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ANIMAL WELFARE SCIENCE UPDATE

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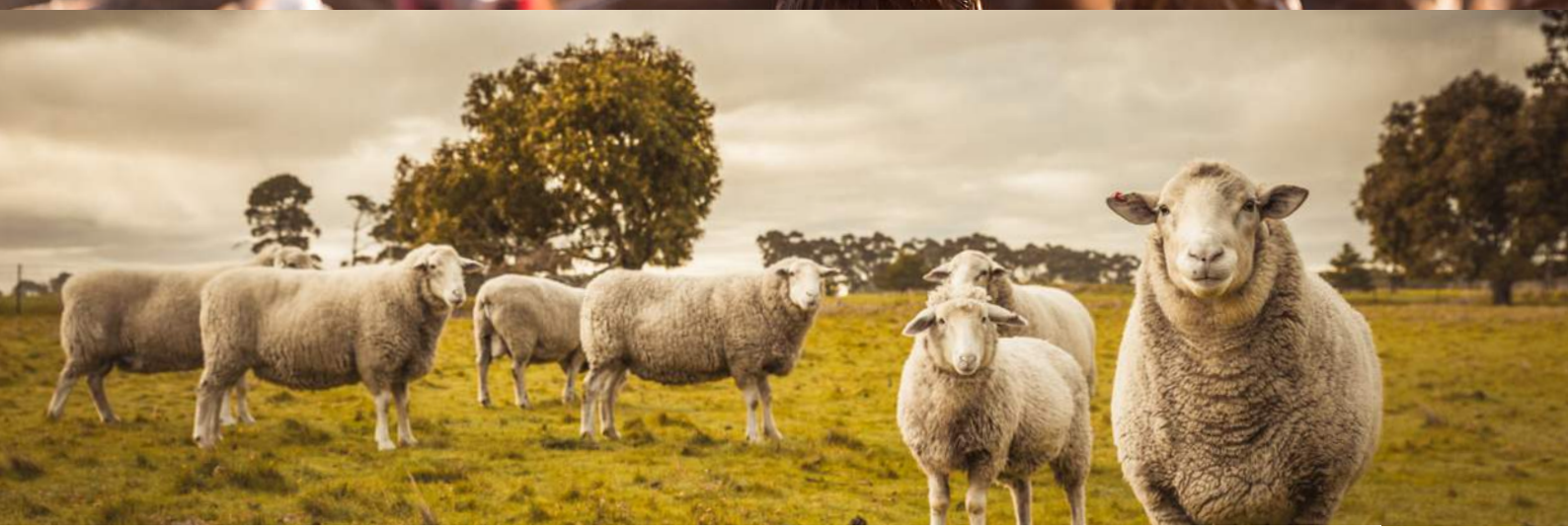


The aim of the animal welfare science update is to keep you informed of developments in animal welfare science relating to the work of the RSPCA. The update provides summaries of the most relevant scientific papers and reports received by the RSPCA Australia office in the past quarter. **Click here to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

COMPANION ANIMALS

Noise reduction in shelters improves cat welfare

An animal rescue shelter, full of unfamiliar people, animals and sensory stimuli, can be a stressful place for a cat. As cats have exceptional hearing and may be averse to loud and unfamiliar noises, noise reduction has been suggested as a strategy to reduce stress to shelter cats.

This study, conducted at a shelter in Vancouver, Canada, investigated cat behaviour in quiet compared to loud noise. Cats (n=98) were observed for behaviours including freezing, flattening ears and hiding that may indicate negative affective states such as fear and stress. These were used to calculate a 'fear score'. Behaviours such as playing, grooming and feeding that may indicate a neutral or positive affective state, were also recorded. These were used to calculate a 'maintenance score'. Noise levels (dB) were measured using a sound meter and the nature of the sounds was noted.

The shelter was noisier in the morning compared to later in the day. Sources of noise included dogs barking, people talking, traffic and shelter operations. Cats had a higher 'fear score' in the morning, coinciding with the noisier part of the day. Hiding appeared to be the most common response to loud noises. 'Maintenance scores' were higher later in the day, coinciding with the quieter period. These findings support the need for noise reduction in shelter environments.

Eagan BH, Gordon E, Fraser D (2021) The effect of animal shelter sound on cat behaviour and welfare. Animal Welfare 30(4):431-440.

Dogs have fearful reactions to high frequency intermittent sounds

Many dogs are fearful of loud noises such as thunder, fireworks and gunshots. Hence, exposure to loud noises may represent an animal welfare risk for dogs. To date, dogs' response to loud noises in the home has not been studied in detail.

This study, conducted in the United States, investigated dogs' response to loud noises in the home. Dog owners (n=386) were surveyed about their dogs' response to sounds in the home environment. Video recordings (n=62) were taken to assess the reaction of the dog and owner to different noises.

In the owner survey, dogs were reported to have fearful reactions to household noises, particularly high frequency intermittent sounds such as smoke alarms and vacuum cleaners. The most common reaction reported by owners was barking. In the videos, dogs displayed behaviours consistent with fear such as lip-licking, panting and retreating. Owners tended to under-estimate their dogs' fearfulness leading to recommendations for increased awareness about how to interpret canine behaviour to different sounds in the home.

Grigg EK, Chou J, Parker E et al (2021) Stress-related behaviors in companion dogs exposed to common household noises, and owners' interpretations of their dogs' behaviors. Frontiers in Veterinary Science 8, 1345.

Social inequity is a One Welfare issue affecting people and pets

Increasing social inequity represents a One Welfare issue affecting the welfare of people and animals. For example, low-income clients may face difficulties accessing veterinary services for companion animals. Lack of or delayed veterinary care represents an animal welfare issue that can also cause distress to owners and veterinary staff.

This study investigated barriers to accessing veterinary services. Low-income clients (n=12) at the Vancouver Humane Society (VHS), Canada were interviewed over the phone about their experience accessing veterinary services.

