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ANIMALS USED FOR SPORT, ENTERTAINMENT, RECREATION AND WORK

Pre-feeding behaviour in horses and associated feeding routine risk factors

In the wild, horses will spend 16–18 hours each day eating low quality forage to meet their nutritional needs. This strongly contrasts to the modern management system for keeping domestic horses where many horses are fed restricted amounts of forage and horses are supplied with discrete high energy cereal based meals. This contrast in feeding regimes in the domestic horse from its wild ancestor can have a detrimental impact on both the physical and psychological welfare of the horse and influence the development of physical problems such as laminitis, colic and gastric ulcers. This management system can also affect the horse's behaviour, and be related to the development of behavioural problems such as oral stereotypies and wood chewing. The arrival of food for stabled horses is an exciting event in their day and consequently feed times are periods of high arousal and frustration. Horses may express this anticipation in various ways that may be unwanted, such as door kicking or the performance of stereotypical behaviour, and it has been suggested that the performance of these behaviours may also be indicative of the horses' overall welfare.

This study aimed to examine the effects that modern feeding regimes have on horses by examining the feeding practices used for horses in the United Kingdom, the prevalence of specific pre-feeding

behaviours in these horses and the risk factors that are associated with these behaviours. A survey was distributed to participants asking 23 questions about their horse's diet and feeding routine as well as information about the horse's management, husbandry and pre-feeding behavioural problems in the week prior to the survey being completed.

When the surveys from the 1,324 respondents were analysed it was found that pre-feeding behaviour problems were common in horses and fell into three main categories: aggression, frustration and stereotypical behaviour. The risk factors for the development of these problems differed, but could be distributed into four main areas: how the horse is fed, the use of nutritional supplements, exercise and stabling and the performance of oral investigative behaviour. The risk factors for pre-feeding behavioural problems raises some concerns as to how horses are kept in the modern domestic setting and suggests that the welfare of horses may be improved by adopting a feeding and management system more suited to their physiological and behavioural needs.

Hockenhill J, Creighton E (2014) Pre-feeding behaviour in UK leisure horses and associated feeding routine risk factors. *Animal Welfare* 23:297–308.



Different head-neck position in dressage horses, conflict behaviour and performance

In recent years, much discussion has been held on different styles used during riding and what can be considered an 'appropriate' Head-Neck-Position (HNP), with the riding technique described as 'rollkur' or 'hyperflexion' being noted as controversial. This is when the horse's head is held in a position so that the horse's nasal plane is held by the reins, behind the vertical. This positioning of the horse's head is in contrast to the classical riding technique, where the nasal plane is held slightly in front of the vertical. It is considered that the rollkur riding style may cause the horse discomfort and restrict its vision, therefore presenting a welfare issue. In light of this, there is an urgent need for an object assessment of this riding style which this study aims to address by examining the behaviour patterns of dressage horses when competing, assessing the different head-neck-positions (HNP) of the horses at different competition levels, and relating this to the given mark in the competition.

171 dressage horses were observed at 11 local, national and international dressage events and the horses assessed for their HNP during the competition itself, and during the warm up. The horses were observed for three minutes in the warm up area, and three minutes during the test, and a HNP allocated if the horse held its head for 95% of the three minute slot in any one of three HNPs; 1) nasal plane in front of the vertical, 2) nasal plane slightly behind the vertical (up to 10°) and 3) nasal plane more than 10° behind the vertical. The amount of conflict behaviour (such as tail-swishing, head tossing or bucking) that the horses showed during the three-minute time periods was recorded. In a second part of the study, the authors performed scan sampling every 15 minutes on 355 other horses during the warm up period in 3 other dressage events and classified these according to their HNP.

It was found that 69% of the 355 horses were ridden with their nasal planes behind the vertical, 19% were ridden at or slightly behind the vertical and only 12% were ridden with their nasal planes in front of the vertical. Horses showed more conflict behaviour the more the head was held behind the vertical, supporting the suggestion that this position is uncomfortable for the horse. The HNP behind the vertical was found to attract lower marks at lower competition levels, but not at the higher levels, suggesting that this head position may be considered more acceptable at high levels of competition. It was also found that the horse's head was more commonly held behind the vertical in warm up than in the test itself. The conflict behaviour exhibited by horses ridden with the HNP behind the vertical at all levels of competition, and therefore regardless of rider skill level, suggests that this riding position has a negative effect on the welfare of competition horses.

Kienapfel K, Link Y, Borstel UK (2014). Prevalence of different head-neck positions in horses shown at dressage competitions and their relation to conflict behaviour and performance marks. *Plos one* 9(8):e103140.

Number, causes and destinations of horses leaving the Australian racing industries

Australia's racing industry has a large economic worth, with breeding, racing, and wagering all making a significant contribution to the national economy. Racehorse wastage within the industry therefore is of importance, both for the horse's welfare and for economic reasons. An apparent lack of demand or suitable 'placings' for horses leaving racing has meant that there is a perception that these animals are usually sent to slaughter. However, the actual fate of these horses is largely unknown and, due to the fragmented roles of the various industry bodies and fluctuations in horse populations, current wastage rates have been unavailable. This study aimed to look at wastage in the racing industries and describe the exit rates of both



Thoroughbred horses and Standardbred horses (used in harness racing) and examine the factors that influence the destinations of racehorses exiting the industry. A questionnaire was distributed to a random selection of 1,258 Thoroughbred and 981 Standardbred trainers registered with a number of different racing bodies throughout Australia in the 2002–2003 official race year. The questionnaire requested information relating to the characteristics of the trainers and their horses and aimed to investigate the role of various factors for wastage including horse age, sex, and number of years in training, as well as the destination of departing horses during the year.

