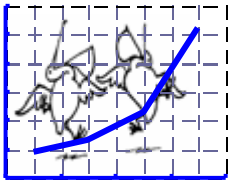


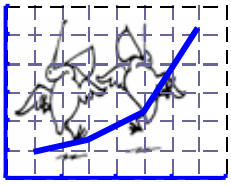
Recent advances in animal welfare science III

UFAW Animal Welfare Conference

York Merchant Adventurers' Hall, 21st June 2012

SCIENTIFIC PROGRAMME:

Speaker Abstracts



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Timetable

8.30 – 9.20 Registration and poster set up

9.20 – 9.30 Introduction to meeting		
	JK Kirkwood UFAW, UK	Welcome and Introduction

9.30 – 10.40 Session 1		
9.30	**Lambton SL, CJ Nicol, JL McKinstry, M Friel, J Walton, C Sherwin and CA Weeks** University of Bristol, UK	Testing a management package designed to reduce injurious pecking in loose-housed commercial laying hen flocks
9.55	**Baker SE and DW Macdonald** University of Oxford, UK	Assessing the relative humaneness of vertebrate pest control methods in the UK
10.20	**UFAW Award Presentations**	UFAW Medal for 'Outstanding Contribution to Animal Welfare Science' UFAW 'Young Animal Welfare Scientist of the Year'

10.40- 11.20 Break: Refreshments

11.20 – 12.40 Session 2		
11.20	**Smulders TV, BA Robertson, O Rhys, L Holmes, MS Turner, RB D'Eath, PW Wilson, IC Dunn and T Boswell** University of Newcastle, UK	Food-restricted broiler breeders: Does chronic hunger lead to chronic stress?
11.40	**Rowan AN and M Jones** The Humane Society of the U.S.	Developing benchmarks for assessing the success of dog management approaches around the world
12.00	**Ellwood SA, SE Baker, RPD Atkinson and DW Macdonald** University of Oxford, UK	The mechanical performance of currently unregulated spring-traps for use with rats, mice and moles
12.20	**Part, C, J Kiddie, W Hayes, D Mills, DB Morton and LM Collins** Queen's University Belfast, UK	Dogs at home: A comparison of welfare physiology and behaviour at home and in a boarding kennel environment

12.40 – 14.10 Lunch – poster session from 13.10

14.10 – 15.30 Session 3		
14.10	**de Haas EN, TB Rodenburg, JE Bolhuis, TGG Groothuis and B Kemp** Wageningen University, The Netherlands	Behavioural development of feather pecking in commercial laying hens – the past or the present?
14.30	**Bateson M, G Feenders, K Klaus and K Jayne** University of Newcastle, UK	Effects of hand-rearing on the cognition and behaviour of caged European starlings
14.50	**Leach MC, K Klaus, AL Miller, M Scotto di Perrotolo, SG Sotocinal and PA Flecknell** University of Newcastle, UK	The assessment of post-vasectomy pain in mice using behaviour and the Mouse Grimace Scale
15.10	**Viitasaari E, L Hänninen, M Heinonen, M Raekallio and A Valros** University of Helsinki, Finland	The benefits of ketoprofen administered intramuscularly 3 days post partum in sows

15.30– 15.50 Break: Refreshments

15.50 – 17.20 Session 4		
15.50	**Packer RMA, A Hendricks and CC Burn** The Royal Veterinary College, UK	How long and low can you go? A preliminary investigation of exaggeration of back length and reduction in leg length as a risk factor for intervertebral disc herniation (IVDH)
16.15	**Nasr MAF, J Murrell, LJ Wilkins and CJ Nicol** University of Bristol, UK	The effect of two classes of opioid drug on the landing ability of laying hens with and without keel fractures
16.40	**Hothersall B, G Caplen, CJ Nicol, AE Waterman-Pearson, CA Weeks and JC Murrell** University of Bristol, UK	Challenges of determining links between pain and lameness in broiler chickens

17.20 End

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TESTING A MANAGEMENT PACKAGE DESIGNED TO REDUCE INJURIOUS PECKING IN LOOSE-HOUSED COMMERCIAL LAYING HEN FLOCKS

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This study was designed to investigate the protective effects of a suite of potential on-farm management strategies against injurious pecking (IP), which can seriously reduce welfare in loose-housed laying hens. A systematic review of the risk factors associated with IP was completed, and a package of 46 potential management strategies was designed. The efficacy of that package was determined by a comparison of levels of IP in 100 study flocks (63 farms): 53 treatment flocks (TRT) where the package was employed versus 47 control flocks (CTL). Levels of IP were measured at 20, 30 and 40 weeks of age, including gentle and severe feather pecking (GFP and SFP), vent pecking (VP) cannibalistic pecking (CP), and plumage scores (PD). Use of each of the 46 management strategies was also recorded. Differences between treatment and control flocks were examined using multilevel modelling techniques in MLwiN 2.2.

