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ANIMAL WELFARE SCIENCE UPDATE

Issue 83 | October 2023

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 viewed by the RSPCA Australia office in the past quarter.

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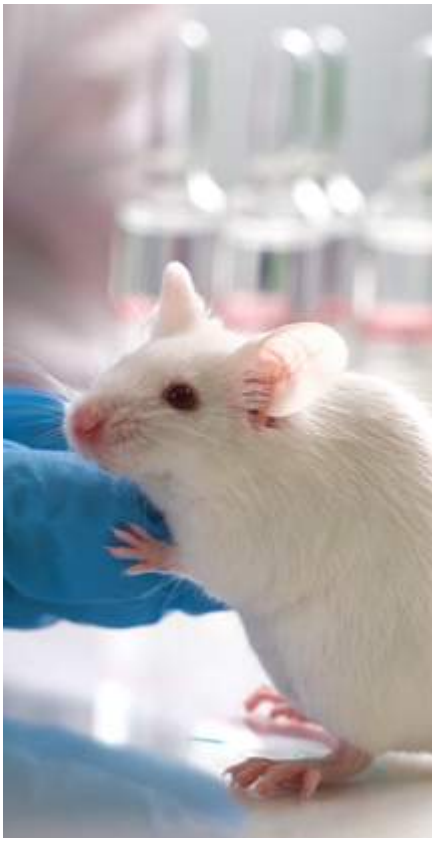
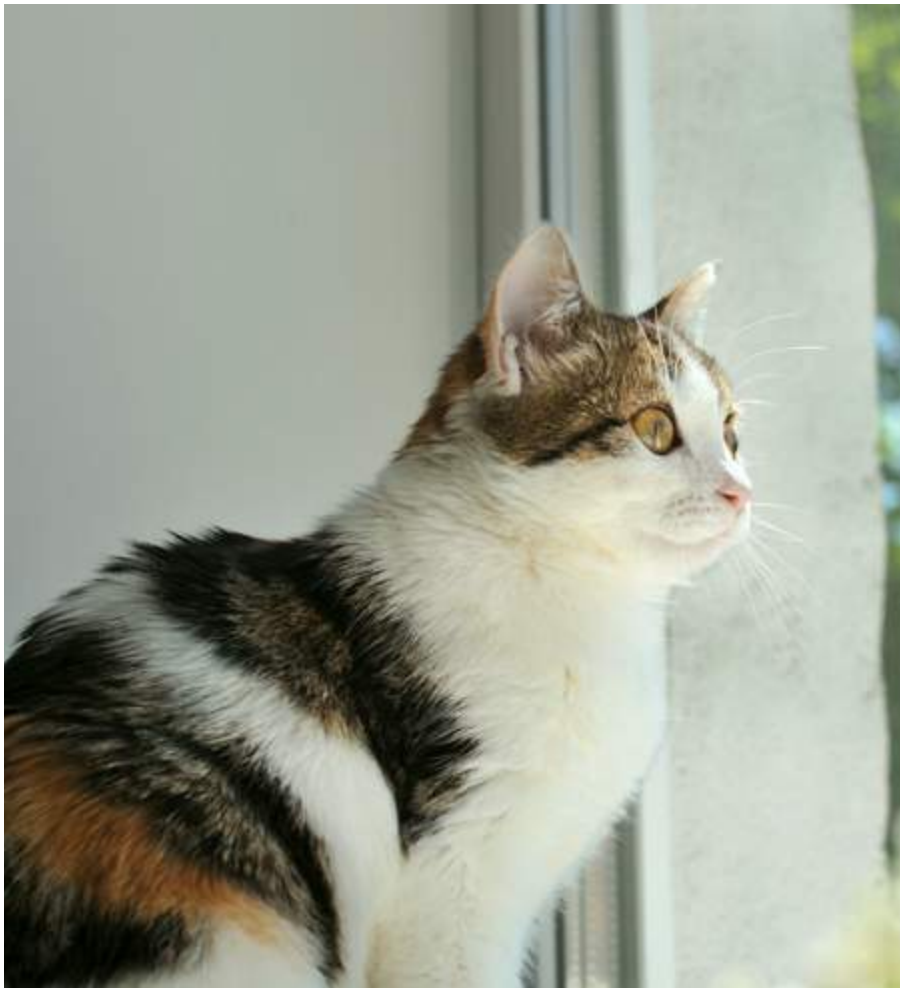
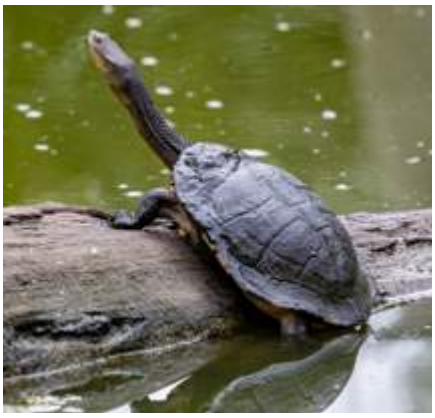
INCLUDED IN THIS UPDATE







COMPANION ANIMALS

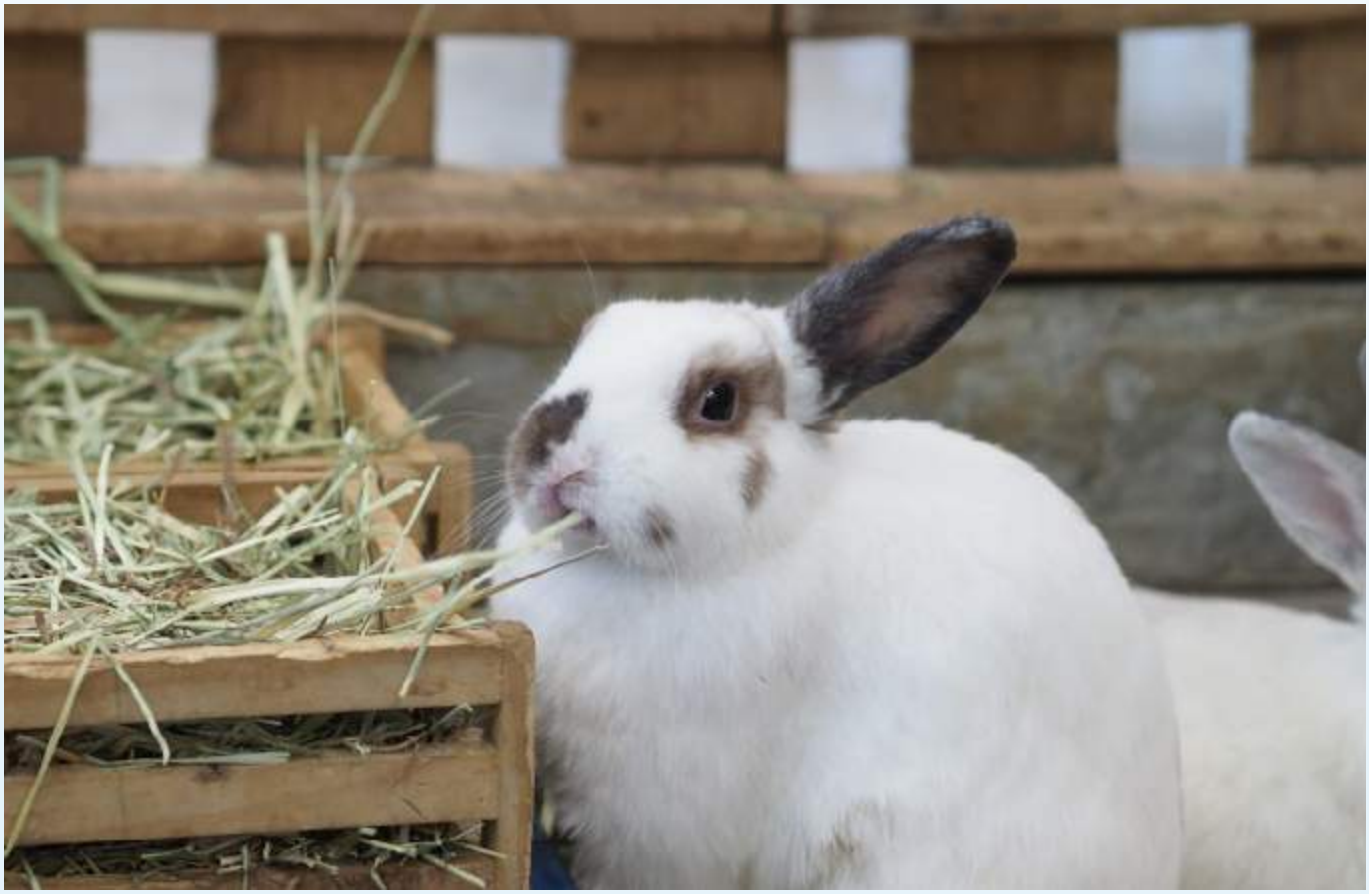
Improved recognition of ear conditions in pet rabbits could improve welfare

Ear disease in pet rabbits can cause pain, hearing impairment, and loss of balance. However, it can be difficult for owners to recognise that there is a problem. Behavioural signs, such as unresponsiveness and reduced activity, can go unnoticed by owners and veterinarians even when conditions are having an impact on the rabbit's quality of life. The topic has not been widely reported in scientific literature, so the authors were motivated by the belief that a greater understanding of the range of potential conditions and their impact could help owners and veterinarians identify when rabbits need treatment, leading to improved care and welfare.

