



The aim of the animal welfare science update is to keep you informed of developments in animal welfare science relating to the work of the RSPCA. The update provides summaries of the most relevant scientific papers and reports received by the RSPCA Australia office in the past quarter. Email science@rspca.org.au to subscribe.

ANIMALS IN RESEARCH AND TEACHING

Use of animal-free methods to develop a treatment for COVID-19

SARS-CoV2 is the virus responsible for causing the COVID-19 pandemic, which has spread to over 100 countries worldwide. This virus continues to be a serious threat for human health until a treatment or vaccine becomes available. In the past, animal testing has been used to develop drugs and vaccines for humans. However, these methods have negative effects on animal welfare, are slow to develop and are ineffective when the virus is species-specific. Therefore, new (animal-free) approach methods (NAM) have been developed to test new treatments and vaccines.

This study provides an overview of NAM that can reduce drug development times and identifies four drug and vaccine testing strategies that may be accelerated by using NAM. These testing strategies are drug efficacy (is effective in treatment or prevention), safety (no negative side effects), quality (high and consistent) and target discovery (clear target).

Drug efficacy and safety can be achieved by developing drugs and then testing them on three-dimensional organ constructs using human cells developed through bioengineering and stem cell technology. Furthermore, quality of vaccines can be tested without the need to infect animals by using non-animal batch release tests. Drug development times can be shortened by repurposing existing (approved) drugs that have known targets. Overall, this overview highlights the possibility of using NAM approaches to accelerate the search for COVID-19 treatments.

Busquet F, Hartung T, Pallocca G et al (2020) Harnessing the power of novel animal-free test methods for the development of COVID-19 drugs and vaccines. *Archives of Toxicology* 94(6):2263–2272.

ANIMALS USED FOR SPORT, ENTERTAINMENT, RECREATION AND WORK

Benefit of free movement on the welfare of sport horses

In natural conditions, horses are accustomed to slow and constant movement while looking for food and grazing. Currently, most sport horses are kept in individual stalls, sometimes up to 20 hours per day, when they are training or competing. Individual stalls are preferred to paddocks due to perceived less agitation and lower risk of injuries to horses. Previous research has shown that a few hours of daily exercise is insufficient for horses. Individual stalls also limit social interactions with other horses, which is an important natural behaviour.

This study aimed to evaluate the feasibility and potential impact of allowing horses housed in individual stalls to have daily access to a paddock. The study included 29 horses in two experiments: the first assessed habituation of horses to free movement and the short term impact on welfare whilst the second evaluated the effect of the time in the paddock and long term impact after daily free movement sessions ceased. Horses were released once per day to a

paddock for 39 to 62 minutes, where they could see other horses but with no physical contact. Blood hormones (oxytocin and serotonin) associated with emotional state were measured and behaviour was recorded.

The results showed that horses with no previous access to paddocks rapidly became accustomed to free movement. It also showed that providing access to paddocks improved horses' welfare as stereotypical behaviours (e.g. wind sucking, crib biting etc) decreased and oxytocin levels increased, indicating a positive emotional state. However, when horses were returned to their stalls, blood oxytocin levels and stereotypic behaviours returned. Overall, the findings of this study indicate that confined sport horses can benefit from having access to free movement and that it is essential for promoting good welfare.

Lesimple C, Reverchon-Billota L, Galloux P et al (2020) Free movement: A key for welfare improvement in sport horses? *Applied Animal Behaviour Science*, 104972.

Mouth pain in sport horses

Mouth pain in horses is an important welfare issue. Mouth pain caused by the bit can be due to compression, injuries, restricted blood flow and stretching of tissues. Although many horses show signs associated with mouth pain, there is a common misconception among many people in the equine sport industry that horses are free of bit-related mouth pain. Mouth pain in horses is not well understood. This study reviews existing literature on mouth pain due to the bit, explores mechanisms causing the pain and examines the effect on horse welfare.

Bit-induced mouth pain has a negative effect on the welfare of horses. In addition to pain, some horses experience fear and anxiety as the bit is fitted. Greater

rein tension was associated with more pain, more lesions and longer healing times. Certain pain-related mouth behaviours impede airflow and can have a negative effect on breathing patterns which, in turn, causes breathlessness leading to further anxiety and fear.

The findings of this review and analysis show that mouth pain caused by the bit poses a serious welfare risk for sport horses and strategies for promoting bit-free bridles are provided to help resolve this issue.

Mellor D (2020) Mouth pain in horses: Physiological foundations, behavioural indices, welfare implications, and a suggested solution. [Animals, 10\(4\), 572.](#)