Before the start of the study, treatment farms appeared to have worse IP problems than control farms. Flocks which preceded the study flocks, in the same houses, were visited at the end of their laying period (65 weeks), and PD was recorded. In flocks preceding TRT, PD was higher ($p=0.008$) than in flocks preceding CTL. Although not directly comparable, the change in PD between preceding flocks (65 weeks) and study flocks (at 40 weeks) was examined. PD was lower in study flocks; however, this difference was greater in TRT ($p=0.003$).

Measures of IP in study flocks are summarised in Table 1. TRT employed more management strategies (mean of 20.5 vs. 17.2; $p<0.001$), had lower PD ($p = 0.003$), lower rates of SFP ($p=0.019$), and a trend for lower rates of GFP ($p=0.070$) than CTL. Regardless of whether the flock was TRT or CTL, the more of the 46 management strategies that were employed the lower the rates of GFP ($p=0.021$) and SFP ($p=0.043$), the lower the likelihood of VP ($p=0.021$), and the lower PD ($p=0.004$). Therefore, initial analyses suggest the package has a protective effect against all forms of injurious pecking in commercial laying hen flocks.

		GFP	SFP	VP	CP	PD
CTL	% flocks affected	95.7	87.2	55.3	17.0	-
	Mean rate/score ±SE *	1.65±0.11	1.16±0.12	0.11±0.02	0.04±0.02	2.35±0.25
TRT	% flocks affected	94.3	90.6	30.2	15.1	-
	Mean rate/score ±SE*	1.49±0.11	0.87±0.10	0.06±0.01	0.01±0.004	2.08±0.22

Table 1 Incidence and mean rate/score of IP measures in study flocks. *Rates of behaviour are bout/bird/h, except SFP, where rate is pecks/bird/h. Mean PD score is per bird; higher scores equate to more plumage damage.

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ASSESSING THE RELATIVE HUMANENESS OF VERTEBRATE PEST CONTROL METHODS IN THE UK

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People are living in increasing proximity to wildlife and this brings greater potential for human-wildlife conflict. There are perceived and legal grounds for controlling vertebrate pests in the UK, but choosing the most humane control method is not straightforward. First, there is no information on the relative humaneness of the methods available in the UK. Second, there is inconsistency in the legislation regarding control methods. For example, break-back traps for catching rats and mice, and spring traps for catching moles, are exempt from the UK spring traps approval process. Third, opinion regarding the humaneness of control methods can vary with stakeholder group and perceived pest status. Fourth, the importance of humaneness in selection of a method may also vary with stakeholder group. There is therefore a need for objective comparison of the humaneness of control methods in the UK.

We are conducting an assessment of the humaneness of vertebrate control methods available in the UK. In a preliminary phase we conducted assessments using rabbits, crows and moles as models, selected to represent key management issues in the UK and a range of management options. We applied a model originally devised by Sharp and Saunders (2008) for assessing the relative humaneness of pest animal control methods in Australia. The model provides a systematic, comprehensive and transparent process for promoting consensus among diverse stakeholders regarding the humaneness of control methods. The welfare impacts of lethal and non-lethal control methods are rarely compared; non-lethal methods are often assumed to be better, but of course this may not be the case. The model examines the impacts of a control method on an animal's welfare and, in the case of a lethal method, how the animal is killed. Part A of the model considers the impact of a lethal or non-lethal method on overall welfare and the duration of that impact. The impact is recorded in each of five domains originally identified for assessing the impact of scientific procedures on experimental animals; ultimately the overall impact is determined. Part B considers, for lethal methods, the intensity and duration of suffering caused by the killing technique alone. Matrices of impact/duration and suffering/time are then used to allocate a score each to parts A and B. These scores are combined to give the overall assessment.

We present the results of our assessments, discussing the main welfare concerns associated with the methods assessed and current gaps in knowledge.