It was found that 40% of Thoroughbred horses and 39% of Standardbred horses left the respondents racing stables during the 2002–2003 year. The reasons for Thoroughbred and Standardbred horses leaving the industry were very similar. The most common reason was poor performance/slow, followed by illness/injury, other reasons, for breeding and unsuitable temperament or behaviour. A larger percentage of Standardbreds than Thoroughbreds went to different trainers or directly to slaughter, whereas a greater percentage of Thoroughbreds went to stud, auctions or entered other equestrian pursuits, suggesting that, at the time of the survey, Thoroughbreds had more of an opportunity to enter other equestrian pursuits than

do Standardbreds following exit from the industry. It is suggested that improved behaviour training and early identification of the causes of poor performance may assist in reducing wastage rates in the racing industries.

Thomson PC, Hayek AR, Jones B *et al* (2014) Number, causes and destinations of horses leaving the Australian Thoroughbred and Standardbred racing industries. *Australian Veterinary Journal* 92(8):303–311.



COMPANION ANIMALS

Behavioural and contextual predictors of adoption of shelter dogs

Millions of dogs are surrendered to animal shelters on an annual basis in the USA, and approximately 60% of these dogs are ultimately euthanased within the shelter. Even those dogs that enter a shelter that has a policy not to euthanase healthy animals are likely to undergo a long stay in a less than optimal environment within the shelter. One way of improving the welfare of these dogs is by increasing their chances of adoption. It has been shown previously that the behaviour that dogs display while in the shelter can have an effect on whether or not they are chosen to be adopted.



This study chose to examine this evidence further and looked at the behaviours that dogs exhibited during interactions with a potential adopter, and whether this affected their chances of adoption. The authors also examined if the other variables, such as the morphology of the dog or the location of the interaction, influenced the chances of adoption, and also investigated the adopter's intention on the day of the visit. 250 interactions between dogs and potential adopters were observed in a shelter situation and, following the interaction, potential adopters were asked to complete a questionnaire asking a range of questions about themselves, and their reasons for adopting or not adopting that dog.

It was found that most shelter visitors only requested to interact with one dog, and did so for an average of 8 minutes. Only two behaviours, and no morphological variables, were found to influence adoption decisions; the dog ignoring play initiation by the visitor (decreased chance of adoption) and the dog lying in close proximity to the visitor (increased chance of adoption). The probability of dog adoption was also found to be higher in a small concrete outdoor area than it was in a large grass area or indoor room. It was found that the adopter's intention to adopt a dog prior to the interaction was the highest predictor of adoption. The results of the study suggest that adopters make a decision whether or not to adopt a particular dog on that day, prior to interacting with the dog, but this decision can be reversed depending on the behaviour of the dog during the short interaction. The visitors that did intend to adopt a specific dog, but then chose not to, may be amenable to programmes designed to improve shelter dog adoption rates.

Protopopova A, Wynne CDL (2014) Adopter-dog interactions at the shelter: Behavioral and contextual predictors of adoption. *Applied Animal Behaviour Science* **157**:109–116.

The effect of conspecific removal on the behaviour and physiology of pair-housed shelter dogs

The presence of strong social bonds has been shown in a number of species, including dogs. The removal of a social conspecific for these species has a negative effect on both their physiology and behaviour which is indicative of decreased welfare. When separated from a conspecific, social species may show behavioural responses indicative of distress such as withdrawal, inactivity, stereotypic behaviours and increased vocalisations and cortisol levels. Traditionally, stress has been assessed using the measurement of cortisol levels, but more recently the response of an animal's immune system has also been used to measure stress, with increased levels of Immunoglobulin A (IgA) indicating acute stress, and decreased levels indicative of chronic stress. The use of cognitive bias has also increasingly been used in recent years to assess an animal's emotions and is based on the idea that animals experiencing a negative emotional state are more pessimistic than those experiencing a positive optimistic emotional state. As dogs held in shelters are likely to be subjected to losing the company of a conspecific in the shelter due to the rehoming process, this study aimed to assess the effect of the removal of a conspecific has on pair-housed dogs.

24 shelter dogs were pair housed (12 pairs) for a mean of 54 days in a shelter environment and exposed, during this time, to normal shelter management practices.



Prior to separation, the dogs displayed more affiliative than agonistic behaviour with conspecifics, but following the removal of the conspecific, increased activity in the form of running, grooming, circling, figure of 8 movement, posture changes and stretching and less play behaviour was noted. IgA increased following separation, indicating that the dogs may be experiencing acute stress, but no changes in cortisol levels were noted. In addition, there was no indication that the dog's emotional valency was affected as a result of the separation. The study suggests that dogs may experience acute stress as a result of being separated from a conspecific, and may benefit from special care during this period when housed in a shelter.

Walker JK, Waran NK, Phillips, CJC (2014) The effect of conspecific removal on the behaviour and physiology of pair-housed shelter dogs. *Applied Animal Behaviour Science* **158**:46–56.

FARM ANIMALS

Consumer perception of the animal friendliness of broiler production systems

As a result of the increasing concern around animal welfare standards for production animals, food policies have been responsive through the development of legislation that requires minimum standards for the husbandry and care of production animals, including broilers (meat chickens). Although this legislation protects the animals at a basic level, not all consumers are satisfied with this and are requesting further increases in the welfare standards. Market-based initiatives that have standards that are beyond the minimum have emerged in several European countries, which form the basis for so called compromise products. These initiatives deliver products from animals that have been farmed above the minimum standards but at a price lower than that produced by organic production systems. A variety of characteristics combine to determine the level of animal welfare in a food production system, and this study aimed to assess the relative importance of these different aspects to different consumers and their willingness to pay for welfare enhanced chicken meat products.

