influences on wildlife. Based on these results, substantial human-driven conservation management is required to minimise the collateral damage wrought by modern civilisation.

Taylor-Brown A et al (2019) The impact of human activities on Australian wildlife. PLoS ONE 14:e0206958.

ARTICLES OF INTEREST

ANIMALS USED FOR SPORT, ENTERTAINMENT, RECREATION AND WORK

Jung A et al (2019) Frequent daily riding sessions daily elevate stress, blood lactic acid, and heart rate of thoroughbred riding horses. Journal of Veterinary Behavior 32:1-5.

Mendonça T et al (2019) Equine activities influence horses' responses to different stimuli: Could this have an impact on equine welfare? Animals 9(6):290.

Merkies K et al (2019) Eye blink rates and eyelid twitches as a non-invasive measure of stress in the domestic horse. Animals 9(8):562.

COMPANION ANIMALS

Alegría-Morán RA et al (2019) Food preferences in cats: effect of dietary composition and intrinsic variables on diet selection. Animals 9(6):372.

Arena L et al (2019) Application of a welfare assessment tool (Shelter Quality Protocol) in 64 Italian long-term dogs' shelters: welfare hazard analysis. Animal Welfare 28(3):353-363.

Aromaa M et al (2019) Assessment of welfare and brachycephalic obstructive airway syndrome signs in young, breeding age French Bulldogs and Pugs, using owner questionnaire, physical examination and walk tests. Animal Welfare 28(3):287-298(12).

Bacon HJ et al (2019) The recognition of canine pain behaviours, and potentially hazardous Catch-Neuter-Return practices by animal care professionals. Animal Welfare 28(3):299-306.

Caffrey N et al (2019) Insights about the epidemiology of dog bites in a Canadian city using a dog aggression scale and administrative data. Animals 9(6):324.

Dendoncker PA et al (2019) On the origin of puppies: breeding and selling procedures relevant for canine behavioural development. Veterinary Record 184(23):710.

Mcguire B (2019) Effects of gonadectomy on scent-marking behavior of shelter dogs. Journal of Veterinary Behavior 30:16–24.

McPeake KJ et al (2019) The Canine Frustration Questionnaire—Development of a new psychometric tool for measuring frustration in domestic dogs (*Canis familiaris*). Frontiers in Veterinary Science, 6:152.

Moody CM et al (2019) Testing two behavioural paradigms for measuring post-handling cat aversion behaviour. Applied Animal Behaviour Science 210:73–80.

Normando S et al (2019) An investigation using different data gathering methods into the prevalence of behavioral problems in shelter dogs—A pilot study. Journal of Veterinary Behavior 30:1–8.

Righi C et al (2019) Welfare assessment in shelter dogs by using physiological and immunological parameters. Animals 9(6):340.

Stella J & Croney C (2019) Coping styles in the domestic cat (*Felis silvestris catus*) and implications for cat welfare. Animals 9(6):370.

West C & Rouen C (2019) Incidence and characteristics of dog bites in three remote Indigenous communities in Far North Queensland, Australia, 2006-2011. Journal of Veterinary Behavior 31:17–21.

Wilder A & Humm K (2019) Pet owners' awareness of animal blood banks and their motivations towards animal blood donation. Veterinary Record. doi:org/10.1136/vr.105139.

Wongsaengchan C & McKeegan DEF (2019) The views of the UK public towards routine neutering of dogs and cats. Animals 9(4):138. doi:10.3390/ani9040138.

FARM ANIMALS

Aquaculture

Saraiva JL et al (2019) A global assessment of welfare in farmed fishes: The FishEthoBase. Fishes 4(2), 30. doi:10.3390/fishes4020030.

Cattle

Abuelo A et al (2019) An investigation of dairy calf management practices, colostrum quality, failure of transfer of passive immunity, and occurrence of enteropathogens among Australian dairy farms. Journal of Dairy Science 102(9):8352-8366.