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DOGS AT HOME: A COMPARISON OF WELFARE PHYSIOLOGY AND BEHAVIOUR AT HOME AND IN A BOARDING KENNEL ENVIRONMENT

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Previous research suggests that dogs experience stress upon admission to a kennel environment. For example, it has been shown that cortisol levels measured the day after admission to kennels were higher than cortisol levels measured in the home environment before kennelling (Rooney et al. 2007), and when compared to a control group of dogs in a home environment (Hennessy et al. 1997). Cortisol:creatinine ratio is perhaps the most frequently used measure of stress reported in published studies of canine welfare. However, recent research has found cortisol:creatinine ratios are less reliable and less informative than previously thought for kennelled dogs (Kiddie et al. *in prep*) . The current study aimed to test the validity of a range of physiological, physical and behavioural welfare indicators and to develop a control profile for each parameter. Measurements were taken from 29 privately-owned dogs (14 males; 15 females) of 21 different breeds and cross-breeds aged between 1 and 10 years (mean = 4.43 years; SE = 0.50) in each of two conditions: in their own home environment and in a boarding kennel, following a counterbalanced design.

Over 70 welfare indicators were assessed for each of the dogs in this study. First urine of the day was sampled from each dog in both conditions and was analysed for cortisol, 5-HT, dopamine, adrenaline and noradrenaline metabolites, all standardised by creatinine levels. Saliva was assessed for oxidative stress and total antioxidant activity. Frequency and duration of defined behaviours were analysed from video recordings under each condition. Diversity and sequential dependency of behaviours were calculated using the Shannon Diversity Index and Markov chain analysis, respectively. Skin dryness, core body and surface temperatures were measured and sclera, food eaten, defecation and body condition were scored. In this presentation, we will highlight those indicators that were significantly different in the two environments and suggest 'normal' ranges for key indicators.

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FOOD-RESTRICTED BROILER BREEDERS: DOES CHRONIC HUNGER LEAD TO CHRONIC STRESS?

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Broiler breeder chickens are severely food restricted in order to keep them physically healthy and in good reproductive condition. However, this food restriction may cause chronic hunger, which may be a source of chronic stress. Detecting this chronic stress is not straightforward. A measure of chronic stress would ideally be stable over time, unaffected by recent changes in circumstances. Therefore stress hormone titres may be less ideal, as they vary over time with many factors. Chronic stressors lead to a decrease in adult neurogenesis (i.e. the generation of new neurons in adulthood) in the dentate gyrus of the hippocampus of rats and mice. In humans as well, multiple episodes of depression are associated with changes in hippocampal morphology. We therefore decided to use hippocampal neurogenesis and hippocampal volume as measures of chronic stress. In addition, we measure the expression levels of Agouti-Related Peptide (AGRP) in the hypothalamus. This peptide is involved in appetite regulation, and therefore serves as a physiological correlate of hunger.

Broiler breeders were kept in 4 treatment groups of 12 birds each: 1) commercial food restriction (FR); 2) *ad libitum* food (AL); 3) commercial food restriction until 10 weeks of age, then *ad libitum* (FR-AL); and 4) a less severe food restriction (twice the food of the commercial restriction; 2FR). The birds were killed at 12 weeks of age. The FR group had the lowest body mass, and the AL group the highest. The FR-AL and the 2FR groups had similar, intermediate body masses at the end of the experiment. AGRP mRNA levels in the hypothalamus mainly reflected chronic restriction level, but were also affected by more recent feeding experiences: hens on *ad libitum* feeding had levels of AGRP mRNA lower than those on a restricted diet, even when their body mass was the same. They therefore did not simply reflect the difference between an animal's mass and its potential mass at that age, but were affected by differing histories of feed availability. Preliminary analysis of hippocampal neurogenesis (based on 3 birds from each group) shows a significant difference in the new neuron density among the groups. An analysis based on the complete data set will be presented.

These results suggest that AGRP may be a valuable integrated measure of the hunger state of the bird, and that hippocampal neurogenesis may be a stable integrative measure of chronic stress for use in monitoring animal welfare.

- Funded by DEFRA AW1141 and a UFAW summer scholarship.

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DEVELOPING BENCHMARKS FOR ASSESSING THE SUCCESS OF DOG MANAGEMENT APPROACHES AROUND THE WORLD.

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Dog populations around the world vary considerably in their demographic characteristics with those in North America (25 dogs per 100 people) and northern Europe (10-15 dogs per 100 people) consisting almost entirely of "pets" whereas those in many other countries (e.g. Greece, the Ukraine, India, the Philippines, Tanzania) have a possible majority of the dogs existing in street populations. Management of these populations ranges from intensive and effective management operations (e.g. in Calgary, Canada and in the UK where fewer than 1 dog is euthanized by shelters per 1,000 people) to intensive and relatively ineffective (e.g. Fresno County in California where approximately 15 dogs are euthanized per 1,000 people) to low intensity management but episodic culling operations (e.g. in South Asia and China) to no management whatsoever (most of Africa). This paper will look at some benchmark measures that might be applied across the globe. For example, the number of dog bites treated in hospital emergency rooms varies over a 1,000-fold range. It appears as though this measure correlates with the effectiveness of community dog management efforts. The rate of dog euthanasia in shelters varies over a 100-fold range in North America and Northern Europe. Sterilization operations are a relatively recent approach to addressing uncontrolled dog populations but there are some concerns about animal care issues and outcomes. Data will be presented that supports the viability and humaneness of high-volume sterilization initiatives and how dog sterilization in the USA has probably driven an extraordinary decline in dog euthanasia in US shelters.