Low-income clients experienced barriers to accessing veterinary services before and during the COVID-19 pandemic. Barriers included concerns about their own and their pets' health and financial constraints. These barriers were compounded by the pandemic. Based on the clients' experiences, recommendations were made to improve low-income clients' access to veterinary services. Recommendations include: assistance packages, free or low-cost clinics, and training for veterinary staff to improve cultural competence and a trauma informed approach.

Morris A, Wu H, Morales C (2021) Barriers to care in veterinary services: Lessons learned from low-income pet guardians' experiences at private clinics and hospitals during COVID-19. Frontiers in Veterinary Science 8, 764753.

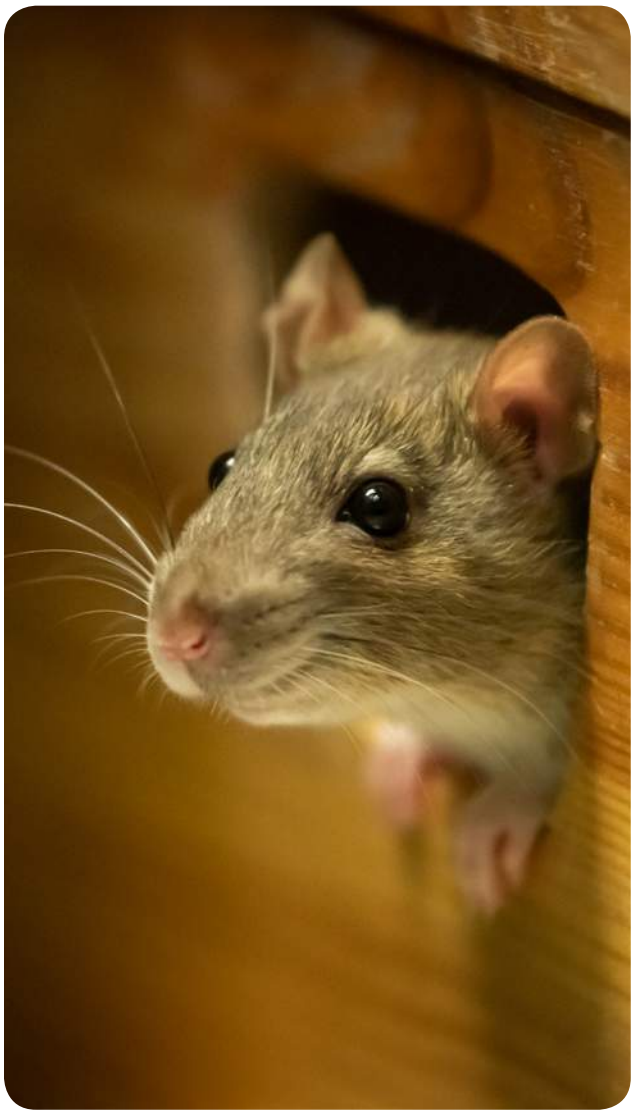
Animal welfare concerns for pet rats in the UK

An estimated 100,000 rats are being kept as pets in the United Kingdom (UK) alone. Compared to their laboratory counterparts, there is much less known about the welfare of pet rats.

This study aimed to evaluate the welfare of pet rats. In an online survey, pet rat owners in the UK (n=677) were asked questions about their rats' (n=3893) health, husbandry and housing. Almost all (99.1%) of the survey respondents recommended rats as pets. Nearly all (99%) of the owners provided their rats with nesting material and enrichment such as a suspended area, climbing structure or hidey hole. Almost all the rats were housed with at least one other rat.

While some of the recognised needs of rats appeared to be met, the study raised animal welfare concerns including lack of opportunity to explore, and exposure to predators and disease. Few pet rats (2.36%) were allowed out of their cage to explore freely. Many pet rats were kept with predators (e.g., cats, dogs, snakes) close-by which is likely to be stressful. Respiratory disease was common (60.4%) as well as tumours (36.6%), abscesses/cysts (31.2%) and hind limb degeneration (25%). Further information is needed to assess and improve the welfare of pet rats.

Neville V, Mounty J, Benato L et al (2021) Pet rat welfare in the United Kingdom: The good, the bad and the ugly. Veterinary Record 189, e559.



Vets getting better at managing pain in cats but still room for improvement

Pain management is an essential part of a veterinarian's duty to animal patients. In 1996, a survey of Australian veterinarians found that only 6% of respondents provided pain relief to female dogs and cats being desexed. Since then, there have been considerable improvements in the management of pain in companion animals but continuous improvement is critical.

This study aimed to characterise how Australian veterinarians manage acute pain in cats. As part of a broader online survey on acute pain management, involving ~6.6% of practicing vets in Australia, some respondents (n=513) answered questions about how they manage pain in cats.

Vets reported pain management practices associated with medical issues (e.g., urethral obstruction, dental procedures) and surgery (e.g., orthopaedic surgeries, lump removals, desexing). Most respondents (84.7%) did not use a validated pain scale to assess cats' pain. Acute pain in cats was typically managed using a multi-modal approach with opioid and non-steroidal anti-inflammatory drugs (NSAIDs). Just over half (55%) of respondents regularly used local anaesthetics to manage pain in cats. The authors recommend increased use of validated pain scales and the provision of longer duration post-operative pain relief.

Rae L, MacNab N, Bidner S et al (2021) Attitudes and practices of veterinarians in Australia to acute pain management in cats. Journal of Feline Medicine and Surgery doi:10.1177/1098612X211043086.