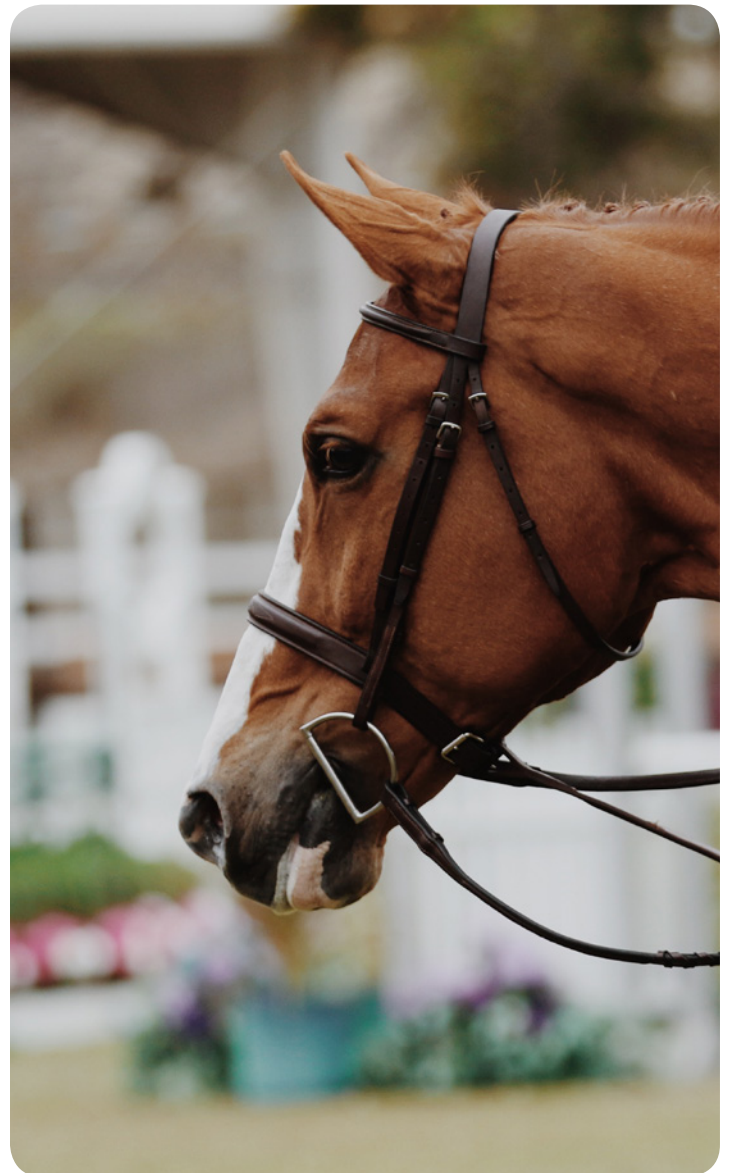
Use of nosebands in horses

Nosebands are routinely used in equestrian sports to keep horses from opening their mouths and displacing the bit. Nosebands can also be attached to the reins so the rider can easily steer the horse and reduce speed, although the specific use will vary across different sports. However, tightly fitted nosebands can be harmful as they can cause lesions to the mouth and restrict the horse from performing normal behaviours such as lip-licking, chewing, yawning and swallowing. This study explores the types of nosebands that owners, riders and trainers use on horses in training and competition and their reasons for selecting these nosebands.

This Australian study involved a survey of 3,040 people involved in equestrian sports. Respondents were asked to describe their activity with horses, whether they use nosebands, how often they use nosebands, type of noseband used, whether they tighten the nosebands for competitions and if the noseband had the desired effect.

The study found that 2,332 of the respondents use nosebands. 20% of the respondents use nosebands to prevent the horse's tongue moving over the bit, another 20% stated their use improves the horse's appearance whilst 30% of respondents use them because it is a requirement of the rules of the sport. Complications with nosebands, such as behavioural difficulties or lesions, were reported by 18% of respondents. Overall, these findings help to understand the use of nosebands and identify the risks for horses involved and can be used for future research and equestrian sport regulations.

Weller D, Franklin S, Shea G et al (2020) The reported use of nosebands in racing and equestrian pursuits. [Animals, 10\(5\), 776.](#)



COMPANION ANIMALS

Understanding cats' preferences: Indoor cats prefer covered over uncovered litter boxes

In developed countries, pet cats are commonly kept indoors, with limited or no access to outdoor areas. Indoor cats must use litter boxes to urinate and defecate but if cats do not like their litter box, they may urinate or defecate in inappropriate places, which is a concern for cat owners, a common reason for veterinary consultations and a reason why cats are surrendered to shelters. Thus, providing cats with litter boxes that meet their needs is imperative, but the importance of an appropriate litter box is usually underestimated.

This French study investigated cats' litter box preferences in desexed cats kept indoors with no access to outdoor areas in a single pet household. Two trials were conducted each lasting 28 days; the first involved 13 cats in which cat owners placed two litter boxes (one covered with no door and one uncovered) side by side in the same room. The litter boxes were of equal surface size. The second trial involved 12 cats

with a similar protocol, but this time the uncovered litter box had a smaller surface area compared to the covered litter box. Every day, the presence of faeces and/or urine in the litter boxes was recorded.

Results from this study indicated that cats have a clear litter box preference and maintain that preference over time. Cats utilised the covered litter boxes significantly more than small-size uncovered litter boxes, and their choice was not influenced by sex nor by the type of litter box used before the study. This study indicates that most cats preferred covered litter boxes rather than uncovered litter boxes and cat owners should consider this information when selecting a litter box for their cats.

Beugnet V, Beugnet F (2019) Field assessment in single-housed cats of litterbox type (covered/uncovered) preferences for defecation. *Journal of Veterinary Behavior* 36:65-69.