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THE MECHANICAL PERFORMANCE OF CURRENTLY UNREGULATED SPRING-TRAPS FOR USE WITH RATS, MICE AND MOLES

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Spring traps are widely used for trapping small mammals in Britain. Under The 1954 Pests Act spring traps require approval, and humaneness is the main criterion for this. This is normally determined through killing trials on free-moving animals. However, break-back traps for use with rats and mice, and spring traps for killing moles, are exempt from approval. Those available vary widely in price and apparent quality. We measured the mechanical forces produced by break-back traps for rats (18 types) and mice (23 types), and mole spring-traps (three types - scissors, Duffus and talpa - produced by several manufacturers).

We measured trap clamping forces and impact momentums. Mechanical performance varied widely among the traps available for killing each species. We also identified considerable overlap in forces among traps designed for killing rats and mice.

We investigated potential indicators of trap performance. There was no relationship for any species between trap price and mechanical performance. Traditional break-back rat and mouse traps are made of wood and have an opening-angle of approximately 180 degrees when set. Recently, plastic break-back traps with acute opening angles and different spring types have appeared on the market. The opening-angle of rat and mouse traps was related to mechanical performance, with smaller angles producing greater clamping forces and larger angles greater impact momentums. There was also an association between mechanical performance and spring type in mouse and rat traps. This information could help to improve rodent trap design.

All of the traps tested might meet current approval requirements. However, our results suggest that this needs to be tested. Increasing availability of weak plastic rodent traps is a particular concern, given our findings regarding their performance. We conclude that all spring-traps for rats, mice and moles should be subject to the UK approval process. This is in line with a recent report to the EU, on trapping standards, which concluded that any new trapping measures adopted by EU Member States should cover all species that can legally be trapped, because there is no scientific justification for excluding any. The report also recognised that only traps of the highest welfare standard available for a species should be used, to encourage improvement of traps. The variation in mechanical trap performance revealed by our study suggests that the welfare of many thousands of rats, mice and moles might benefit from adopting such a system.

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BEHAVIOURAL DEVELOPMENT OF FEATHER PECKING IN COMMERCIAL LAYING HENS – THE PAST OR THE PRESENT?

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It is unclear whether feather pecking in commercial laying hens is influenced by trans-generational effects or mainly by the present environment. We therefore combined information on parent stock with information on behavioural development of their offspring. Two commercial hybrids were used: Dekalb White (DW) and ISA Brown (ISA). Of each hybrid, we studied five parent stock flocks of which three to seven rearing flocks were followed. In the parent stock, we recorded feather damage at 40 weeks of age. In the rearing flocks, we scored feather pecking behaviour at one, five and 10 weeks and feather damage at five, 10, and 15 weeks of age. DW parent stock flocks had more feather damage than ISA flocks, with two specific farms having the most feather damage. Interestingly, offspring of the parental stocks that showed the highest level of feather pecking showed during their first week relatively high feather pecking as well. During rearing, feather pecking behaviour was highest at five weeks of age. Feather damage was generally low throughout rearing, but severe damage (i.e. wounds and denuded areas) was only recorded at five weeks of age which coincided with discontinuation of foraging substrate. Feather damage during rearing was more severe in DW than in ISA flocks, but feather pecking behaviour during rearing did not differ between hybrids. These results indicate that even under commercial conditions, parental birds can have an effect on the risk to develop feather pecking in their offspring. A possible underlying pathway is that housing conditions of the mother affects her stress levels that in turn affects the composition of her egg – for instance egg-hormones – which in turn affects the development of the chick. This is currently under study. At the moment this study is also continued with information of the rearing flocks in the laying period. Again, we will investigate whether the past environment (rearing) or the present environment (laying) cause more risk in the development and aggravation of feather pecking.

