



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](mailto:science@rspca.org.au) to subscribe.

## ANIMALS USED FOR SPORT, ENTERTAINMENT, RECREATION AND WORK

### **Working horse welfare is better when horse owners are empathetic and perceptive to equine pain**

Working equids provide vital support and transport for over 600 million people in poor or marginalised communities. The welfare of working equids is typically poor, and this has been attributed to the limited knowledge and resources available to working horse owners. However, recent research found no relationship between working horse welfare and the social vulnerability of their owners, with other factors possibly involved. These include the degree of empathy that horse owners experience, which may motivate them to act altruistically, and their ability to perceive pain in their horse. This study investigated the relationship between horse owner empathy, their ability to perceive equine pain, and the welfare status of their horse.

A total of 100 working horse owners in Chile were interviewed to determine their degree of human-human empathy and human-animal empathy. Equine pain perception was assessed by providing the participants with photos of horses suffering from different conditions, and asking them to rate the intensity of pain that the horse in each photo was experiencing. The welfare status of the participant's horse was then assessed using behavioural and physical measures to produce a welfare index score.

The higher the score, the poorer the welfare status of the horse. The results of the empathy scales, the pain perception results, and the welfare status of the horse were then correlated to determine whether relationships existed between these factors.

Contrary to previous research, the majority (84%) of working horses assessed had adequate welfare and responded in a friendly manner to the owner and the observer. The main health problem found was hoof abnormalities, which is likely due to owners performing farriery without formal training. Skin lesions were also common, due to poor fitting equipment (e.g. harnesses). Most of the horse owners had high levels of empathy toward humans and animals, and a high perception of equine pain. A high degree of empathy and equine pain perception was correlated with better horse welfare, and empathy toward animals explained 60% of the variation in horse welfare score. Promoting the development of empathy in working horse owners may improve working horse welfare.

Luna D, Vásquez RA, Yáñez JM et al (2018) The relationship between working horse welfare state and their owners' empathy level and perception of equine pain. *Animal Welfare* 27:115-123.





## Who wants whipping and who would walk away if whipping horses was banned?

Recent research has shown that whipping horses during races does not improve their speed or placement at the finishing line, and in fact may be detrimental to their performance. This raises the question of whether whipping during horse races should continue. Whip use has been cited as a means of improving jockey safety by aiding steering, but jockey behaviour during races does not support this stance, and the continued support of whip use by the racing industry is contentious. A recent survey of public attitudes toward whip use found that the majority of respondents (87%), but not all, would continue to watch horse racing if whip use was banned. This study examined the characteristics of those respondents that supported the use of whips and who would stop gambling if whipping was banned.

Data were extracted from the previous survey of public attitudes toward whip use in Australia. This survey comprised 1533 respondents, of whom 384 supported whip use with 107 stating that they would cease watching or betting on horse races if whip use were banned. Demographic data that had been collected concurrently was then used to characterise this subset

of people who supported whip use and would cease gambling if whip use was banned in terms of their age, gender, household income level, and frequency of attending horse races.

Horse racing enthusiasts who supported the use of whips were significantly more likely to be male. The more frequently that respondents attended races or gambled on them, the more likely they were to support whip use. People with the lowest household income were the most likely to state that they would stop attending races or gambling on them if whip use was banned. The authors suggest that this view may be related to the belief that a horse that has not been whipped may not race at its highest capacity, and thus the race may not be 'fair' in terms of gambling outcomes. Racing organisations may find the results of this study useful when considering the merits of continuing whip use in horse racing.

McGreevy PD, Griffiths MD, Ascione FR et al (2018) Flogging tired horses: Who wants whipping and who would walk away if whipping horses were withheld? PLOS One 13: e0192843.

## Using the Five Domains model to assess the impacts of common interventions on horse welfare

Horses are exposed to a wide range of anthropogenic interventions for a variety of reasons, such as training procedures, medical procedures, and concentrated diets. The impact of these interventions on horse welfare can be assessed using a suite of behavioural and physiological measures, however these are time consuming and costly to apply. There is also no single measure of horse welfare available. One option for assessing horse welfare is to make use of expert opinion. This study examined how a panel of specialist equine experts could apply their knowledge to assess horse welfare using the Five Domains model.

A panel of 16 equine-related professionals was convened in Australia for a four-day workshop to discuss and rate horse welfare in a variety of situations. The expertise of the panel included a range of backgrounds such as equitation science, veterinary science, and equestrian coaching. Prior to the workshop, each panellist was asked to submit a comprehensive list of all interventions that they knew of that were applied to horses. The resulting list of 116 interventions was grouped into 14 categories, such as weaning, diet, housing, training, veterinary interventions etc, and each panellist ranked the

severity of the intervention on horse welfare using a scale of 1-10. During the four-day workshop the panellists discussed each intervention in detail, and used an adapted version of the Five Domains model to again rate the impact of each intervention on horse welfare. The pre- and post-workshop scores allocated to each intervention were compiled and compared.

The most severe impacts within each of the 14 categories were identified. For example, housing horses in isolation or using restrictive equipment such as anti-cribbing collars or excessively tightened nosebands were considered to have substantial impacts on horse welfare. Generally, the nutritional interventions were considered to have less impact on welfare than the behavioural restrictions. Topics were also identified that require further research before assessment could be made. It was concluded that general horse welfare could be assessed using the Five Domains model.

McGreevy P, Berger J, de Brauwere N et al (2018) Using the Five Domains model to assess the adverse impacts of husbandry, veterinary and equitation interventions on horse welfare. Animals 8,41.

## Reducing whip use in harness racing was not associated with a decrease in horse speed

In harness racing in Australia, whips are traditionally used in training and racing to improve performance and maintain control of the horse. Whip use in horse racing is a contentious topic due to the potential to cause pain, and in 2010 Harness Racing Australia made amendments to its whip rules so that horses were struck with less force. This was imposed by requiring drivers to hold a rein in each hand at all times, allowing the drivers to make a flicking motion with the whip but not a striking motion. This amendment was later removed for drivers during the last 200m of a race, and reimposed again in 2016. This study examined whether reducing the severity of whip use caused horses to run slower in harness races.

The winning times of 133,338 harness races from 2007 – 2016 were supplied by Harness Racing Australia. These winning times were classified as either slow (>2.00 mins), medium (1.55 – 2.00 mins) or fast (<1.55 mins), and winning speed was compared before and after the introduction of the more stringent whip use rules using logistic regression.

Despite concerns that tightening the whip regulations might reduce performance, none of the analyses revealed any significant reduction in either fast or medium winning times following the tightening of whip use regulations. In fact, the winning times of harness race horses were more likely to be fast (<1.55 mins) following introduction of these regulations. This result may be partly due to the improvements that were made to some of the racing tracks during the 9-year record period, however the authors argue that if this is the case then changes to whip rules are insubstantial in comparison to the benefits that can be achieved by improving track surfaces. Previous research has shown that whipping horses has no impact on their speed, and the results of the current study question the need for the whip as a performance aid in harness racing.

Wilson B, Jones B, McGreevy P (2018) Longitudinal trends in the frequency of medium and fast race winning times in Australian harness racing: Relationships with rules moderating whip use. *PLOS One* 13:e0184091.

## COMPANION ANIMALS

### Owner personality and psychological status affects canine behavioural problems

Behavioural problems are known to be the most common cause for owners to surrender their dogs to shelters, and over 3 million dogs enter US shelters each year. A better understanding of the factors that lead to behavioural problems in dogs could help reduce the number of pet relinquishments and euthanasia that occur each year. Previous research has related behavioural problems in dogs to the personality of their owners, but the mechanism of this relationship is not known. This study investigated relationships between owner personality, psychological status, the use of aversive training methods and the prevalence of behavioural problems in their dogs.

Owner and dog behaviour were assessed using an online survey that was distributed to registered members of The Simon Foundation Inc's Center for Canine Behaviour Studies. The survey collected demographic data about the owner's dogs, and used the following five survey instruments to evaluate owner personality, psychological status, training methods and dog behaviour: a Personality Inventory; the Beck Depression Inventory; the Emotional Regulation Questionnaire; the Attitudes to Training scale, and an abbreviated version of the Canine

Behavioral Assessment and Research Questionnaire.