The authors conducted an online survey of UK pet rabbit owners (n = 551) using a questionnaire that consisted of 32 multiple choice questions. 28.5% of rabbits had reportedly experienced ear conditions, with 21.2% problems diagnosed or mentioned by veterinarians. Otitis and excess cerumen were the most common conditions, and lop-eared, half-lop, and older rabbits were most at risk. Those rabbits who showed ear pain responses had reduced owner-reported quality of life compared with other rabbits. For example, they were less likely to binky (jump for joy) and less likely to respond to the sound of treats being prepared.

The survey increased knowledge of the prevalence and risk factors for ear conditions in rabbits in the UK. The authors believe that ear problems in rabbits may be under-diagnosed and under-treated due to the difficulty owners have in recognising them. They therefore conclude that increased recognition of problems is needed to address the associated rabbit welfare concerns. They also recommend that breeders should avoid breeding from rabbits with early signs of ear disease or with a family history of problems.

Chivers BD, Keeler MR, Burn CC (2023) ***Ear health and quality of life in pet rabbits of differing ear conformations: A UK survey of owner-reported signalment risk factors and effects on rabbit welfare and behaviour.*** *PLOS ONE. https://doi.org/10.1371/journal.pone.0285372*



Emergency boarding program provides value to people and animals

Emergencies such as acute hospitalisations, homelessness, and natural disasters can result in people being separated from their companion animals. This can lead to socially isolated people avoiding care as they don't have friends or family to care for their animals while they undergo treatment. The RSPCA NSW Emergency Boarding and Homelessness program is designed for these people, and this study aimed to understand the social value it created.

The value of the program was calculated as social return on investment (SROI). The calculation is made by allocating a financial value to a change that has occurred for a stakeholder using financial proxies. For example, some clients reported experiencing improved physical health, and this was equated to an annual gym membership. The methodology included delineating how much change was due to the program itself, what would have happened anyway, and how long the change lasted. In-depth interviews were conducted for a range of stakeholders (n = 13) including RSPCA Inspectors and NSW police, and questionnaire responses were received from 29 program clients. The main benefits were felt by clients and their animals, and this was estimated at over AUD 5 million for the 2020–2021 financial year. The estimated SROI was AUD 8.21 for each AUD 1 invested.

The bulk of the benefit was attributed to preserving the human–animal bond and to improvements to the mental health and wellbeing of the animal owners as their animals gave them purpose and direction. The authors concluded that keeping people together with their companion animals or ensuring they are reunited as soon as possible after separation can reduce stress and improve outcomes for people and animals.

Ma GC, Ravulo J, McGeown U (2023) ***Emergency animal boarding: A social return on investment****. Animals 13(14), 2264 [author Gemma MA is from RSPCA NSW]*

Rise in number of brachycephalic (flat-faced) dogs with in the UK raises welfare concerns

Designer dog breeds continue to be popular even though there is greater awareness among the UK public about the potential health and welfare risks associated with dog breeds with extreme phenotypic characteristics. Dogs with brachycephalic skulls (i.e. dogs with a broad short skull and a flat face), for example, are at increased risk of respiratory compromise (BOAS – brachycephalic obstructive airway syndrome), a key welfare issue, along with corneal ulceration, and skin fold dermatitis as they age. The aim of this study was to present reliable demographic information about UK dogs to aid in the proactive development of responses to changes in health and welfare issues.

The authors evaluated data from the VetCompass program that allowed them to collect data on breed, age, and gender for over two million dogs alive in 2019. Overall, 69.4% (n = 1,551,462) were classified as purebred, 6.7% (n = 149,308) as designer-crossbred and 24.0% (n = 536,335) as nondesigner-crossbred. The most common pure breeds were Labrador Retriever (n = 154,222, 6.9%) and Jack Russell Terrier (n = 101,294, 4.5%). When only dogs under the age of one were considered, the most frequent classifications were nondesigner-crossbred (n = 45,995, 20.0%), French Bulldog (n = 16,036, 7.0%), and Cockapoo (n = 14,321, 6.2%). Designer-crossbreds were significantly younger than nondesigner-crossbred dogs. Overall, breeds classified as brachycephalic comprised 43.1% (n = 969,403) of the population. Additionally, the ratio of male to female dogs was 1.09: 1.00.

The authors suggest that a worsening health and welfare crisis for dogs could result due to an increase in extreme conformations and hereditary diseases if current market forces are not altered to prioritise innate health in dog purchasing decisions. They also warn that the longer-term welfare issues for designer-crossbreds are largely unknown..

O'Neill DG, McMillan KM, Church DB, Brodbelt DC (2023) ***Dog breeds and conformations in the UK in 2019: VetCompass canine demography and some consequent welfare implications****. PLOS ONE. https:/doi.org/10.1371/journal.pone.0288081 .*

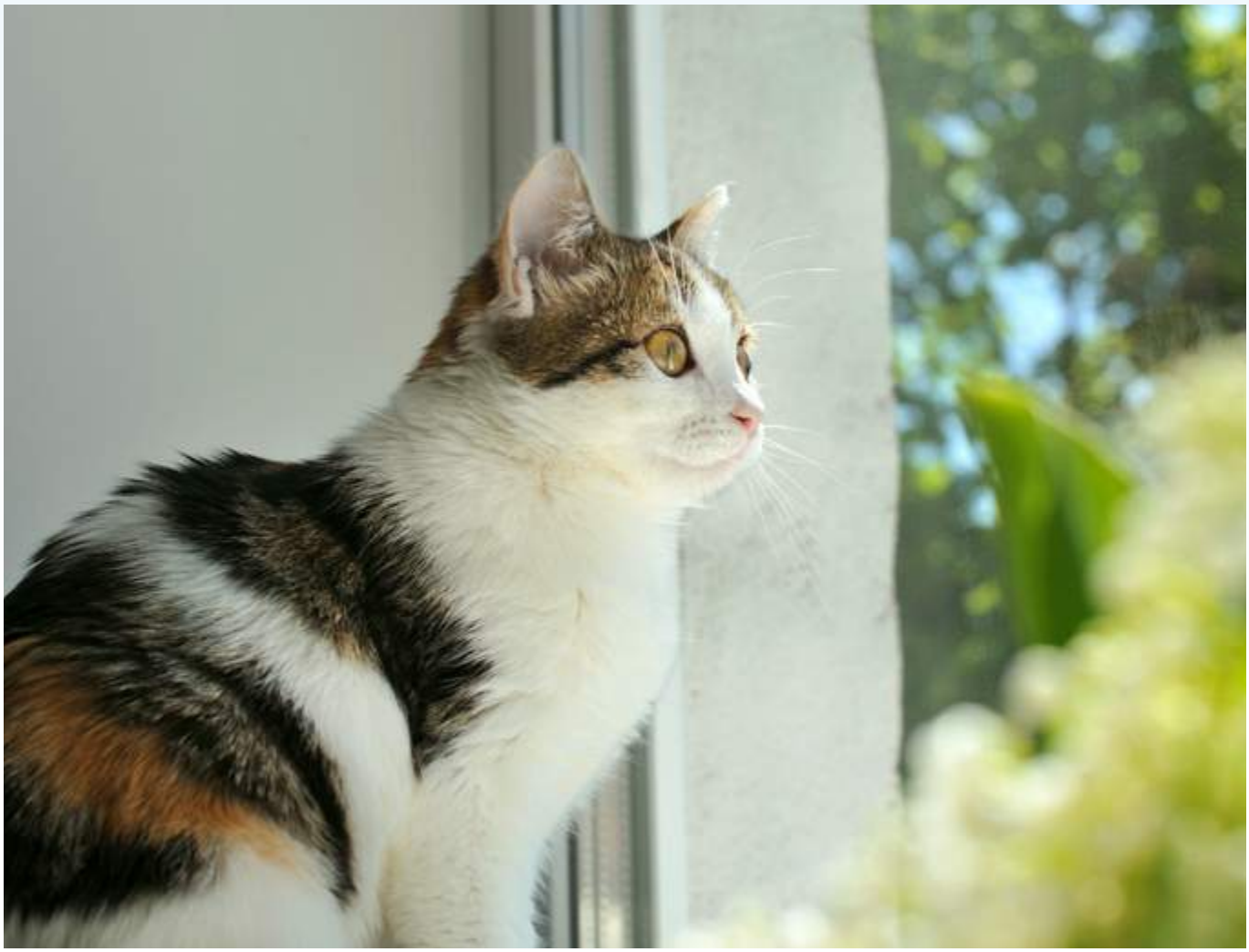
Owners perceive feline behaviours that affect the owner's lifestyle as problematic

Studies have shown that a quarter of cats in shelters have been relinquished by their owners due to problem behaviours. These behaviours might be normal feline behaviours or the result of medical or behavioural pathology. For example, urination in undesired places can be the result of stress, anxiety, medical issues, or inappropriate litter box provisions. The aim of this study was to understand how owners perceived problem behaviours and how they rated their relative importance.