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EFFECTS OF HAND-REARING ON THE COGNITION AND BEHAVIOUR OF CAGED EUROPEAN STARLINGS

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Recent changes in European legislation ban the use of wild-caught animals in research unless strong justifications can be given for their use. This change is partly predicated on the assumption that captive-breeding and/or hand-rearing results in animals with reduced levels of fear and hence improved welfare in the laboratory. However, there are few actual data on the long-term behavioural effects of captive-breeding/hand-rearing in non-domestic species, and these are urgently needed in order to understand the welfare and scientific consequences of adopting these practices. Here we present the results from a three-year project designed to describe the behavioural and cognitive effects of hand-rearing in the European starling (*Sturnus vulgaris*), the wild passerine bird most commonly used in laboratory research. We created two groups of 16 age-matched starlings from the same population of wild birds resident in North East England: the hand-reared (HR) group were taken from the nests at 7-10 days post-hatch and hand-reared in the laboratory, whereas the wild-caught (WC) group were caught from the wild as fledged juveniles approximately 4 months later. All birds were kept in identical aviaries prior to being transferred to individual cages for behavioural recording and cognitive testing. We found a range of subtle differences in the adult behavioural and cognitive phenotypes of the HR and WC birds. HR birds were more active in their cages, made fewer visits to the cage walls and were less likely to develop both route-tracing and somersaulting stereotypies. HR birds also showed lower escape motivation when placed in a novel environment and in response to a human entering the laboratory. We found some evidence that HR birds learned an association faster and generalised to a novel stimulus more quickly. HR birds were less risk-prone for variability in delay to reward, perhaps indicating a slower rate of time discounting. Finally, we found some behavioural and physiological evidence for an interaction between how birds were reared and where they were housed in the laboratory with WC birds appearing to find the lower cages more stressful. Taken together these results show that there are significant behavioural and cognitive effects of hand-rearing. We tentatively conclude that there are likely to be some welfare benefits to hand-rearing in terms of reduced fearfulness and stress in the laboratory, but these need to be set against the many costs of this practice including increased time in captivity and reduced likelihood of successful release to the wild.

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THE ASSESSMENT OF POST-VASECTOMY PAIN IN MICE USING BEHAVIOUR AND THE MOUSE GRIMACE SCALE

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Recently, facial expressions have been identified that are potentially associated with pain in mice and rats following a range of nociceptive tests (Langford et al. 2010, Sotocinal et al. 2011). Such assessments of facial expressions could offer means of scoring post-procedural pain that overcomes some of the limitations associated with the current behaviour-based assessments. This study aims to compare behavioural changes assessed using both an automated system ("HomeCageScan") and manual analysis with changes in facial expressions assessed using the Mouse Grimace Scale (MGS). Mice (n= 6/group) were assessed before and after vasectomy and following analgesia (20mg/kg meloxicam or 5mg/kg bupivacaine) or saline post-operatively. Both the MGS and manual scoring of pain behaviours identified clear differences between the pre and post surgery periods and between the animals receiving analgesia or saline post-operatively. Both these assessments exhibited a high positive correlation with each other. Automated behavioural analysis in contrast was only able to detect differences between the pre and post surgery periods. The results suggest that both the MGS and manual scoring of pain behaviours are assessing the presence of post-surgical pain, whereas automated behavioural analysis could be detecting surgical stress and/or post-surgical pain. This study suggests that the MGS could prove to be a quick and easy means of assessing post-surgical pain, and the efficacy of analgesic treatment in mice that overcomes some of the limitations of behaviour-based assessment schemes.

- **Langford D, Bailey A, Chanda M, Clarke S, Drummond T, et al.** (2010) Coding of facial expressions of pain in the laboratory mouse. Nature Methods, 7: 447–449.
- **Sotocinal S, Sorge R, Tuttle A, Marton L, Wieskopf J, et al.** (2011) The Rat Grimace Scale: A Partially Automated Method for Quantifying Pain in the Laboratory Rat via Facial Expressions. Molecular Pain, 7: 55.

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THE BENEFITS OF KETOPROFEN ADMINISTERED INTRAMUSCULARLY 3 DAYS POST PARTUM IN SOWS

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Farrowing is a critical event in the life of a pig. Parturition is painful, and beginning of lactation may cause pain or discomfort for longer period. Shoulder sores are also rather common in early lactating sows, and further impair their welfare. Sows may thus benefit from non steroidal anti-inflammatory drugs but there is little research performed on the field.

We performed a double blinded, randomized study on 40 sows. Half of the sows received ketoprofen (NSAID) intramuscularly for 3 consecutive days (days 0-2) post partum and the other half isotonic saline as placebo (PLACEBO). Parity varied between 2 and 9 in experimental sows and they were further classified as young (parity 2-3), middle aged (parity 4-6) and old (parity 7-9). The occurrence of constipation and shoulder sores were followed daily from day 0 to day 7 (0 = no feces, 1 = dry pellet like feces, 2 = normal feces). Shoulder sores were scored from 0 to 3 (0 = intact, 1 = redness of the skin but no wound, 2 = small wound, 3 = severe or large wound). The appetite was scored as either normal (trough is empty) or feed refusal (some feed left in a trough). The effects of treatment (PLASEBO or NSAID), parity and parity*treatment on the mean number of constipation days (0 or 1), occurrences of shoulder sores (0-1 healthy, 2-3 shoulder sore), and the first disappearance of appetite were studied with variance analyses.