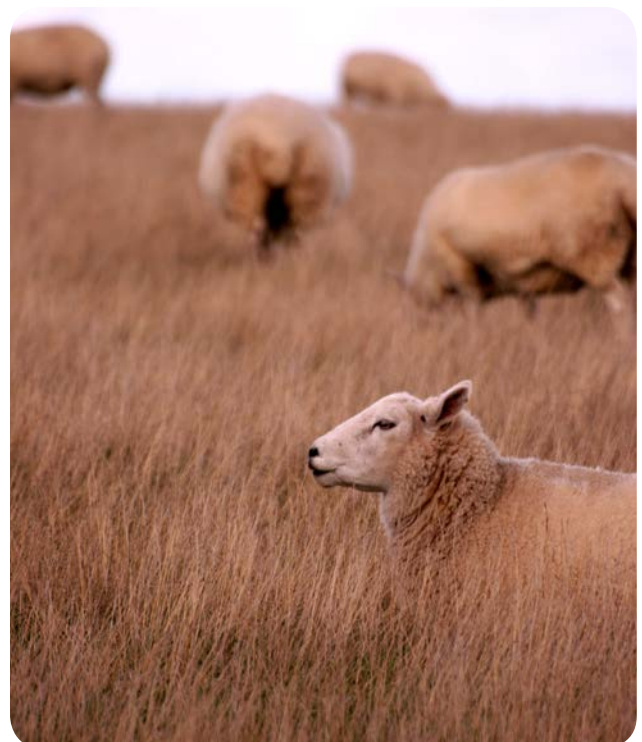
Three different consumer segments were identified which differed in regards to the aspects that they consider to form an overall opinion on the animal friendliness of the production system, as well as the aspects that they give most weight to. One segment takes an inclusive perspective view on animal welfare, whereas two other segments take a more heuristic or uni-dimensional perspective to assess the animal friendliness of a system based on the amount of space provided or the slaughter method.

Clear differences between the three segments were observed regarding breed of bird, a natural day-night rhythm and the slaughter method used. Those aspects that were important across segments were outdoor access and stocking density and respondents believed that sufficient space and some sort of outdoor area was important for the animal's welfare. The study suggests that the use of gradual labelling schemes indicating animal welfare levels, combined with detailed information tailored towards specific concerns of the heuristic-based consumer segments, may help to further develop the market for compromise animal products.

De Jonge J, van Trijp H (2014) Heterogeneity in consumer perceptions of the animal friendliness of broiler production systems. *Food Policy* 49:174–185.

Balancing consumer and societal requirements for sheep meat production in Australasia

The sheep meat industries are required to constantly meet the requirements of consumers, as well as societal demands, to ensure their future. Increasingly, consumer requirements are not only restricted to the quality of the meat they are purchasing (e.g. the texture, flavour and colour), consumers are now adopting a more holistic approach and considering a wider range of factors which include the welfare of the animal and the ethical and environmental dimensions of the production system in which it was raised. However, consumers are not the only ones who are asking for farmers to consider the psychological, as well as physical, needs of livestock in production systems, there are also a large number of non-consumers who place pressure on the farmers to increase the welfare of their livestock. These non-consumers range from individuals and organisations who are avidly opposed to animal farming to those who choose, for a variety of reasons (religious, cultural,



lifestyle), not to consume some or all meat products. These non-consumers can have a considerable influence on the meat industries. Thus, the ongoing commitment to improving the 'quality of life' for livestock on-farm is equally important as producing quality meat products when considering how to balance consumer and societal requirements for the sheep meat industries.

With this in mind, this paper explores the future of the sheep meat industries from an Australian and New Zealand perspective. It explores the more 'at risk' practices that are associated with these industries which are considered to include 1) restriction of movement for animals in different management systems, 2) surgical husbandry practices, 3) mortality and disease induced by the production environment,

4) long distance transport of farm animals and 5) humane slaughter, and the processes that may be involved in reducing the risk in these different areas. The paper then discusses those factors and drivers that will influence farm animal welfare over the next decade and how the industry may need to move to meet these changes.

Effective assessment and management of the risks that are likely to impact on the extensive sheep farming husbandry systems that exist in Australasia is central to the growth of consumer trust and confidence in the sheep meat production industries into the future.

Ferguson DM, Schreurs NM, Kenyon PR *et al* (2014). Balancing consumer and societal requirements for sheep meat production: An Australasian perspective. *Meat Science* 98:477–483.

The effects of food withdrawal in combination with direct and indirect road transport of dairy calves

Male dairy calves are commonly transported at a very young age from their farm of origin for slaughter or further rearing. The transport process is associated with high levels of subsequent mortality. Calves are not fed during this, often long, transport period and, as the calves are commonly unweaned, the transport process effectively involves the withdrawal of both feed and water during the transport and lairage process. Welfare concerns have been raised as to the effect that the transport has on the calves. Regulatory requirements in Australia include stipulations that calves transported without their mothers must be at least five days old, fed within six hours prior to loading and transported for no more than 12 hours.

This study aimed to assess the effects of transport and food withdrawal on sixty 5–9 day old calves all having food withdrawn for 30 hours and being transported according to four different treatments (n=15 in each treatment group); 1) no transport (control), 2) transport for six hours to a new environment, 3) transport for 12 hours to a new environment, 4) transport for one hour to a holding pen, remain for six hours and then transport for five hours to a new environment (indirect). Calves were fed six hours prior to the feed withdrawal and commencement of the treatment phase, and then again after 30 hours, following the conclusion of the study. Blood samples were taken from the calves pre-feeding, pre-loading, during the treatment phase and again immediately prior to re-feeding.