Preventing predatory behaviour in greyhounds

Greyhounds can become good companion animals after their racing career is over. One of the behavioural issues that keeps some greyhounds from being adopted is predatory behaviour. Predatory behaviour is when greyhounds chase smaller animals such as rabbits or cats. Greyhound adoption programs find appropriate homes for greyhounds who need and are suitable for adoption. However, most adoption programs have limited resources and funding. It is currently unclear if greyhounds who show predatory behaviour can be rehabilitated to adequately reduce their predatory drive. This study explores the potential for greyhounds who show signs of predatory behaviour from repeating this behaviour in the future.

The study included a 23-question online survey of 84 dog training and behaviour experts with 12 of these experts participating in follow up interviews. The respondents (from Australia, UK/Ireland and USA) agreed that predatory behaviour is not associated with aggressiveness and can even be related to play. Respondents also agreed that greyhounds can be

taught early in life to be friendly to small animals by being rewarded for not chasing them. Respondents who use positive, reward-based training methods were less inclined to believe that predatory behaviour could be resolved compared to those who used both aversive and reward-based methods. However, there was consensus that dogs who have shown predatory behaviour can still be adopted if the new owners carefully manage the environment so that the dogs are not exposed to conditions which would elicit predatory behaviour.

Overall, this study suggests that dogs who show predatory behaviour can still be suitable for adoption if their environment is managed appropriately.

Howell T, Bennett P (2020) Preventing predatory behaviour in greyhounds retired from the racing industry: Expert opinions collected using a survey and interviews. *Applied Animal Behaviour Science*, 104988.

A review of methods for managing cat populations in remote Australian Indigenous communities

Cat populations are rising in remote indigenous communities in Australia. In these communities, the cat-human relationship is seen as one of companionship, rather than ownership. Thus, the cats' right to roam free is perceived to be important. However, free-roaming cats can have negative impacts on biodiversity through predation and transmission of diseases. To inform future strategies, the aim of this study was to review the global cat population management practices that could potentially be implemented in remote indigenous communities.

This study involved a systematic review. The following search terms were entered in the Google Scholar search tool: "cat" OR "feline" AND "population management" OR "population control" AND "owned" OR "semi-owned" OR "community" OR "free roaming." To determine current practices, the filter "since 2015" was also used. A total of 13 articles were deemed relevant out of the 987 articles found. The relevant articles were divided into two separate categories, field work (n=8) and simulations (n=5). Following the systematic review, three methods were found to be the most common and effective strategies used to control cat populations. The first method

was Surgical Sterilisation (SS). This method requires owned cats to be transported to a facility for surgical sterilisation after which the cats are returned to their home. The second method is Trap-Neuter-Release (TNR) which involves trapping, desexing and returning cats (usually unsocialised cats) to where they are living. The third method, Trap-Remove (TR), involves trapping and removing social cats via adoption and unhealthy cats via euthanasia.

The main findings of this review indicate that a combination of long-term TNR/SS programs combined with TR, provides the most humane strategy to manage cat populations in remote Indigenous communities in Australia. Further research investigating the feasibility of implementing these methods needs to occur, and cultural differences need to be carefully considered and integrated to achieve a sustainable management strategy.

Kennedy B, Cumming B, Brown WY (2020) Global strategies for population management of domestic cats (*Felis catus*): A systematic review to inform best practice management for remote Indigenous communities in Australia. [Animals 10\(4\): 663](#).

Incidence and management of post-operative respiratory complications in brachycephalic dogs

Brachycephalic dog breeds (those with very short muzzles) such as British Bulldogs, Boston Terriers, Pugs and Pekingese are common pets. However, they suffer from anatomical abnormalities which cause upper respiratory tract obstruction called brachycephalic airway syndrome (BAS). Common anatomical abnormalities in these breeds include stenotic nares (narrow nostrils), elongated soft palate and hypoplastic (underdeveloped) trachea. Respiratory tract obstruction is very common in these dogs so veterinarians highly recommend surgical correction of components of BAS to improve the health and welfare of affected dogs. The aim of this study was to describe the incidence of respiratory complications in brachycephalic dogs and common management strategies for post-operative respiratory complications.

This study used retrospective medical record data from 248 brachycephalic dogs treated surgically for BAS in a private US veterinary hospital. The data collected included demographic information, procedures performed, post-operative complications and treatment implemented, hospitalisation time, and need for further surgery.

The most common breeds treated surgically for BAS at the study hospital were Pugs, Cavalier King Charles Spaniels and British Bulldogs. The study population was made up of 48.4% males, 51.6% females with an age range of 31 days to 15.8 years. The most common abnormality identified and treated surgically was an elongated soft palate, but many dogs had additional abnormalities.

Post-operative respiratory complications were observed in 58 dogs (23.4%). These complications included: dyspnoea (shortness of breath), aspiration and respiratory or cardiac arrest. The overall mortality rate was 2.4% ($n = 6$). Age and concurrent airway pathology significantly predicted the development of post-operative complications. Dogs who developed post-operative complications were significantly older than those who did not, and the odds of developing complications increased (1.15 times) with each year of age. It was recommended that surgical intervention for BAS symptomatic dogs should be considered at an early age as an elective procedure to reduce the risk of post-operative complications. Due to the number of post-operative complications observed, close monitoring for a minimum of 24 h following surgery by an experienced veterinarian or veterinary technician is advised.