We found a statistically significant effect of treatment on the occurrence of shoulder sores, lack of appetite and constipation ($p < 0.05$ for all): NSAID sows had more days without observed shoulder sores than PLACEBO sows (6.0±0.5 vs 4.4±0.5). Lack of appetite emerged in NSAID sows on day 7.7±0.3 and in PLACEBO sows on day 2.9±0.3. NSAID sows had 5.6±1.4 constipation days, and PLACEBO sows 6.4±1.1. We found a statistical tendency ($p < 0.09$) between parity*treatment for the occurrence of shoulder sores: middle aged NSAID sows had shoulder sores later than PLASEBO sows (6.3±0.9 days vs 3.5±0.9 days, $p < 0.05$), and 7-9 parity NSAID sows showed a tendency for later occurrence than PLACEBO treated ones (6.0±0.8 days vs 3.7±1.1 days, $p < 0.09$).

Farrowed sows seem to benefit from the administration of im ketoprofen. It alleviates the duration of constipation, delays the occurrence of shoulder sores and maintains good appetite longer.

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HOW LONG AND LOW CAN YOU GO? A PRELIMINARY INVESTIGATION OF EXAGGERATION OF BACK LENGTH AND REDUCTION IN LEG LENGTH AS A RISK FACTOR FOR INTERVERTEBRAL DISC HERNIATION (IVDH) IN DOMESTIC DOGS

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Intervertebral disc herniation (IVDH) is a common neurological disorder in certain dog breeds, resulting in spinal cord compression and injury which may cause paresis, paralysis, and/or pain, which can significantly worsen quality of life (Schroder et al 2011). In some cases paralysis may be permanent, with owners choosing to euthanse their dog or nurse them as long-term paraplegics, using carts for mobility (Bauer et al 1992). The majority of disc extrusions occur in chondrodystrophic breeds (those with disproportionate dwarfism e.g. Dachshund, Basset Hound, Pekingese), where selection for the 'long and low' morphology is linked to intervertebral discs abnormalities. Consequently, many chondrodystrophic dogs develop IVDH between 3-7 years of age (Gage 1975), with an estimated lifetime incidence of 18% in Dachshunds alone (Jensen et al 2008).

A reduction in back length may decrease the incidence of disc disease in chondrodystrophic breeds (Verheijen and Bouw, 1982). There is a liability to larger bending moments in long backs if the bending is not spread evenly over the entire spine; indeed IVDH is most common in the most mobile region of the spine (Hoerlein 1953). Also, within-breed, longer backs increase the risk of severe thoracolumbar IVDH in Dachshunds (Levine et al 2006). Therefore the aim of the current study was to investigate how extreme the back to leg length ratio can be before the risk of IVDH increases significantly.

To investigate the relationship between long-low conformations and IVDH, a cross-sectional study of dogs entering the Queen Mother Hospital for Animals (QMHA) for both IVDH and other conditions is underway. Dogs are measured on 22 bodily dimensions, including the back length and height at the withers. Affected dogs are defined as those who have undergone diagnostic imaging (e.g. MRI/CT/myelogram) to confirm disc extrusion. Of the 554 dogs measured thus far, the 58 dogs diagnosed with IVDH have exhibited relatively higher mean back length: height at the withers (BLHW) ratios (mean: 1.37, SD: 0.26) in comparison to unaffected control dogs (mean: 1.05 SD: 0.47). The most commonly represented breed is the Miniature Dachshund (48.3% of cases, mean BLHW ratio: 1.54, SD: 0.19); with the Pekingese, Shih Tzu, Cocker Spaniel, Dandie Dinmont Terrier, French Bulldog, Beagles and their crosses and Basset Hound crosses also affected. Once data collection is completed in December 2011, we will model the risk of IVDH across the spectrum of BLHW ratios, to create recommendations for maximum 'healthy' values of this parameter, to assist breeders and buyers in avoiding IVDH in future dogs.

