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ANIMAL WELFARE SCIENCE UPDATE

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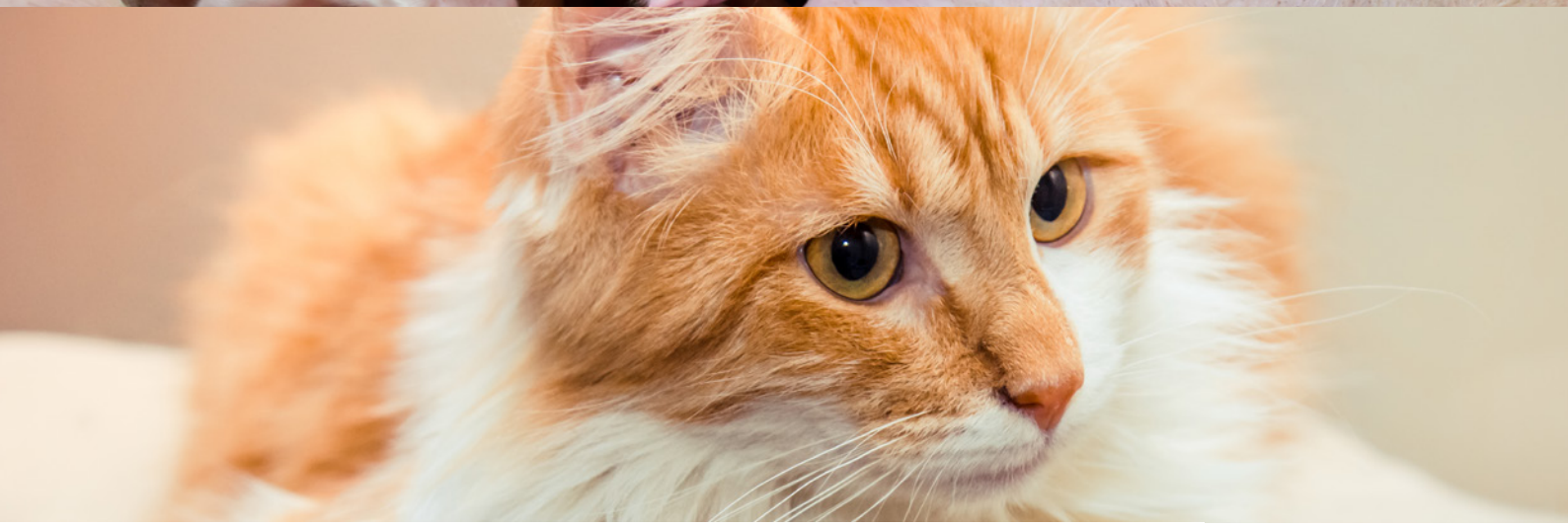


The aim of the animal welfare science update is to keep you informed of developments in animal welfare science relating to the work of the RSPCA. The update provides summaries of the most relevant scientific papers and reports received by the RSPCA Australia office in the past quarter. **Email science@rspca.org.au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

ANIMALS USED FOR SPORT, ENTERTAINMENT, RECREATION AND WORK

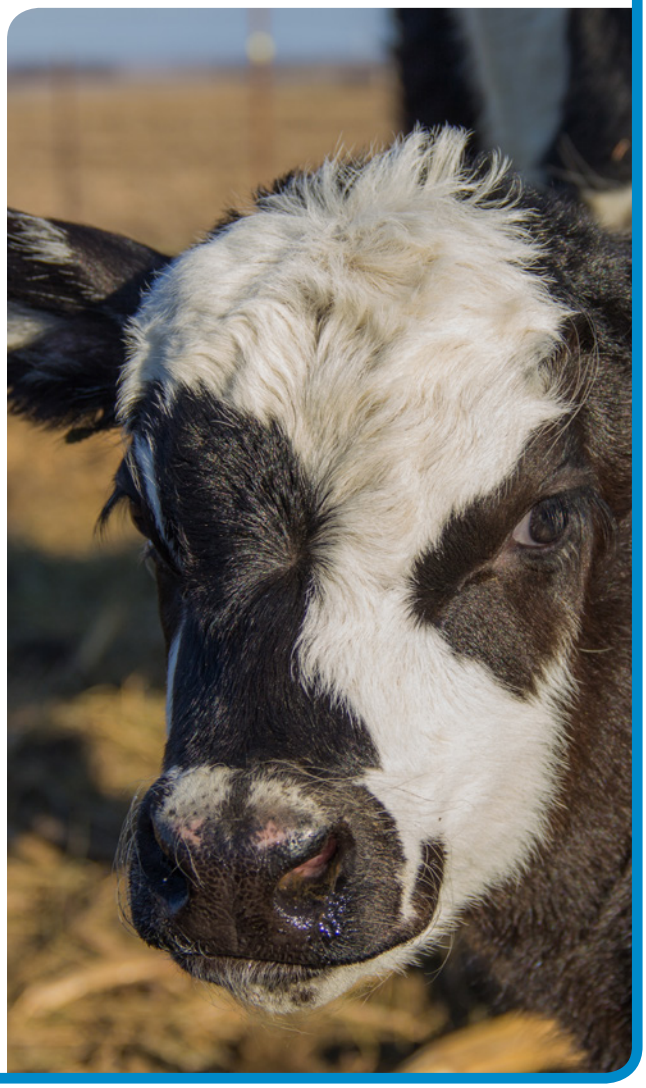
BEHAVIOURAL AND PHYSIOLOGICAL RESPONSES OF CALVES IN CALF ROPING RODEO EVENTS

Rodeos began as competitive events at which people could display their stockperson skills associated with cattle ranching. These skills include roping, riding and wrestling cattle to the ground, which were traditionally undertaken in order to perform procedures such as branding the animal or providing medical treatment. However, there are significant concerns for the welfare of animals used in rodeo, and the event of calf roping is considered particularly contentious. This event involves chasing a calf on horseback, lassoing the calf and then throwing it on its side and tying the legs so that it is unable to rise again until untied.

This study aimed to determine whether rodeo calf roping is stressful to the animals by assessing the behaviour and physiology of calves before and after two major components of the roping event. Measurements were made of behaviour and stress responses of ten rodeo-naïve calves marshalled by a horse and rider, and ten rodeo-experienced calves that were roped. Blood samples were taken before and following each activity, to measure for stress hormones and each activity was repeated once after two hours.