Lindsay B, Cook D, Wetzel et al (2020) Brachycephalic airway syndrome: management of post-operative respiratory complications in 248 dogs. [Australian Veterinary Journal 98\(5\):173-80](#).



The following article is authored by an RSPCA Alan White Scholarship 2018 recipient

Understanding dog-human relationship in Australian Aboriginal communities to inform dog management strategies

Canids have had an important relationship with Aboriginal people in Australia since the arrival of dingos, some 5000 years ago. Domestic dogs are often found in Australian Aboriginal communities (65% of households report owning at least one dog). However, dog population management is very challenging, particularly when veterinary services are unavailable or unaffordable, common circumstances in Australian Aboriginal communities. This study aimed to better understand the role of dogs in Aboriginal communities and the barriers to owners accessing veterinary services for their dogs.

The study involved a questionnaire, which was delivered as a semi-structured interview. The questionnaire consisted of three sections: (1) relationship with your dog; (2) dogs in the community; and (3) dogs and your house. Participants had to be dog owners living in Aboriginal communities across NSW, Australia and they had to be involved in the RSPCA's Indigenous community companion animal health programs. A total of 85 dog owners, from nine Aboriginal communities across NSW, completed the questionnaire.

This is the first study investigating relationships with dogs in Aboriginal communities in NSW. The findings indicated that dogs are considered an important part of family and community life. Most dogs were kept for companionship (84.7%) and/or as guard dogs (45.9%), and they were usually allowed indoors (63.4%). All respondents considered their dog a family member. Respondents stated that they want their dogs to have the same quality of life that they do and want their dogs to be free; freedom was considered an important aspect of the dogs' rights. However, the findings of the study suggest that low standards of dog health and welfare have been normalised in some communities and community engagement with basic veterinary services was low. Many respondents identified cost, access to transport and distance from vet clinics as main barriers to accessing veterinary care, highlighting the challenges of managing the dog population among these communities.

Ma GC, Ford J, Lucas L et al (2020) "They reckon they're man's best friend and I believe that." Understanding relationships with dogs in Australian Aboriginal communities to inform effective dog population management. [Animals 10\(5\): 810](#).



Cat desexing policies and activities in Queensland veterinary practices

Overpopulation of cats is a significant animal welfare concern globally. If cats are not desexed prior to puberty, this can result in the production of large numbers of unwanted kittens. Therefore, pre-pubertal desexing (PPD) is an important component of cat population management. Veterinarians are a key source of information for cat owners and play a key role in educating owners and promoting PPD in cats. The aim of this study was to investigate ways that veterinary practices promote desexing of cats and perceptions of their effectiveness.

This study was conducted in Queensland and involved an online questionnaire distributed to 517 Queensland veterinary practices. The questionnaire consisted of 12 questions on the role of veterinarians in helping to reduce cat overpopulation, the recommended age that cats be desexed, the average actual age that cats are desexed at the practice, what steps the practice takes to promote desexing, and how successful these are perceived to be.

Desexing at the age of 6 months (later than puberty in most cats) was recommended by 45% of participants. In 30% of the practices, cats were desexed after 6

months, usually after having a litter. Most practices take several steps to encourage their clients to have their cats desexed, including 1) discussing desexing at vaccination appointments and 2) suggesting desexing at the cat's final vaccination. The most common barriers to desexing cats perceived by practitioners were cost, desexing not being considered a priority by owners, beliefs that it is best to allow the cat to have a litter before desexing and perceptions that the operation is dangerous.

The findings of this study indicate that, while veterinarians agree that cats need to be desexed before having their first litter, desexing of cats is usually performed after puberty and often after a cat had already had a litter of kittens. Thus, it is important to increase the proportion of veterinarians both recommending and conducting PPD.

Paterson M, O'Donoghue M, Jamieson P et al (2020) The cat desexing policies and activities of private veterinary practices in Queensland. [Animals 10\(5\): 841](#).

Is it safe to feed your dog a raw meat-based diet?

Lately it has become increasingly popular among dog owners to feed their dogs raw meat-based diets (RMBD) (may also be called bones and raw food or biologically appropriate raw food [BARF] or raw animal products [RAP]). RMBD can be home-made or commercially made and do not undergo any form of heat treatment before chilling or freezing. Dog owners have been reported to choose this type of product because they believe that it represents a fresh and natural diet that will be healthier for their dogs. However, as the RMBD does not undergo heat treatment, there is concern that it will contain many pathogens that potentially cause diseases in animals and humans, and antibiotic resistant bacteria.

This study was conducted by researchers from the Swedish University of Agricultural Sciences in Uppsala, Sweden. The aim of the study was to investigate the difference in bacterial population in faeces of dogs fed RMBD and dogs fed dry food. Dog owners from Uppsala, Sweden were asked to send in their dog's faeces for analysis. Samples from 50 dogs were

collected and analysed, 25 dogs fed RMBD and 25 dogs fed a dry diet. Faecal samples were analysed for *Salmonella*, *Campylobacter* and *E. coli*.