Data for the study was taken from 100-item online surveys undertaken between 2016 and 2022 by cat owners from around the world (n = 4,941), but mostly the US. As well as using an ordinal scale to rate cat problem behaviours, the survey included the recording of demographic data such as cat age, gender, and their access to outdoors. The results indicated that 31.4% of cats were perceived as having minor behavioural problems and 9.9% had moderate to serious behaviour problems. These were not related to cat age or gender. Indoor cats were significantly more likely to be perceived as showing moderate to serious behavioural problems. Behaviours that weren't seen as problematic included separation-related behaviour, excessive self-grooming, predatory behaviour, prey interest, vocalisations, location preferences for resting, and lying on items when in use. This contrasted with behaviours that affect owner's lifestyle which were perceived as problematic including owner-directed aggression, aggression with other familiar cats, urine spraying, fear of novelty, escaping behaviour, and crepuscular activity.

The authors concluded that educating owners on cat behaviour might improve their recognition of problems and help them understand the animal welfare implications.

Powell L, Watson B, Serpell J (2023) ***Understanding feline feelings: An investigation of cat owners' perceptions of problematic cat behaviors****. Appl Anim Behav Sci 266:106025*



Welfare problems linked to perception of rabbits as "starter pets"

Previous studies have indicated that many companion rabbits live in conditions that raise welfare concerns. The authors hypothesise that this could be the result of children being responsible for their care, the perceptions that rabbits are good "starter pets" for children, or that many owners have a low willingness to pay for veterinary care.

Using data from a Statistics Denmark survey (n =76) and a more detailed social media survey (n = 4,335), the authors used regression analysis to evaluate how owners viewed their rabbits and how they were housed, fed, and interacted with. Many rabbits were reported to have been acquired for children, kept in unsuitable cages, and not checked daily. Owners who perceived rabbits as starter pets and had a low willingness to pay for veterinary care were more likely to house rabbits in restricted space and not provide continuous gnawing opportunities, ad libitum hay, or veterinary access. When a child was the main caretaker, rabbits were also more likely to have restricted-space housing and fewer gnawing opportunities.

The authors noted that views varied on whether rabbits were good starter pets or children's pets. They proposed further investigation to understand what characteristics lead to this conclusion. They also suggested that rabbits should not be portrayed with small children or in small cages, as this may give the misleading impression that they are a low effort, low cost pet. Portraying rabbits with adequate space and enrichment could change owner perceptions and lead to better welfare outcomes, fewer health problems, and longer lifespan. The authors also suggested that promotion of an official code of practice would be helpful in reducing the number of rabbits relinquished at shelters.

Skovlund CR, Forkman B, Lund TB, Mistry BG, Nielsen SS, Sandøe P (2023) ***Perceptions of the rabbit as a low investment 'starter pet' lead to negative impacts on its welfare: Results of two Danish surveys****. Animal Welfare https://doi.org/10.1017/awf.2023.41*

Many health conditions found in captive central bearded dragons are preventable

Captive reptiles can be susceptible to disease and mortality if their owners fail to understand and implement optimal husbandry and meet the needs of their reptiles. The number of reptiles kept as pets is growing in Australia, but many veterinarians still have limited experience with diagnosing health issues. The authors aimed to provide owners and veterinarians with information about clinical presentation and disease prevalence in captive central bearded dragons (*Pogona vitticeps*) to help address that knowledge gap.

Clinical records spanning 17 years from three exotic pet veterinary hospitals were analysed to provide information about 1,000 individual visits (n = 724 individual lizards). Lethargy was the most reported reason for presentation (n = 181), and the gastrointestinal tract (18.25%) and the skin (18.25%) were the most commonly affected organ systems. The most common diseases identified were endoparasites (n = 103), metabolic bone disease (n = 65), skin wounds (n = 59), and periodontal disease (n = 48). Routine health examinations (n = 159) resulted in 45.30% of lizards receiving some form of intervention to treat or prevent disease. The most common husbandry issues identified were insufficient provision of basking temperatures, a lack of ultraviolet B radiation, not using a photothermal heat source, feeding an unbalanced diet that was low in calcium, and cohabitation of this naturally solitary species with other lizards.

The authors conclude that many of the health conditions identified in the study are traditionally correlated with suboptimal husbandry and may

be easily prevented. For example, low temperatures may weaken the lizard's immune system, allowing an endoparasite burden to become clinically significant. The authors propose that health and husbandry training should be included in the licensing process for lizard ownership. They hope that the study supports veterinary students with an interest in reptile medicine.

Sollom H, Baron H (2023) ***Clinical presentation and disease prevalence of captive central bearded dragons (Pogona vitticeps) at veterinary clinics in Australia****. Aust Vet J 101:200–207*

FARM ANIMALS

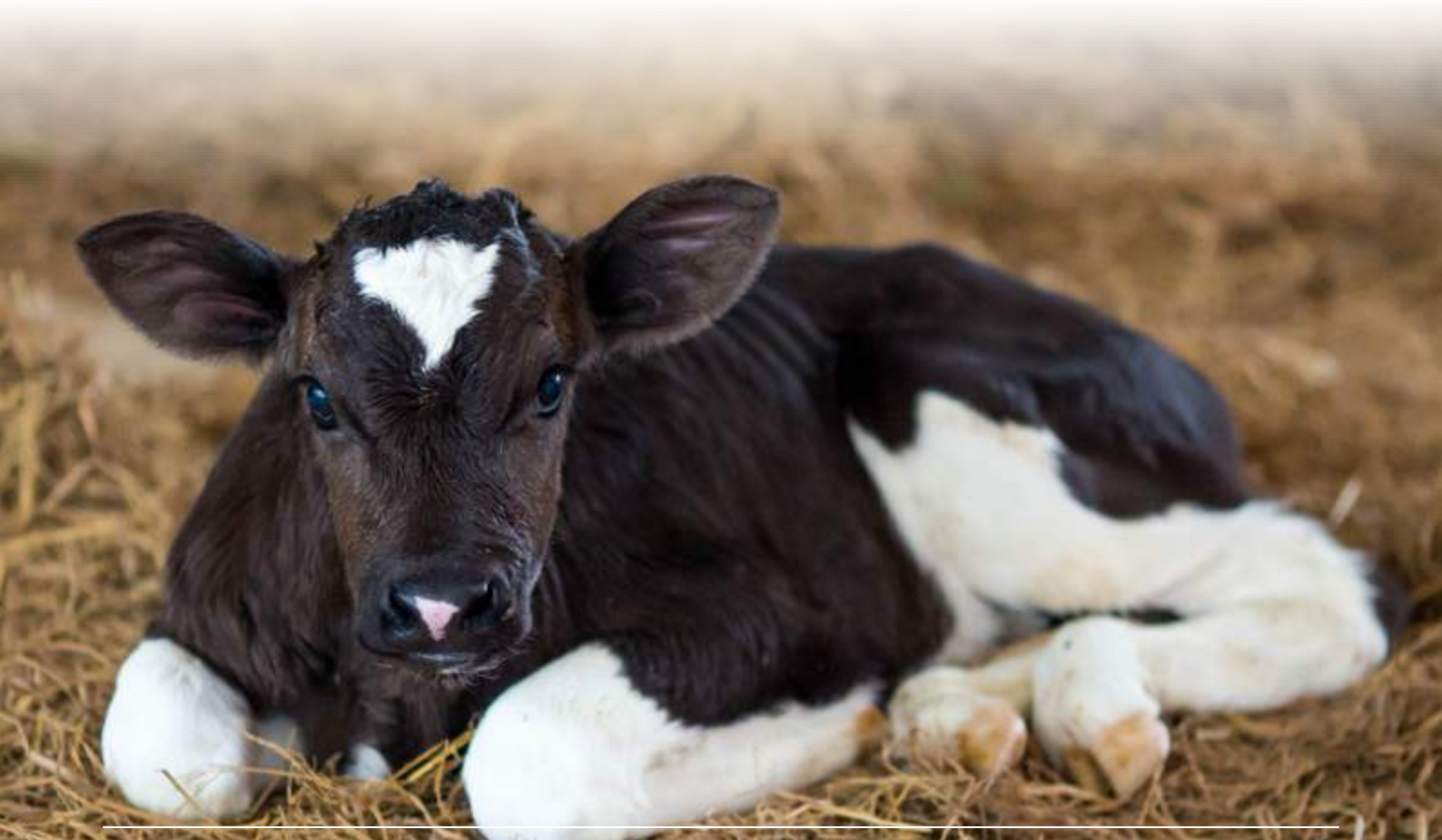
Disbudding alters calf behaviour for at least three weeks

Welfare concerns persist about hot-iron disbudding, which prevents the growth of horns in dairy calves, even though some pain management strategies have been introduced in recent years.