It was found that there was an increase of cortisol, epinephrine and norepinephrine in both groups of calves. This detection of an acute stress response suggests that the experience is stressful and aversive for calves. The repeat roping also produced an acute stress response. Behavioural evidence suggests that the experienced roped calves had a flight response to the presence of the pursuing horse and rider. The authors state that consistent eye white response (100% of calves) at the point of lift and drop during the rope tying may indicate that this event caused them significant stress. Following the calf drop all rodeo-experienced calves displayed eye roll while on their side which may indicate that the animal is blocking out its environment from view. The authors conclude that the roping event in rodeos is stressful for both experienced and naïve calves.

Sinclair M, Keeley T, Lefebvre A *et al.* (2016) Behavioral and physiological responses of calves to marshalling and roping in a simulated rodeo event. *Animals* **6**:30, doi:103390/ani6050030



Effect of noseband tightening on horses' behaviour and physiology

Restrictive nosebands are common in equestrian sport. This is concerning, as recent evidence suggests that very tight nosebands can cause a physiological stress response, and may compromise welfare. 'Crank' (sometimes called 'cranked') nosebands, developed in the 1980s and are frequently used in equestrian sports today, are similar to a plain cavesson noseband with the addition of a leveraged buckle to allow for tighter fit. This study involving 12 horses aimed to investigate the influence that increasing noseband tightness has on the behaviour and physiology of horses. Observations of oral and non-oral behaviours were recorded concurrently with measures of physiological function, specifically heart rate and heart rate variability (HRV) and eye temperature.

The horses were randomly exposed to one of the four treatment groups each day over four consecutive days. Prior to treatment, a baseline score was taken of the physiological parameters of the horse and then the crank noseband was fitted for ten minutes. The treatment groups were 1) unfastened noseband (UN), 2) conventional area under noseband of 2 fingers width (CAUN), 3) half conventional area under noseband of one finger width (HCAUN), and 4) no area under noseband (NAUN). Oral behaviours, heart rate and eye temperature were measured during treatment and during recovery. The study found that during the tightest treatment (NAUN), horse heart rate increased, HRV decreased and eye temperature increased compared with baseline readings, indicating a physiological stress response and suggesting that horses experience pain or discomfort when nosebands are tightened such that there is no space available underneath them. Chewing decreased during the HCAUN and NAUN treatments and licking was eliminated by the NAUN treatment. Following the removal of the noseband and double bridle during the recovery session, yawning, swallowing and licking significantly increased compared with baseline, indicating a post-inhibitory rebound response.

The current data indicate that nosebands tightened to the extent that there is no area available underneath them cause a stress response and prevent the expression of normal behaviour. To that end, gear stewards in a competition environment should be required to check that each rider is complying with rules that prevent excessive tightening of the noseband. The dressage rules that call for "submission" in horses, demonstrated by a willing acceptance of the bit cannot be properly upheld if the equipment in use prevents the expression of the very behaviours that would indicate oral discomfort and a lack of submission. Further research should focus on the process of habituation to these devices, the measurement of tension in nosebands and the tension level at which the noseband produces a stress response in horses. The auhors conclude that on ethical grounds, the use of relentless pressure to eliminate oral behaviours in pursuit of a competitive advantage may be difficult to justify.

Fenner K, Yoon S, White P *et al.* (2015) The effect of noseband tightening on horses' behaviour, eye temperature, and cardiac responses. *Plos One* DOI:10.1317/journal.pone.0154179

The use of the whip in thoroughbred horse racing

Changing social values and new technologies have contributed to increasing media attention and debate about the acceptable use of animals in sport, including the use of the whip in thoroughbred horse racing. Those who defend the use of the whip argue it is a necessary tool needed for safety, correction and encouragement, and that it does not cause the horse any pain. For those who oppose its use, it is an instrument of cruelty that inflicts pain. Societies view on what is acceptable in horse racing has changed in recent years as the general public become more aware of animal welfare issues. This is partly due to animal welfare and animal rights organisations playing key roles and partly due to the increase in media and communication around horse racing and the associated welfare issues.

This Australian paper focuses on the debates playing out around the use of the whip in mass media, both in the U.K. and in Australia, and focuses on recent key periods of the debate: April 2011-February 2012 in the U.K. following the release of the British Horse Association report, the introduction of new whip rules and subsequent amendments; and in March – September 2009 in Australia, following the introduction of the padded whip and new whip rules. Media coverage from August 2014 – 2015 was also examined to determine what, if anything had changed, since the new rules were introduced. The paper describes the rule changes and subsequent amendments around the use of the whip in detail and presents information around media framing. Differences between countries, time periods and media platforms are also discussed.

It was found that media interviews or articles in print media were mostly held with people within the racehorse industry, and narratives around the horses and their care dominated. But the opinions of those outside the industry were expressed in various social media forums, with the conversation mainly focusing on the use of the whip, and whether it should be banned or not. It was found that this tension remained in 2015. The authors consider that the paper contributes to discussions on the impact that media sites have in reinforcing existing perspectives or creating new perspectives, and how this impacts on equine welfare.

Graham R, McManus P (2016) Changing human-animal relationships in sport: An analysis of the U.K. and Australian horse racing whip debates. *Animals* **6** (32): doi:10.3390/ani6050032

The contribution of equitation science to minimising horse-related risks to humans

Equitation science is the art and practice of horsemanship and horse riding. It seeks to apply scientifically obtained data to training and riding horses to improve safety and wellbeing of both horse and rider. It is not a single method, but allows all methods of horse handling, training and riding to be analysed on a cost-benefit analysis that embraces their humaneness and effectiveness. Equitation science focuses on training horses acknowledging the way horses learn, and their adaptive behavioural tendencies. Riders and trainers work with horses in a way that are within the species' cognitive limitations. If humans do not accept and work within these limitations, this can lead to unrealistic expectations of how quickly a horse can learn, which in turn may lead to the human punishing the horse for perceived 'disobedience'. Punishment in turn, will switch the horses focus from learning, to finding safety and relief from conflict, which can result in the horse expressing defensive behaviours, flight responses, or if cornered, aggressive behaviour, all of which are a hazard to human safety.