Overall, faeces from dogs fed RMBD contained more bacteria that cause diseases in humans and more antibiotic resistant bacteria compared to faeces from dogs fed a dry diet. For example, *E. coli* was found in 13 samples from the dogs fed RMBD and only in one sample from the dogs fed a dry diet. It is concluded that faeces from dogs fed RMBD could represent a considerable risk of transmission of bacteria to other animals and humans. Therefore, if feeding RMBD, great care and strict hygiene should be used when handling the RMBD. Furthermore, it is recommended that families with children or people with compromised immune system should not feed RMBD to their dogs.

Runesvärd E, Wikström C, Fernström L et al (2020) Presence of pathogenic bacteria in faeces from dogs fed raw meat-based diets or dry kibble. *Veterinary Record* doi:10.1136/vr.105644.

FARM ANIMALS

Effect of different housing systems on duck welfare

Ducks grown commercially for meat are most commonly housed in indoor housing systems without water access, that are designed to be highly efficient and low cost. However, it has been argued that housing systems without water access do not provide ducks a high level of welfare. Research has demonstrated that providing ducks with open water access has a beneficial effect on both the welfare and health of ducks.

The study was conducted in Egypt and aimed to compare the impact of different housing systems on duck productivity, health, welfare and meat quality. The study involved 300 day-old Pekin ducklings reared in four different housing systems: indoor house (shed), indoor house with an outdoor yard, indoor house with a swimming pool, and indoor house with a swimming pool and an outdoor yard.

The study showed that ducks with access to a swimming pool had higher body weights and utilised feed more efficiently than ducks housed without swimming pool access. Ducks with access to an outdoor yard and/or swimming pool also showed more muscle, less fat and stronger immune systems than ducks in closed indoor housing systems. The overall findings of this study suggest that the provision of an outdoor yard and/or swimming pool may improve duck welfare, productivity and health.

Abo Ghanima M, El-Edel M, Ashour E et al (2020). The influences of various housing systems on growth, carcass traits, meat quality, immunity and oxidative stress of meat-type ducks. [Animals 10\(3\), 410](#).



Is corticosterone concentration in eggs an indicator of welfare in laying hens?

There is increasing public concern over the welfare of intensively farmed animals such as laying hens housed in conventional cages. The welfare of laying hens can be measured by evaluating behaviour or health as well as physiological parameters such as hormone concentrations in blood. Elevated level of corticosterone has been used in research as an indicator of stress and poor welfare in birds. However, the handling of birds to collect the required blood samples can be stressful which can unintentionally increase corticosterone making sample results difficult to interpret. A suggested alternative to address this problem is to measure corticosterone in the egg albumen as an indirect indicator of stress in laying hens.

The study was conducted at The University of Technology in Sydney using a laboratory technique called high-pressure liquid chromatography (HPLC) coupled with mass spectrometry (MS) to measure corticosterone concentration in egg albumen. Eggs from hens in caged housing systems were collected within a few hours of lay and the egg albumen was

separated, frozen and analysed for corticosterone concentration to identify stress levels of laying hens.

The results showed corticosterone level in egg albumen to be barely above the level of detection, whereas other hormones such as progesterone and cortisol were measured in significant concentrations. These hormones are known to cross react with anti-corticosterone antibodies, which could explain the previous high levels of corticosterone that were found in studies using immunoassay (a procedure that measures antibodies) of the egg albumen. Overall, the findings of the study suggest that because corticosterone level in egg albumen is negligible, it should not be used as an indicator of welfare in laying hens.

Caulfield M, Padula M (2020) HPLC MS-MS analysis shows measurement of corticosterone in egg albumen is not a valid indicator of chicken welfare. [Animals 10\(5\), 821](#).

Special issue of *animals*: "Perspectives on physiological measures of animal welfare in chronic conditions"

"Measures of animal welfare often include assays of physiological factors, such as levels of adrenal hormones (cortisol, corticosterone) and other hormones such as oxytocin, blood cells, proteins, heart-rate, respiration rate, immune system effects, and a range of brain changes. Physiological measures can be valuable welfare indicators, especially for short-term welfare problems, providing interpretation includes reference to other measures and relevant context. However, some physiological measures give little information about how poor welfare is over the long-term, for example during long-term confinement, or about how good the welfare of the individual is. Furthermore, it is important to understand what changes in physiological measures tell us about the efficacy of coping attempts. What changes are of real significance to the animal?"

Guest editors: Dr Malcolm Caulfield and Prof Donald Broom

Deadline for manuscript submissions: 31 March 2021

Egg productivity impact on bone health of laying hens

Laying hens have been genetically selected and bred for productivity, which has led to a significant increase in egg production per bird. This selection for productivity has been suggested to have had unintentional negative impacts on bird welfare, such as behavioural changes and poor bone health. The higher rates of bone damage seen in high egg-producing hens is likely because of calcium being prioritised for egg production over bone health. Behavioural issues also associated with high egg-producing hens include changes in hens' ability to adapt to new groups and new environments.

The study aimed to evaluate whether egg production levels and genetics have an impact on hens' motor coordination and bone health. The study involved 742 laying hens and was conducted in Germany at the Institute of Animal Welfare and Animal Husbandry of the Friedrich-Loeffler-Institute. High and moderate egg-laying hens, as well as hens from white and brown egg layer genetic lines were divided into four groups, the hens were then housed in either small or large housing compartments.