The behaviour of Holstein calves from the University of California Davis' Dairy Teaching and Research Facility was monitored for three weeks after disbudding to determine if there were differences in rest time, rumination and sucking that might be indicative of on-going pain. The disbudded calves (n = 19) received lidocaine (corneal nerve block) prior to and meloxicam immediately after disbudding at around eight days of age. Ear tag accelerometers were fitted to 15 control calves and 15 disbudded calves to provide information on behaviours at one-minute intervals, with recordings included from day three to day 21 after disbudding to avoid confounding effects of the pain relief provided. Live observations were also made at five-minute intervals for 24 hours on days 3, 10 and 17. Disbudded calves spent an average of 54 minutes longer being inactive each day over the observation period and the accelerometer showed that calves ruminated for 55 minutes less in the first three to 11 days after disbudding compared to age-matched controls (n = 19). Sucking behaviour was monitored in a subset of the calves (n = 6) and this indicated, unexpectedly, that they sucked more from day five onwards.

The authors predicted that the calves would suck less to avoid pain evoked by associated head and ear movements. They hypothesised that, for their experimental design, the increased sucking response may have resulted from an attempt to gain more nutrients for healing. The behavioural changes in rest time and rumination were interpreted as evidence of ongoing pain until at least three weeks after the procedure. Further studies using analgesic intervention are needed to confirm this, but the authors cite other studies demonstrating the long-term negative consequences of various disbudding procedures and say that alternatives are needed.

Adcock SJJ, Downey BC, Owens C, Tucker CB (2023) ***Behavioral changes in the first 3 weeks after disbudding in dairy calves****. J Dairy Sci 106:6365–6374*



Unweaned dairy calves benefit from higher milk allowances

Calves typically suckle from their mother eight to 12 times a day during the first few weeks of life before shifting to consuming fewer but larger quantities of milk. On dairy farms, calves may be fed only once or twice a day, and milk may be offered from a bucket rather than a teat. A systematic literature review was undertaken to assess the relationship between feeding practices and calf behaviour, health, and performance.

A survey of 94 relevant articles was undertaken to evaluate different feeding strategies. Overall, feeding calves higher milk allowances increased growth (90% of 69 studies), reduced signs of hunger, and increased play behaviour. It also reduced the intake of starter food by unweaned calves. The volume of milk consumed each day did not appear to affect calf health, and evidence linking the potential for higher milk allowances to diarrhea was not decisive. Teat feeding led to fewer abnormal oral behaviours than bucket feeding, but measured growth did not differ between feeding methods or access to dry teats. Feeding frequency appeared to have little effect on the amount of milk consumed or calf growth, although there were more signs of hunger in calves with lower feeding frequency (less than two or three portions per day, depending on age).

The authors conclude that their review of the literature strongly suggests that feeding calves higher volumes of milk using a teat is optimal. However, further work is needed to determine the optimal feeding frequency for calves at different ages and should be based on epidemiological study designs that provide adequate sample sizes. This will aid understanding of the effects of milk feeding practices on calf health.

Welk A, Otten ND, Jensen MB (2023) ***Invited review: The effect of milk feeding practices on dairy calf behavior, health, and performance—a systematic review****. J Dairy Sci 106:5853–5879*

Relationship between pain and stress indicators in piglet castration not clear

A range of pain mitigation measures are used for piglet castration, but their efficacy and sufficiency remain unclear. The study of the interrelationships between different physiological, vocal, and behavioural indicators of pain and stress could help interpret experimental research and ultimately lead to better welfare outcomes. This study explored the data of two previous experiments to look for relationships between indicators, and specific responses within indicators, to determine how well they align with each other.

Piglets in both experiments conducted in a conventional Danish herd were 3-4 days old (weight 0.9 – 2.7kg) at the time of castration or sham-handling (n = 406 in study 1, and n = 174 in study 2). Piglets were not ear tagged, tail docked, or teeth clipped before castration. Piglets were given local anaesthetic, then castrated or sham handled, and administered a non-steroidal anti-inflammatory drug within 24 hours of castration. The 40 parameters from six main indicator types evaluated included measures of vocalisation, resistance movements, saliva cortisol concentration, behavioural response in a social motivation test, behaviour in the home pen, and reaction to a human. The authors found that many of the associated measures correlated less than expected. For example, acute responses to castration, such as vocal parameters and resistance movements, showed some positive correlation but with different underlying mechanisms.

The authors conclude that vocal parameters, resistance movements, cortisol concentrations, and home pen behaviours, for example, may not be all qualified as pain responses, as they are also expressed in the absence of acute pain. This highlights the need for methodological development in experiments gauging pain and stress responses, and the authors conclude that careful analysis of indicators within specific experimental designs is required. The relative importance of different indicators may not be clear, and this could lead to misinterpretation of results and impair the evaluation of any welfare measures.

Coutant M, Malmkvist J, Foldager L, Herskin MS (2023) ***Relationship among indicators of pain and stress in response to piglet surgical castration: An exploratory analysis****. J Vet Behav 67:20–32*

More options and more space positively impact broiler chicken behaviour

The high density housing of broiler chickens with relatively barren conditions limits their ability to express natural behaviours. This can lead to a negative affective state and therefore impact their welfare. The authors of this study assessed whether housing broilers at lower stocking densities and in a more complex environment would result in more normal behaviours such as foraging, locomotion, and preening being expressed.

The study was conducted at the Virginia Tech poultry facility in the US. Ross 708 male broiler chicks (n = 1080) were allocated to pens that either contained high or low complexity at either high or low stocking density from day 0 to day 50. Birds kept in the high complexity environment were provided sand for dustbathing, perching opportunities, and various enrichment objects such as metal balls filled with alfalfa hay. The stocking density from day 15 to 50 was 6.2 - 42.0 kg/m^2 for the high group and 2.9 – 23.8 kg/m^2 for the low group. The behaviour of the broilers (n = 484) was recorded continuously for five minutes twice on one day during weeks 2, 4, and 7.

The birds in complex environments were more active and spent more time preening and foraging than those in the barren environment, however activity generally decreased in all the birds as they aged. Birds in high stocking densities foraged, drank, and ate less frequently, and also spent more time drinking on fewer occasions possibly due to challenges accessing resources and their ability to move. Overall, the authors concluded that housing broilers in a complex environment with adequate space can encourage birds to express normal behaviours as they age including foraging, locomotion, and preening. The authors also suggested that providing birds increased opportunities to perform normal behaviours would likely promote more positive affective state and improved welfare outcomes.

Evans L, Brooks GC, Anderson MG, Campbell AM, Jacobs L (2023) ***Environmental complexity and reduced stocking density promote positive behavioral outcomes in broiler chickens****. Animals 13(13):2074*

Housing Muscovy ducks at higher stocking increases adverse behaviours

Muscovy ducks in commercial production systems are commonly raised indoors and at high stocking density, which can negatively affect duck welfare and production outcomes. Research into the impact of stocking density on ducks is limited. To address the research gap, this study aimed to assess the impact of different stocky densities on behaviour, physiology, and performance of Muscovy ducks.

The study was conducted at the poultry and research unit at Assiut University in Egypt. One-day old male Muscovy ducklings (n = 135) were housed in pens (110cm x 110cm) for 60 days and assigned to one of three stocking density treatments with five replicates per treatment group: 6, 9, and 12 birds/m^2. The behaviour of five ducklings per replicate was monitored three times a week for one hour twice a day. One duckling from each replicate was slaughtered at 60 days to collect blood samples to measure various blood parameters, as well as carcass weight and other performance traits. Ducks housed at 9 and 12 bird/m^2 performed less feeding, crouching, standing, walking, and feather ruffling, as well as more drinking, huddling, sitting, preening, feather pecking, and wall pecking behaviours compared to the ducklings housed at 6 birds/m^2. The ducks reared at the higher stocking densities had lower body weights, feed intake, body weight gain, carcass eviscerated weight, and carcass dressing percentage. The blood samples of ducks housed at higher stocking densities had lower serum calcium, phosphorus, total protein, thyroxine (T4), and total antioxidant levels and had higher malondialdehyde and corticosterone levels. The blood parameter results suggested birds at higher stocking densities showed more signs of heat stress, dietary deficiency, and stress.