1564 surveys were completed, of which 91% of respondents were female, and 31% of respondents had mild to severe depression. Almost half of the dogs (47%) were living in single dog households, and 71% were purebred. A positive relationship was found between the owner's self-reported use of aversive training methods and the prevalence and severity of their dog's behavioural problems. These included aggression, separation anxiety, barking and house-soiling. Interestingly, aversive training methods were not associated with fear and anxiety in the dogs, which is contrary to previous research. There was a strong relationship between male owner depression and the tendency to use aversive training methods. Several relationships were also found between owner personality types and canine behavioural problems, but these relationships did not appear to be mediated by the training methods used.

Dodman NH, Brown DC, Serpell JA (2018) Associations between owner personality and psychological status and the prevalence of canine behaviour problems. *PLOS One* 13(2):e0192846.



## Examining individual differences in reward responsiveness of the domestic dog

The term 'reward processing' relates to the value an individual places on a certain resource or situation, such as social interactions. In humans, variation in reward processing is associated with a range of psychiatric disorders, and animal models of this feature are sought to aid scientific research. Dogs are increasingly used as models for human psychiatric research due to the similarity in their socio-cognitive skills with humans, therefore it is important to determine whether dogs can show individual differences in reward sensitivity. This study involved a survey that could be used by dog-owners to assess reward responsiveness in their pets.

The Canine Reward Responsiveness Scale examined how dogs tended to respond to two types of reward: toys and food. The questionnaire included topics such as whether the dog would approach strangers for play or food, if the dog became excited when it was about to receive a toy or food, and if the dog ever had leftover food or stopped playing with toys. The questionnaire was distributed online in three languages (Hungarian, German and English) and received 2149 responses. To assist with validation, a sample of 30 dogs were rated by their owners and then subjected to behavioural tests in the laboratory to

determine whether the questionnaire was an accurate reflection of dog behaviour. The behaviour of the dogs was observed after being given a reward (toy or food), and again when the reward was visible but unattainable (inside a cage).

The questionnaire results confirmed that dogs did display variation in reward responsiveness, and agreed with the observed behaviour of dogs during the laboratory tests. High reward responsiveness was associated with behavioural traits such as inattention, hyperactivity-impulsivity and indicated problems in physical health and social functioning. For example, dogs that were rated by their owners as having high hyperactivity-impulsivity and inattention also showed extreme levels of reward responsiveness. In conclusion, the questionnaire provides an accurate method of assessing reward responsiveness in dogs, and dogs can provide a reliable and valid model of human behaviour.

Gerencsér L, Bunford N, Moesta A et al (2018) Development and validation of the Canine Reward Responsiveness Scale – Examining individual differences in reward responsiveness of the domestic dog. *Nature Scientific Reports* 8:4421.



## Changes associated with improved outcomes for cats entering RSPCA shelters in Queensland

Australia is home to almost 4 million cats, with large numbers of stray and owned cats admitted annually to animal shelters. Historically, these cats have poor survival outcomes, and their euthanasia rates are between 50-70% in Australia. The number of cats that are reclaimed by their owners is very low (2-5%), and many animal welfare agencies make considerable efforts to reduce the number of cats that are euthanased. In 2016, it was noticed that RSPCA shelters in Queensland had substantially lower rates of euthanasia than those in other Australian states, and that these rates had been decreasing for the five years prior. This study aimed to identify the changes that contributed to the markedly improved outcomes for cats in RSPCA shelters in Queensland.

A retrospective study was conducted using RSPCA Queensland data for cat admissions during the 2011-2016 period. For each cat admitted to the shelter demographic data was collected as well as the reasons for its admission and the outcome of the admission. Outcomes were classified as: reclaim by owner, rehome, transferred to a rescue group, euthanasia,

died whilst in care, or other (e.g. stolen).

The greatest contributor to the reduction in euthanasia rates was a marked increase in the number of cats that were rehomed, rising from 34% in 2011 to 74% in 2016. This increase was due to a doubling of in-shelter adoptions, and through an agreement with Petbarn to rehome cats through their stores. The higher than normal adoption rates were attributed to a substantial increase in the RSPCA advertising budget (\$0 in 2011 to \$40,000 in 2016). A further contributor was the increased number of shelter cats that could be placed in temporary foster care, which markedly improved their chances of adoption by improving socialisation, or in the case of kittens, providing specialised care. To achieve further improvements, programs that decrease the number of cats being admitted to shelters would be beneficial.

Kerr CA, Rand J, Morton JM et al (2018) Changes associated with improved outcomes for cats entering RSPCA Queensland shelters from 2011 to 2016. *Animals* 8,95.

## Ethical dilemmas encountered by small animal veterinarians

Small animal veterinarians are often faced with situations where the needs of their patient compete with the needs of the owner. For example, an animal may need expensive treatment that the owner cannot afford. These situations are classed as ethical dilemmas, and exist when there are competing interests of equal moral weight, with no obvious way to prioritise one responsibility over others. Ongoing exposure to ethical dilemmas in veterinarians can result in moral stress, which occurs when their view of 'ideal' behaviour and the reality of their actual behaviour do not match. This study surveyed small animal veterinarians to determine the frequency and type of ethical dilemmas they were exposed to and how they responded to these dilemmas.

An online survey was distributed to small animal veterinarians in the USA through their membership of various veterinary organisations. The survey consisted of five sections: frequency of ethical dilemmas and moral stress; the use of euthanasia to resolve ethical dilemmas, the personal values of the respondents; methods of addressing ethical dilemmas, and impacts of ethical dilemmas on stress. A total of 484 useable responses were received.

The majority (52%) of small animal veterinarians reported experiencing an ethical dilemma at least once per week, and 19% reported experiencing them at least daily. The two most common types of ethical dilemmas that veterinarians faced were client financial limitations, and having to base treatment on their own experience and judgement rather than using diagnostic tests. The majority (52%) of respondents cited ethical dilemmas as one of the leading causes of work-related stress, and found performing euthanasia for economic reasons stressful. The stressfulness increased when the veterinarian perceived that the clients chose euthanasia due to an unwillingness to pay for treatment rather than an inability to pay. Many respondents relied on their gut instinct to resolve ethical dilemmas, and felt that further training about ethical theories in veterinary school would help them address and cope with these dilemmas in practice.

Kipperman B, Morris P, Rollin B (2018) Ethical dilemmas encountered by small animal veterinarians: characterisation, responses, consequences and beliefs regarding euthanasia. *Veterinary Record* 182(9):548.



## The impacts of tickling pet store rats on human-animal interactions and rat welfare

Rats are a popular pet, but as they are a prey species they initially find interactions with humans frightening. This fear can be exacerbated in pet stores if their fear leads to difficult handling and further negative interactions with humans. Because pet rats are expected to interact with their owners in a friendly manner, improving the human-rat relationship at the pet store prior to sale is an important goal. One method of providing positive human-rat interactions is by tickling rats on the nape of their neck and then on their stomach. This mimics their play behaviour, and causes them to emit high-pitched ultrasonic vocalisations. Some rats emit more of these vocalisations during tickling than others, allowing rats to be categorised as high-callers and low-callers. This study investigated the impact of daily tickling sessions on the behaviour, stress physiology, and fear of humans displayed by rats in a pet store.

36 female rats (5-7 weeks old) were housed in glass enclosures at a pet store in the USA, with 6 rats per enclosure. Two enclosures acted as the Control, and these rats were not handled. The remaining rats were tickled daily for 5 mins each by the researcher for 3 days to allow classification as high-callers and low-

callers. The rats were re-grouped on this basis, and were then tickled daily (15 secs) for 4 days by store employees. Faeces were collected during this period for corticosterone analysis, and behaviour in the home cage was recorded using video cameras. On Day 8 the rats were subjected to approach and manual restraint by an unfamiliar handler to test for fear of humans.

Short-term tickling of pet store rats improved the ease of handling by an unfamiliar human, and high-calling rats showed less fear during this test than low-calling rats. Tickled rats had higher concentrations of faecal corticosterone, which may have indicated higher levels of arousal and anticipation of tickling bouts, particularly for high-callers. Tickled rats also spent less time hiding in their home cage than the control group. In conclusion, tickling of pet store rats may improve some human-rat interactions, especially for high-calling rats.