Battini M et al (2019) Understanding cows' emotions on farm: are eye white and ear posture reliable indicators? Animals 9(8), 477.

Bravo VM et al (2019) Factors affecting the welfare of calves in auction markets. Animals 9(6), 333.

Broom DM (2019) Land and water usage in beef production systems. Animals 9(6), 286.

Byrd CJ et al (2019) Short communication: Assessment of disbudding pain in dairy calves using nonlinear measures of heart rate variability. Journal of Dairy Science 102(9):8410-8416.

Coombe JE et al (2019) Antimicrobial stewardship in the dairy industry: responding to the threat of antimicrobial resistance. Australian Veterinary Journal 97(7):231-232.

Cuttance EL et al (2019) Effects of a topically applied anaesthetic on the behaviour, pain sensitivity and weight gain of dairy calves following thermocautery disbudding with a local anaesthetic. New Zealand Veterinary Journal.

de la Cruz-Cruz LA et al (2019) Effects of weaning on the stress responses and productivity of water buffalo in different breeding systems: A review. Livestock Science 226:73-81.

Della Rosa MM et al (2019) Performance, carcass and meat quality traits of grazing cattle with different exit velocity. Animal Production Science 59(9):1752-1761.

RSPCA scholarship recipient

Dutton-Regester KJ et al (2019) Understanding dairy farmer intentions to make improvements to their management practices of foot lesions causing lameness in dairy cows. Preventive Veterinary Medicine 171. doi:10.1016/j.prevetmed.2019.104767.

Ede T et al (in press) Symposium review: Scientific assessment of affective states in dairy cattle. Journal of Dairy Science. doi:10.3168/jds.2019-16325.

Hendriks SJ et al (2019) Lying behavior and activity during the transition period of clinically healthy grazing dairy cows. Journal of Dairy Science 102(8):7371-7384.

Hirata M et al (2019) Can cattle visually discriminate between green and dead forages at a short distance while moving in the field? Animal Cognition 22(5):707-718.

Kismul H et al (in press) Nighttime pasture access: Comparing the effect of production pasture and exercise paddock on milk production and cow behavior in an automatic milking system. Journal of Dairy Science. doi:10.3168/jds.2019-16416.

Lees AM et al (2019) The impact of heat load on cattle. Animals 9(6), 322.

Lomax S et al (2019) Does virtual fencing work for grazing dairy cattle? Animals 9(7), 429.

Lowe G et al (2019) Infrared thermography—A non-invasive method of measuring respiration rate in calves. Animals 9(8), 535.

Lutz J et al (in press) Horned and dehorned dairy cows differ in the pattern of agonistic interactions investigated under different space allowances. Applied Animal Behaviour Science. doi:10.1016/j.applanim.2019.05.008.

Mullins IL et al (2019) Validation of a commercial automated body condition scoring system on a commercial dairy farm. Animals 9(6), 287.

Neave HW et al (in press) Individual characteristics in early life relate to variability in weaning age, feeding behavior, and weight gain of dairy calves automatically weaned based on solid feed intake. Journal of Dairy Science. doi:10.3168/jds.2019-16438.

O'Connor AH et al (2019) Associating cow characteristics with mobility scores in pasture-based dairy cows. Journal of Dairy Science 102(9):8332-8342.

Oehme et al (in press) Kinetic effect of different ground conditions on the sole of the claws of standing and walking dairy cows. Journal of Dairy Science. doi:10.3168/jds.2018-16183.

Pearson JM et al (2019) Clinical impacts of administering a nonsteroidal anti-inflammatory drug to beef calves after assisted calving on pain and inflammation, passive immunity, health, and growth. Journal of Animal Science 97(5):1996-2008.

Rey J et al (2019) Comparison between non-invasive methane measurement techniques in cattle. Animals 9(8), 563.

Ripoll G et al (2019) Preliminary study of the effects of an anti-gonadotropin-releasing factor vaccine at two initial liveweights on the carcass traits and meat quality of bulls. Animal Production Science Volume 59(8):1462-1469.