Horse riding is an inherently dangerous activity, known to be more dangerous than motorcycling, and so procedures that can reduce the risk of injury are of vital importance. With this in mind, the 10 Principles of Equitation Science have recently been introduced. These principles are intended to address training goals that serve to minimise frustration and confusion in horses during horse riding and husbandry. The principles are 1) Train according to the horse's ethology and cognition, 2) Use learning theory appropriately, 3) Train easy-to-discriminate signals, 4) Shape responses and movements, 5) Elicit responses one-at-a-time, 6) Train only one response per signal, 7) Form consistent habits, 8) Train persistence of responses, 9) Avoid and dissociate flight responses and 10) Demonstrate minimum levels of arousal sufficient for training. The review discusses these 10 principles in detail and examines how they can minimise horse-related risks to humans as well improve the welfare of horses being trained.

Starling M, McLean A, McGreevy P (2016) The contribution of equitation science to minimising horse-related risks to humans. *Animals* **6**(3),15.

COMPANION ANIMALS

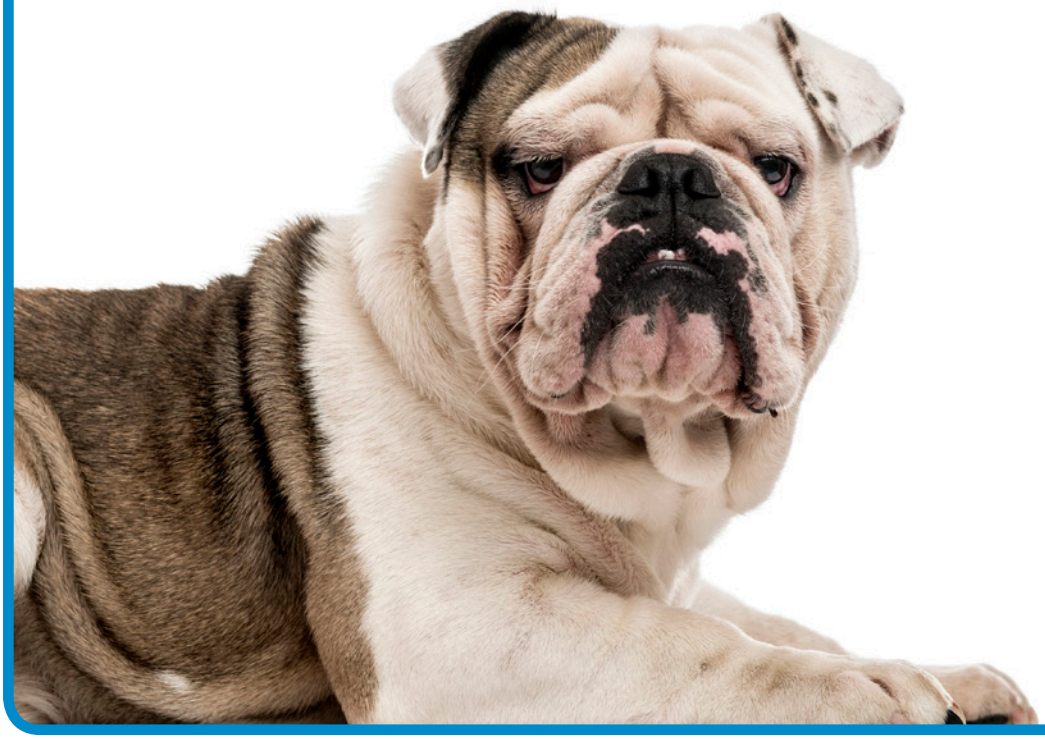
TRENDS IN POPULARITY OF PUREBRED DOGS IN AUSTRALIA

Some diseases in dogs are related to certain physical characteristics. For example, larger breeds have a higher risk of suffering hip dysplasia and certain cancers while breeds with wider and shorter heads such as Pugs and French bulldogs (known as brachycephalic due to their flat faces), are susceptible to serious breathing problems, difficulty giving birth, digestive disorders and multiple eye disorders, among other health problems. Therefore, trends in popularity of dog physical types can reveal potential disease pervasiveness. Different people prefer to own different types of dogs and will use various criteria for selecting their household dogs. These criteria can include human lifestyle, cultural backgrounds, media exposure, education and the physical appearance of the dog.

This study investigated trends in the height, dog size and head shape of Australian purebred dogs. The numbers of dogs registered within the 181 breeds derived from the Australian National Kennel Council (ANKC) every year from 1986 to 2013 were obtained and analysed. This study showed that the total number of dogs registered with the ANKC had decreased gradually from 95,792 in 1996 to 66,902 in 2013. Compared to the larger and taller breeds of dog, the shorter and smaller breeds of dog, as well as the brachycephalic breeds, have increased in popularity in the 28 years examined.

Concerns for the welfare of brachycephalic dogs have been highlighted recently and this issue is likely to become an increasing concern for veterinarians and dog owners in Australia and worldwide. In New Zealand, 4 of the top 5 dog breeds considered by veterinarians to be unsuitable for continued breeding due to compromised health and welfare are brachycephalic breeds. With the increase of smaller and brachycephalic dogs, conditions leading to mortality in small breeds (urogenital diseases, degenerative diseases, metabolic diseases) will potentially be seen more, compared to those that have an increased risk of death in larger breeds, such as diseases of musculoskeletal, gastrointestinal systems and cancers. The results of this study provide valuable predictive information on the pervasiveness of certain diseases in dogs.

Teng KT, McGreevy PD, Toribio JLML *et al.* (2016) Trends in popularity of some morphological traits of purebred dogs in Australia. *Canine Genetics and Epidemiology* **3**(2):1-9.



MIXED BREEDING REDUCES THE RISK OF PAINFUL SYRINGOMYELIA IN DOGS

Chiari-like malformation (CM) is a developmental abnormality of the skull and related structures in dogs. It is associated with brachycephaly (short muzzle) and miniaturisation and results in a painful condition called syringomyelia (SM).

The heritability of SM has been estimated in the Cavalier King Charles Spaniel (CKCS) as moderately high. CM is ubiquitous in the CKCS and has an estimated prevalence of 65% in the Griffon Bruxellois dog breed.