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THE EFFECT OF TWO CLASSES OF OPIOID DRUG ON THE LANDING ABILITY OF LAYING HENS WITH AND WITHOUT KEEL FRACTURES

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Up to 80% of commercial laying hens incur keel bone fractures during the laying cycle. Many people assume keel fractures will affect bird welfare because of pain associated with keel fractures but this has not been widely tested. We found that healed keel bone fractures are associated with reduced bird mobility (Nasr et al., in press). If reduced mobility is due to pain, then appropriate analgesia should restore mobility. Here we investigated whether the opioid drugs morphine or butorphanol affected the latency time of hens with and without keel fractures to land from different perch heights to the ground. 62 laying hens (35 weeks of age), were obtained from commercial farms and the keel fractures initially estimated by palpation (28 with suspected old fractures and 34 with suspected no fracture). The time taken to land or fly down from different perch heights (50, 100 and 150cm height) was measured for hens with and without keel fractures. Unexpectedly, morphine increased the latency time to land from the different perch heights to the ground. But, birds without keel fractures were still quicker to fly down than hens with keel fractures. In line with our expectations, butorphanol decreased the latency to land from the different perch heights in hens with keel fractures compared to the time taken for birds with keel fractures to land following saline (1.73±0.26 vs 2.23±0.30 p = 0.05 for 50cm; 12.48±6.64 vs 16.92±6.68 p = 0.03 for 100cm and 20.64±7.44 vs 26.30±7.59 p = 0.02 for 150cm perch height). The contrasting effects of the drugs were associated with differential effects on core body temperature. Butorphanol appeared the more appropriate analgesic for hens, increasing mobility, and supporting the hypothesis that laying hens with keel bone fractures feel pain.

- **MAF Nasr, J Murrell, LJ Wilkins and CJ Nicol (In press):** The effect of keel fractures on egg production parameters, mobility and behaviour in individual laying hens. Animal Welfare.

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CHALLENGES OF DETERMINING LINKS BETWEEN PAIN AND LAMENESS IN BROILER CHICKENS

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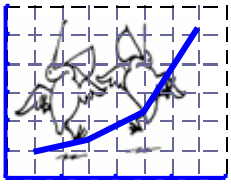
Lameness remains a key issue affecting a large proportion of the 800m chickens reared for meat in the UK every year. There is no simple way of identifying or quantifying pain in broilers, and different types of lameness may vary in whether or how much they cause pain. Pain can alter behaviour patterns. In birds with experimentally induced pain, administration of analgesic drugs restores some behaviours to normal. This suggests pain relief, but we have obtained very limited evidence of pain-relief effects using lame birds acquired from commercial farms.

We developed and validated simple behavioural tests to try to identify indicators and indeed correlates of pain experience in chickens. We also explored novel technological measures such as thermal imaging, kinematic analysis and nociceptive threshold testing. Subsequent aims were to determine effective analgesic treatments and to employ self-selection techniques to examine whether chickens can make decisions to manage their pain.

Although rapid growth rate and temporal variability in gait score precluded repeat testing, behavioural tests did consistently discriminate between lame and sound birds. For example, when a small obstacle was placed between food and water resources, sound birds crossed the obstacle sooner and more often than lame birds. Chickens find contact with water aversive, and sound birds stood for significantly longer than lame birds to avoid contact with tepid water. Thermal profiles were not consistently different between lame and sound birds' legs, but kinematic analysis indicated clear differences in walking style; thermal nociceptive threshold was also higher in lame birds.

Several key factors have impeded the progress of our research in understanding the relationship between lameness and pain and we consider it important to publicise these. Use of commercially reared birds increased the relevance of our findings, but strain differences in lameness 'type' and test responses were observed. In agreement with existing literature no clear association between pathology and lameness was evident – a finding backed up by noticeable variability in gait impairment 'type' between batches of birds. In most groups, differences in gait score were unavoidably confounded with mass and sex.

Extensive preliminary dosing studies were required due to a lack of previous data on effective drug regimes. Extrapolation from other species has been of limited success; doses of both anti-inflammatory and opioid drugs showed sedative behavioural effects in some tests, without demonstrating analgesic properties. Kinematic data do, however, suggest some gait parameters such as velocity may be beneficially altered.



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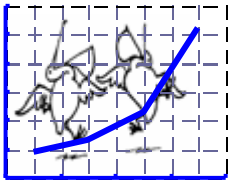
SCIENTIFIC PROGRAMME:

Poster Abstracts



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Posters:

Baker SE, NC D'Cruze and DW Macdonald (University of Oxford and WSPA, UK)
A systematic review of the animal welfare impact of global wildlife trade

Buckland E, H Volk, CC Burn and S Abeyesinghe (The Royal Veterinary College, UK)
Owner-perceived indicators of positive affective states in companion dogs

Burn CC (The Royal Veterinary College, UK)
A vicious cycle: Dog tail-chasing and human responses to it on a free video-sharing website

Childs A and L Greening (Hartpury College, UK)
Investigating the perception of horse owners in relation to the use of the word vice to describe stereotypic behaviours displayed by horses

Clapp J (Newcastle University, UK)
Can heart rate variability distinguish between the welfare qualities of different beef cattle housing?