LaFollette MR, O'Haire ME, Cloutier S et al (2018) A happier rat pack: The impacts of tickling pet store rats on human-animal interactions and rat welfare. *Applied Animal Behaviour Science* 203:92-102.



## The role of social workers in companion animal grief and loss

The strength of the bond between humans and their pets is increasingly recognised as an important contributor to human welfare. This bond satisfies needs in both humans and their pets for companionship, love, nurturing and emotional support, and pets are often considered integral members of the family. Traditionally, an anthropocentric approach by social workers means that the importance of the human-animal relationship has been overlooked, and this represents a missed opportunity to provide support to both humans and animals. This is particularly relevant in the case of humans grieving for the loss of a companion animal, as this sort of grief is often not acknowledged by society. This article investigates whether there is a role for social workers to provide support for grieving pet owners.

This Australian research examined the public comments made in response to an online media article titled 'Why dead pets matter'. Over 300 comments were made on this article, of which 218 were sufficiently detailed and relevant to be analysed. A qualitative thematic analysis of these comments identified four major themes: strength of the bond, anthropocentrically disenfranchised grief, anticipatory

grief in the context of euthanasia, and the need for professional support.

The strength of the bond was demonstrated by respondents consistently referring to pets as family members, and the source of much reciprocal love. Anthropocentrically disenfranchised grief was demonstrated in comments that described the delegitimised experience of losing a companion animal, and the social exclusion that was associated with this. Comments relating to anticipatory grief described the owner's knowledge that one day their pets will die, and the anticipated grief this will cause. The need for professional support, such as grief and loss counselling, was not consistently demonstrated by pet owners in the comments, despite the profound grief they had experienced. This may be due to a lack of need for this service, or a lack of recognition of this need. In conclusion, adopting a biocentric approach rather than an anthropocentric approach will aid social workers in improving the support that both humans and animals receive.

Laing M, Maylea C (2018) "They burn brightly, but only for a short time": The role of social workers in companion animal grief and loss. *Anthrozoös* 31:221-232.





## A canine simulator model is suitable for training veterinary students to perform gastrointestinal endoscopy

Gastrointestinal endoscopy is a veterinary procedure that involves inserting a flexible tube with a camera down a patient's throat so that the digestive tract can be visually examined. This is a commonly used but technically challenging technique in veterinary medicine, and veterinary students must be trained in this procedure before they are competent to practice it on live animals. Traditionally canine cadavers have been used for this sort of practical training, but due to a variety of issues with maintaining a sufficient supply of cadavers, new instructional tools have been developed. These include a realistic plastic model of a canine abdomen into which the viscera of a small pig is placed, simulating the viscera of a dog. An endoscopic camera can be inserted into the model, as for a cadaver. This study compared the effectiveness of the canine simulator model to that of canine cadavers in teaching gastrointestinal endoscopy to veterinary students.

48 final-year veterinary students in Spain that had not received prior endoscopic training were allocated to receive training on either a canine cadaver, or on the canine simulator model (24 students per treatment). The students received 2 hrs of training per day for five days, after which their skills were assessed by

performing three endoscopic procedures on a live, anaesthetised dog. Each student received a score for each procedure, and the time taken to complete each procedure was recorded. Students were also asked to rate the usefulness of their assigned training method.

The students showed the same level of skill when performing gastrointestinal endoscopy on a live dog, regardless of whether they were trained using cadavers or the canine simulator model. The students that were trained using the simulator model took slightly longer to perform the procedures, especially inserting the endoscope down the oesophagus, which is likely to be due to the simulator model lacking a full-length oesophagus. The canine simulator model appears to be a viable alternative to canine cadavers for veterinary endoscopic training, and provides students with a good level of proficiency before performing endoscopic procedures on live dogs.

Pérez-Merino EM, Usón-Gargallo J, Sánchez-Margallo FM et al (2018) Comparison of the use of fresh-frozen canine cadavers and a realistic composite ex vivo simulator for training in small animal flexible gastrointestinal endoscopy. *Journal of the American Veterinary Medical Association* 252:839-845.

## Assessment of a targeted trap-neuter-return pilot study for cats in New Zealand

New Zealand is home to over 1.1 million pet cats and almost 200,000 stray cats, making them the most popular type of companion animal in the country. These cats cause significant impacts to the native wildlife, and cause a number of societal issues such as community nuisance, disease spread, and concern for their welfare. The financial cost and moral stress incurred by shelters that manage stray cats can also be significant. Stray cat populations must be managed for these reasons, but there is community resistance to lethal control methods. A non-lethal option for population control is trap-neuter-return (TNR) programs, but this type of program has not yet been officially trialled under New Zealand conditions. This study examined the effects of a TNR program on the number of cats that were admitted to a local animal shelter in Auckland.

The suburb of Manurewa was targeted for the TNR program, as it contributed a significant proportion of the stray cats being admitted to the focal animal shelter. The suburb was divided into 14 zones, and each zone was targeted with traps for one month. The traps were set in the evenings, and checked in

the morning. Any cats that were identifiable as pets or that had already been sterilised were released immediately. This resulted in a total of 364 cats that were taken to a participating veterinary clinic for a health check and sterilisation, after which they were released. To assess the impact of this program on shelter intake, the shelter records were obtained for the years prior to, during and after the trapping program, and these were examined for changes in the number of incoming cats and their euthanasia rates.

The number of incoming stray cats and euthanasia rates were reduced considerably for the suburb targeted by the TNR program. These changes were significantly greater than the corresponding averages for other suburbs that were not targeted by the TNR program. This study suggests that the use of TNR programs could be a valuable humane cat management tool in urban New Zealand, and further assessment is warranted.

Zito S, Aguilar G, Vigeant S et al (2018) Assessment of a targeted trap-neuter-return pilot study in Auckland, New Zealand. *Animals* 8:73.

## FARM ANIMALS

### The effects of loose housing and nesting material on sow behaviour and piglet survival

Commercial sows are strongly motivated to build nests prior to farrowing, and performing this behaviour is positively associated with farrowing outcomes and piglet performance. In comparison, sows housed in farrowing crates are prevented from performing nest building, and this is associated with increased activity levels and a longer duration of parturition. Despite the benefits of nest building, producers often cannot provide nesting materials such as straw because it blocks the manure removal system. This study investigated the effects of sow housing and the provision of alternative nesting materials on sow behaviour and piglet survival.

This study was conducted at a research piggery in the Netherlands using a 2 x 2 factorial design to examine the effects of housing and nesting materials on 68 sows and their litters. The sows were allocated to either a standard farrowing crate or a loose housing pen. Each sow was then allocated to receive either standard nesting material (a 2.1m rope attached to the pen), or alternative nesting material (2 straw balls, 2 jute sacks and the 2.1m rope). These materials were selected due to their compatibility with the manure removal systems. The behaviour of the sows was analysed for 12 hrs prior to parturition, during

parturition, and for 24 hrs after parturition. Piglet survival during parturition and for 48 hrs after birth was also recorded.

Both housing and the provision of alternative nesting material influenced peri-parturient behaviour of the sows. Loose housing was associated with more lying behaviour prior to parturition and more sow-piglet interactions during parturition. Crate housing was associated with more time spent sitting and more postural changes during nesting and parturition. Crate-housed sows also crushed less piglets in the 48 hrs following parturition. Sows that received additional nesting materials spent longer manipulating these materials, with a preference shown for the sack over the straw balls. Sows with additional nesting materials also spent more time resting prior to and during parturition. In conclusion, loose housing and additional nesting materials have a beneficial effect on sow behaviour.

Bolhuis JE, Raats-van den Boogaard AME, Hoofs AIJ et al (2018) Effects of loose housing and the provision of alternate nesting material on the peri-partum sow behaviour and piglet survival. *Applied Animal Behaviour Science* 202:28-33.