This study, performed in the U.K, involved a family of 27 Griffon Bruxellois dogs, including five founder dogs. The authors investigated the inheritance of CM and the feasibility of crossbreeding a brachycephalic CM affected Griffon Bruxellois with a non-brachycephalic normal Australian terrier and then backcrossing to produce individuals free of the malformation and regain GB breed characteristics. Mating individuals from different breeds of dog can result in 'hybrid vigour' in the offspring and thereby alleviate inherited defects or adverse effects of inbreeding. Backcrossing the offspring of the cross with healthy individuals of the original breed can be a way of improving the health of the breed while preserving breed characteristics with less extreme phenotypes.

Results indicated that mixed breed traits posed less risk for CM and SM. The external phenotypes showed that by outcrossing breed types and with careful selection of appropriate conformation characteristics in the first generation, it was possible to maintain the Griffon Bruxellois breed standard and reduce the degree of CM.

Knowler SP, van der Berg H, McFadyen *et al* (2016) Inheritance of chiari-like malformation: Can a mixed breeding reduce the risk of syringomyelia? *Plos One* doi:10.1371/journal.pone.0151280.

Reasons that people surrender cats to Australian animal shelters

Millions of cats are surrendered to animal shelters around the world each year and many are euthanased. The large number of unwanted cats and the resulting euthanasia of healthy animals result in financial, social and moral costs, as well as welfare issues for the cats thereby highlighting the need for more research to address unwanted cat issues. Cats being surrendered are classified into two main categories, those considered 'stray' or 'unowned' and those considered 'owned'. An understanding of the reasons that cats are surrendered to animal shelters is important in order to develop effective intervention strategies to reduce this problem.

This study examined cats being surrendered to four different animal shelters located across Sydney, Melbourne and Brisbane between February and September 2012. The study aimed to 1) describe the reasons for the surrender of both owned and unowned cats to these animal shelters, 2) compare reasons for surrender between owned and unowned cats and 3) describe the reasons that people give for not want to keep the cats that they are surrendering. The authors did this by approaching the person who had surrendered the cat and gathering information about the surrender using a questionnaire.

It was found that the most common reasons for owners surrendering cats were related to the owners themselves such as accommodation, financial or personal reasons. Respondents surrendering unowned cats most commonly gave reasons that related to their concern for the cat's welfare, with the majority believing that the cat would be better cared for by the shelter. Multiple reasons contributing to the decision to surrender are common for both owners and nonowners, highlighting the complexity and multifactorial nature of the decision process involved in surrender. Recording only one reason for surrender does not capture the complexity of the surrender decision. Collecting information about multiple reasons for surrender, particularly reasons for surrender of unowned cats and barriers to assuming ownership, could help to develop strategies to reduce the number of cats surrendered. Unwanted kittens commonly contributed strongly to the reasons for surrender of both owned and unowned cats to animal shelters in Australia. Therefore reducing the numbers of unwanted kittens bred in Australia represents a major potential point of intervention for reducing the numbers of cats surrendered to shelters.

Zito S, Morton J, Vankan D *et al.* (2016) Reasons people surrender unowned and owned cats to Australian animal shelters and barriers to assuming ownership of unowned cats. *Journal of Applied Animal Welfare Science* **19**(3):303-319.

Dog bites in Poland

Dog bites to humans are considered a serious health issue which can result in physical and mental trauma, transmission of disease, and occasionally death. They are also an important social problem, and highly publicised. Data concerning dog bites differ between countries. Poland, with an estimated number of 8 million dogs (approximately 1 dog per 3 households) does not systematically collect data on dog bites and so, to date, no reliable statistics are available around the circumstances of dog bites in this country.

This study therefore aimed to review and analyse the incidents of dog bites recorded by the outpatient unit of the Department of Forensic Medicine of the Medial University in Wroclaw over the period 2005 to 2010 involving 63 cases of dog bites. Data was obtained regarding the circumstances in which the bite was sustained.

It was found that most dog bites were sustained by adults from dogs that they did not know. Most of the injuries were deep and were sustained more frequently on the lower extremities. Using the data obtained, a draft forensic medical assessment worksheet was developed to improve the process of examining patients who presented at the clinic with a dog bite. The authors suggest that the effectiveness of prevention programmes to reduce the number of dog bites are dependent on intensifying educational efforts to be targeted at the general public to improve an understanding of dogs, their behaviour and the importance of early socialisation programmes. The authors also emphasise the importance of maintaining reliable records to provide the capacity to study the scale and structure of the circumstances of which dog bites are occurring into the future.

Maksymowicz K, Janeczek A, Szotek S *et al.* (2016) Dog bites in humans in a large urban agglomeration in the southwest of Poland, an analysis of forensic medical records. *Journal of Veterinary Behavior* **12**:20-26.

Numbers and characteristics of cats admitted to RSPCA shelters in Australia

Despite high numbers of cats admitted to animal shelters annually, there is surprisingly little information available about the characteristics of these cats. This study examined 195,387 admissions to 33 Australian RSPCA shelters and six friends of the RSPCA groups from July 2006 to June 2010. The aims of this study were to describe the numbers and characteristics of cats entering Australian RSPCA shelters, and to describe reasons for cat surrender. Data collected included shelter, state, admission source, age, gender, date of arrival, colour, breed, reproductive status (desexed or not prior to admission), feral status and surrender reason (if applicable).

This study found that most admissions were presented by members of the general public, as either stray animals or owner-surrenders, and more kittens were admitted than adults. Owner-related reasons were most commonly given for surrendering a cat to a shelter. The most frequently cited owner-related reason was accommodation, that is, cats were not allowed. This has far-reaching implications for potential management as it demonstrates that reducing numbers of admissions to shelters in Australia (and, thereby reducing numbers of cats euthanased in shelters), requires strategies that focus on changing rules and potentially legislative requirements related to the inclusion of pets in rental agreements and other housing arrangements. Of the cat-related reasons, 42% were for unfriendly, aggressive or poorly socialised behaviour and 22% were for house soiling, and the frequency of these behaviours would be exacerbated, particularly in male cats, by the relatively low desexing rates.

Importantly, although the percentage of admissions where the cat was previously desexed (36%) was the highest of any shelter study reported to date, this was still lower than expected, particularly among owner-surrendered cats (47%). The percentage of admissions where the cat was previously desexed was low even in jurisdictions that require mandatory desexing. The authors state that the introduction of low-cost or no cost desexing targeted to locations over-represented by cat and kitten intake into shelters may be more effective than legislation.