The results of the study suggest that genetic selection for high egg production has had a significant impact on hens' motor coordination and bone strength. Highly productive hens showed poorer motor coordination and lower bone strength than moderately productive hens. Additionally, housing hens in larger pens with more space and lower stocking densities appeared to have a positive effect on hens' motor coordination, particularly for moderately productive hens. These results show how only selecting for high productive traits in layer hens can consequently have a negative effect on hen welfare and health.

Dudde A, Weigend S, Krause E et al (2020). Chickens in motion: Effects of egg production level and pen size on the motor abilities and bone stability of laying hens (*Gallus gallus* forma domestica). Applied Animal Behaviour Science, 104998.

Hunger in dairy calves

Dairy calves will drink between 7 and 12 litres of milk (or ~20% of their bodyweight) per day in up to 11 drinking bouts if left to suckle off their mothers. However, on commercial dairy farms, calves are separated from their mothers at birth and fed once or twice receiving around 4 L of milk replacer per day (~10% of their bodyweight). Calves raised on commercial dairy farms have been reported to show signs of hunger and stress. This study evaluated the effect of feeding frequency and amount of milk offered on calf behaviour and hunger.

This experiment was conducted on two farms in Victoria, Australia and involved 46 male calves. Calves were fed either a low volume of milk replacer (10% of the calf's bodyweight, standard commercial ration) either once or over two feeds a day, or a high volume of milk replacer (20% of the calf's bodyweight) over two feeds per day. Calf weight, milk replacer intake and behaviour (number and duration of drinking bouts, non-nutritive sucking and play behaviour) were measured for 7 days.

The results showed that calves offered 20% bodyweight in milk, were able to drink more milk and grew more quickly than calves fed 10% bodyweight. Three-day old calves were not able to drink more

than 2 L of milk in one bout but in following days were able to drink 10% bodyweight in one meal. By 5 days of age, calves offered 20% bodyweight drank ~40% more than calves fed 10% bodyweight with no signs of scouring (diarrhea). Physiological indicators of hunger were significant in calves fed 10% bodyweight and in calves fed once per day, and were present in all calves during the night. Non-nutritive sucking occurred more often in calves fed 10% bodyweight over two feeds (suggesting these calves were still hungry after each feed) compared to those fed that amount in one meal. Calves fed 10% bodyweight over two feeds were also less likely to exhibit play behaviour. These findings suggest that calves fed the standard commercial ration of 10% bodyweight in milk fed either once or twice daily are left hungry. This can be addressed by increasing milk feeding amount and frequency.

Jongman E, Conley M, Borg S et al (2020) The effect of milk quantity and feeding frequency on calf growth and behaviour. Animal Production Science 60(7):944-952. domestica).

Welfare concerns with under feeding pregnant sows

Common practice in commercial piggeries is to restrict the feed of pregnant sows to prevent health problems associated with obesity during pregnancy. Sows are fed a diet rationed to meet their nutritional needs, but the quantity is usually not enough to satiate them, leaving sows chronically hungry. Furthermore, sows can generally eat their entire ration rapidly in approximately 20 minutes, meaning sows are also unable to fulfil their natural foraging behaviour where they will spend most of the day engaging in foraging and feeding behaviours. The chronic hunger and boredom experienced by sows has been associated with stereotypical behaviours such as sham chewing and teeth grinding, and with increased aggressive behaviour towards other sows.

This study, conducted in the UK at Scotland's Rural College Research Pig Unit, observed 47 sows and measured the extent of feed restriction of sows fed a standard commercial ration compared to their desired (*ad libitum*) intake. The behaviour of sows fed a standard commercial ration versus *ad libitum* intake was also recorded.

The study showed that the standard restricted ration represents approximately 44% of their desired feed intake. In contrast to *ad libitum* fed sows, the feed-restricted sows displayed hunger-related behaviour such as spending more time in the feed stall, nosing the straw bedding and drinking more water. Where *ad libitum* feeding occurred, sows showed a reduction in activity and foraging behaviours suggesting greater satiety. These findings support the argument that sows fed less than half their desired intake are in a chronic state of hunger and exhibit behaviours associated with poor welfare. This study highlights the welfare challenges that face commercial breeding sows and the need to address the poor welfare experienced by providing diets that can satisfy their hunger while avoiding the negative consequences associated with over-feeding.

Read E, Baxter E, Farish M et al (2020). Trough half empty: Pregnant sows are fed under half of their *ad libitum* intake. *Animal Welfare* 29(2):151-162.



Promotion of a good life for farm animals is rewarding for farmers

Most current animal welfare certification schemes are focused on eliminating factors that lead to negative affective states in animals. However, it is now widely accepted that animal welfare is not only about avoiding negative experiences, but also about providing positive experiences that promote a good life for the animal. The objective of this study was to evaluate measures of welfare on farm and the degree of investment required to achieve positive welfare.