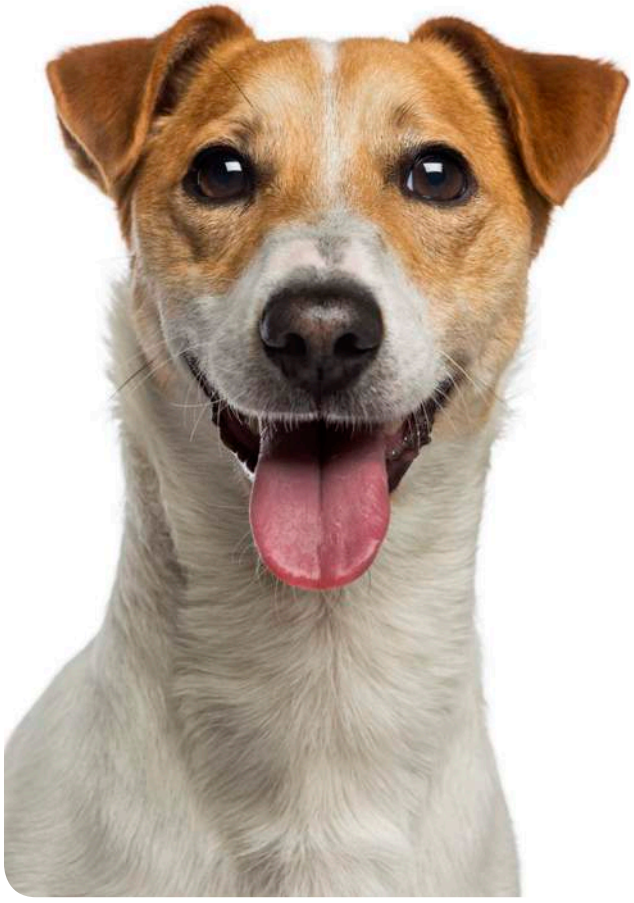
Fostering and matching programs increase the live-release rate of dogs from shelters

Live-release rate is the percentage of animals who leave the shelter alive (e.g., adopted, returned to owner). Animal rescue shelters aim for the highest possible live-release rate. It is important to understand how the live-release rate can be maximised.

This study surveyed 370 animal rescue shelters across the United States to investigate factors contributing to the live-release rate of dogs. It investigated how factors including shelter traits, human resources, programs and policies, affected live-release rate. Programs included transfer (moving animals from one shelter to another e.g., due to capacity issues or for medical treatment), fostering (caring for rescue animals in a home environment), and matching (ensuring the best fit between dog and adopter).

Removing breed labels for dogs who are evidently not 'pure-bred' was associated with higher live release and lower return rates. This may be due to adopters being put off by misconceptions about certain breed labels. Transfer, matching and foster programs were strongly associated with higher live-release rate. The authors recommend that animal rescue shelters employ these programs to improve animal welfare and maximise live-release rate.

Reese LA (2021) Shelter and rescue programmes associated with higher live release and lower return rates for dogs. Animal Welfare 30(4):419-430.



FARM ANIMALS

Environmental enrichment benefits fish in aquaculture

Environmental enrichment (EE) is the provision of novel sensory and motor stimuli. EE aims to cater for animals' psychological and physical needs. There has been considerable research on EE in land-based agriculture but the use of EE in in aquaculture has received less attention. In aquaculture, fish are typically kept in stressful and barren environments. There is increasing acknowledgement that this is not conducive to good welfare and EE may address these deficiencies.

This review examines different types of EE for fish in aquaculture. Physical enrichment involves the provision of objects or structures to increase environmental complexity and give fish an opportunity to hide and rest. There is evidence that physical enrichment also benefits fish cognitive function and physical health. Flooring substrates (e.g., sand, pebbles) also have physical and behavioural health benefits for fish. Sensory enrichment (e.g., lights, tank covers, colours, sounds, odours, textures, mirrors) can have positive or negative effects on fish welfare depending on how they are deployed. For example, some types of music appear to have stress-relieving effects on captive fish but it depends on characteristics such as tempo, harmony and frequency. Occupational enrichment (e.g., flows or currents) gives fish the opportunity to exercise. Social enrichment takes into account fishes' social needs and their individual personalities. Dietary enrichment considers not only the type, composition, quantity and distribution of feed but also feeding routine and level of choice. For example, automatic fish feeders allow fish to choose when and how much to eat.

While acknowledging species and individual differences in response to EE, the authors provide guidelines on how to implement EE in aquaculture. There are many EE options available and they have a range of animal welfare and production benefits.

Arechavala-Lopez P, Cabrera-Álvarez MJ, Maia CM et al (2021) Environmental enrichment in fish aquaculture: A review of fundamental and practical aspects. Reviews in Aquaculture doi: 10.1111/raq.12620.

Does slower growth improve meat chicken's welfare?

Meat chickens (broilers) have been bred to grow and gain weight rapidly, which has caused concern for their health and welfare. Reaching over 2kg in just a few weeks, conventional fast-growing meat chickens may suffer from lameness, metabolic, muscle and bone diseases, and painful deformities. Consequently, meat chickens spend the majority of their time inactive, which can lead to other health and welfare issues including injuries and infections, and inability to engage in normal behaviours such as walking, dustbathing, feeding and drinking.

This study, conducted at a poultry research facility in Canada, investigated inactivity in two conventional fast-growing meat chicken strains compared to 12 moderate and slow-growing strains. All strains were raised in similar conditions and different types of enrichment (elevated platforms, pecking stone, rope) were tested to see if they would affect inactivity. Eight trials were conducted with 28 pens of 44 birds (22 male, 22 female) per pen. Behaviours were observed including sitting, standing, walking, feeding, drinking, preening, pecking and leg stretching. Bird movements were continuously monitored using accelerometers attached to one randomly selected male and female bird per pen.

All strains of meat chicken were inactive for most of the day (up to 80%) but at a young age, faster growing strains were more inactive compared to slower growing strains. Slower growing strains stood and walked around and engaged with enrichment items more often compared to faster growing strains. Elevated platforms were the most used enrichment item. These results suggest that faster and slower growing meat chickens may use enrichment differently and that slower growth in meat chickens may improve animal welfare outcomes.