Alberthsen C, Rand J, Morton J *et al* (2016) Numbers and characteristics of cats admitted to Royal Society for the Prevention of Cruelty to Animals (RSPCA) shelters in Australia and reasons for surrender. *Animals* **6**:23; doi:10.3390/ani6030023

FARM ANIMALS

Entire male pig production in Europe

The proportion of male pigs that are left entire has been high for many years in countries in Europe such as Britain, The Netherlands and recently Germany and France. Various European partners agreed in 2010 on a road map to abandon piglet castration by 2018. The main driver for this was that there is now sufficient scientific evidence to indicate that surgical castration is a painful procedure, even on very young animals. In addition to this, castration is performed to avoid the incidence of boar taint in entire male pigs, which is a market-driven decision, rather than driven by welfare. Not performing surgical castration may increase productivity as entire male pigs are more efficient at converting feed to growth than those that have been castrated. This review paper provides an overview of the current situation in Europe in respect to entire pig production, the type of initiatives that have been undertaken to reach a ban on piglet castration, the goals achieved to date and which efforts need attention in the near future.

Reducing the incidence of boar taint at a production level, and at the same time overcoming possible greater aggressive behaviour of entire male pigs, is critical for abandoning castration. As one threshold when boar taint becomes apparent in the meat cannot be established, before the castration of piglets can be abandoned completed, there needs to be some universally accepted system which can distinguish boar-tainted meat. However, until this technology can be developed, producers can choose to implement other alternatives such as immunovaccination (the disadvantage of this is that it is not generally accepted by consumers in Europe), or surgical castration with anaesthesia or analgesia (with the associated higher cost). Genetic selection for breeds with low boar-taint may be the most acceptable alternative, but the successful selection of these genetic lines, without an adverse consequence on reproduction or growth performance, will take time.

Bee G, Chevillon P, Bonneau M (2015) Entire male pig production in Europe. *Animal Production Science* **55**:1347-1359.

Producing pigs without antimicrobials

An antimicrobial is a naturally occurring, semi-synthetic or synthetic compound that can be administered orally (via mouth), parenterally (injection) or topically (via skin). The use of antimicrobials is common in pig production in Australia, and a range of different compounds are available for use. They act in a variety of different ways and can be used for therapy (administration of an antimicrobial to an animal or group of animals exhibiting disease), prophylaxis (treatment of an animal or group of animals prior to clinical signs of disease to prevent the disease occurring), metaphylaxis (treatment of an animal or group of animals after the occurrence of disease in part of the group, with the aim of controlling the spread of the disease) and growth promotion. However, there is an increasing pressure from supermarkets, consumers and other sectors to reduce or eliminate the use of antimicrobials in food production. Preventing the use of these compounds in some countries has led to an increase in disease and associated welfare problems, so it is important to understand what sort of conditions pigs can be produced under without the use of antimicrobials.

This review discusses the use of antimicrobials in pork production in Australia and the authors examine the results from experimental trials in this area, collating the important practices that manage or prevent disease and improve pig health. High standards of biosecurity and hygiene on farm are vital if antimicrobials are not to be used. Factors important in preventing disease include the elimination of pathogens, minimising the mixing of pigs, cleaning and disinfection of pens and sheds, ensuring ventilation to improve air quality, reducing stocking density and eliminating potential vectors of disease. Improving pig health also relies on vaccination, improved consistency of nutrition, and diagnostic techniques that enable detection of potential disease problems before disease outbreaks occur. When making any move towards antimicrobial-free pig production, it also needs to be acknowledged that production costs may increase and production practices change. Any discussion on anti-microbial-free pork production must recognise that a move in this direction must involve definite aims for farms, markets and consumers, and clear guidelines for pig farmers to follow.

Gleeson BL, Collins AM (2015) Under what conditions is it possible to produce pigs without using antimicrobials? *Animal Production Science* **55**:1424-1431.

An opportunity to revolutionise sow management

In recent years, the pork industry has been under pressure to reduce confinement for sows on farm. The Australian pork industry has committed to eliminating the use of sow stalls during gestation, but it is expected that questions will soon begin to be asked around confining sows in farrowing crates during lactation. Sows are confined in these crates shortly before the birth of their piglets as there is a high risk of the sow crushing her piglets. The sow and piglets remain in the crate until weaning. The farrowing crate restricts the movement of the sow and allows the piglets to get out of the way of the sow when she lies down, reducing piglet crushing. This is especially important during the early part of lactation, when the piglets are at their most vulnerable. There exists, therefore, conflicting needs for the welfare of the sow (confinement in the crate) and the piglets (increased survival). At the current time, there is a reliance on needing to wean the sow and remove the piglets to be able to re-mate the sow, which is based on the long held principle that sows are naturally anoestrus during lactation. This practice limits the number of litters that the sow can have each year. The basis of lactational anoestrus is the lack of luteinising hormone (LH); the low levels act to prevent ovarian follicle development and ovulation. However, the author of this paper challenges this assumption, stating that any management strategy that reduces the LH inhibition has the potential to trigger lactational oestrus.

This Australian review evaluates the potential for changing sow management so that the piglets do not need to be weaned prior to re-mating the sow. The author discusses the advantages of changing sow management and lists potential management opportunities: 1) piglets can be weaned at a later age and avoid some of the negative effects associated with weaning at a young age, 2) a gradual weaning strategy can be used instead of abrupt weaning, 3) sows that spontaneously ovulate during lactation by using positive stimuli (e.g. group housing of sows, boar exposure and intermittent suckling by the piglets) can be identified and mated to synchronise a group lactational oestrus and 4) a two-stage lactation system could be used that includes the benefits of a farrowing crate in early lactation (10-14 days) and then the welfare benefits of reduced sow confinement in groups during later lactation. The two-stage lactational system also has potential benefits for the piglets in the form of increased feed intake and better post-weaning health. Removing the need to wean sows to re-mate them provides the opportunity to increase weaning age and implement gradual weaning, helping to increase post-weaning growth and potentially limit antimicrobial use in weaner pigs.