It was found that transport did not exert a significant additional effect on the welfare of calves beyond the withdrawal of feed. There was an increase in creatine kinase noted in the calves transported for 12 hours, which may indicate muscle damage as a result of bruising from the transport. The key effect of the 30 hours of food withdrawal was a decline in blood glucose in the calves, and it was concluded that best practice would be not to withdraw feed for more than 24 hours. The results of this study suggest that time off feed needs to be carefully managed when transporting young dairy calves.

Fisher AD, Stevens BH, Conley, MJ *et al* (2014) The effects of direct and indirect road transport consignment in combination with feed withdrawal in young dairy calves. *Journal of Dairy Research* 81:297–303.

Factors affecting ranging behaviour in laying hens

Consumer-driven demand and the EU ban on the housing of laying hens in conventional cages in 2012, has resulted in an increased number of non-cage systems used for keeping hens, including free-range systems. The outdoor range provides the birds with an environment that enables them to perform behaviours such as foraging and dust bathing. It also provides an opportunity for the birds to redirect feather pecking behaviour (a serious problem in the laying hen sector) away from flock mates to performing explorative pecking instead. Good range use is indicated by both the percentage of the flock outside on the range and the extent of the range that is being used, which can be affected by a large number of variables.

This study examined a range of variables in indoor and outdoor rearing and laying environments to assess how they affected the ranging behaviour of young and adult laying hens. Thirty-three laying hen flocks were examined in this study, 16 were reared with range access and 17 without. It was found that, at eight weeks, three flocks had outdoor access and 28% of birds were found to range at this age (22% ranging more than 5m from the house). Thirteen flocks had outdoor access at 16 weeks and 12% were found to range at this age (with 29% of these ranging more than 5m from the house). At 35 weeks, all flocks had range access and the average that used the range was 13% (with 42% of these ranging away from the house).

A lower stocking density was found to have a positive effect on ranging behaviour, and the authors suggest that this may be because the birds are able to access the pop holes more easily. A higher light intensity within the house also encouraged ranging behaviour



and this may be due to the lower change in light intensity from inside the house to outdoors.

A greater length of pop hole per bird also encouraged the birds to range outdoors, possibly because it reduced the distance for the birds to travel to the nearest hole. The presence of cover on the range increased the bird's willingness to use the range and ranging was reduced in wet weather, again suggesting a role for cover to encourage them to use the outdoors in bad weather.

Flocks that had access to the range during rearing ranged no more, nor did they move further away from the house, than those that did not have range access during rearing and no difference was found in the occurrence of feather pecking between the two treatment groups.

This study confirmed that range use was improved by reducing stocking density and flock size, by increasing light intensity in the shed and by increasing availability of pop holes.

Gilani AM, Knowles TG, Nicol CJ (2014) Factors affecting ranging behaviour in young and adult laying hens. *British Poultry Science* 55(2):127–135.

Effect of altering the diet during the rearing of broiler breeder females

Broiler breeders are bred specifically to produce fast-growing offspring: the modern day broiler (or meat chicken). As broiler breeders have the genetic potential to grow as quickly as their offspring, they are severely feed restricted throughout the rearing period to avoid obesity and ensure optimal health. However, this feed restriction results in chronic hunger for the birds and broiler breeders often display high levels of oral stereotypies and aggression as a result of the frustration of hunger and feeding motivation that they experience. This can also result in severe feather pecking of other flock members, causing pain and distress, and in turn increasing heat loss if feathers are removed from large parts of the body, therefore increasing costs for the farmer to maintain the bird's body heat. It is common for North American broiler breeder producers to adopt a feeding schedule on which broiler breeders are fed twice their daily allocation every other day (skip-a-day or SAD), but this feeding regime is considered to be detrimental to the bird's well-being and so is banned in the United Kingdom.

This study aimed to assess differences in feather condition of broiler breeder hens fed one of 6 different dietary treatments; birds were fed a control diet, or a diet containing soyabean hulls used as a bulking ingredient with



either a feed grade (F) quality or purified (P) appetite suppressant. All three diets were fed either on a daily or SAD basis.

It was found that both of the alternative diet types, F and P, have a positive effect on feather condition in the birds, with F showing the best results on feather condition, which may indicate that it was most effective at reducing hunger. Feather condition also worsened more quickly for those birds that were fed daily compared to those fed on a SAD basis. This suggests that the birds fed on a SAD basis adjusted to their feeding schedule and knew when to expect feed and on the days that they were fed, were receiving enough food to satisfy their hunger. The results obtained in this study suggest that the use of alternative diets with the SAD feeding regime may be beneficial for broiler breeder welfare – i.e. feeling full every other day could be more welfare friendly than never feeling full on a daily feeding schedule.

Morrissey KLH, Widowski T, Leeson S *et al* (2014) The effect of dietary alterations during rearing on feather condition in broiler breeder females. *Poultry Science* **93**:1636–1643.

Cognitive roles and sociodemographic characteristics in consumer attitudes towards animal welfare

Animal welfare has increasingly become one of the major topics of concern for stakeholders involved in farm animal production. Consumer concerns have the ability to influence the products that they purchase and this has led to an increase in studies examining consumer characteristics, what different consumers are willing to pay and how animal welfare can influence different peoples choices. The empathising-systemising theory of individual differences is based on two core cognitive psychological dimensions; empathising and systemising. Empathising is described as the drive to identify others' mental states to predict their behaviour and respond with appropriate emotions, whereas systemising is defined as the drive to understand systems and rules (e.g. how an engine works). Every person will have both empathising as well as systemising skills, but these will be in varied amounts in each person, with one being dominant (or both being balanced in some individuals). This paper explored the role of these cognitive styles and sociodemographic characteristics in consumer's perceptions of animal welfare and their willingness to pay for animal-friendly products.