Dawson LC, Widowski TM, Liu Z et al (2021) In pursuit of a better broiler: A comparison of the inactivity, behavior, and enrichment use of fast- and slower growing broiler chickens. Poultry Science 100(12), 101451.

Why do laying hens pile on top of one another?

Egg-producing (laying) hens can die from smothering when the birds cluster in one location and pile on top of one another (piling). There are three types of piling observed in laying hens, these are panic, nest box and recurrent piling. There is limited research particularly on recurrent piling and its causes. Recurrent piling involves slow moving, apparently non-panicked birds, and can occur throughout the entire laying period.

This review aimed to identify the causes of recurrent piling and characterise the animal welfare consequences. Immediate causes included fear, light and temperature. For example, hens may be startled by sudden stimuli or may be drawn to heat or light. Routine and habits such as gathering around feed or perching in the evening, may also lead to birds clustering in one location. Due to hens being a highly social species there may also be a degree of social attraction whereby a cluster of hens attracts more hens. These behaviours may develop due to the rearing environment, stress response and domestication process.

Four distinct hypotheses emerged from this review for the causes of recurrent piling: attraction/repulsion, social influence, early life experiences and maladaptive collective behaviour. Piling has serious animal welfare consequences including physiological stress, heat stress, injury and death by smothering. Good management, well-planned housing and limited stress were highlighted as key strategies to preventing piling in laying hens.

Gray H, Davies R, Bright A et al (2020) Why do hens pile? Hypothesizing the causes and consequences. Frontiers in Veterinary Science 7, 616836.

Turkey's digits shouldn't be forgotten when scoring painful footpad dermatitis

Footpad dermatitis (FPD) is a painful condition which can affect turkeys farmed for meat. The assessment of FPD severity is a commonly used animal welfare indicator on farm. At present, the European standard scoring system for FPD only involves looking at the size of the lesion on the metatarsal pad (footpad) at slaughter. There are concerns, however, that the current scoring system is insufficient as an animal welfare indicator.

To investigate FPD, this study photographed and assessed turkeys' (n=500) feet from a German slaughterhouse for lesions, swellings, and the number of digits affected. These findings were compared to the European standard scoring system to investigate whether current assessment methods are sufficient to assess the severity of FPD.

Pathological changes to turkeys' digits were observed at a European standard score level of 0, where there was no change in the metatarsal pad. As FPD affects other areas of the foot, which can occur prior to changes in the scored metatarsal pads, the current European standard scoring system is insufficient. The authors from this study suggested that including digits may help refine and improve the FPD scoring system as an animal welfare indicator for turkeys.

Stracke J, Volkmann N, May F et al (2021) Walking on tiptoes: Digital pads deserve increased attention when scoring footpad dermatitis as an animal welfare indicator in turkeys. Frontiers in Veterinary Science 7, 613516.

Dairy calf welfare in pasture-based systems

There is increasing community concern for the welfare of dairy calves. The dairy industry's social licence to operate is at risk if animal welfare concerns are not addressed.

This review examines the welfare of calves in pasture-based production systems typical of the Australian and New Zealand dairy industries. In many cases, the animal welfare issues identified are also seen in indoor dairy systems. Key animal welfare concerns include routine calving induction, increasing perinatal mortalities, hypothermia, painful procedures (e.g., disbudding) without pain relief and restricted feeding (to ~10% of body weight which is half what they typically require). Cow-calf separation is a significant animal welfare concern. Separation causes distress, and is not aligned with public expectations. Each year in Australia, approximately 570,000 (38%) surplus dairy calves (all males and some females) are killed before they reach four weeks of age. The transport, management, on-farm killing (often by blunt force trauma) and slaughter of surplus calves are major animal welfare concerns.

The authors make three key recommendations: (1) awareness programs to address 'farm blindness', where poor welfare has become normalised, (2) research to understand barriers to change and how they may be overcome, and (3) biological research to provide the basis for new management strategies. Recommendations include increasing the value of surplus calves, effective communication strategies, benchmarking, and research into the effects of dystocia, pen design and dam rearing on calf welfare. Improvements are also required in pain management, feeding (including extended suckling) and weaning practices.

Verdon M (2021) A review of factors affecting the welfare of dairy calves in pasture-based production systems. Animal Production Science 62(1):1-20.

ANIMALS IN SPORT, ENTERTAINMENT, PERFORMANCE RECREATION AND WORK

Conflicts over what makes horses happy

There are growing concerns about the welfare of horses in sport. These concerns can impact on equine sports' social license to operate. In early 2021, the Animal Welfare Research Network (AWRN) and National Equine Welfare Council (NEWC) ran an online equine welfare workshop "How Happy are Equine Athletes? Assessing Equine Quality of Life in Equestrian Sporting Disciplines". The workshop aimed to understand current perceptions of equine welfare in sport. Presentations were made by representatives from dressage, eventing, show jumping and endurance including riders, trainers, owners, vets, spectators and coaches.

This study details perceptions of equine welfare gleaned from the workshop focus groups. Focus group participants included people in equestrian sports (n=38) and animal welfare researchers (n=10). Discussion topics included ethical dilemmas, what constitutes good welfare versus poor welfare, the equine athlete versus 'life as a horse', demands of the sport, horses' level of enjoyment and animal welfare indicators.

The focus groups revealed conflicts between stakeholders responsible for equine welfare. At an elite level, horse welfare may be compromised if they are seen as only athletes or commodities. While there appeared to be a focus on the physical health of horses, their psychological needs were not always met. Areas for improvement were identified such as training for judges and stewards to identify the behavioural signs of stress or pain, closer scrutiny during pre-endurance event physical examinations and greater emphasis on positive affective states (feelings).

Furtado T, Preshaw L, Hockenhull J et al (2021) How happy are equine athletes? Stakeholder perceptions of equine welfare issues associated with equestrian sport. Animals 11, 3228.