Scott K et al (2019) Risk factors identified on arrival associated with morbidity and mortality at a grain-fed veal facility: A prospective single cohort study. Journal of Dairy Science 102(10):9224-9235.

Sharma A & Phillips CJC (2019) Avoidance distance in sheltered cows and its association with other welfare parameters. Animals 9(7), 396.

Sharma A et al (2019) Hair cortisol in sheltered cows and its association with other welfare indicators. Animals 9(5), 248.

Tremetsberger L et al (2019) Animal health and welfare state and technical efficiency of dairy farms: possible synergies. Animal Welfare 28(3):345-352(8).

Van Os JMC et al (2019) Sampling strategies for assessing lameness, injuries, and body condition score on dairy farms. Journal of Dairy Science 102(9):8290-8304.

Pigs

Contreras-Aguilar MD et al (2019) Application of a score for evaluation of pain, distress and discomfort in pigs with lameness and prolapses: correlation with saliva biomarkers and severity of the disease. Research in Veterinary Science 126:155-163.

Escriban D et al (2019) Changes in saliva proteins in two conditions of compromised welfare in pigs: an experimental induced stress by nose snaring and lameness. Research in Veterinary Science 125:227-234.

Fels M et al (2019) Biometric measurement of static space required by weaned piglets kept in groups of eight during 6 weeks. Animal Production Science 59(7):1327-1335.

Figueroa J et al (2019) Palatability in pigs, the pleasure of consumption. Journal of Animal Science 97(5):2165-2174.

Friedrich L et al (2019) Test–retest reliability of the 'Welfare Quality® animal welfare assessment protocol for sows and piglets'. Part 1. Assessment of the welfare principle of 'Appropriate behavior'. Animals 9(7), 398. doi:10.3390/ani9070398.

Godyń D et al (2019) Effects of environmental enrichment on pig welfare—a review. Animals 9(6).

Gourdine JL et al (2019) Genotype by environment interactions for performance and thermoregulation

responses in growing pigs. Journal of Animal Science 97(9):3699-3713.

Goursot C et al (2019) Visual laterality in pigs: monocular viewing influences emotional reactions in pigs. Animal Behaviour 154:183-192.

Kells NJ et al (2019) Post-natal development of EEG responses to noxious stimulation in pigs (*Sus scrofa*) aged 1–15 days. Animal Welfare 28(3):317-329(13).

Lahrmann HP et al (2019) The effect of straw, rope, and bite-rite treatment in weaner pens with a tail biting outbreak. Animals 9(6), 365.

Larsen MLV et al (2019) Prediction of tail biting events in finisher pigs from automatically recorded sensor data. Animals 9(7), 458.

Luhken E et al (in press) Microbiological air quality in free-farrowing housing systems for sows. Veterinary and Animal Science. doi:10.1016/j.vas.2019.100065.

Manu H et al (2019) Effect of feeding frequency and sow parity based on isocaloric intake during gestation on sow performance. Journal of Animal Science 97(5):2154-2164.

Marcet-Rius M et al (2019) Are tail and ear movements indicators of emotions in tail-docked pigs in response to environmental enrichment? Animals 9(7), 449.

McKenzie P & Carter R (2019) Change management reduces antibiotic use on pig farms. Australian Veterinary Journal 97(7):233-234.

Miller AL et al (2019) How many pigs within a group need to be sick to lead to a diagnostic change in the group's behavior? Journal of Animal Science 97(5):1956-1966.

Moser J et al (2019) Executing specific foraging behaviours does not represent a general goal state of foraging in dry sows (*Sus scrofa*). Behavioural Processes 164:115-122.

O'Malley CI et al (in press) Animal personality in the management and welfare of pigs. Applied Animal Behaviour Science. doi:10.1016/j.applanim.2019.06.002.

Perez-Calvo E et al (2019) The measurement of volatile organic compounds in faeces of piglets as a tool to assess gastrointestinal functionality. Biosystems Engineering 184:122-129.