The authors conclude that housing ducks at higher stocking densities negatively affected the welfare and performance of Muscovy ducks. The results from this study showing the negative effect of higher stocking densities are consistent with other studies on stocking density in other poultry species such as Pekin ducks and broiler chickens.

Negm E, Mohammed A (2023) ***Effect of stocking density on behavior, performance and some blood parameters of Muscovy ducks****. SVU-International Journal of Veterinary Sciences 6(3):17–32*

Environmental complexity during rearing improves pullet's spatial and navigational skills

Layer hens in cage-free housing systems, unlike in caged housing systems, are able to perform normal behaviours such as walking, flying, foraging, and dustbathing. The spatial skills that hens use to navigate the more complex environments of cage-free housings systems safely mainly develop during rearing. It has been argued that pullets (young hens) are unable to develop the necessary spatial skills required to navigate and adapt to complex cage-free housing systems if reared in cages or barren simple environments. This study assessed the impact of rearing housing systems with varying levels of environmental complexity on the learning ability of two genetic strains (brown and white) of pullets.

The study was conducted at the Arkell Research Station in Ontario, Canada. The two genetic strains used for the study were Lohmann Brown lites (brown hen strain) and Lohmann Selected Leghorn-lites (white hen strain). Four consecutive flocks of brown and white (n = 1497 each flock) chicks were raised in conventional barren cages or an aviary with low, intermediate, or high complexity for their first six weeks of life. The spatial learning ability was birds was assessed with T-maze tests in the birds at four weeks of age and 13 weeks of age.

At four weeks of age, the white chicks performed significantly better in the T-maze than the brown chicks, although generally chicks had poor performance. The birds housed in intermediate and high complexity environments at 13 weeks of age had better learning performance than those housed in the low complexity aviaries or conventional cages. The white pullets also had a quicker time to attain the learning goals set than brown pullets when they were older. During the study, methodological changes to the T-maze test had to be made to address unexplained differences between flock replicates, which the authors suggest could have impacted the experimental outcomes. Overall, the authors conclude that increased environmental complexity during rearing can improve learning and spatial skills in hens and the learning ability of hens differs between strains.

Rentsch AK, Harlander A, Niel L, Siegford JM, Widowski TM (2023) ***Rearing laying hens: Environmental complexity and genetic strain affect pullet but not chick performance in a T-maze learning task****. Applied Animal Behaviour Science 265:105997*

Noise can affect welfare of farmed animals

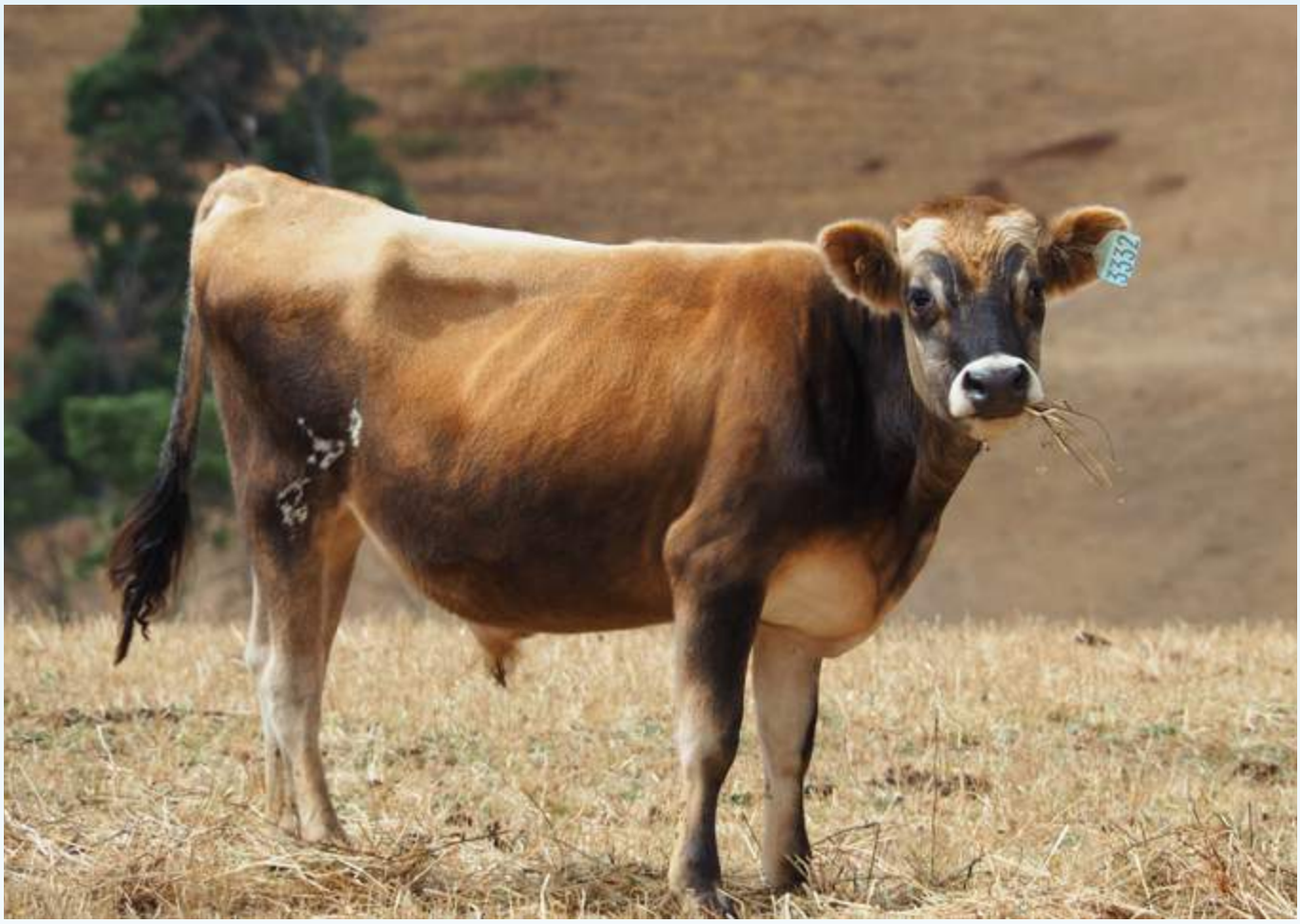
Long-term exposure to noise can result in welfare issues for farm animals including stresses that can result in lowered immunity. Sounds can also be associated with particular actions, people, or conspecifics. For example, research indicates that mother goats never forget the sound of their offspring. The aim of the study was to present information about the role of sound and hearing in farm animals and their impact on animal welfare.

The authors considered sound from a bottom-up (the transfer of information from sensory input) and top-down (interpretation of sensory information based on knowledge and experience) perspective. They considered the sounds made by the animals themselves, farm equipment, and human-generated sounds such as voice, whistles, radio, and music. Effect of sound and noise on a range of farm animal species was presented. High-frequency and high-pitched tones may stress animals whereas low-frequency sounds have a calming influence, highlighting the importance of calm, low and soothing tones when handling animals. Animal vocalisations can be indicative of their emotional state, e.g. cows will vocalise differently when isolated compared to when they are reunited with their herd.

The authors note that while there is a wide range of research papers examining the negative impacts of noise on animal welfare, most of them involve rats. There is also an increasing number of papers on how vocalisation

is linked to emotional state and animal welfare. However, there is still insufficient research on the practical implementation of sounds and music in agriculture and the potential for harnessing benefits of certain sounds to guide the use of sound-based techniques in farm management to improve farm animal welfare.

Olczak K, Penar W, Nowicki J, Magiera A, Klocek C (2023) ***The role of sound in livestock farming—selected aspects****. Animals 13:2307*



Livestock welfare complaints in Victoria linked to seasonal rainfall and livestock prices

Extensive farming of cattle, sheep and goats offers welfare benefits such as the ability to express natural behaviour and lower stress levels, but it does leave the animals more vulnerable to variability in the quality and quantity of pasture available to them. For example, low rainfall can impact pasture availability. Neglect of animals has been associated with issues such as inadequate nutrition, supervision, or treatment. This can arise from a number of socio-economic factors; only in rare cases is the neglect or abuse malicious. The aim of this study was to evaluate whether the rate of substantiated welfare complaints in Victoria could be related to rainfall and livestock prices so that contributing issues could be better understood.