Downing JA (2015) An opportunity to revolutionise sow management. *Animal Production Science* **55**:1411-1423.

Management in cattle and risk of bovine respiratory disease

Bovine respiratory disease (BRD) is the major cause of clinical disease and death in feedlot cattle. BRD comprises of a complex of diseases involving the respiratory system in cattle and remains a major problem in intensively managed cattle populations worldwide. The more effective management of BRD requires an improved understanding of approaches to animal management and how that affects the biological pathway. There is increasing evidence that the risk of feedlot cattle developing BRD is influenced by a range of factors, including those the animal has experienced prior to arrival at the feedlot. To reduce stressors, preconditioning techniques may be used which may include ensuring that stressful procedures occur before feedlot entry. Cattle may also be introduced to roughage and concentrates, receive training into the use of feed bunks, parasite control and vaccination against respiratory pathogens. In Australia, weaning normally occurs when calves are six to ten months of age and upon separation from their dams, weaners may be immediately returned to pasture (paddock weaned) or they may be yard weaned (where they are held in small yards and are introduced to handling, water troughs, feed bunks and concentrated rations or forage) and are held there for 5-7 days.

The National Bovine Respiratory Disease Initiative (NBRDI) was a study conducted in Australia to investigate the risk factors in the development of BRD in feedlot cattle. The management practices employed by 10,721 cattle producers who supplied 35,131 cattle within 170 cohorts within 14 feedlots were documented. It was found that the practice of yard weaning was significantly associated with a reduced risk of BRD. Prior feeding of grain was also associated with a reduced risk of BRD. The study highlights the importance of prior management of cattle before they are placed at the feedlot in reducing BRD. These results could be used to provide an industry-wide framework to direct efforts at reducing the impact of BRD in Australia. Yard weaning is already commonly practiced, and educating producers about the advantages of this type of weaning with the introduction of grain and prior vaccination, is likely to be successful in reducing BRD in feedlot cattle.

Hay KE, Morton JM, Schibrowski ML *et al.* (2016) Associations between prior management of cattle and risk of bovine respiratory disease in feedlot cattle. *Preventative Veterinary Medicine* **127**:37-43.

Using behavioural change to predict tail damage outbreaks

Tail biting in pigs, leading to tail damage, is a multifactorial welfare problem that also has negative economic effects. Tail biting can cause pain and distress for the receiver of the bites, can spread infection and result in reduced performance and carcass condemnation at slaughter. Tail docking is commonly used to prevent tail biting. However, removal of the tail does not remove the motivation for the pigs to bite, and they may still bite at the shorter tail that remains following docking. Tail docking is not allowed on a routine basis in the EU, and hence it is important to search for alternative strategies for preventing tail biting outbreaks, while keeping the tail intact.

Strategies to prevent tail damage outbreaks include keeping pigs at a lower stocking density or increasing the number of feeders available to the pigs, or providing enrichment, but there may be difficulties recognising the factors triggering a tail-biting outbreak under commercial conditions. Another potential strategy is to monitor pigs for behavioural indicators of an impending tail-biting outbreak, and if these behaviours are seen, preventative measures can be put in place. This paper by Danish authors discusses the latter strategy in more detail, and reviews the existing literature around this subject. Pig behaviours found to change prior to a tail-biting outbreak include an increased level of activity, increased enrichment object manipulation and an increased proportion of pigs holding their tails between their legs. The authors also discuss potential strategies for monitoring these behaviours, for the purpose of developing an automated warning system for tail-biting outbreaks, but advise that further research is undertaken prior to this occurring in order to develop a more precise description of how the predictive behavioural indicators relate to the development of tail-biting behaviour.

Larsen MLV, Andersen HM, Pedersen LJ (2016) Can tail damage outbreaks in the pig be predicted by behavioural change? *The Veterinary Journal* **209**:50-56.

Animal welfare initiatives improve feather cover of cage-free laying hens

Feather loss in layer hens has been shown to be common in both cage and cage-free systems. Feather loss commonly arises as a result of injurious pecking by other birds, and in severe cases, can lead to substantial feather loss and the bird's inability to thermoregulate effectively. The reason for the development of feather pecking is multifactorial, with genetic factors, rearing conditions, nutrition and the bird's environment all thought to have an effect. In the UK, cage-free egg production systems account for 49% of all eggs produced. Almost all of these farms are assured under the RSPCA Assured Scheme or certified to the Soil Association organic standards. Together with the University of Bristol, these associations were partners in the AssureWel project, which aims to improve farm animal welfare through welfare assessments within farm assurance schemes. This paper outlines the results of farm assurance assessor observations of feather loss on these farms over two years in the context of AssureWel and other industry activities aimed at reducing feather loss.

Feather loss from the head and neck (HN) and the back and vent (BV) was assessed on 50 birds from each flock included in the study. Feedback was provided to the farmers, and was designed to encourage behaviour change in the farmers to improve welfare. In the second year of the study, farmers were asked about changes they had made, and intended to make on their farms. The timing of this also coincided with wider industry initiatives to improve feather cover. It was found that, from year one to two, there was a significant reduction in feather loss from 31.8% (9.6% severe) to 20.8% (6% severe) for the HN region and from 33.1% (12.6% severe) to 22.7% (8.3% severe). This represents approximately 1.8 million extra fully feathered cage-free birds in the UK. Fifty-nine percent of the 662 farmers reported that they had made changes on their farms during year one to improve welfare. This study shows that the implementation of initiatives to improve welfare by a range of actors can have a positive effect on farm animal welfare improvements.

Mullan S, Szmaragd C, Cooper MD *et al.* (2016) Animal welfare initiatives improve feather cover of cage-free laying hens in the UK. *Animal Welfare* **25**:243-253.

The usefulness of measuring glucocorticoids for assessing animal welfare

Glucocorticoids (corticosterone in birds and rodents and cortisol in all other mammals) are produced by the adrenal glands as a result of the activation of the hypothalamic pituitary adrenal (HPA) axis. They are primarily considered to be stress hormones, and are measured to assess the amount of stress an animal is experiencing, sometimes in combination with the measurement of behaviour or other physiological changes. However, it is not only stress that can activate a change in the level of these steroids, and other stimuli can result in seemingly similar stress responses. In addition, stress hormones rarely act only in this function and have other non-stress-related functions. Further complications are also brought about by the difficulties in establishing accepted definitions of stress and welfare. This review explores the usefulness of measures of glucocorticoid in the assessment of animal welfare.