Behavioural and hormonal indicators show weaning is stressful for foals

Foals experience considerable stress when they are removed from their mothers (weaning). Many factors can affect how stressful weaning is for foals including age and management factors (e.g., feeding, social grouping, handling, housing).

This study, conducted in Italy, aimed to investigate stress in foals exposed to two different weaning protocols. Foals in situation 1 (S1) (n=10) were weaned at five months old, two at a time and handled regularly. Foals in situation 2 (S2) (n=12) were weaned at seven months old, all on the same day with little handling. Stress was evaluated by watching video recordings of foal behaviour and measuring stress hormones (cortisol) in saliva and hair samples. Behaviours included interactions between foals, exploring, resting, eating, drinking, urinating and defaecating.

On the day of weaning, all foals displayed behavioural changes consistent with stress such as increased vocalisations and decreased time eating. One week after weaning, foals in S1 had higher cortisol in hair samples compared to foals in S2. However, as this was not an experimental study, it could not establish causality. That is, the study could not determine what aspect of S1 may have been more stressful to foals compared to S2, with the authors recommending further research to investigate influencing factors.

Normando S, Giaretta E, Schiavon I et al (2021) Behavioral and hormonal effects of two weaning situations in trotter foals. Journal of Veterinary Behavior 47:99-110.

Assistance dogs exposed to multiple stressors

Dogs are widely used in Animal-Assisted Interventions (AAI). Different types of AAI include: Animal-Assisted Activities (AAA) such as motivational visits; Animal-Assisted Therapy (AAT) as part of structured physical or mental health treatment; Animal-Assisted Education (AAE) as part of structured educational interventions; and Animal-Assisted Crisis Response (AACR) to intervene in disasters. Dogs in all types of AAI are not merely tools but sentient beings with needs and interests. Hence, there is an increasing focus on the welfare of dogs in AAI settings, including their comfort, autonomy and enjoyment.

This review aimed to highlight how animal welfare principles can be applied to AAI. Dogs used in AAI may be exposed to a range of potentially stressful scenarios including crowds, classrooms, hospitals and disaster zones. They are confronted with unfamiliar people and sensory stimuli. Trigger-stacking may occur where a dog is exposed to multiple stressors without adequate recovery time. Dog factors that may influence their stress response include fatigue, age, health and workload.

Behavioural indicators of stress in dogs include avoidance, gaze duration, freezing, aggression and assenting/dissenting body language. These indicators may be missed in AAI for various reasons including handlers' lack of knowledge and experience, as well as internal and external pressures on the handler. Recommendations are made to minimise stress to dogs in AAI and apply the Lincoln Education Assistance with Dogs (LEAD) Assessment Tool to conduct risk-assessments.

Townsend L, Gee NR (2021) Recognizing and mitigating canine stress during animal assisted interventions. Veterinary Sciences 8(11), 254.

ANIMALS IN RESEARCH AND TEACHING

Animal testing must be a last resort as per European law

In 2010, the European Union (EU) passed a Directive that made the 3Rs of animal research ethics (replacement, reduction, refinement) a legal requirement. The EU Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) legislation, states that testing on vertebrate animals shall only be used as a last resort. However, animals are still widely used in chemical safety testing in the EU.

This paper outlines the need to use contemporary non-animal methods (NAMs) to replace animal testing. The use of NAMs is hindered, not by lack of scientific advancement but by lack of progress in legislation.

The authors question the commitment to ensure that animal testing is only used as a last resort and the scientific basis for new animal testing on existing chemicals, and instead urge researchers and regulators to support the application and development of NAMs.

Fentem J, Malcomber I, Maxwell G et al (2021) Upholding the EU's commitment to 'animal testing as a last resort' under REACH requires a paradigm shift in how we assess chemical safety to close the gap between regulatory testing and modern safety science. Alternatives to Laboratory Animals 49(4):122-132.

A non-animal model future for respiratory research?

Animals are currently used in biomedical research to test the toxicity of aerosols (inhaled substances) and study human respiratory diseases. As per the 3Rs of animal research ethics, the aim should be replacement (finding alternatives to animal use), reduction (using the fewest animals to produce valid results) and refinement (designing methods to reduce the harm to animals).

This review aimed to identify the limitations of animal testing in respiratory research and highlight alternatives. Rodents (e.g., rats, mice, guinea pigs, hamsters) and rabbits are the most commonly used animals in respiratory research. However, animal models have several limitations in their translatability to humans. There are significant differences between the lungs and breathing of rodents and humans. For example, there are differences in the size and distribution of lung tissue and cells. Rodents are obligate nose-breathers whereas humans breathe through the nose and mouth and mice do not cough. In addition, rodents do not develop many of the respiratory diseases seen in humans.

Alternatives to animal testing in respiratory research include in vitro (cell-based) and in silico (computer-based) models. In vitro models include ready-to-use, commercially available reconstructed tissues. There are also a range of instrument systems available to test aerosol exposure. To reduce the reliance on animal testing, the author recommends prediction by in-silico modelling and testing using advanced cell and tissue models.

Fröhlich E (2021) Replacement strategies for animal studies in inhalation testing. Sci 3(4), 45.

First Australian study on netting wild deer from a helicopter

Net-gunning deer from a helicopter has been used as a method to capture wild deer in New Zealand and the Americas. However, this method has not yet been used in Australia where six species of deer have been introduced. The technique is used for capture, handling and restraint of wild deer to assist management and conduct research. Before this method is considered for use in Australia, there is a need to understand the health and welfare risks.

This study, conducted at a site in New South Wales, is the first to describe net-gunning of deer in Australia. A helicopter was manoeuvred over the deer and a 5 m x 5 m weighted net fired. The helicopter landed 50 to 200 m away and three people secured the deer, conducted a brief examination, took measurements including body temperature and fitted a Global Positioning System (GPS) collar. An observer timed each stage of the procedure from the beginning of the manoeuvre to release.