A questionnaire was completed by 376 individuals in Potenza, Southern Italy. It was found that, overall, the respondents were concerned about animal

welfare, with younger, well-educated and high income respondents showing the higher levels of concern. Women also showed more concern than men. Survey respondents had negative perceptions about the way production animals were treated in general. They stated that they were willing to pay more for animal-friendly products, and showed positive attitudes towards some of the suggested ways in which animal welfare could be improved for production animals. More empathetic dominant people showed a greater concern for animal welfare than did systematic people, and empathetic people were more aware of the importance of providing information on animal welfare to help consumers make purchasing decisions. In contrast, the main concern of systemising dominant people was related to food security and these people expressed high levels of distrust or scepticism towards proposed actions to improve animal welfare. The findings of this study contribute towards gaining a better understanding of how people make their food choices based on their personal characteristics.

Musto M, Faraone D, Cellini F (2014) The role of cognitive styles and sociodemographic characteristics in consumer perceptions and attitudes towards nonhuman animal welfare. *Journal of Applied Animal Welfare Science* **17**:198–215.

Lung lesions, liver abnormalities and rumen health scores in beef cattle at slaughter

Accurate diagnosis of the most common diseases affecting lotfed cattle is difficult. Many reports have described the use of lung lesions as a diagnostic tool for bovine respiratory disease complex, commonly a result of deficiencies in management practices. Other reports have outlined the deleterious effects of liver abscesses on performance and carcass characteristics. Prior to the abscess forming, rumenitis will occur, and so examining the rumen for pathological evidence of damage may be valuable in diagnosing nutritional health. The occurrence of lesions in cattle negatively impact slaughter processes, and also have a negative economic impact. As lesions have a detrimental effect to the animal, cattle lotfeeders and processing plants, monitoring lesion prevalence, along with information about the animal's productivity and how the animal was managed at the feedlot, can provide important information about the entire beef production process.

The objectives of this study were to determine the prevalence and relationships between pathology lesions in beef cattle at slaughter, develop a system that would enable pre-harvest and performance data to be recorded along with carcass characteristics and gross pathology, and associate the performance of the cattle with the lesions measured. Gross pathology data was obtained from 19,229 cattle at commercial processing plants in Kansas and Texas. In addition, preharvest and carcass data was obtained on 13,226 of these cattle.

It was found that 67.3% of the cattle had no pulmonary lesions and 22.5% and 9.8% of the cattle displayed mild and severe lesions respectively. Overall, 68.8% of the cattle observed had normal livers. Of cattle severely affected by liver abscesses, 14.9% also displayed severe pulmonary lesions and 28.3% displayed mild pulmonary lesions. Rumenitis lesions were observed in 24.1% of all cattle. Of cattle with mildly abscessed livers, moderately abscessed livers and severely abscessed livers, 20.6%, 21.6% and 9.2% displayed mild or severe rumenitis at slaughter. Overall, there was 22.9% prevalence of severe lesions in the lung, liver or rumen, which were associated with reduced performance, indicating that a significant opportunity exists to improve the well-being and productivity of beef cattle by changes in management systems at feedlots.

Rezac DJ, Thomson DU, Bartle SJ *et al* (2014) Prevalence, severity, and relationships of lung lesions, liver abnormalities, and rumen health scores measured at slaughter in beef cattle. *Journal of Animal Science* **92**:2595–2602.

Consumers' valuation of sustainability labels on meat

Consumers are increasingly concerned about the way in which their food is produced, and while they still expect food to be of a quality that they enjoy, they are also increasingly considering the social, ethical and environmental attributes of how their food was produced. In recent years, there has been an increase in sustainability labelling that focuses on the environmental or ethical benefits that the food that they are purchasing can provide, which allows consumers to make informed purchasing decisions.

This Belgian study used a choice experiment to assess the 359 participants' preferences and willingness to pay for chicken breast meat according to the following sustainability attributes: 1) organic label, 2) free range label, 3) EU animal welfare label, 4) carbon footprint label and 5) price, and investigates and quantifies the size of the preferences for the different sustainability claims.

The study found that most consumers had positive preferences towards the use of the labels, suggesting

that consumers like to be informed through labelling about the sustainability characteristics of the food that they purchase. Nine in every ten participants favoured the free range claims, which also attracted the highest willingness to pay premiums at 43% to 93%. The majority of participants (87%) also indicated that they would value the introduction of an EU level animal welfare label. The carbon footprint and organic labels were less appealing, and participants were less willing to pay for these labels. High income consumers were found to be willing to pay a 50% higher price premium for sustainability labels on chicken breast compared to those in the low income group. Studies of this type are useful in determining the market potential of products and also provide information to producers about the potential to convert from conventional systems to production practices that attract a premium due to consumer preference.

Van Loo EJ, Caputo V, Nayga Jr RM *et al* (2014) Consumers' valuation of sustainability labels on meat. *Food policy* **49**:137–150.

Effect of ketoprofen on post-partum behaviour in sows

Farrowing is an intrinsically painful process for sows, but very little is known about the pain that sows might experience post-farrowing. Sows show an increase in activity prior to farrowing, but then increase the amount of lying behaviour during lactation. Lying behaviour and position changes in sows have been related to their pain response, and administration of a non-steroidal anti-inflammatory drug (NSAID) has been shown to reduce the sow's total lying duration. Feeding behaviour and feed intake may also be altered as a result of pain.