The review examines the activation of the HPA axis and discusses the role of the glucocorticoids in fear and stress, and in non-stress-related responses, such as reward. It then examines how increased glucocorticoids may also be an indicator of positive welfare states, may have a role in fitness, and in improving the welfare of an animal. The authors conclude that activation of the HPA system and concomitant release of glucocorticoids does not always mean negative consequences for the animal. They argue that it is important to consider why the HPA axis has been activated, the sensory systems involved detecting stressors, the metabolic fate and actions of glucocorticoids within the target tissues and the physiological consequences of the activation. It is these aspects of physiology that have the potential to enlighten the animal welfare debate, reduce the ambiguity around measuring glucocorticoids in the assessment of animal welfare, and enable a more comprehensive assessment of the welfare of animals to be made.

Ralph CR, Tilbrook AJ (2016) The usefulness of measuring glucocorticoids for assessing animal welfare. *Journal of Animal Science* **94**:457-470.

Including dietary fibre and resistant starch to reduce aggression in gestating sows

Some states in the US and all countries in the EU have moved away from individual housing for pregnant sows and sows are now held in groups during gestation. Although group housing is beneficial to allow sows to live in less confinement when compared to individual housing, the main disadvantage of group housing is the aggression that occurs between sows as they establish their social hierarchy. Different approaches have been taken to reduce aggression in group housing, including altering group size, pen design, using chemical interventions and altering the diet of the sows. Pregnant sows are fed limited amounts of food in these systems, and they will fight to obtain this resource. This paper examined the effect of using different dietary fibres on aggressive behaviour of sows when mixed in small groups.

Sows were firstly housed in individual stalls after mating, and were fed on a CONTROL diet (soybean based meal with no additional fibre), RSTARCH (10.8% resistant starch), BEETPULP (27.2% sugar beet pulp), SOYHULLS (19.1% soybean hulls), or INCSOY (14% soybean hulls) for 21 days. On day 22, the sows were mixed into groups of 5 pigs. Behaviour of the pigs both in stalls, and after mixing was measured, as were a number of other blood parameters. It was found that sows stood more ($P<0.01$) and rested less ($P<0.001$) over time, irrespective of the diet. Sows on BEETPULP stood more ($P<0.01$) and sows on SOYHULLS rested more ($P<0.01$). Chewing behaviour (to the bars of the pen or feeder) increased with the number of days on diet ($P<0.001$) and was lowest in sows on the SOYHULLS diet ($P=0.045$). When the sows were mixed, biting frequency was highest in the sows on the CONTROL diet, and lowest for sows on the RSTARCH diet. The study suggests that RSTARCH and SOYHULLS improved the welfare of sows and that including resistant starch and soy hulls in a proper proportion in the diet fed 3 weeks prior to mixing might be effective in overall reduction of aggression, restlessness, and improve the welfare of sows during mixing.

Sapkota A, Marchant-Forde JN, Richert BT *et al.* (2016) Including dietary fiber and resistant starch to increase satiety and reduce aggression in gestating sows. *Journal of Animal Science* **94**:2117-2127.

Lighting patterns for broilers and turkeys

Vision may be the most important sense in poultry, and lighting programs, including the length of the photoperiod, have the potential to affect their welfare and productivity. Europe requires that birds be given a light/dark period that results in circadian rhythms for the majority of their life, however many parts of the world have no requirement for a light/dark photoperiod. Sleep deprivation in birds can have negative impacts on their welfare, and lack of behavioural rhythms and disturbed sleep could result in sleep fragmentation. While broilers and turkeys are both avian species used for meat production, there are marked differences between the two species which could impact how the birds respond to varying hours of daylength and darkness per day. In addition, while broilers tend to be slaughtered for meat production between 30 and 64 days of age, the grow-out period for turkeys extends up to 25 weeks of age. Turkeys therefore may respond differently to light and dark in a way that broiler chickens do not get the opportunity to do.

This Canadian paper reviews two studies using either broilers (n=16128) or turkeys (n=1560) which were completed in the same research facility using the same lighting programs. The birds were exposed to lighting programs of 14L:10D, 17L:7D, 20L:4D and 23L:1D and were initiated at either 7d (broilers) or 10d of age (turkeys). Prior to the initiation of the program, all birds were exposed to 23L:1D. Growth rate, feed efficiency and gait scoring were assessed.

The results indicated the exposure to near constant light 23L:1D has significant negative effects on both turkeys and broilers. The study also showed that long daylengths did not benefit productivity in either species (measured by body weight and feed efficiency) and both species showed a decreased level of activity and reduction in the expression of other behaviours when reared on long daylengths when compared to those including a dark period. The authors believe that long daylength significantly reduces the well-being of broilers and turkeys and, for turkeys, the welfare challenges may be magnified (e.g. negative impact on eye health) as a result of the long time that the birds spend in the environment. The amount of darkness needed to maximise well-being may differ between bird types. It may therefore be beneficial to base the darkness requirement on the specific species being produced.

Schwean-Lardner K, Vermette C, Leis M *et al.* (2016) Basing turkey lighting programmes on broiler research: A good idea? A comparison of 18 daylength effects on broiler and turkey welfare. *Animals* **6**:27; doi:10.3390/ani6050027

HUMANE KILLING

Responses of goats to slaughter without stunning

Goat meat production has increased in recent years, driven by its perceived healthiness compared to other red meat. Slaughter procedures for goats are usually governed by legislation or codes of practice, but the suitability of the slaughter method depends on availability of facilities, as well as customer demands and economic considerations. Religion is one of the most influential factors determining choice and subsequent selection of foods, and the market for meat from animals slaughtered without stunning is an important proportion of the global production and supply.

Slaughtering of animals without stunning prior to ventral neck cut and bleed out is considered as the appropriate method for slaughtering animals by a number of religious faiths including Islam and Judaism, but it is extremely controversial with regards to animal welfare. Areas of concern include the pain and distress during and immediately following the neck cut, and the time until insensibility. There is some suggestion that the use of an extremely sharp knife is not perceived as painful by the animal, but there is little neurophysiological and physiological evidence to support this. Animals subjected to minimal anaesthesia have been accepted as a humane model to study noxious stimuli, especially when associated with electroencephalography (EEG). This Malaysian study aimed to compare the changes in blood biochemistry, hormonal and EEG changes following neck cut in conscious non-anaesthetised slaughter goats (SWS) (n=5) versus minimally-anaesthetised goats (SMA) (n=5).