## Perch use in broiler breeders

Poultry prefer to roost at night on elevated structures as part of their anti-predator strategy. Providing laying hens with perches is associated with reduced fear and aggression, and improves the quality of their resting behaviour. Unlike laying hens, broiler breeders are typically not provided with perches for roosting, and producers claim that they do not use perches if they are provided. This Swiss study investigated how broiler breeders used perches, and how perches affected their welfare and production.

Two strains of broiler breeder (one fast growing and one slower growing) were housed in floor pens that each held 119 females and 12 males, from 0 – 48 weeks of age. Each pen was allocated to one of the following treatments: Control, Wooden perches, or Aviary perches. The Wooden perch treatment provided eight wooden aerial perches in an A-frame shape, the Aviary perch treatment provided four staggered platforms with built-in perches, while the Control pen had no perches. Perch use was assessed at 5-week intervals by counting the number of birds on the perches every hour for 24 hours. Egg production and quality was recorded, and the welfare of the birds was assessed at 28 and 46 weeks of age.

The results of this study confirmed that broiler breeders perform perching on a variety of objects, including perches and pen features. Perch use increased with age, and the Aviary perches were used more than the aerial perches. This may have been due to the aviary platforms being easier to navigate as the birds became older and heavier, particularly for the heavier fast-growing strain. Both types of perches were associated with a higher prevalence of keel bone fractures and dirtier plumage, which was likely due to the droppings from birds on the top perches falling on the birds at the bottom. Birds in the Control pens produced more viable eggs, and more floor eggs were found in the Aviary perch treatment. In conclusion, broiler breeders show similar perching behaviour to laying hens, and the negative impacts of perches on welfare and production could largely be improved by altering management.

Gebhardt-Henrich SG, Toscano MJ, Würbel H (2018) Use of aerial perches and perches on aviary tiers by broiler breeders. *Applied Animal Behaviour Science* 203:24-33.

## Current approaches to avoid the culling of day-old male chicks in the layer industry

Every year approximately 7 billion male chicks are killed as a by-product of the egg industry worldwide. A substantial amount of research has been directed toward resolving this problem, but so far none of the potential solutions have advanced to the level of practical application. This article reviews the different approaches that have been investigated to find alternatives for the culling of male layer chicks.

Several attempts have been made to grow the male chicks for meat production, however due to their slow growth, lean bodies and poor feed conversion efficiency, this option is not economically feasible. Determining the gender of the chick embryo within the egg is possible, using several methods. The shape of the eggshell may be an indicator of sex, but little information about the accuracy of this method is provided. The volatile compounds released by quail eggs (their odour) can be used to differentiate between the sexes as early as 1 day post-lay, but this research has not yet been conducted with laying hen eggs. Small samples of tissue, blood or cells can be used to sex the embryos using molecular assay techniques in under 15 mins, but this technique has

only been developed for laboratory use so far. Genetic engineering can tag the male sex chromosomes with fluorescent proteins so that the developing embryo shows sex-specific patterns of fluorescence. Hormone assays can determine gender after day 9 of incubation, but the sampling procedure reduced the hatching rate. Optical imaging methods can be used to accurately determine the sex of the embryo, but require a hole to be cut in the egg shell. This can reduce the hatching rate by about 10%.

For any of these methods to be adopted by the egg industry they must be rapid, highly accurate, cost-efficient, and able to be performed prior to day 7 of incubation, when the chick embryo develops the capacity to experience pain. Currently, in-ovo sex determination has the most potential for use in hatcheries, but requires more development for use at high speed under commercial conditions.

Krautwald-Junghanns M-E, Cramer K, Fisher B et al (2018) Current approaches to avoid the culling of day-old male chicks in the layer industry, with special reference to spectroscopic methods. *Poultry Science* 97:749-757.

## Assessing and mitigating post-operative castration pain in cattle

The vast nature of cattle farming in Northern Australia means that cattle are mustered annually for husbandry procedures. These husbandry procedures can include painful interventions such as castration, and typically no anaesthetic or analgesia is provided. There is increasing concern from society regarding the pain that castration causes, and the associated decrease in growth rates is also cause for economic concern. This study investigated the practical application of pain relief during castration to support change in husbandry techniques.

48 Brahman bull calves at 6-8 months of age were sourced from an extensively managed cattle station in Western Australia and transported to a research farm for castration. All calves except for the non-castrated control group were surgically castrated, and the following pain relief options were examined: no pain relief, application of a short-acting (40 mins) local anaesthetic into the testicles, application of a long-acting (2 days) analgesic pre-operatively or post-operatively, and combinations of the two types of pain relief. This resulted in 6 treatment groups, with 8 animals per treatment. The impacts of these treatments on welfare was assessed using liveweight,

serum cortisol, and activity levels as measured by pedometers for 13 days post-operation. The behaviour of the calves when being placed in the crush was also rated (balking or not balking) and the degree of distress they displayed in the crush was rated on a 1-5 scale.

The administration of local anaesthetic (lignocaine), a systemic analgesic (meloxicam), or a combination of the two improved objective measures of calf welfare following castration. Pain relief reduced the cortisol response to castration, increased activity levels on the following day, and increased the average weight of the calves. The effect of pain relief on the balk score and crush score was not apparent due to low variation in these measures. Providing both pain relief options would cost \$8.50/animal, and both can be easily administered by non-veterinarians. In conclusion, 6-8 month old bull calves benefit from the administration of both lignocaine and meloxicam, and these methods are readily adoptable by industry.

Laurence M, Barnes A, Collins T et al (2018) Assessing and mitigating post-operative castration pain in *Bos indicus* cattle. *Animal Production Science* 58:909-919.





## Enrichment using a chewable block improved exploratory behaviour and learning in pigs

Environmental enrichment allows captive animals to perform a greater range of their species-specific behaviours and make behavioural choices. Enrichments generally provide novelty, social contact and exercise for animals, and these are associated with improved welfare. It appears that enrichment benefits the welfare of pigs by enhancing their ability to learn and their ability to cope with stressors. This study examined the effect of providing chewable enrichment blocks during early rearing on the behaviour of pigs.

384 piglets were raised under standard commercial conditions in Australia, spending 21 days in the farrowing crate with the sow (sucker phase) followed by 8 weeks in group pens with other piglets (weaner phase). Enrichment blocks were provided to the piglets at a rate of one block / 4 pigs in a crossover design, resulting in the following four treatments: no enrichment, enriched during sucker and weaner phase, enriched during sucker phase only, enriched during weaner phase only. These blocks were a 'nutritional lick block' that had been commercially developed specifically for piglets, and could be orally manipulated as well as climbed on and around. Three behavioural tests were conducted after weaning: an open field test

with a novel object (red bucket) to assess fearfulness; a maze test, and an executive function test to test their ability to learn an association between an audio cue and a food reward. Piglet weight and injury scores were assessed weekly.

The provision of enrichment altered the behaviour of the pigs in all three behavioural tests, suggesting an increased willingness to explore. The proportion of pigs that correctly performed the executive function task and navigated the maze correctly was greater for enriched pigs, suggesting an improved ability to learn. Injury scores were lower after weaning if pigs received enrichment during both phases, and highest if they received enrichment during the sucker phase that was then taken away during the weaner phase. This suggests that enrichment may help to reduce aggression, but taking the enrichment away may lead to increased aggression. In conclusion, enrichment likely impacts the behavioural development of piglets and may help them adapt faster to new environments.

Ralph C, Hebart M, Cronin GM (2018) Enrichment in the sucker and weaner phase altered the performance of pigs in three behavioural tests. *Animals* 8, 74.

## The effects of simulated ship motions on the behaviour and physiology of sheep

During transport, animals continuously try to avoid contact with other animals and the vehicle, and maintain their balance by stepping and leaning on vehicle structures. If the movement of the vehicle is unpredictable, the stressfulness of transport may be increased. This Australian study examined whether unpredictable combinations of roll and pitch movement (simulating an ocean voyage) influenced the behaviour and welfare of sheep, and how this relationship was influenced by the presence of other sheep.