The number of complaints (n = 2,486) received by the Victoria State Government between 2011 and 2020 for non-dairy cattle, sheep, and goats in extensive farming systems was analysed in relation to month, year, various rainfall metrics, and livestock prices. Most complaints were made in late winter. There was considerable variation between months, years, and regions. The ratio of the actual mean rainfall of the last three seasons to the long-term mean of the last three seasons of rainfall combined with livestock prices were the best predictors of the total number of substantiated welfare complaints.

The authors noted that the study is the first to compare livestock welfare complaints on a month-by-month basis. They concluded that while rainfall showed some correlation with the number of substantiated welfare complaints, other factors are likely involved, because favourable seasonal conditions were not necessarily protective of livestock welfare. In addition, welfare incidences are likely to be under-reported.

Williams N, Chaplin S, Hemsworth L, Shephard R, Fisher A (2023) ***An analysis of substantiated complaints made about incidents of poor livestock welfare, in Victoria, Australia.*** Front Vet Sci. *https://doi.org/10.3389/fveterinarians.2023.1242134*

ANIMALS IN SPORT, ENTERTAINMENT, PERFORMANCE, RECREATION AND WORK

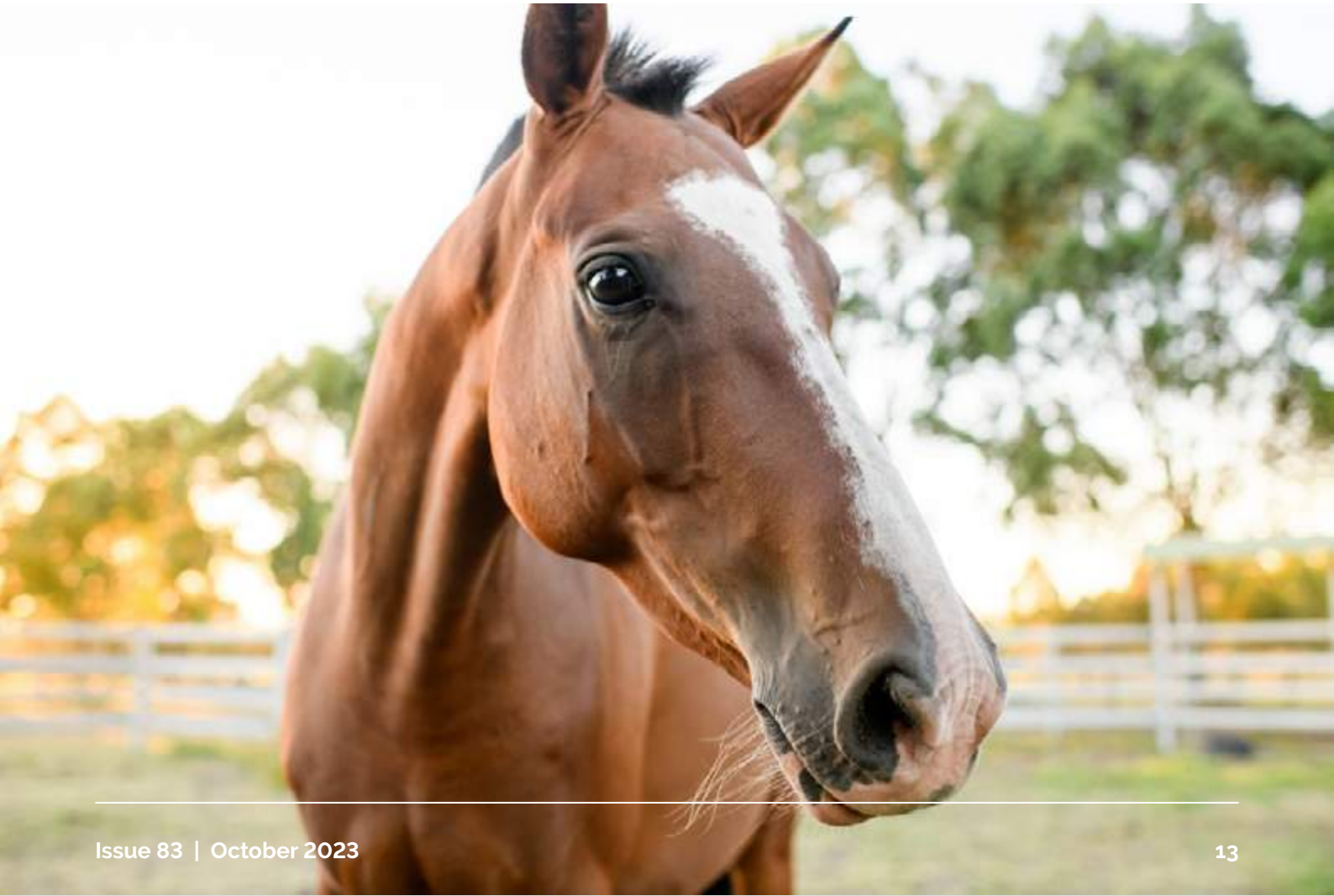
Horse hair trimming attitudes could help reduce welfare impacts of other grooming practices associated with showing and competition

In July 2022, Australian equine organizations banned the trimming of horses' vibrissae (sensory hairs located around the muzzle, ears and eyes) competing in their events due to horse welfare concerns. Vibrissae are believed to help with spatial awareness, protect horses from insects and dirt, facilitate water drainage from the ear canal, identify suitable grass for consumption, and disperse pheromones. The aim of the study was to assess owner attitudes to the practice of trimming so that it could be applied to other similar interventions that might raise horse welfare concerns.

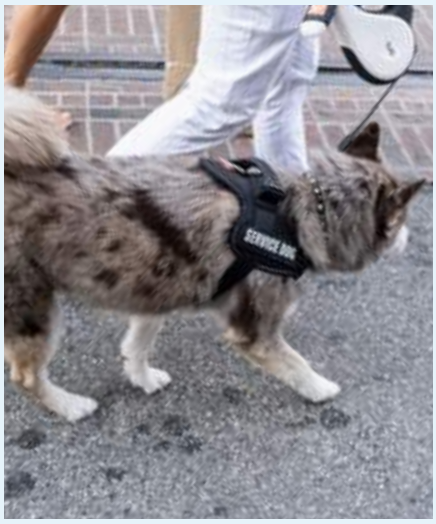
An online survey of 33 questions was completed by horse owners (n = 422) several months prior to the ban. 42% of respondents trimmed vibrissae, with 34% trimming muzzle hairs and 50% trimming ear hairs. This was typically done just before a competition, with 28 respondents needing an extra person to restrain the horse, 28 respondents using a twitch, and nine using sedation. Respondents involved in showing competitions more commonly believed that it was a normal practice in their discipline (76.2% trimmed their horse's muzzle versus 6.7–19.5% in the other types of competition). They believed that a trimmed horse was more likely to win and that horses did not need muzzle or ear hairs for day-to-day living. Many respondents reported there were no changes to their horse's behaviour after trimming.

The authors believe that their findings could be useful for understanding the impact of other non-regulated horse presentation practices that can compromise welfare, including clipping hair from the ear canal and 'pulling' manes and tails.

Hazel SJ, Holman C, Thompson K (2023) What's the fuzz: ***The frequency, practice and perceptions of equine facial hair trimming revealed in a survey of horse owners in Australia.*** Human-Anim Inter. *https://doi.org/10.1079/hai.2023.0023*



Facilitated discussions can help keep owners and their assistance dogs together in aged care



Many aged care facilities don't allow people to keep their assistance dog when they move in. Relevant legislation is designed to prevent discrimination in accommodating owners and their dogs, but there can be limited space and a lack of acceptance amongst staff and others which makes it difficult for aged care facilities to accept resident's dogs. The aim of this study was to use a deliberative democracy approach to facilitate discussions on the issues in a holistic and collaborative manner. This could then help them decide what factors should be considered to achieve the best outcomes for owner and dog.

Focus groups were held in Queensland with 18 professionals involved in aged care or assistance animals, and these were followed up by questionnaires. Importance was placed on how traumatic it would be for owners to have to give up their dog, and their capabilities when entering care and then subsequently, were also important considerations. The size and behaviour of the dog would be important factors in ensuring adequate space for them and in gaining acceptance from staff, other residents, and their visitors. A suitable outcome could be the establishment of dog friendly spaces with enthusiastic staff recruited as dog ambassadors. Ultimately, it was agreed that policies should be developed for when the owner is able to keep their dog and also when then can't.

The authors concluded that fair decisions could be made regarding the welfare of both the owner and their dog, but policy and procedures would need to be put in place to ensure ongoing support, such as training, care plans, and emergency directives. This would lead to better aged care outcomes for owners and their dogs.