Of 127 attempts, nets were fired at 64 fallow deer of which 26 (41%) were captured. The mean time from the beginning of the helicopter manoeuvre to release, was 11 minutes 19 seconds. Three deer ran for up to 100 m after being netted while the others became entangled and fell over after running ~20 m. Around a third of captured deer experienced hyperthermia. GPS collar data indicated reduced activity following capture, suggesting that deer experience acute stress and exertion related fatigue. Net gunning did not result in serious injuries or mortalities in this study, offering a safer option when compared to alternative methods such as use of chemical immobilisation or ground trapping. The authors suggest that helicopter net-gunning may be used to capture fallow deer in cool conditions and open areas.

Bengsen AJ, Hampton, JO, Comte S et al (2021) Evaluation of helicopter net-gunning to capture wild fallow deer (*Dama dama*). Wildlife Research 48:722–729.

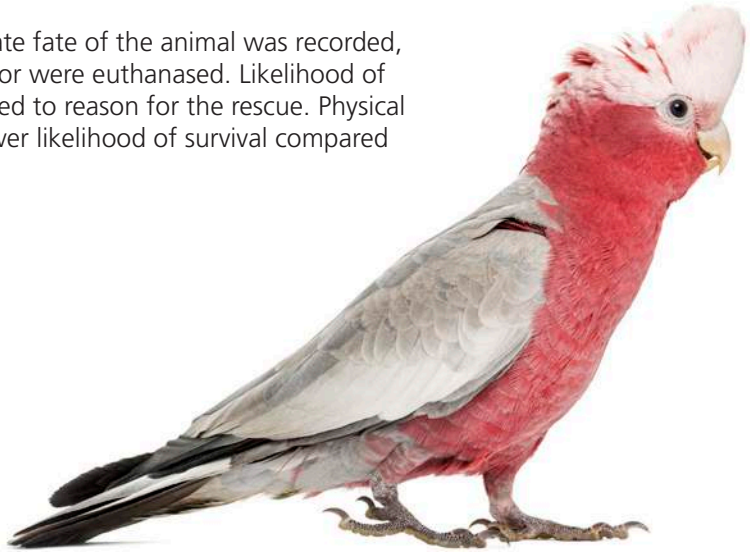
Thousands of wildlife rescue records confirm human activities threaten wildlife

Wildlife rescue and rehabilitation efforts aim to restore animals back to the wild. However, long-term outcomes for rehabilitated wildlife are rarely scrutinised.

This study analysed six-years of data on 469,553 wildlife rescues from over 50 volunteer wildlife rescue providers in New South Wales. Over 680 species of mammals, birds and reptiles were represented including threatened species. Over half of the records pertained to birds (53.4%), followed by mammals (34.1%) and reptiles (12.5%).

Where the ultimate fate of the animal was recorded, 92% either died or were euthanased. Likelihood of survival was related to reason for the rescue. Physical trauma had a lower likelihood of survival compared to other reasons for the rescue such as 'orphaned'. Analysis highlighted that many human activities threaten the welfare of wild animals including vehicle collisions and clearing of habitat. 'Collision with vehicles' was one of the main reasons for the rescue of birds and mammals. These threats need to be addressed to improve outcomes for wildlife.

Kwok ABC, Haering R, Travers SK et al (2021) Trends in wildlife rehabilitation rescues and animal fate across a six-year period in New South Wales, Australia. PLOS One doi:10.137/journal.pone.0257209.



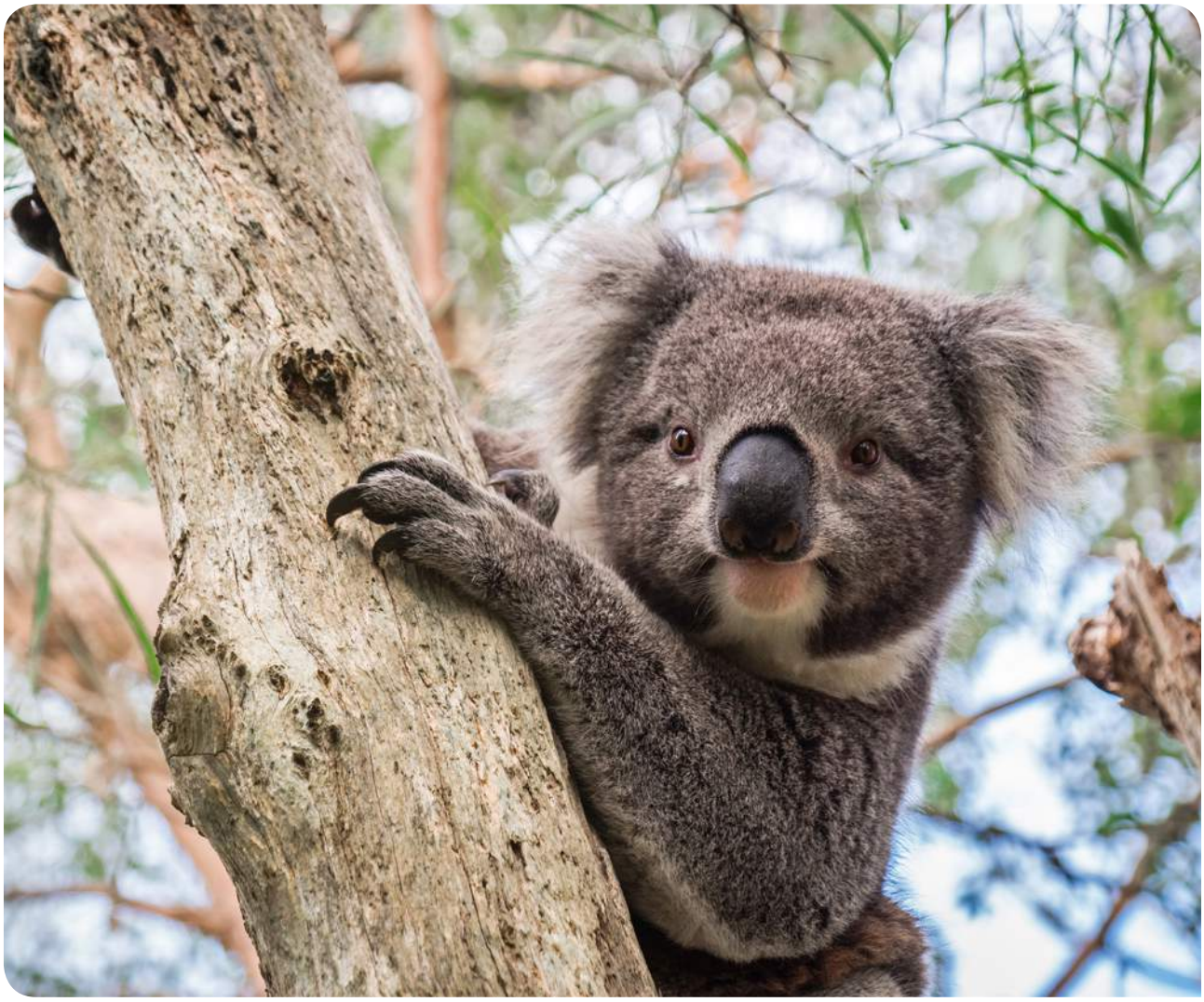
Contraceptive implants can replace surgical sterilisation of koalas on Kangaroo Island