This study examined the changes in the behaviour of post-partum sows being administered with either the NSAID drug, ketoprofen (n=19), compared with controls, who were administered with sodium chloride (n=19) intramuscularly for three days post-partum. All pigs were observed for six days post-partum using video analysis. It was found that, in general, the behaviour of the sows changed very little after treatment with ketoprofen, however young and old sows showed different behavioural changes. Young sows (parity 2–3) showed increased activity if treated with ketoprofen than did the young control sows, suggesting that ketoprofen had beneficial effects on pain in this age group. The ketoprofen treated young sows were also found to eat and drink more frequently than the control young sows, and had more frequent lateral lying bouts with the udder pointed toward the piglet area, which has the potential for increasing nursing opportunities for piglets. However, older sows (parity 4–9) did not show this difference in effect between ketoprofen treated sows and control sows and it is suggested that the older sows may not be able to alleviate underlying pain caused from a range of factors such as clinical or subclinical mammary

gland problems. Young sows in general seemed more active than the older sows, and were changing position more frequently than older ketoprofen treated sows.

The results of the study suggest that ketoprofen is able to relieve pain in some sows post-partum and careful observation of body positioning and lying behaviour may provide an indication of the sows that may benefit from pain alleviation.

Viitasaari E, Raekallio M, Heinonen M (2014) The effect of ketoprofen on post-partum behaviour in sows. *Applied Animal Behaviour Science* 158:16–22.

Providing large quantities of straw at farrowing prevents bruising and increases weight gain in piglets

Piglet production systems in Sweden use a loose-housing system for housing and farrowing sows. These farmers supply their sows with 15–20kg of chopped straw two days prior to the birth of piglets. The straw provides the sow with material to carry out nest building behaviour which sows are strongly motivated to perform. The EU Council Directive for the welfare of pigs requires that sows and gilts are provided with suitable nesting material in a sufficient quantity during the week before farrowing, however,

what is regarded as 'sufficient' is not defined. It is also believed that the provision of straw has a dual purpose and will also prevent bruising of the piglet's claws and limbs, which are extremely soft in their first two days of life. The aim of this study was to investigate the effects of providing a large quantity of straw (15–20kg) before farrowing compared to the provision of limited daily amounts (0.5–1kg) on bruising and growth in pre-weaning piglets.



Four commercial piglet-producing farms were used in this study and each batch of sows was studied during two consecutive lactations. The sows were assigned to two treatment groups: 1) STRAW (n=181 litters) where sows were provided with the 15–20kg of straw 2 days prior to farrowing and 2) CONTROL (n=182 litters) where sows received 0.5–1kg on a daily basis plus 2kg of straw for nest building when the sow was about to farrow. The sows switched to the opposite treatment group during the second lactation and recordings were made of a number of aspects regarding the farrowing

and resulting litter. It was found that the prevalence of lesions on piglets was significantly lower on the STRAW than CONTROL piglets and the percentage of piglets with more than one limb or digit affected were also numerically lower in the STRAW than CONTROL groups in most cases. In addition, the average daily gain in weight of the piglets until five days of age, and the body weight of the piglets at weaning were positively influenced by the use of large quantities of straw at farrowing.

The provision of a large amount of straw prior to farrowing provides the sow with the ability to perform nest building behaviour, significantly reduces leg and foot injury in the piglets and increases their bodyweight at weaning, all signalling an increase in animal welfare in pig production systems.

Westin R, Holmgren N, Hultgren J *et al* (2014) Large quantities of straw at farrowing prevents bruising and increases weight gain in piglets. *Preventative Veterinary Medicine* 115:181–190.

HUMANE KILLING

A comparison of handling methods during the religious slaughter of sheep

During the slaughter process, sheep are exposed to both physiological and physical stressors including novelty, handling and isolation, and associated physical fatigue and injury. In addition, they are often restrained for stunning and/or slaughter, which in itself is stressful, but may be exacerbated when they are isolated from their flock for this procedure. Animals slaughtered without stunning to meet with religious requirements for Halal or Shechita slaughter must be individually and mechanically restrained, which is currently interpreted in the UK as meaning that only one animal at a time can be loaded into a V shaped restrainer for slaughter. This individual loading is in conflict with a sheep's natural behaviour to move with a flock. Sheep cannot be released from the restrainer until unconscious or insensible, which must be no less than 20 seconds following the neck cut.

This study aimed to assess the effects of individually loading and restraining lambs compared to the normal practice of group loading and restraint using a V-shaped restrainer at an abattoir that commercially performs the religious slaughter of sheep. Two hundred lambs were placed into one of four treatments: 1) individual loading onto a V-shaped restrainer using a rotating crowd pen, 2) group loading onto a V-shaped restrainer using a rotating crowd pen, 3) individual loading onto a V-shaped restrainer using a static crowd pen, and 4) group loading onto a V-shaped restrainer using a static crowd pen. Behaviour of the sheep and handler were recorded and blood samples were obtained from the sheep post neck cut.

The study found that higher levels of cortisol and lactate were present in those sheep loaded individually indicating higher levels of stress and increased muscle activity, probably due to increased handling and struggling. The loading pen type had a less obvious effect, but it was thought that the rotating crowding pen minimised physical exertion in the lambs. Group loaded lambs were held within the restrainer for longer periods than those held individually, which goes against those recommendations made by the Farm Animal Welfare Council in the UK who advocate that animals should only be restrained for short periods, but this study suggests that the fact that the sheep are isolated creates more stress than the fact that they are restrained, suggesting that group restraint for sheep slaughtered for religious reasons would increase their welfare.

Bates LSW, Ford EA, Brown SN *et al* (2014) A comparison of handling methods relevant to the religious slaughter of sheep. *Animal Welfare* 23:251–258.