Salmon AJ, Pachana NA (2023) ***Cultivating the acceptance of assistance dogs in aged care through deliberative democracy****. Animals 13(16):2680*

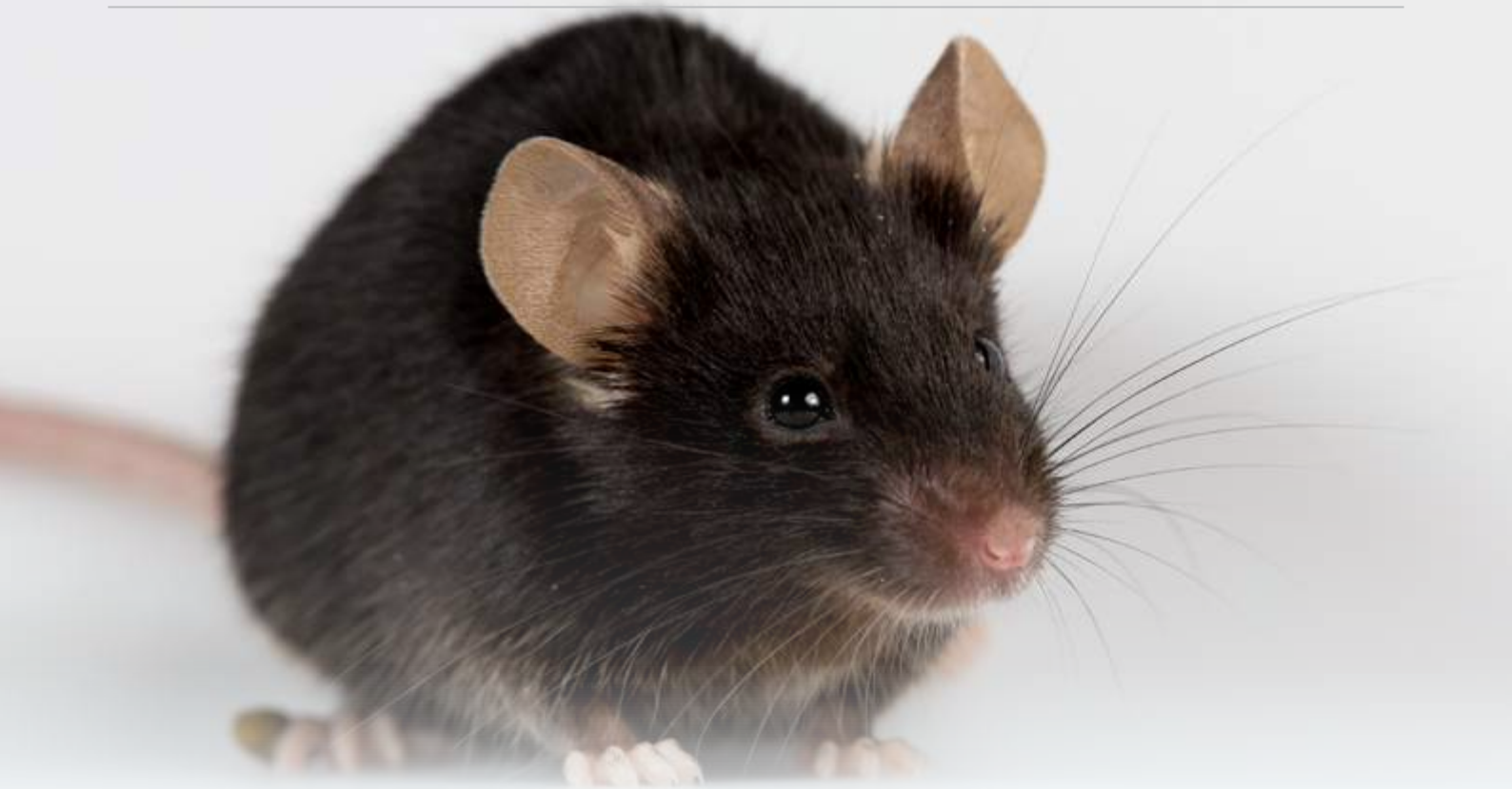
An increase of 15 degrees in ridden poll flexion poses risks to horse welfare

The International Society for Equitation Science has advised that lesser degrees of poll flexion – a head and neck posture forced on a horse during some competitive riding sports – should be maintained after studies of extreme positions have demonstrated that they can adversely affect horse health and welfare. The authors aimed to study respiratory system responses and horse behaviour for two poll flexion angles of only 15 degrees difference.

The study, conducted in Portugal, involved high-level dressage (n = 20) and show-jumping (n = 20) horses which were given a 40-minute riding test at a ground angle (the angle between the ground and the line from the forehead to the muzzle) of 85 degrees. The test was repeated three weeks later with a 100-degree ground angle. The authors evaluated dynamic airway collapse, pharyngeal diameter (size of opening at the back of the throat), pleural pressure (of the cavity between the lungs and the ribs), blood oxygenation and lactate level, and the occurrence of conflict behaviour including tail swishing, teeth grinding, rearing. The second test resulted in significantly more frequent conflict behaviours and upper airway tract abnormalities than the first for both groups of horses. Heart and respiratory rates were significantly lower at the beginning of the second test, perhaps as a result of familiarity with the environment, but were higher than the first test at the end. Pleural pressures were also higher and pharyngeal diameters lower. Relaxation behaviours were significantly more frequent during the first test.

The authors surmised that their results support the notion that a relatively small increase in riding poll flexion can have negative effects on the respiratory system and behaviour of a horse and therefore on welfare. They suggest that more research into the impact of minimising the amount of time spent riding with a poll flexion ground angle greater than 85 degrees is required.

Tilley P, Simões J, Sales Luis JP (2023) ***Effects of a 15° variation in poll flexion during riding on the respiratory systems and behaviour of high-level dressage and show-jumping horses****. Animals 13(10):1714*



ANIMALS IN RESEARCH AND TEACHING

New disease models assist drug development and reduce animal use

Microphysiological system disease models are complex in-vitro systems (those which occur outside a living organism) that include organ-on-a-chip, organoids, spheroids, and 3D bioengineered tissues that integrate key in-vivo properties (those which occur inside a living organism) needed for drug discovery and development. They can, for example, include disease-relevant human cells and simulate blood flow and organs in 3D. The aim of this review article was to highlight notable successes in the use of microphysiological system disease models. Additionally, the article discussed limitations and opportunities for this technology given its advantages over more traditional 2D systems and its potential for reducing the need for animal testing as it gains greater acceptance amongst regulators and the pharmaceutical industry.

The authors provided in-depth analysis on how these disease models are used in cancer, liver/kidney diseases, respiratory diseases/COVID-19, neurodegenerative diseases, gastrointestinal diseases, and select rare diseases. Current challenges include the low throughput of the technology, sub-optimal simulation of biological barriers such as membranes, and a short lifespan that limits simulation of long-term disease development. Another limitation is the lower translatability of the in-vitro findings to living system outcomes than is typically provided by large historical datasets. This means it's not clear how regulatory agencies might interpret results.

The authors concluded that there are many opportunities for further development. For example, they noted that there are no therapies for many viral infections, and animal models can be poor surrogates for human models. They suggest that companies, academic authors, pharmaceutical industry scientists, and regulatory agencies should work together to standardise microphysiological system disease model testing and use.

Irrechukwu O, Yeager R, David R, Ekert J, Saravanakumar A, Choi CK (2023) ***Applications of microphysiological systems to disease models in the biopharmaceutical industry: Opportunities and challenges****. ALTEX 40(3):485-518*

WILD ANIMALS

Anticoagulant rodenticides potentially pose a threat to Australian avian predators

Anticoagulant rodenticides have been shown to impact predator populations around the world, with most research being conducted in the northern hemisphere. Second generation poisons, such as brodifacoum and bromadiolone, do not require multiple feeding sessions to be effective, but it can take several days for the mice or rats that ingest these chemicals to die. This means they can become food for predators such as owls. There is also some evidence that these chemicals can be present in non-target species, so this study aimed to investigate interspecific differences in liver concentrations of anticoagulant rodenticides in four Australian birds of prey.

Dead birds were collected with the support of a community outreach program (n = 60). First generation rodenticides were rarely detected, but second generation chemicals were detected in 92% of birds analysed. Potentially lethal levels were detected in 33% of powerful owls (n = 24), 68% of tawny frogmouths (n = 19), 42% of southern boobooks (n = 12), and 80% of eastern barn owls (n = 5). There was no association between landscape composition (urban, agricultural, forest) and rodenticide prevalence.

The authors voiced support for the formal consideration of second generation rodenticides as a threatening process. Given that tawny frogmouths and powerful owls don't primarily eat rodents, but that they had comparable poison concentrations to rodent predators, broader contamination of the food-web than anticipated is suspected. Given the importance of predators in ecosystems, the authors proposed that governments should regulate the use of second generation anticoagulant rodenticides. In Australia, regulations are currently limited in scope.