A motion platform was constructed from a crate (0.87m wide x 1.2m long x 0.95m high) that could be programmed to move in various combinations of roll and pitch. The crate contained video cameras, food and water, and could hold up to two sheep. During Experiment 1, two sheep were placed into the crate but were separated by a barrier, and exposed to one hour of regular or irregular movements simulating ship motion on 12 occasions. In Experiment 2, the experiment was repeated without the barrier between the sheep. The behaviour of the sheep was monitored using video cameras, and feed intake and heart rate

were also monitored. The behaviour of the sheep after each treatment was also monitored to assess fatigue.

Irregular roll and pitch motion was associated with increased feed intake and affiliative behaviour, and the sheep supported themselves against the crate or by kneeling. The increased feeding and affiliation were considered to be comfort behaviours. Heart rate data indicated a stress response to the irregular movements. The sheep had greater trouble maintaining balance when the barrier was removed, indicated by more stepping, and sheep showed both affiliative and agonistic interactions toward each other. The sheep also showed more resting behaviours after the treatments, indicating fatigue from maintaining balance. At no point were the sheep seen leaning on each other, contradicting the view that a high stocking density allows animals to support each other during transport. In conclusion, unpredictable simulated ship motions had a negative impact on sheep welfare.

Santurtun E, Phillips CJC (2018) The effects of regularity of simulated ship motions on the behaviour and physiology of sheep. *Applied Animal Behaviour Science* 204:43-52.

## Genetically modifying livestock for improved welfare

In recent years, humans' ability to selectively modify genes has increased dramatically through improvements in genetic modification technology. This provides a means of improving farm animal welfare, as farm animals could be modified in ways that improve their resistance to disease, or negate the need for painful husbandry procedures. In this article, the authors argue that societies currently relying extensively on intensive confinement of animals for food production should invest research in gene-editing technology to improve farm animal welfare.

Two ethical theories are used to argue for the use of gene editing technology to improve animal welfare: consequentialism and deontological ethics. The consequentialism approach views the rightness of actions based on their consequences; with an ethical choice being one that maximises good consequences and minimises bad consequences. The authors argue that due to the likelihood of gene editing causing a significant reduction in animal suffering, combined with the much lower possibility of the animals experiencing negative consequences, that this approach would be strongly supported using a consequentialist view. The deontological approach views the rightness of a situation based on the rightness of the actions that

led to that situation, rather than the consequences of those actions. Using this approach, killing animals for food is considered unacceptable, but by reducing any additional harm to the animals, further violation of their rights can be avoided.

The arguments against using gene technology to improve welfare are largely based around the public disapproval, especially the perceived 'unnaturalness' of it. Other arguments state that altering the animals genetically will diminish their integrity and have negative consequences that go 'beyond welfare', even if welfare is improved. The authors argue that these are human constructs that are not part of the subjective experience of animals, and do not apply. The large-scale adoption of a plant-based diet or lab-grown meat would be much more effective in reducing a variety of harms than genetic engineering of farm animals could address. The authors conclude that despite these comparative disadvantages, there are important reasons for continuing the pursuit of welfare improvements via genetic technologies.

Shriver A, McConnachie E (2018) Genetically modifying livestock for improved welfare: A path forward. *Journal of Agricultural and Environmental Ethics* 31:161-180.

## Effects of environmental enrichment on activity and lameness in commercial broiler production

Providing animals with biologically relevant enrichment improves welfare by allowing them to perform highly motivated behaviours that may reduce frustration and boredom, and increase activity. Increasing activity in commercial broiler chickens may have benefits for leg health by strengthening muscular and skeletal development. Most Norwegian broiler companies require their producers to provide a range of enrichments for their flocks, such as peat, roughage and elevated platforms. This study investigated the effects of these commercially applied enrichments on the behaviour and lameness of broiler chickens.

Two consecutive flocks of broilers on a commercial farm in Norway were used in this study, providing a total of 18,200 birds. The broiler house was divided into two treatment areas using a small wall, and the following enrichments were added to one side: two large wooden trays full of peat, two elevated platforms with ramps to allow easy access, two partially opened bales of peat, and two bales of Lucerne hay. The remaining side of the shed acted as the Control treatment, and had no enrichments added. The behaviour of the birds was observed at 16 and 30 days by slowly walking through the house

and pausing at eight locations to count the number of birds performing different types of behaviour. On day 30, a sample of birds were gait scored for lameness, and performance data were collected from the farm production records and the slaughterhouse records for carcase characteristics.

The provision of enrichment increased specific exploratory, locomotor and comfort behaviours in the broilers compared to the Control group. The enriched broilers also displayed more exploration (ground pecking) and comfort behaviours (body shaking) in areas of the house that did not contain enrichments, suggesting that the welfare benefits were experienced even when not directly interacting with these items. The enriched birds tended to have better leg health, and the increased activity levels did not reduce the growth or productivity of the birds. In conclusion, providing a variety of environmental enrichments successfully improved the welfare of broiler chickens.

Vasdal G, Vas J, Newberry RC et al (in press) Effects of environmental enrichment on activity and lameness in commercial broiler production. *Journal of Applied Animal Welfare Science*.



## Pair housing dairy calves in modified calf hutches promotes feeding and reduces neophobia

Approximately 70% of US dairy farms raise their female calves individually prior to weaning, and 40% of these are housed in hutches. Raising calves in small groups is associated with a range of welfare benefits in comparison to individually raised calves, such as higher feed intake, more play behaviour and improved social skills. One option for dairy farmers to improve the welfare of their heifer calves is to raise them in pairs rather than individually. This study compared the performance of 5-day old calves housed in pairs with that of calves housed individually, and examined the effects of housing type on their response to novel feed.

This study took place on a commercial dairy farm in Canada. 14 calves were housed individually in hutches (2 x 1.2m) with a small outdoor area (1.8 x 1.2m). 16 calves were housed in pairs, with access to two hutches and a shared outdoor space (2.9 x 1.8m). The calves were weaned at 60 days and transferred to an indoor group pen. While housed in the hutches, all calves received a high milk allowance (10L / day) from a nipple feeder, and were given hay and a concentrated calf starter feed. Starter feed

consumption, health, body weight and cross-sucking behaviour were assessed weekly. The calves were tested for food neophobia (fear of new or unfamiliar food) at 60 days of age by presenting them with a bucket of adult concentrate feed (total mixed ration), and their latency to interact with the feed, and the amount consumed, was recorded.

The pair-housed calves showed less food neophobia and consumed more of the novel feed. This is beneficial for the weaning process, as neophobic calves may eat less during this stressful period due to the novelty of the new feed. The pair-housed calves also consumed more solid feed (calf starter) while housed in the hutches, but this did not transfer to an increase in growth, possibly due to increased activity levels. Very little cross sucking was observed, probably due to the nipple feeding and high milk allowance. In conclusion, pair housing provides a practical method of providing social contact for calves on commercial dairies.

Whalin L, Weary DM, von Keyserlingk MAG (2018) Pair housing dairy calves in modified calf hutches. *Journal of Dairy Science* 101:5428-5433.



## Local anaesthetic and anti-inflammatories provide pain relief for calves during cautery disbudding

Cautery disbudding is a procedure that prevents calves from developing horns by destroying the horn bud at an early stage. The horn bud is destroyed using a hot iron, and when performed without pain relief, is a key welfare issue. Cautery disbudding is the most commonly used method of arresting horn growth in the US and Canada, but full adoption of pain relief methods during this procedure has not been achieved. This may be due to a lack of consistent recommendations provided by research on this topic. This article systematically reviews the research relating to pain relief during cautery disbudding, and the effect of pain relief on pain-related outcomes in calves.

A systematic search strategy was applied to several scientific databases, and over 4000 scientific articles were identified. These articles were screened to ensure that they only related to calves less than 12 weeks old who received cautery disbudding, with no other painful procedures incurred concurrently. Other selection criteria were the use of local anaesthetic or non-steroidal anti-inflammatory (NSAID) pain relief, and the collection of data on cortisol concentration, pain behaviours or

pressure sensitivity of the horn bud. This screening process reduced the number of usable articles to 21. A meta-analysis was performed for all outcomes measured at similar time points for 2 or more studies.