Portele K et al (2019) Sow-piglet nose contacts in free-farrowing pens. Animals 9(8):513.

Rosvold EM et al (in press) Early mother-young interactions in domestic sows – nest-building material increases maternal investment. Applied Animal Behaviour Science. doi:10.1016/j.applanim.2019.104837.

Roy C et al (2019) Effects of enrichment type, presentation and social status on enrichment use and behaviour of sows with electronic sow feeding. Animals 9(6), 369.

Schoos A et al (2019) Use of non-steroidal anti-inflammatory drugs in porcine health management. Veterinary Record. doi:10.1136/vr.105170.

Sirovica LV et al (2019) Preference for and behavioural response to environmental enrichment in a small population of sexually mature, commercial boars. Animal Welfare 28(3):271-278(8).

Sørensen JT & Schrader L (2019) Labelling as a tool for improving animal welfare—the pig case. Agriculture 9(6), 123.

van de Weerd H & Ison S (2019) Providing effective environmental enrichment to pigs: how far have we come? Animals 9(5), 254.

Yun J et al (2019) Behavioural alterations in piglets after surgical castration: effects of analgesia and anaesthesia. Research in Veterinary Science 125:36-42.

Zeng ZK et al (2019) Implications of early-life indicators for survival rate, subsequent growth performance, and carcass characteristics of commercial pigs. Journal of Animal Science 97(8):3313-3325.

Poultry

Alfirevich S (2019) Antimicrobial stewardship in the Australian chicken meat industry. Australian Veterinary Journal 97(7):235-237.

Antunes IC et al (2019) Effect of immunocastration and caponization on fatty acid composition of male chicken meat. Poultry Science 98(7):2823-2839.

Bach MH et al (in press) Effects of environmental complexity on behaviour in fast-growing broiler chickens. Applied Animal Behaviour Science. doi:10.1016/j.applanim.2019.104840.

Beaulac K et al (2019) The effects of stocking density on turkey tom performance and environment to 16 weeks of age. Poultry Science 98(7):2846-2857.

Coton J et al (in press) Feather pecking in laying hens housed in free-range or furnished-cage systems on French farms. British Poultry Science. doi:10.1080/00071668.2019.1639137.

Crabb HK et al (2019) Survey of veterinary prescribing for poultry disease. Australian Veterinary Journal 97(8):288-288.

de Koning C et al (2019) Determination of range enrichment for improved hen welfare on commercial fixed-range free-range layer farms. Animal Production Science 59(7):1336-1348.

Decina C et al (2019) Development of a scoring system to assess feather damage in Canadian laying hen flocks. Animals 9(7), 436.

Ferreira VHB et al (in press) Relationship between ranging behavior and spatial memory of free-range chickens. Behavioural Processes. doi:10.1016/j.beproc.2019.103888.

Giersberg MF et al (2019) Linear space requirements and perch use of conventional layer hybrids and dual-purpose hens in an aviary system. Frontiers in Veterinary Science 6:231. doi:10.3389/fvets.2019.00231.

Giersberg MF et al (2019) On-farm evaluation of an automatic enrichment device with maize silage for laying hens. Journal of Applied Animal Welfare Science 22 (4):309-319.

Hu JY et al (2019) Effect of cooled perches on performance, plumage condition, and foot health of caged White Leghorn hens exposed to cyclic heat. Poultry Science 98(7):2705-2718.

Jung L & Knierim U (in press) Differences between feather pecking and non-feather pecking laying hen flocks regarding their compliance with recommendations for the prevention of feather pecking – a matched concurrent case control design. Applied Animal Behaviour Science. doi:10.1016/j.applanim.2019.104839.

Krause ET & Schrader L (2019) Suggestions to derive maximum stocking densities for layer pullets. Animals 9(6), 348.

Malchow J et al (2019) Is the rotarod test an objective alternative to the gait score for evaluating walking ability in chickens? Animal Welfare 28(3):261-269(9).