RESEARCH ANIMALS

Mouse aversion to isoflurane versus carbon dioxide gas

Current laboratory guidelines recommend using an inhalant substance over carbon dioxide gas (CO₂) for rodent euthanasia. Evidence in the current literature has suggested that isoflurane, a halogenated hydrocarbon, is less aversive than CO₂ and other inhalant anaesthetics. Isoflurane can be administered using either the drop method (where the liquid isoflurane is placed onto an absorbent material and placed into a closed compartment containing the mouse), or using a vaporiser machine (in which case a carrier gas, and an anaesthetic waste gas scavenging system is used). Some researchers argue that the use of this vaporiser (which controls the amount of anaesthetic entering the chamber) is unnecessary and in addition, vaporisers can be costly. Some laboratories still use the CO₂ gradual-fill method for euthanasia of rodents.

The aim of this study was to test the aversion of mice to three euthanasia methods: 1) 20% gradual-fill chamber vol/min of CO₂, 2) 5% isoflurane administered using a vaporiser set at 4L/ min (40% chamber vol/min) oxygen flow, and 3) 5% isoflurane administered using the drop method. Mice were given the choice of remaining in a small dark compartment with a rising concentration of one of the three treatments, or escape to a brightly lit chamber (which they find aversive). The longer length of time that the mice spend in the gas compartment therefore, the less aversive they find the gas in there.



The authors found that isoflurane concentrations rose more quickly when using the drop method rather than the vaporiser, and the mice stayed longer in the gas compartment when the vaporiser was used. Mice also stayed longer in the compartment when they were exposed to isoflurane using the vaporiser than when the mice were exposed to gradual-fill CO₂. Five of nine mice became recumbent in the dark compartment when exposed to the vaporiser treatment compared to two of nine during the drop treatment, and zero of nine during the CO₂ fill treatment. Re-exposure to isoflurane administered with a vaporiser was more aversive than initial exposure, suggesting that re-exposure to isoflurane should be avoided.

The results of this study agree with other recent literature indicating that mouse euthanasia using isoflurane administered by a vaporiser is a humane alternative to the use of gradual-fill CO₂ and, suggests that the drop method (as tested in the current study) should be avoided.

Moody CM, Weary DM (2014) Mouse aversion to isoflurane versus carbon dioxide gas. *Applied Animal Behaviour Science* 158:95–101.

WILD ANIMALS

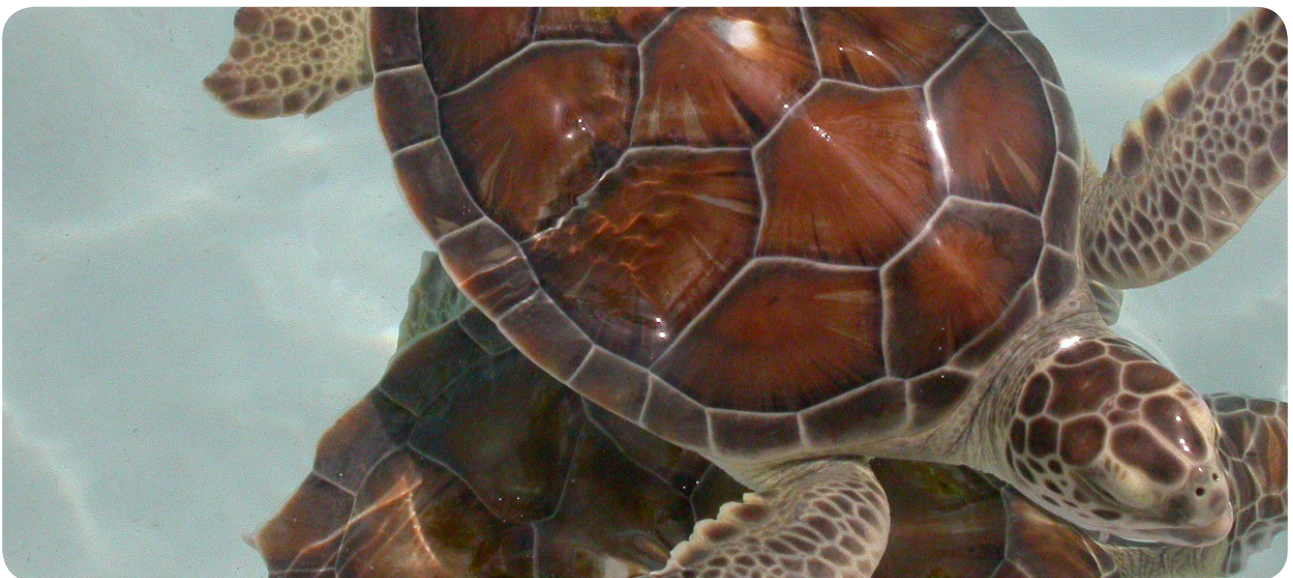
Welfare and environmental implications of farmed sea turtles

Green turtles are raised commercially by the Cayman Turtle Farm (CTF), which is located in Grand Cayman, and farms turtles for consumption by the island population. CTF is the only large-scale sea turtle farm in the world and holds approximately 9,800 turtles. Farming of sea turtles for meat, like the farming of other reptiles, presents a range of complex challenges for the provision of the animal's physical, health and behavioural needs. When these needs are not met, captivity stress may develop with morbidity and mortality resulting. Reptiles also have low metabolic rates, meaning that underlying disease, which is more likely to develop if the turtles are not kept in a state of good health, can long remain dormant but can be transmitted to other turtles, and may be zoonotic, meaning that they may also transfer to humans. A decreased level of welfare in this facility therefore poses a risk for the turtles housed there, but also to human visitors who are allowed contact with some of the turtles via a 'touch tank'. In addition, there is a risk that disease transmission could spread to wild turtle populations via the release of wastewater, which is regularly discharged from the facility into the ocean.