Local anaesthetic was associated with reduced plasma cortisol until 2 hours post-disbudding, and a rise in cortisol at 4 hours post disbudding which was probably due to inflammatory pain when the anaesthetic wore off. The provision of an NSAID in combination with the local anaesthetic prevented this subsequent cortisol rise, and reduced pain behaviours and pressure sensitivity for up to 6 hours. Based on these reductions in plasma cortisol, pain behaviours and pressure sensitivity, the use of local anaesthetic and an NSAID is recommended for best practice pain mitigation during cautery disbudding of calves at 12 weeks of age or less.

Winder CB, Miltenburg CL, Sargeant JM et al (2018) Effects of local anesthetic or systemic analgesia on pain associated with cautery disbudding in calves: A systematic review and meta-analysis. *Journal of Dairy Science* 101:5411-5427.

## MISCELLANEOUS

### Assessing aquatic mammal welfare while assessing differing values and imperfect tradeoffs

Animal welfare assessment is complex and relies on the assessor making a value judgement based on multiple welfare indicators. The assessor's beliefs, attitudes, personal experience and societal values are examples of factors that inform how animal welfare is evaluated. For example, the welfare of companion animals may be valued more than the welfare of production animals, and thus judged differently, despite the capacity of all these animals to suffer. This article reviews the underlying values/attitudes and associated tradeoffs that may influence how the welfare of various aquatic mammals is considered.

Individuals have different values that shape their view of the desirable welfare outcomes for aquatic mammals. The ethical frameworks that underlie these values can be categorised as: instrumental (aquatic mammals are viewed as resources); focused on the interests of individual aquatic mammals; focused on the interests of populations of aquatic mammals; and focused on general ecosystem or ecological interests. In terms of how these welfare outcomes are achieved, individuals can assume one of three value systems: consequentialism (the end justifies the means); duty-

based (doing the 'right' thing), and pragmatism (practical solutions to problems). For example, an individual with duty-based values may find it difficult to accept the use of a cost-effective feed that is not identical to what the animal would eat in the wild, where as a pragmatist would view this compromise as the best feeding solution for aquatic mammals.

The welfare of aquatic mammals can be considered in a variety of settings, such as when used for public performances, research and working settings, sanctuaries, rehabilitation facilities, and free-ranging wild animals. The value system adopted by welfare assessors will determine the acceptability of certain practices used in each setting, such as housing cetaceans in captivity or the commercial harvesting of whales, as well as acceptable rates of morbidity and mortality for each setting. Discordant value systems between people can result in polarised responses rather than a concerted focus on assessing and improving the welfare of aquatic mammals using objective indicators.

Miller DS, Anthony R, Golab G (2018) Assessing aquatic mammal welfare while assessing differing values and imperfect tradeoffs. *Aquatic Mammals* 44:116-141.



## RESEARCH ANIMALS

### **Zebrafish welfare: natural history, social motivation and behaviour**

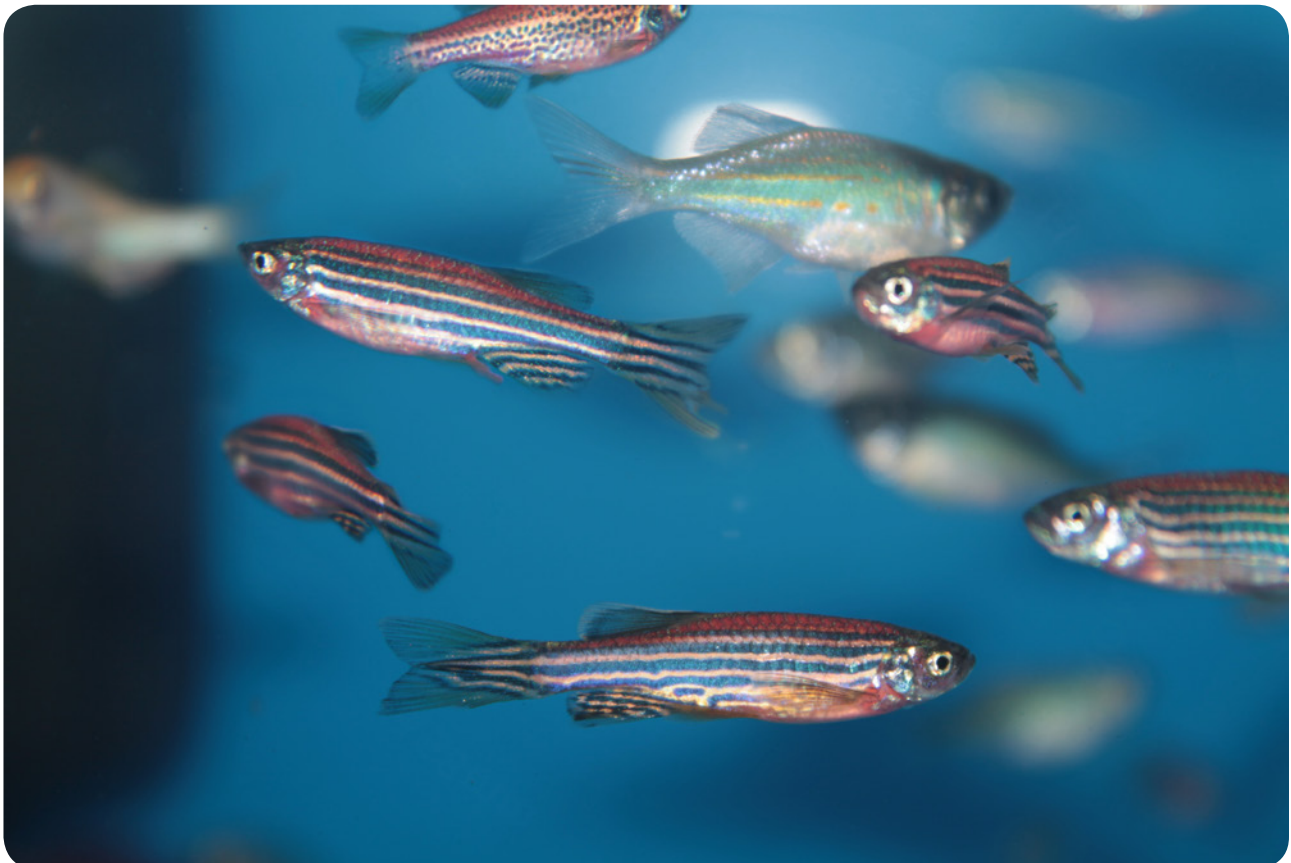
Zebrafish are one of the most commonly used animal species in scientific research, owing to their social nature, fast growth, high reproduction rates, and established genome. Standard laboratory housing for zebrafish involves small barren tanks (3-10L) with high stocking densities (5 fish/L). These impoverished conditions are likely to lead to poor fish welfare and compromise the scientific research that they are used for, as barren environments are known to alter behaviour and cognitive functioning. This article reviews what is known about the natural history of zebrafish, and how their housing conditions can be improved.

Zebrafish are a freshwater species that are native to the Himalayas. They are a social species, but their preferred group size and spacing varies with local conditions. They also form dominance hierarchies, and display exploratory behaviour. It is thus likely that social behaviours are disturbed when housed at high densities, and that zebrafish find a barren environment under stimulating. When zebrafish are housed in much larger tanks (110-1100 L) with substrate, plants and hiding spaces, they have shown previously unreported behaviours for this species (e.g. burrowing a space beneath a plant base, and performing pair-breeding

rather than group-breeding). It seems likely that the behavioural repertoire of zebrafish housed under laboratory conditions is not representative of their full behavioural repertoire. This is concerning, as much of the research that zebrafish are used for relates to changes in their 'normal' behaviour, and this 'normal' baseline may be based on abnormal behaviours. For example, zebrafish prefer dark environments, but some behavioural tests involve placing a zebrafish in a white tank to aid in tracking its movements. Placing a social species into an aversive environment on its own is likely to alter its behavioural response, and the results of these tests may reflect fear rather than the intended variable.

As a highly gregarious species that is often used in the study of many human social disorders and mechanisms, understanding the natural social behaviour of zebrafish is crucial to improving the scientific validity of the research as well as the quality of life of the fish.

Graham C, von Keyserlingk MAG, Franks B (2018) Zebrafish welfare: Natural history, social motivation and behaviour. *Applied Animal Behaviour Science* 200:13-22.