Meyer MM et al (in press) A novel environmental enrichment device improved broiler performance without sacrificing bird physiological or environmental quality measures. Poultry Science. doi:10.3382/ps/pez417.

Muvhali PT et al (in press) Extensive human presence and regular gentle handling improve growth, survival and immune competence in ostrich chicks. Journal of Applied Animal Welfare Science. doi:10.1080/10888705.2019.1640696.

Rufener C et al (2019) Keel bone fractures are associated with individual mobility of laying hens in an aviary system. Applied Animal Behaviour Science 217:48-56.

Saatkamp HW et al (2019) Transition from conventional broiler meat to meat from production concepts with higher animal welfare: experiences from The Netherlands. Animals 9(8):483.

Saeed M et al (2019) Heat stress management in poultry farms: A comprehensive overview. Thermal Biology 84:414-425.

Toledo TDSD et al (in press) The effect of litter materials on broiler performance: a systematic review and meta-analysis. British Poultry Science. doi:10.1016/j.vas.2019.100062.

Vissers LSM et al (2019) Global prospects of the cost-efficiency of broiler welfare in middle-segment production systems. Animals 9(7), 473.

Rabbits

Masthoff T & Hoy S (2019) Investigations on the influence of floor design on dirtiness and foot pad lesions in growing rabbits. Animals 9(6), 354.

Sheep/goats

Alvarez L et al (2019) Sensitivity and wound healing after hot-iron disbudding in goat kids. Journal of Dairy Science. doi:10.3168/jds.2018-16062.

Grant EP et al (2019) Remote identification of sheep with flystrike using behavioural observations. Animals 9(6), 368.

Greeff JC et al (2019) Are breech strike, dags and breech wrinkle genetically the same trait in crutched, uncrutched and mulesed Merino sheep? Animal Production Science Volume 59(10):1777-1782.

Horton BJ et al (2019) Estimation of lamb deaths within 5 days of birth associated with cold weather. Animal Production Science 59(9):1720-1726.

Muñoz CA et al (2019) Evaluating the welfare of extensively managed sheep. PlosOne. doi:10.1371/journal.pone.0218603.

General

Barrell GK (2019) An appraisal of methods for measuring welfare of grazing ruminants. Frontiers in Veterinary Science. doi:10.3389/fvets.2019.00289.

Bundy JM et al (2019) The impact of an introductory animal handling course on undergraduate students who lack previous livestock handling experience. Journal of Animal Science 97(8):3588-3595.

RSPCA scholarship recipient

Cornish A et al (2019) Review: Applying the behavioural change wheel to encourage higher welfare food choices. Animals 9(8), 524.

Elkins P (2019) Less and better meat consumption. Veterinary Record 184 (19).

Fernandes J et al (2019) Addressing animal welfare through collaborative stakeholder networks. Agriculture 9(6), 132.

Grandin T (in press) Crossing the divide between academic research and practical application of ethology and animal behaviour information on commercial livestock and poultry farms. Applied Animal Behaviour Science. doi:10.1016/j.applanim.2019.06.009.

Kraimi N, Dawkins M, Gebhardt-Henrich SG et al (2019) Influence of the microbiota-gut-brain axis on behaviour and welfare in farm animals: a review. Physiology & Behaviour 210, doi:10.1016/j.physbeh.2019.112658.

Mackenzie LE (2019) Antibiotics in agriculture: the retail customer perspective. Australian Veterinary Journal 97(8):292-294.

Sinclair M & Phillips CJC (2019) Asian livestock industry leaders' perceptions of the importance of, and solutions for, animal welfare issues. Animals 9(6).

Sinclair M et al (2019) Motivations for industry stakeholders in China, Vietnam, Thailand and Malaysia to improve livestock welfare. Animals 9(7), 416.

Sinclair M et al (2019) Turning intentions into animal welfare improvement in the asian livestock sector. Journal of Applied Animal Welfare Science 22(4):385-399.