The study was conducted in the UK and included 49 non-caged laying hen farms that were either a member of RSPCA Assured or the Soil Association assurance schemes. Input-based measures of positive welfare were applied using a framework incorporating opportunities for comfort, pleasure, confidence, interest and a healthy life along with their respective resource needs. Outcome-based measures of welfare included six commonly used indicators: feather loss, beak trimming, antagonistic behaviour, flightiness, mortality and litter score as well as a score for the

general 'mood' of the flock. The study also explored the financial cost of achieving positive welfare experiences.

The study showed that many farmers are already focusing on providing positive welfare experiences for hens above those required by the certification scheme but for which they are not rewarded. 'Mood' score of the flock was positively correlated with resources providing positive experiences. The economic modelling showed that providing at least some good life opportunities can be achieved with minimal additional cost (0.05GBP/dozen eggs or 0.09 AUD). The authors suggest that providing positive experiences for farm animals may be more motivating to farmers than asking them to take steps to reduce negative experiences.

Stokes J, Mullan S, Takahashi T et al (2020) Economic and welfare impacts of providing good life opportunities to farm animals. [Animals 10\(4\), 610](#).

CSIRO survey: quality of life for beef cattle

The CSIRO animal welfare team are interested in what **YOU** think about the **quality of life of beef cattle** raised in Australian pasture-based production systems. The CSIRO team would like your opinion on which parts of an animal's environment and experiences you think are most important and should be **measured when determining quality of life**. You do not need to have any experience with beef cattle to get involved.

Your opinions will help the CSIRO animal welfare team develop an effective and meaningful tool for Australian beef producers to benchmark quality of life in cattle raised on pasture. Benchmarking is a tool that can be used by the beef industry to **measure and compare the quality of life** experienced by cattle across different properties and regions and to demonstrate how farmers can go **above and beyond** the minimum requirements. If you are interested in sharing your thoughts, please consider completing this anonymous survey which should take approximately 10-15 minutes. You must be an Australian resident aged 18 years or older to be eligible to participate.

The survey can be accessed by heading to <https://www.surveymonkey.com/r/QOLinBeefCattle>

The Humane Food podcast aims to educate Australians about the lives of farm animals, farming practices, and the power of consumers in supporting better welfare. Check out our latest episode *Live export: why is it still happening?* With Dr Bidha Jones and Dr Jed Goodfellow.

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TRANSPORTATION OF ANIMALS

Effect of temperature on welfare of sheep during live export

The growing demand for meat in many developing countries and the need for religious slaughter has led to a global increase in the live export of sheep and cattle. Australia is an important exporter of sheep, most of which are shipped to the Middle East. The journey from Australia to the Middle East is one of the world's longest and can take up to 20 days. When sheep leave Australia in winter (average minimum ~7°C), they arrive in the Middle East in summer (average >40°C) and heat stress is believed to be the major cause of shipboard mortality at this time of year. In addition to ambient temperature, heat is also generated by the ship itself as well as heat released by animals in close confinement on each deck. This study used shipboard temperature and mortality data from different voyages from Australia to the Middle East to determine critical thresholds when high temperatures affect sheep welfare.

This study was conducted by the University of Queensland. Data from 14 different voyages completed between 2016 and 2018 was collected. Heat stress was observed with temperatures

over 27.5°C on the ship's bridge and 50% of the voyages reported temperatures of 27.5°C or above. Mortality increased with day of voyage and during journeys made in June, July and August. Mortality rate increased exponentially as temperature on the ship's bridge and decks increased. Another finding of this study was that the voyages' route also affects mortality. When the first stop of the voyage is Doha, temperature was highest, and mortality was highest.

Overall, the findings of this research show that high temperatures increase mortality during live export voyages and that around 50% of voyages offloading at Doha and Dubai will experience temperatures of 27.5°C or higher. Heat stress related mortality can be decreased by restricting voyages leaving Australia during winter to the Middle Eastern summer and not offloading at Doha, the hottest port, first.

Carnovale F, Phillips C (2020) The effects of heat stress on sheep welfare during live export voyages from Australia to the Middle East. [Animals 10\(4\), 694.](#)

Factors affecting the welfare of beef cattle transported from feedlots to slaughter

The welfare of cattle transported to slaughter is an important priority for the US beef industry. In the last few decades, consumers have become more concerned about the welfare of animals and many consumers now prefer meat from animals treated humanely. When cattle are transported to abattoirs, they are exposed to several stressors that can potentially lead to reduced welfare including noise, unfamiliar animals and humans, extreme temperatures, temporary food/water deprivation, variable transport distances and experiences, and new pen conditions.

This US study included a review of the existing literature and a survey conducted at the 2019 North American Meat Institute Animal Care and Handling Conference (n = 40). Transport is considered the most stressful part of the supply chain and the authors highlight a number of factors that impact on beef cattle welfare including: US regulations which allow 28-hour transport; truck driver skill and experience; an animal's fitness for transport; and space allowance on trucks. Once animals arrive at the abattoir, further

factors affect animal welfare including: efficiency of unloading; the design and condition of the facilities including lairage; animal handling and training of stock people (including workforce culture); an animal's mobility and the treatment of 'downers'. Effective stunning to ensure animals are unconscious at slaughter is the most critical factor impacting animal welfare at slaughter.

The survey identified that cattle handling, particularly of downer cows, staff training and stunning are seen as the main issues affecting animal welfare at abattoirs, and that training of workers, communication, facility maintenance and research are the main areas that need improvement. The results of this study show that further research is needed to better understand and implement strategies that will enhance human-animal interactions from farm to slaughter.