## A retrospective harm benefit analysis indicates that the benefits of animal research do not outweigh the harms for six interventions

In the UK, a harm benefit analysis (HBA) is a legal requirement for animal research, in which the anticipated suffering of the animals is weighed against the anticipated benefit to humans. Recently, the effectiveness of the HBA in protecting animals has come under doubt due to a lack of transparency, systematic procedures and accountability. This study conducted a retrospective HBA on six different types of medical interventions to determine whether the harm imposed on the animals actually led to benefits for humans.

This study was based on a similar study conducted in 2007 that identified six medical interventions for which adequate scientific literature was available to assess the impacts on both animals and humans. The 2007 study was conducted sufficiently long ago that the outcomes for human medicine could now be determined. The six interventions were: corticosteroids for brain injury, antenatal corticosteroids for neonatal respiratory distress, bisphosphonates for osteoporosis, antifibrinolytics for haemorrhage, thrombolytics for stroke, and Tirilazad for stroke. All published, controlled studies for these interventions were examined for methodological quality, the number of animals used, the specific procedures performed on the animals, and any information provided on animal

welfare. An expert panel of welfare scientists and veterinarians then rated the severity of each procedure in terms of animal suffering. The severity of the harms imposed on the animals was then compared to the benefits of this research to human medicine using the scientific literature.

Over 27,000 animals were used in the 212 studies examined, and the majority of studies involved 'severe' animal suffering. The reported use of analgesics was rare (despite some animals undergoing significant procedures), many animals were kept alive for prolonged periods without post-operative care, and the methods used for killing some animals would no longer be considered acceptable. The methodological quality of all studies was poor, and only one intervention (bisphosphonates) was associated with benefits to human medicine. It was concluded that the regulatory systems in place to protect animals have failed, and there is an urgent need to review the regulations and processes involved in determining whether an animal study is justified.

Pound P, Nicol CJ (2018) Retrospective harm benefit analysis of pre-clinical animal research for six treatment interventions. PLOS One 13:e0193758.

## WILD ANIMALS

### Sterilisation of kangaroos using keyhole surgery

Over-abundant kangaroo populations in urban areas must be managed to reduce conflict with humans. Culling and baiting are no longer considered acceptable in these settings, and fertility control offers a more acceptable method of reducing population size. Surgically sterilising female kangaroos offers the greatest benefits for population management as it is a single procedure that causes permanent sterilisation. In comparison, chemical sterilisation requires the kangaroos to be periodically re-captured to replace the hormonal implants, and as kangaroos are particularly susceptible to capture-related stress and myopathy, a sterilisation method that involves a single capture is preferred. This study describes a rapid method of surgically sterilising female kangaroos in the field using keyhole (laparoscopic) surgery.

Free-ranging kangaroos living in an enclosed 1545-ha site in Sydney, Australia, were used in this study. The kangaroos were caught by herding them into a series of smaller yards, and the females darted with anaesthetic to allow capture. These females were inspected for health and body condition, after which keyhole surgery was performed to remove both ovaries. Following recovery, the kangaroos were released into a safe yard for one week to allow

regular post-operative inspections and protection from predators. After release from the safe yard into the home range, the deaths of all kangaroos were monitored for 60 days. A total of 1409 female kangaroos were sterilised in this manner over an eight-year period.

The surgical technique used in this study was considered very successful. The small incisions used were less invasive, did not damage the pouch, and needed no post-operative care, unlike the single large incision (laparotomy) used for standard abdominal surgery. In fact, of the 1409 kangaroos sterilised, only one case of post-operative infection was recorded. The mortality rate was also low, with a total of 30 kangaroos (2.13%) dying from direct or indirect surgery related causes, such as failing to recover from anaesthesia. This surgical technique was easily adapted for juveniles, with kangaroos as small as 1 kg being successfully sterilised. In conclusion, this surgical technique provided a rapid, safe and effective method of permanently sterilising female kangaroos.

Colgan SA, Green LA (2018) Laparoscopic ovariectomy in eastern grey kangaroos (*Macropus giganteus*) and red kangaroos (*Macropus rufus*). Australian Veterinary Journal 96:86-92.

## Short and long-term effects of tourism on seal and sea lion behaviour

Wildlife tourism provides a sustainable economic activity that can increase conservation awareness among tourists and prevent other unsustainable uses of wildlife and the environment. However, exposure to humans can be aversive for wildlife, and ideally wild populations would habituate to the presence of tourists and decrease their behavioural response to them. This study investigated the behavioural responses of seals and sea lions to tourist approaches over short- and long-term periods.

A colony of seals and sea lions at a small coastal town in Uruguay was observed in 1996 and 2014. During the summer period, the population of this town increased from 95 to around 30,000 tourists. Tourists had unrestricted access to the seal colony, and often approached the seals when they were seeking refuge on a rocky outcrop. A wire fence was erected around part of the colony in 1997, but this fence only excluded tourists from part of the colony, and the exclusion zone was not enforced. During each observation period, the behaviour of the tourists as they approached the seals was categorised as calm, intermediate or intense, and their proximity to the seal was recorded. The behavioural response of the

seal being approached was categorised as either at rest, being alert, threat response, showing retreat or leaving the beach. The behaviour of the tourists was compared to the response of the seals in the short-term (spring vs summer 2014) and over the long-term (spring 1996 vs spring 2014).

The behaviour and proximity of the tourists influenced the response of the seals to human approach. The seals showed less avoidance behaviour toward humans if they acted in a calm manner. The seals showed a decrease in avoidance behaviour as the 2014 season progressed, suggesting that the population may have started habituating to the presence of the tourists. When seal behaviour was compared between 1996 and 2014, the level of avoidance behaviour shown by seals almost tripled in 2014. The authors attributed this to the presence of the fence, which may have concentrated tourist approaches in the non-fenced areas, or interfered with the habituation process.

Corral CT, Szteren D, Cassini MH (2018) Short- and long-term changes in the intensity of response of pinnipeds to tourist approaches in Cabo Polonio, Uruguay. *Applied Animal Behaviour Science* 201:111-116.



## Anthropogenic impacts on the welfare of wild marine mammals

The marine environment has been altered by humans to such an extent that the animals living in it are regularly exposed to pollution, marine debris, and human disturbance. The majority of research involving wild marine mammals (cetaceans and pinnipeds) has focused on population level disturbances that may impact the conservation status of these species, rather than the welfare impacts on individual animals. This article reviews the impact of anthropogenic effects on marine mammal welfare.

Noise pollution caused by shipping engines, sonar and seismic surveys reduces the ability of marine mammals to communicate and catch prey using echolocation, and prolonged exposure may cause hearing loss. Chemical pollutants can bioaccumulate in marine mammals, and have been associated with endocrine disruption, impaired health and reduced reproduction. Plastic pollution can be mistaken for food and ingested, leading to gastric blockages, internal injuries, starvation and toxicity due to chemical leaching.

Entanglement in fishing gear or marine debris can cause suffocation and/or decompression sickness due to being trapped deep underwater in fishing nets, and injuries due to lacerations and constriction. Animals

that become entangled in loose debris may suffer for months before succumbing to exhaustion, starvation, chronic wounds, and infection. Fisheries may use acoustic deterrents or lethal culling methods to reduce the number of marine mammals that compete for their fishing stocks. Animals that are hit by boats may take many days to die from these injuries. High levels of boat traffic and tourism harassment can pose a chronic stressor due to repeated disruption of feeding, resting and socialising. Whale and seal hunting is considered to pose less of a threat to welfare than other anthropogenic disturbances, but can harm welfare if it involves a prolonged pursuit or a non-instantaneous death. Climate change is causing rapid changes in prey availability, increased exposure to thermal extremes, storms, and human encroachment into arctic areas. Research can also harm welfare when tissue samples are taken or tags are attached to animals without pain relief. In conclusion, marine mammal welfare is impacted by many anthropogenic influences, and humans have the capacity and responsibility to find solutions to these problems.

De Vere AJ, Malin MK, Frick EE (2018) Anthropogenic impacts on the welfare of wild marine mammals. *Aquatic Mammals* 44:150-180.