Cooke R, Whiteley P, Death C, Weston MA, Carter N, Scammell K, Yokochi K, Nguyen H, White JG (2023) ***Silent killers? the widespread exposure of predatory nocturnal birds to anticoagulant rodenticides****. Sci Total Environ 904:166293*

Freshwater turtles in South-East Queensland face significant anthropogenic threats

Veterinary records from wildlife hospitals can shed light on the incidence of disease and anthropogenic threats such as vehicle collisions, attacks from domestic pets, and entanglement. In Australia, 11 of 25 native freshwater turtle species are classified as threatened and may become extinct by the end of the millennium. The aim of the study was to assess threats to local populations by examining the clinical records of turtles presented to a wildlife hospital in Currumbin, Queensland.

There were 1,038 documented cases between 2010 and 2011 that were relevant to the study and had sufficient data for analysis. The number of cases, covering six species, remained constant over time except for one species which declined. Turtles were most commonly presented to the hospital between late summer and early autumn, the time of hatchling emergence for all species. Trauma accounted for 83% of cases, but this diagnosis decreased over time, and disease presentations increased. In a third of cases, the turtles were euthanised or died, with disease cases having the worst prognosis.

The authors concluded that there are significant anthropogenic threats, with some species more susceptible to road trauma or entanglement in abandoned fishing equipment due to their habits. They raised concern over the increase in disease, as there have been recent mass mortality events in some Australian freshwater turtle populations. They proposed that their findings highlight the need for ongoing disease investigation in local wild populations. They also suggested education initiatives could reduce the number of healthy turtles presented to veterinary/wildlife hospitals.

O'Leary K, Hill A, Doneley R (2023) ***Freshwater turtle admissions to a wildlife hospital in South-East Queensland, Australia over an eleven-year period, 2010–2021****. Aust Vet J 101(6):258–264*

Measuring cortisol in rescued koala joeys may improve rehabilitation outcomes

Faecal cortisol metabolite levels for koala joeys have not been recorded even though, as a measure of stress, they could help reveal why hand-reared and rehabilitated joeys have such a high mortality rate. It's likely that the loss of their mother and handling by humans is stressful for the animals. This study set out to measure faecal cortisol levels in koala joeys to provide a baseline for further study, with the authors noting that koalas are now listed as "Endangered" with the International Union for Conservation.

Faecal samples (n = 39) were taken from four joeys admitted to Port Macquarie Koala Hospital in New South Wales, two male and two female, and undergoing rehabilitation. The average concentration of cortisol metabolites varied from 18.34 to 44.18 ng/g which is within the range reported for adult koalas in previous studies. There was intra- and inter-individual variation but no average difference between males and females. The small sample size precluded detailed analysis of possible causes for the variation found, but previous studies have recorded higher cortisol levels in mature males than mature females. This is possibly the result of territorial behaviour, but this would not have manifested itself in the immature joeys chosen for the current study.

The authors offered their data as a first record of physiological stress in male and female rescued koala joeys during rehabilitation. In the future, longitudinal monitoring of faecal cortisol metabolites in response to known stressors could provide useful information about the impact of rehabilitation interventions on physiological stress levels in rescued koala joeys.

Pahuja HG, Narayan EJ (2023) Quantifying faecal cortisol metabolites in rescued orphaned koala joeys undergoing rehabilitation. Aust Mammal 45(3):317–323

HUMANE KILLING

Non-penetrating captive bolt devices are ineffective for stunning water buffalo

Mechanical stunning methods commonly used in cattle (genus *Bos*) to induce unconsciousness to prevent pain and suffering during slaughter have been shown to be ineffective for stunning water buffalo (*Bubalus bubalis*). Ineffective stunning can lead to the animal remaining conscious during sticking, hoisting, and bleeding. The differences in skull structure and hide thickness of water buffalo is considered the likely reason for the ineffectiveness of mechanical stunning methods used for cattle. Additionally, while electroencephalographic (EEG) response has been used in cattle to assess the effect of stunning and neck-cutting methods, it has not yet been used to evaluate methods in water buffalo. The review aimed to describe the differences in skull structure between water buffalo and cattle and the implications these differences may have for assessing stun effectiveness and unconsciousness in water buffalo.

The authors conducted a literature review on the effectiveness of using various penetrating and non-penetrating captive bolt devices, as well as free-bullet firearms to render buffalo unconscious. The review addressed the importance of stunning prior to slaughter to prevent animals experiencing pain from the neck cut and bleeding out process before death. The authors also reviewed the signs used to assess stun effectiveness, unconsciousness, and death for water buffalo.

Common stunning devices used for cattle were inappropriate for water buffalo because of their wider frontal sinus anatomy and thicker hide. The authors concluded that current scientific evidence shows that non-penetrating captive bolt devices are ineffective for stunning water buffalo and should not be used. Very high-pressure pneumatic devices were recommended for stunning smaller water buffalo, and bullet gun devices were recommended for larger water buffalo. Signs that can be used to assess unconscious in water buffalo included voluntary movements and the presences eye reflexes, such as the pupillary light reflex. The authors recommended further research to support the adoption of effective stunning methods and identify objective methods of assessing pain and brain activity in water buffalo.

Grandin T, Velarde A, Strappini A, Gerritzen M, Ghezzi M, Martínez-Burnes J, Hernández-Ávalos I, Domínguez-Oliva A, Casas-Alvarado A, Mota-Rojas D (2023) ***Slaughtering of water buffalo (Bubalus bubalis) with and without stunning: A focus on the neurobiology of pain, hyperalgesia, and sensitization****. Animals 13(15):2406*

Pigs show aversive behaviours while still conscious during CO2 stunning

Welfare concerns have been raised about the use of carbon dioxide (CO_2) stunning for pigs because high concentrations are aversive. Pigs can show vigorous movements and agonal gasping during CO_2 stunning, which suggests they could be experiencing respiratory distress and fear prior to death. CO_2 stunning systems result in a gradual loss of consciousness and therefore it is currently uncertain what behaviours occur during stunning in pigs before and after they are unconscious. The study aimed to examine the onset of a range of behaviours to determine how each behaviour relates to the level of consciousness in pigs during CO_2 stunning.

The study was conducted at a research animal facility in Norway using commercial cross-bred pigs (n = 11). The pigs were initially given anaesthesia to surgically insert a tracheostomy tube and then administered CO_2 of 90-94% via that tube. Arterial blood samples measuring the partial pressure of arterial carbon dioxide ($PaCO_2$) and pH were taken along with other physiological measures such as blood pressure and heart rate. The behaviour of the pigs was recorded on video and categorised at five second intervals.

The arterial blood pressure and heart rate of the pigs was consistent with consciousness even after the pigs appeared unconscious, which was suggested to indicate that circulatory collapse did not cause loss of consciousness. Common behaviours observed in the pigs during CO_2 were characterised and examined. Gasping, slow extremity movement, vigorous extremity and head movement were observed during consciousness in some of the pigs based on pH and $PaCO_2$ values. The authors suggested that the aversive behaviours prior to loss of consciousness were related to "air hunger" from increasing $PaCO_2$ levels rather than mucosal irritation because the tracheostomy tube delivering the CO_2 bypassed the upper respiratory tract of the pigs. Physiological changes when opisthotonos (backward arching of the head, neck, and spine) and agonal gasping behaviours occurred were indicative of unconsciousness in the pigs. Overall, the authors concluded that gasping and vigorous movement were unreliable indicators of unconsciousness in pigs during CO_2 inhalation.

Hognestad BW, Digranes N, Opsund VG, Espenes A, Haga HA (2023) ***CO2 stunning in pigs: Physiological deviations at onset of excitatory behaviour****. Animals 13(14):2387*

MISCELLANEOUS

Australia in good position to advance non-animal biomedical model capabilities

The CSIRO report *Non-animal models: A strategy for maturing Australia's medical product development capabilities* assesses the potential of emerging non-animal models and Australia's potential for using them to replace traditional approaches to medical product development. Its scope included opportunities over the next 15 years and recommendations for improving research quality and productivity while generating new revenue streams for Australia.

Non-animal models that use human-derived or humanised cells, tissue, or data are advancing rapidly, and Australia has recognised strengths in cardiovascular, respiratory, and nervous system modelling. Benefits of non-human models include that they can help fast-track preclinical toxicity screening and can allow candidate drugs to fail early in the clinical development process, saving time and resources.

The US and Europe are transitioning away from animal use where possible, and this is likely to boost the market for non-animal testing, creating an opportunity for Australia to take advantage of its clinical trial experience and facilities to expand its success in the sector. The report recommended coordinating and updating existing model capabilities, integrating local capabilities including development of a national biobanking and tissue collection network, and strengthening commercialisation opportunities.

CSIRO (2023) ***Non-animal models: A strategy for maturing Australia's medical product development capabilities****. CSIRO, Canberra.*

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