Edwards-Callaway L, Calvo-Lorenzo M (2020) Animal welfare in the US slaughter industry—a focus on fed cattle. [Journal of Animal Science 98\(4\):1-21.](#)

WILD ANIMALS

A protocol for assessing the welfare of wild animals

There is growing interest in our society about the impact of human activities on the welfare of wild animals. Measuring the welfare of wild animals is important for evaluating the effect that humans have on wildlife and the environment they live in. It is also important for evaluating the positive effects of conservation strategies. Methodologies exist for evaluating the welfare of farm animals and zoo animals. However, measuring the welfare of wild animals in their natural environment is complicated and challenging especially as no standard methodology is available.

This study used free-roaming horses as an example to describe a ten-stage protocol for assessing the welfare of non-captive wild animals. The protocol was based on the Five Domains model covering nutrition, environment, health, behaviour and mental state. The first three stages of the protocol involved

understanding the concepts of animal welfare and relating them to the specific species. Other stages required choosing several measurable welfare indices for identifying individual animals and parameters for measuring the welfare indices. The remaining steps involved using the Five Domains for grading the animal's welfare state, assigning a confidence score to the indices and ensuring that only practical indices are used for the grading.

Although wild horses have been used as an example, this ten-stage protocol could be adapted and used for assessing the welfare of other wild animal species to achieve significant improvements in their welfare.

Harvey AM, Beausoleil NJ, Ramp D et al (2020). A ten-stage protocol for assessing the welfare of individual non-captive wild animals: Free-roaming horses (*Equus Ferus Caballus*) as an example. [Animals 10\(1\), 148](#).



Non-avian reptile sentience: A conceptual, ethical and scientific review

Historically, non-human animals have been denied acknowledgement of complex abilities such as thoughts and feelings: “Many have argued that there is no way to empirically know that animals have conscious experiences. Yet others argue that consciousness, awareness and sentience in non-human animals can be quite obvious and can indeed be measured empirically.” Despite diverging opinions, many institutions, organisations and governments are now recognising the complexity of animals’ inner lives. Most modern declarations of animal sentience include *all vertebrate animals* which includes reptiles. However, reptiles are often not considered in relation to specific legislation to safeguard their welfare, both as captive pets and for wild living populations.

This review article discusses the concepts of consciousness, awareness and sentience in non-avian reptiles – that is, thinking and feeling. Contemporary examples, mainly from Australia, are discussed to illustrate some of the legal protections that are

specifically afforded to non-avian reptiles, and how they are enforced. The author argues that given the recent advances in our scientific understanding of behaviour and cognition due to research findings from fields such as comparative psychology, ethology and neurobiology, there is no denying that animals have complex, rich inner lives. This knowledge has contributed to more informed ethical considerations of our responsibilities towards our treatment of animals.

It is concluded that non-avian reptiles possess all the necessary capacities to be declared sentient beings, at least in the small proportion of reptile species that have been empirically investigated so far. Based on these findings, it can be cautiously asserted that the rest of the animals in the order Reptilia that have not yet been studied are sentient.

Learmonth MJ (2020) The matter of non-avian reptile sentience, and why it “matters” to them: A conceptual, ethical and scientific review. [Animals 10\(5\), 901](#).

GENERAL ANIMAL WELFARE

Animal welfare centres: Advantages and disadvantages in improving animal welfare

The formation of animal welfare centres around the world may have allowed animal welfare knowledge to advance more rapidly than it would otherwise have done through individual scientists. Established welfare centres usually benefit from the recognition of their expertise and may have more opportunities to support/ collaborate with animal industries to improve animal welfare. However, collaboration with industries could see scientists potentially influenced by the funding body, leading to a failure to identify and address important welfare issues. This study compared the characteristics of scientific papers on animal welfare by scientists within animal welfare centres and by those outside.

A bibliometric search of the scientific literature using Web of Science was conducted focusing on articles published between 1900 and 7 May 2020. Keywords included ‘animal welfare’ and ‘animal wellbeing’, and the search included 22 different languages. The proportion of articles produced in centres was calculated. The proportion of funding sources related to the animal industries was compared between papers produced in animal welfare centres and papers not affiliated with centres.

8% of scientific publications found were from established animal welfare centres. Significant funding

was obtained from the livestock industries for these centres. For the other publications, the main funding sources were likely to be government-based. The study found that the establishment of animal welfare centres worldwide allows groups of scientists to collaborate and advance animal welfare knowledge more effectively than isolated scientists. However, reliance on industry funding could mean that animal welfare goals may be more aligned with industry goals than considering the welfare needs of animals. On the other hand, the relationship with industry may be beneficial as it may facilitate industry adoption of knowledge as it becomes available. Key features of successful centres that are discussed in this paper include: (1) independence from industry, advocacy and government biases; (2) a willingness to collaborate externally and internally; (3) a good support network within the university; (4) value placed on independence from industry, advocacy groups, government; and (5) a strong reliance on science-based approaches. Further research is required to investigate ethical conflicts of scientists affiliated with animal welfare centres.

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ARTICLES OF INTEREST

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