## Who cares for the wellbeing of Australian wildlife carers?

Road traffic presents a threat to wildlife, and it is estimated that at least 4 million Australian mammals are killed on the roads every year. The road deaths of female marsupials creates an estimated 500,000 orphans per year, of which approximately 50,000 are rescued and raised by wildlife carers. The calculations for these estimates are provided below. Raising and caring for wildlife takes an emotional and financial toll on wildlife carers, and this article reviews the impact of this commitment on these volunteers, and estimates the scale of roadkill deaths in Australia.

The number of roadkill deaths per year (4 million) was estimated by multiplying the published rates of roadkill per km by the number of kilometres of roads in Australia. One study reported that 14% of pouch young survived the impact of a traffic collision, and the number of orphaned young created by roadkill each year was estimated at 14% of 4 million (560,000). The number of orphaned animals that were rescued each year was estimated using the quantity of milk replacement powder sold in Australia, and the number of registered wildlife carers (over 15,000). It was estimated that raising one orphaned joey to releasable

age costs \$2000 and takes 1000 hrs of care. Placing a value of \$31/hr on this work equates to a financial input by wildlife carers of approximately \$6 billion/year.

In addition to the cost and time needed to raise orphaned wildlife, this duty significantly impacts the health and psychological wellbeing of wildlife carers. They experience sleep deprivation due to night time feeds, and are exposed to multiple zoonoses. The continual exposure to grief and animal suffering can lead to compassion fatigue and eventual burn out in wildlife carers. The number of wildlife carers in Australia is decreasing as the number of roadkill increases. Wildlife carers are a strategic national asset, and need to be acknowledged and supported if their health and the public service they provide is not to be compromised.

Englefield B, Starling M, McGreevy P (2018) A review of roadkill rescue: who cares for the mental, physical and financial welfare of Australian wildlife carers? *Wildlife Research* 45:103-118.



## Fertility control alone is not a viable method of controlling wild horse populations

Australia has the largest population of wild horses in the world, and they are considered a pest species due to the negative impact they have on the environment. Their population can be managed immediately through culling, or by capture for rehoming or euthanasia, but lethal methods are vehemently opposed by some sections of the community. Fertility control is considered a more acceptable method, and this article reviews the current feasibility of this approach in managing wild horse populations in Australia.

Fertility can be inhibited in female horses through remote delivery (dart) of immunocontraceptive vaccines. These vaccines cause an immune response that attacks the reproductive tissues and causes infertility for several years. Targeting females is more effective than targeting males, as a small number of non-treated males can still impregnate many females. Immunocontraceptive vaccines are safe and effective for horses, with little impact on horse welfare. There is some stress associated with human proximity and being shot with a dart, but there are very few adverse reactions and post-treatment care is not needed. The associated hormonal changes do not appear to alter horse behaviour, and the body condition of females improves due to the absence of pregnancy and lactation.

In terms of the feasibility, fertility control as a stand-alone method is only suitable when it is targeted at small, closed populations (e.g. on an island). In open populations, fertile horses are free to enter the group, negating any fertility control that has been applied previously. In addition, the wide range and mountainous habitat of wild horses in Australia means that vaccinating an adequate proportion of the population is very difficult. In conclusion, fertility control alone will not reduce the population size of wild horse populations over 10 years and will not effectively stop population growth unless >50% of females are vaccinated concurrently every 2-4 years. An integrated management approach that includes other methods of population control is considered the only feasible method of reducing wild horse populations in these conditions.

Hobbs RJ, Hinds, LS (2018) Could current fertility control methods be effective for landscape-scale management of populations of wild horses (*Equus caballus*) in Australia? *Wildlife Research* 45:195-207.



## Promoting human-dingo co-existence in Australia through non-lethal control methods

The dingo is Australia's largest terrestrial carnivore, and is known to predate on livestock such as sheep and calves. Prevention measures involve exclusion fencing and lethal control, such as baiting, trapping and shooting, at an estimated cost of over \$15 million / year. Despite the time and effort invested in killing dingoes, lethal control methods are ineffective in the long term due to population migration. This article discusses the opportunity to develop non-lethal control methods whereby dingoes can co-exist with livestock.

Dingoes live in social groups within defined territories, and will exclude other dingoes and predators (such as foxes) from this area. In addition, dingoes can promote sustainable pasture management by regulating the populations of other herbivores, such as kangaroos and rabbits, who contribute to grazing pressure. It appears that livestock are not the preferred prey species of dingoes, and dingoes could be discouraged from attacking livestock through a number of methods. Exclusion fencing is of vital importance, and this can be enhanced by creating an artificial dingo territory around the livestock using non-resident scent marks and audio playbacks of howling. The resident dingoes are likely to avoid this area as it will be

perceived as the territory of another pack. Radio and GPS collars can be used to monitor their movements, and electric shock collars could be used to train dingoes to avoid livestock. One of the most effective methods of deterring dingoes is the use of guardian dogs that live with the livestock and protect them from attack, and sheep predation was reduced from 15% to <4% on one farm following the introduction of guardian dogs.

In addition to the deterrent measures described above, the dingoes should also be provided with a 'safe' core territory that is more attractive than the area near the livestock. This territory should have abundant prey and be devoid of human disturbance. The combined use of the measures described above has great potential to deter dingoes from attacking livestock, and are likely to be more effective than the currently used lethal control measures.

Smith BP, Appleby RG (2018) Promoting human-dingo co-existence in Australia: moving towards more innovative methods of protecting livestock rather than killing dingoes (*Canis dingo*). *Wildlife Research* 45:1-15.







## RSPCA Animal Welfare Seminar 2019

Save the date! RSPCA Australia's 2019 Animal Welfare Seminar will be held on Friday 22 February 2019 at the Alastair Swayne Theatre at Canberra Airport.

Call for abstracts: RSPCA Australia is calling for submissions for oral presentations relating to the Seminar's key themes:

- Selective breeding for improved production – impacts on welfare of farm animals
- Traditional breeding – e.g. mules-free Merinos, slower-growing broilers
- Marker-assisted breeding – e.g. polled beef cattle
- Gene editing – e.g. hornless dairy cattle, in-ovo sex determination
- Cellular agriculture – e.g. egg-free egg white, cow-free milk, in vitro meat
- Genetics and ethics – e.g. what implications do gene technologies have for animal welfare
- Genetics and consumers – e.g. consumer/retailer acceptance of products resulting from gene technologies
- General – traditional breeding, gene editing, CRISPR, etc: what's it all about?
- General – gene technology and animal welfare: the dos and don'ts
- General – genetic selection for temperament, robustness, mothering ability, etc

Find out more here [rspca.org.au/facts/science/animal-welfare-seminar/2019](http://rspca.org.au/facts/science/animal-welfare-seminar/2019)

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## RSPCA Australia Scholarships 2018

RSPCA Australia now invites applications for the 2018 RSPCA Australia Scholarships. The three scholarships seek to encourage students to take an active interest in animal welfare issues, to support animal welfare research that might not otherwise attract funding, and to promote the objectives of the RSPCA within the research community. Applications close on Friday 28 September 2018. More information, including application forms, can be found here: [rspca.org.au/facts/students/scholarships](http://rspca.org.au/facts/students/scholarships)



## New report on domestic cat management released

In May 2017, RSPCA Australia released a draft Discussion Paper on best practice domestic cat management for public consultation. After further development and consideration of feedback from various interest groups across Australia, the final report has now been released – Identifying Best Practice Domestic Cat Management. The report contains 21 recommendations which focus on aspects including mandatory desexing, inconsistency in legislation, benefits from collaboration between councils and rescue groups, and the urgent need for universal adoption of definitions for feral and domestic cats.

The full report and accompanying documents are now available via the RSPCA Australia Knowledgebase:

- [The full report – Identifying Best Practice Domestic Cat Management in Australia](#)
- [Response to public consultation on the Discussion Paper](#)
- [Summary of findings and recommendations](#)

You can also access these three documents through the RSPCA Australia Knowledgebase article - [How can we best manage domestic cats in Australia?](#)



## ARTICLES OF INTEREST

### ANIMALS USED FOR SPORT, ENTERTAINMENT, RECREATION AND WORK

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## HUMANE KILLING

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