It was found that hormonal changes and changes in EEG parameters were not influenced by slaughter method. The SWS had higher glucose and lactate than did the SMA goats, but the other blood parameters assessed did not differ between slaughter methods. The slaughter method also had no effect on the EEG responses. The authors conclude that the noxious stimuli from the neck cut is present in both conscious and minimally anaesthetised goats, and the application of slaughter without stunning causes changes in EEG activities that indicate noxious sensory input associated with tissue damage, which would be expected to be experienced as pain in goats.

Sabow AB, Goh YM, Zulkifli I *et al* (2016) Blood parameters and electroencephalographic responses of goats to slaughter without stunning. *Meat Science* doi: 10.1016/j.meatsci.2016.05.009

MISCELLANEOUS

Opinions on animal welfare in veterinary students

Worldwide, the public is becoming more aware of and concerned about animal welfare, and is increasingly turning to veterinarians, given their advanced scientific knowledge and experience, as leading animal welfare advocates responsible for safeguarding the health and welfare of all animals. With veterinarians in a strong position of social influence in regards to animal-related issues, veterinary schools have an opportunity to raise the standard of animal care and related policy-making by improving the animal welfare and ethics education of veterinary undergraduates.

As part of a survey in Australia and New Zealand, this study reports on whether veterinary students prioritise animal welfare topics or professional conduct on the first day of practice, and examines links between students' career preferences and their institution, gender, and year of study. The questionnaire was designed to explore the importance that students assign to topics in animal welfare and ethics. A total of 851 students participated. Students' preferences increased for companion-animal practice and decreased for production-animal practice as they progressed through their studies. Females ranked the importance of animal welfare topics higher than males, but the perceived importance declined for both genders in their senior years. In line with previous studies, this report highlighted two concerns: (1) the importance assigned to animal welfare declined as students progressed through their studies, and (2) males placed less importance overall on animal welfare than females.

Given that veterinarians have a strong social influence on animal issues, there is an opportunity, through enhanced education in animal welfare, to improve student concern for animal welfare and in turn improve animal care and policy-making by future veterinarians.

Cornish AR, Caspar GL, Collins T *et al.* (2016) Career preferences and opinions on animal welfare and ethics: A survey of veterinary students in Australia and New Zealand. *Journal of Veterinary Medical Education*, doi: 10.3138/jvme.0615-091R2

The ethical implications of de-animalisation in intensive production systems

In modern agriculture, animals are generally removed from any natural or semi-natural contexts that would allow them to express themselves, which in turn affects our understanding of what an animal is. The welfare of farm animals is compromised by the practices of intensified agriculture, such as crate confinement, social stress and lack of behavioural opportunities, and animals are generally seen as parts of a productive and economic system. The authors of this paper discuss the 'de-animalisation' of animals in intensive farming systems and argue that this de-animalisation prevents us building an ethical relationship with them.

The authors firstly present two different animal welfare issues, cows on pasture and the castration of pigs, and use these examples to show how competing understandings of animal welfare exist both in the public and in animal welfare research. Secondly, they discuss how animals have become de-animalised and what this means for our perception and treatment of animals. Thirdly, they argue that accepting welfare compromises has led to the de-animalisation process, and in itself has made it possible to perceive animals as a production unit. The authors argue that a focus on the animal's welfare, rather than production, will give animals the ability to live more of their own lives. Higher welfare standards are established as a result of the pressures from the public, non-government organisations, politicians and parts of agricultural society. If higher standards of animal welfare could be established, then this may lead to a re-animalisation of animals, which in turn, may lead to a renewed discussion of the legitimacy of using animals for production purposes at all.

Harfeld JL, Cornou C, Kornum A *et al.* (2016) Seeing the animal: On the ethical implications of de-animalization in intensive animal production systems. *Journal of Agricultural and Environmental Ethics*. **29**:407-423.

WILDLIFE

Developing vaccines and antivirals for variants of rabbit haemorrhagic disease

Rabbit haemorrhagic disease (RHD) is a highly infectious disease with a high case fatality and morbidity rates in adult rabbits. The incubation period ranges between 1-3 days and rabbits usually die within 12-36 hours after the onset of fever (but which may not always be observed). The disease causes haemorrhages in a variety of organs, particularly in the lungs, heart and kidneys. RHD was first detected in China, and subsequent disease outbreaks were reported in other continents. In Australia and New Zealand, RHDV (rabbit haemorrhagic disease virus) has been utilised since the mid-1990s as a biological control agent for rabbits.

In 2010, a new RHDV variant (RHDV2), that caused atypical RHD outbreaks among vaccinated and young rabbits emerged in France. The existing vaccines intended to target RHD, were partially effective against RHDV2, but there was no guaranteed way of reliably protecting valuable breeding stock and pets in the years between the detection of this new emerging rabbit virus and the development of a specific vaccine, which has only just become available. RHDV2 has now spread beyond Europe and has recently been reported in Australia, where the new RHDV2 vaccine is not yet available, and farmed and pet rabbits are currently at risk.

Antivirals that could effectively treat infected rabbits would be an additional tool to control outbreaks until a new vaccine became available. This Australian study used cell-free in vitro assays to examine the biochemical characteristics of two rabbit calicivirus RNA-dependant RNA polymerases, and the non-nucleoside inhibitor NIC02 was identified as a potential scaffold for further drug development against rabbit calicivirus. The experiments also resealed a high temperature optimum (between 40 and 45˚C) for RNA-dependant RNA polymerases, derived from both a pathogenic and non-pathogenic rabbit calicivirus, possibly demonstrating an adaptation to a host with a physiological body temperature of more than 38˚C. The sudden emergence of RHDV2 and the likely risk that even more virulent RHDV variants may emerge over time, highlight the need to develop alternative approaches to protect rabbits including pets. The availability of effective antiviral agents against a broad range of RHDV variants would enable the prevention or control of RHD outbreaks more effectively.

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