In some areas, due to human-induced environmental changes, wildlife can become overabundant; that is they reach unsustainable densities that can endanger animals, resources and ecosystems. Population management strategies such as fertility control, may be required. However, some fertility control methods may pose animal welfare risks including stress associated with capture, handling and restraint of koalas and if surgical sterilisation is performed, risk of infection and/or post-operative complications.

This study investigated the outcomes of fertility control in koalas on Kangaroo Island (KI), South Australia and Budj Bim National Park (BBNP), Victoria. Surgical 'tubal ligation' of female koalas (n=8035) took place on KI from 1997 to 2013. In contrast, from 2004 to 2013 in BBNP, female koalas (n=4350) were treated with minimally invasive contraceptive implants. The implants last approximately a decade. Population density, breeding success of untreated females and body condition data were modelled for both KI and BBNP.

While there was evidence of compensatory breeding success in untreated females, koala population density declined overall in both KI and BBNP. Minimally invasive contraceptive implants had comparable results to invasive surgical 'tubal ligation'. On animal welfare grounds, the authors recommend that contraceptive hormone implants can replace surgical sterilisation for fertility control in KI koalas.

Watters F, Ramsey D, Molsher R et al (2021) Breeding dynamics of overabundant koala (*Phascolarctos cinereus*) populations subject to fertility-control management. Wildlife Research 48(7):663-672.



TRANSPORTATION OF ANIMALS

Australian cattle suffering at sea

There are significant concerns for the welfare of Australian livestock exported overseas. Following exposés of poor animal welfare and animal cruelty in the live export industry, the Australian Government deployed Independent Observers (IO) on some voyages. Generally, there is a lack of transparency about how animals are treated in live export, but publicly available summaries of IO reports provide a potential source of information.

This study reviewed summaries of IO reports on live cattle export voyages from Australia to China from 2018 to 2019 (n=37). In total, the summaries covered the export of over 147, 000 slaughter, feeder and breeder cattle of dairy and beef breeds. Voyages lasted between 14 and 25 days (mean 19.5 days).

Animal welfare issues identified from the summaries of IO reports included cattle suffering from severe heat stress, hunger and thirst. Cattle were exposed to extreme heat and extreme cold. Numerous instances were recorded of rough seas and ship infrastructure breaking down, contributing to heat stress and insufficient food and water. Health problems were recorded on all voyages including eye, lung, skin, gastrointestinal and metabolic issues, as well as painful lameness compounded by poor pen conditions. On the majority (22/37, 59.5%) of voyages, there was no vet on board. Animal welfare issues were also recorded at discharge in China including no food, poor handling and unsafe vehicles. In some cases, these animal welfare issues represent contraventions of the World Organisation for Animal Health (OIE) guidelines and/or the Australian Standards for Export of Livestock (ASEL). In other cases, they highlight deficiencies in the Standards and/or lack of adequate enforcement. The deployment of IO has now ceased but available summaries provide evidence of significant animal welfare issues in live cattle export.

Hing S, Foster S, Evans D (2021) Animal welfare risks in live cattle export from Australia to China by sea. Animals 11, 2862. [Author D Evans is from RSPCA Australia]

HUMANE KILLING

Alternatives to blunt force trauma for on-farm euthanasia of piglets

When piglets are weak, sick, injured and unable to recover they are euthanased on farm. If euthanasia is to take place, the method that causes the least stress and most rapid loss of consciousness and death should be used. However, to date, one of the most common methods of on-farm euthanasia of piglets is blunt force trauma, which involves hitting the piglet on the head or smashing their head up against a hard surface. Blunt force trauma raises serious animal welfare concerns and should be replaced by more humane alternatives.

This review considered available on-farm euthanasia options for piglets. Current alternatives to blunt-force trauma are captive-bolt guns, free-bullet firearms and electrical stunning/killing. The animal welfare risks for these euthanasia methods include incomplete loss of consciousness, delayed death, stress and pain. Controlled atmosphere stunning with gas has also been suggested as an alternative to blunt force trauma, however, high concentration carbon dioxide (CO_2) is aversive to pigs and causes pain, breathlessness, anxiety and distress. Other gases such as argon (Ar) and nitrous oxide (NO_2) may be less aversive but may not reduce overall distress. Low Atmospheric Pressure Stunning (LAPS) systems use a gradual reduction of atmospheric pressure. LAPS systems are not currently commercially available for pigs and there are concerns that it causes painful expansion of trapped gases in pig's body cavities.