Ufer D et al (2019) Economic foundations for the use of biotechnology to improve farm animal welfare. Trends in Food Science & Technology 91:129-138.

HUMANE KILLING

Abdullah A et al (2019) Halal criteria versus conventional slaughter technology. Animals 9(8):530.

Alam MR et al (in press) Animal-based welfare assessment of cattle and water buffalo in Bangladeshi slaughterhouses. Journal of Applied Animal Welfare Science. doi:10.1080/10888705.2019.

Bandara RMAS et al (2019) Efficacy of a novel mechanical cervical dislocation device in comparison to manual cervical dislocation in layer chickens. Animals 9(7), 407.

Grist A et al (2019) An examination of the performance of blank cartridges used in captive bolt devices for the pre-slaughter stunning and euthanasia of animals. Animals 9(8):552.

Guijarro A et al (in press) Effects of two CO2 stunning methods on the efficacy of stunning and blood stress indicators of turkeys under commercial processing conditions. Journal of Applied Animal Welfare Science.

Loudon KMW et al (2019) The use of biochemical measurements to identify pre-slaughter stress in pasture finished beef cattle. Animals 9(8), 503.

Nielsen SS et al (2019) Slaughter of pregnant cattle in Denmark: Prevalence, gestational age, and reasons. Animals 9(7), 392.

Wigham E et al (2019) The influence of welfare training on bird welfare and carcass quality in two commercial poultry primary processing plants. Animals 9(8):584.

MISCELLANEOUS

Chatigny F (2019) The controversy on fish pain: a veterinarian's perspective. Journal of Applied Animal Welfare Science 22(4):400-410.

Nind LS (2019) International trends impacting antimicrobial stewardship in animal health. Australian Veterinary Journal 97(9):362-364.

Venkatachalam D et al (2019) Analgesic efficacy of articaine hydrochloride for velvet antler removal in red deer (*Cervus elaphus*) and analysis of drug residues in the harvested velvet antlers. New Zealand Veterinary Journal 67(5):228-233.

RESEARCH ANIMALS

Guinnefollau L et al (2019) Benefits of animal exposure on veterinary students; understanding of equine behaviour and self-assessed equine handling skills. Animals 9(9):620.

TRANSPORTATION OF ANIMALS

Rocha LM et al (2019) Validation of anatomical sites for the measurement of infrared body surface temperature variation in response to handling and transport. Animals 9(7), 425.

Scanes CG et al (in press) Effect of transportation and shackling on plasma concentrations of corticosterone and heterophil to lymphocyte ratios in market weight male turkeys in a commercial operation. Poultry Science. doi:10.3382/ps/pez485.

Vecerkova L et al (in press) Welfare of end-of-lay hens transported for slaughter: effects of ambient temperature, season, and transport distance on transport-related mortality. Poultry Science. doi:10.3382/ps/pez468.

Wild R et al (2019) Prevalence of lameness in sheep transported to meat processing plants in New Zealand and associated risk factors. New Zealand Veterinary Journal 67(4):188-193.

WILD ANIMALS

De Mori B et al (2019) A protocol for the ethical assessment of wild animal-visitor interactions (AVIP) evaluating animal welfare, education and conservation outcomes. Animals 9(8):487.

Heathcote G et al (2019) Citizen reporting of wildlife interactions can improve impact-reduction programs and support. Wildlife Research 46(5):415-428.

Jakob-Hoff R et al (2019) Potential impact of construction noise on selected zoo animals. Animals 9(8):504.

Martin AM et al (2019) Population-scale treatment informs solutions for control of environmentally transmitted wildlife disease. Journal of Applied Ecology 00:1-13.

Spee LB et al (2019) Endangered exotic pets on social media in the Middle East: Presence and impact. Animals 9(8):480.

RSPCA

for all creatures **great** & **small**

ANIMAL WELFARE SCIENCE UPDATE

ISSUE 66 – OCTOBER 2019