This paper provides an overview of an investigation into the welfare of the turtles being held in this facility. The authors use a literature review of turtle farming followed by an onsite inspection of the facilities in addition to reports provided by the World Society for the Protection of Animals (WSPA), now known as World Animal Protection (WAP).

It was found that there were a large number of animal welfare issues present at the farm, which were translated to being due to physical injury, disease, abnormal and problematic arousal and discomfort or stress related behaviour. Although the problems were not apparent in all ponds, or all turtles, the problems that were apparent ranged from mild to severe injury, genetic related defects, lack of food for the turtles, cannibalism, dirty water and a range of behaviours indicative of maladaptation and captivity-stress. Overcrowding of turtles was apparent in all ponds. In nature, green turtles are largely solitary animals that occupy large and diverse environments and so the problematic behaviours that the turtles show would largely be reflective of the unstimulating conditions in which they are held, in particular in the display areas where the 'touch tanks' are located. The large number of animal welfare problems that were identified at the CTF relate substantially to the limitations of the sea turtle to be able to adapt to these facilities that are so different to that which they experience in their natural habitat. It is considered that the facility cannot be modified to meet the turtle's needs as the facility cannot provide the space or complexity that the turtles require to remain in good health, and additionally there is risk of disease transmission from captive to wild populations via the release of contaminated wastewater from the facility.

Arena PC, Warwick C, Steedman C (2014) Welfare and environmental implications of farmed sea turtles. *Journal of Agricultural and Environmental Ethics* 27:309–330.



Use of fertility control to mitigate human-wildlife conflicts

As a result of human population growth, the number of human-animal conflicts is increasing. In the past, these have been primarily controlled using lethal cull methods; however there is substantial public opposition to this form of population control. This opposition has influenced the increase in non-lethal methods over the last three decades, with one of these alternative methods being fertility control which has been advocated as a safe, humane and effective means of managing populations of wildlife.

This review paper provides a critical overview of the available fertility control methods (hormonal, immunocontraceptive vaccines and other types) and examines current trends and recent developments in fertility control, delivery methods and the effects that fertility control has on wildlife populations.

The authors also suggest a framework of criteria to guide decisions as to the suitability of fertility control to mitigate human-wildlife conflicts, which encompasses aspects such as public consultation, considerations about animal welfare and feasibility, costs and sustainability. The review suggests that substantial effort is required initially to reduce population growth if fertility control is used as the sole management technique, but it can be successful, particularly in isolated populations.

Massei G, Cowan D (2014) Fertility control to mitigate human-wildlife conflicts: a review. *Wildlife Research* 41:1–21.

Behaviour of feral horses in response to culling and GnRH immunocontraception

Populations of feral horses have historically been reduced by culling, using either lethal methods such as hunting, or non-lethal methods such as capture and relocation. However, limiting population growth through the use of immunocontraceptives is becoming a more commonly used tool. Immunocontraceptive tools may, however, cause physiological changes that can alter behaviour and influence population dynamics in unforeseen ways, such as changing social behaviour and the structure of these herd living animals. A number of fertility control techniques have been investigated to date, but many of these are publically unacceptable, expensive or impractical on a large scale. This study examined the use of gonadotropin-releasing hormone (GnRH), an immunocontraceptive agent that prevents reproduction for a number of years and is relatively easy to use, on a population of feral horses. The horses were observed for a year prior and a year following vaccination with GnRH, to assess the effect that this fertility control agent may have on the social behaviours and the separate bands of horses in this population.

Horses were rounded up and culled non-lethally (n=78) or vaccinated at the end of the first year, leaving 116 horses occupying the park. 57 adult female horses were allocated to either a treatment group or control group and were vaccinated with GnRH (treatment; n=29) or saline solution (control; n=28), and then released. Their behaviour was then observed for another year.

It was found that only minimal differences existed in the time budget behaviours of vaccinated and control horses, and these differences were consistent with the metabolic demands of pregnancy and lactation. There was no difference in average body condition between the two groups. Similar social behaviours were also found between treatment groups, which reflected a reduced reproductive behaviour among control females resulting from GnRH-inhibited ovarian activity. Changes in band structure of the horses were found following culling and vaccination of the treatment group with herding behaviour of the stallion in each group (a social behaviour where the stallion drives the female horse by use of snaking movements with its neck) decreasing, whereas harem-tending behaviour (a social behaviour where a stallion defends a band female or recruits a new female into the band) increasing. The study supports the theory that social behaviour of feral horses is affected following vaccination with GnRH, but this is thought to be of a lesser extent, at least in the short term, than other available immunocontraceptives.

Ransom JJ, Powers JG, Garbe H *et al* (2014) Behavior of feral horses in response to culling and GnRH immunocontraception. *Applied Animal Behaviour Science* 157:81–92.

Protecting native mammals in research and teaching

The National Health and Medical Research Council (NHMRC) has released 'A guide to the care and use of Australian native mammals in research and teaching'.



The Guide is designed for use by researchers, state and territory regulators, members of animal ethics committees and carers of these animals. It seeks to ensure that any use of Australian native mammals for scientific purposes is ethical, humane and responsible and maintains NHMRC's commitment to the three key tenets of animal research – to use non-animal methods where possible, to reduce the number of animals used and to refine studies to minimise harm.

The Guide ensures that those involved in the care and use of Australian native mammals have the information they need to promote a high standard of care and minimise any unavoidable harm or discomfort. It includes best-practice guidance for over 120 species and was developed in consultation with experts in their fields.

The Guide is available on the NHMRC website: <https://www.nhmrc.gov.au/guidelines/publications/ea29>.

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