There are serious animal welfare concerns about the routine use of blunt force trauma to euthanase piglets on farm. Alternatives such as CO_2 also raise serious animal welfare concerns and more research is required on the use of LAPS. The authors of this review conclude that captive bolt or electrical stunning/killing methods may provide effective and more humane alternatives to blunt force trauma if operators are properly trained and equipment is correctly calibrated.

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Steps required to reduce animal welfare consequences for sheep and goats at slaughter

Animals encounter welfare consequences at every stage of the livestock slaughter process including unloading, handling, restraint, stunning and bleeding.

At the request of the European Union (EU), the European Food Safety Authority (EFSA) Panel on Animal Health and Welfare reviewed the literature on the welfare of sheep and goats at slaughter. A final set of 46 relevant references were discussed by a Working Group (WG) of experts. Following the EFSA Risk Assessment Methodology, the WG identified twelve animal welfare consequences for goats and sheep at slaughter.

Animal welfare consequences of slaughter include heat stress, cold stress, fatigue, thirst, hunger, insufficient space, restricted movement, lack of rest, social stress, pain, fear and distress. For example, fatigue is an animal welfare consequence associated with hazards including high temperature, prolonged food and water deprivation, mixing unfamiliar animals and insufficient space. Forty animal welfare hazards were identified, largely relating to lack of adequate human skills at stunning and bleeding. For example, hazards associated with electrical stunning include inappropriate restraint, incorrect placement of electrodes, inducing cardiac arrest in conscious animals, poor electrical contact, too short exposure time and inappropriate electrical parameters. Preventive and corrective measures were identified for each hazard. The WG recommend the use of animal-based welfare indicators and standard operating procedures (SOPs) to reduce severe consequences for sheep and goats at slaughter.

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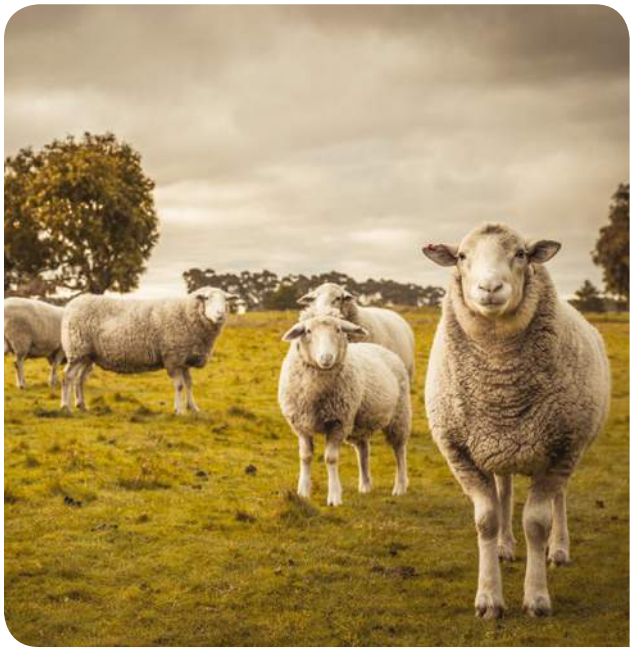

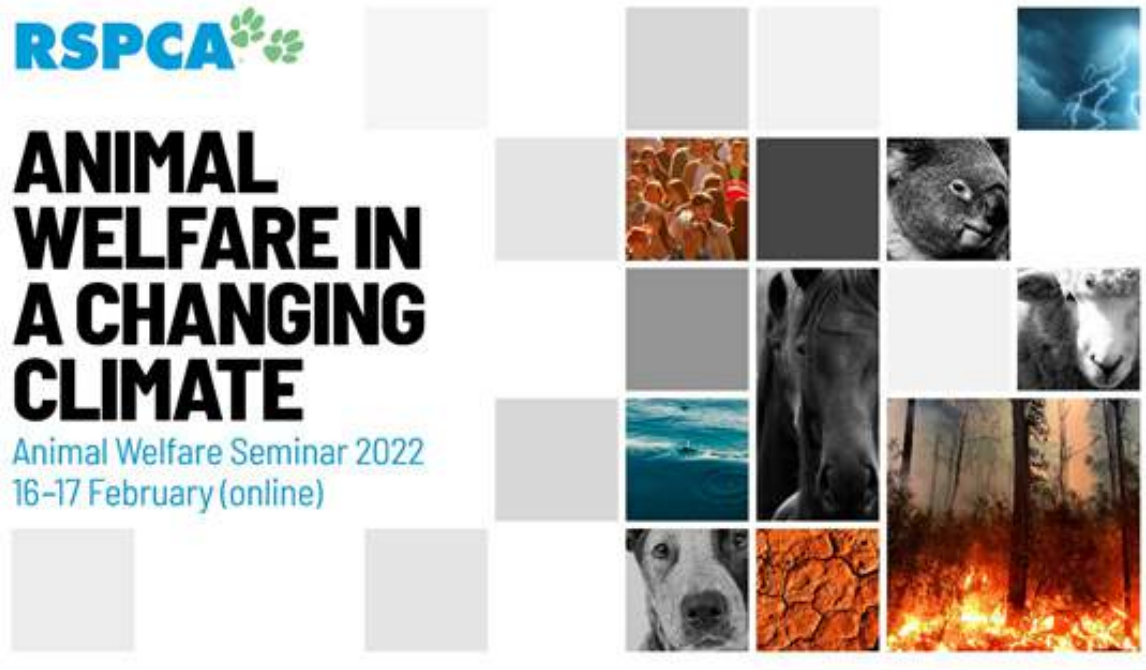

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