Crowther L, CC Burn, S Abeyesinghe and CM Wathes (The Royal Veterinary College and The Horse Trust, UK)
Development of a tool to assess equine welfare: Selection of welfare indicators

Demery Z and J Chappell (University of Birmingham, UK)
A bird's eye view on how a little enrichment can go a long way

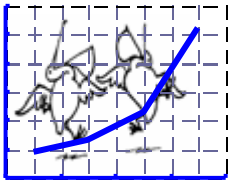
Dixon LM, V Sandilands, M Bateson, S Brocklehurst, BJ Tolkamp and RB D'Eath (Scottish Agricultural College and Newcastle University, UK)
Using conditioned place preference and aversion to assess animal welfare: limitations in its application

Favreau-Peigné A, C Duvaux-Ponter, H Erhard, J Servière, L Fromhage, JM McNamara, AI Houston and JAR Marshall (INRA and AgroParisTech, France; University of Jyväskylä, Finland; University of Bristol and University of Sheffield, UK)
Modelling feeding and drinking motivations: A way to improve welfare in domestic ruminants

Forster LM, CM Wathes and SA Corr (The Royal Veterinary College and University of Nottingham, UK)
How do you ask a cat if their missing limb still hurts? Exploring the possible existence of phantom sensation and post-amputation pain in feline amputees using behavioural observation

Fraccaro E; JF Coetzee; LN Edwards, R Odore, JC Dockweiler and L Bergamasco (University of Turin, Italy and Kansas State University, USA)
Effects of age and castration method on plasma cortisol and haptoglobin concentration in growing calves

Garland K, C Buckley, N Koyama and EJ Bethell (Liverpool John Moores University, UK)
Short term housing enrichment impacts cognitive markers of welfare in the Syrian hamster (*Mesocricetus auratus*)



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Gedge A, SJ Wood, F Ritchie, A Fedotova, J Tacey, L Bonnin, E Davies, K Merkies and C White (Nottingham Trent University, UK)
The equine meat industry: A comparison of information available in the United Kingdom and Canada. Undergraduate research and inquiry based learning.

Giles S, CJ Nicol, SA Rands and PA Harris (University of Bristol and WALTHAM Centre for Pet Nutrition, UK)
Fat all year round - The welfare consequences of continuous equine obesity

Gouveia KG and JL Hurst (University of Liverpool, UK)
Taming anxiety through handling in mice

Hall LE, S Robinson, J Moors and HM Buchanan-Smith (University of Stirling and AstraZeneca, UK)
Development of a welfare assessment framework for laboratory-housed beagles

Hockenhull JS and E Creighton (University of Bristol and University of Newcastle, UK)
Nature versus nurture: Exploring associations between breed, gender and behaviour problems in UK leisure horses

Jamieson J, MJ Reiss, D Allen, L Asher, MO Parker, CM Wathes and SM Abeyesinghe (The Royal Veterinary College, University of London, The RSPCA, University of Nottingham and Queen Mary University of London, UK)
Do adolescents care about farm animal welfare, and does it matter?'

Jarman N and R Bhuller (Hartpury College, UK)
Assessing dog owner's awareness of their pets' needs, regarding their environment, diet, behaviour, level of companionship and health as set out in the Animal Welfare Act 2006

Jayne K, G Feenders and M Bateson (University of Exeter and Newcastle University, UK)
Behavioural responses of wild-caught and hand-reared European starlings (*Sturnus vulgaris*) to laboratory husbandry

Kiddie J, DB Morton, D Pfeiffer and L Collins (The Royal Veterinary College, University of Birmingham and Queen's University Belfast, UK)
Developing a scoring system for assessing Quality of Life in kennelled dogs

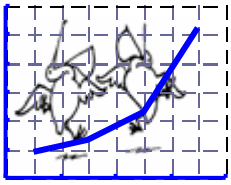
Kleinhappel T, L John, T Pike, A Wilkinson and O Burman (University of Lincoln, UK)
The use of social network analysis to provide novel insights into animal welfare problems

Lanser A, R Bhuller and F da Mata (Hartpury College, UK)
Evaluating 3 methods of capture in impala (*Aepyceros melampus*) to reduce the risk of capture myopathy

Lin YC, S Mullan and DCJ Main (University of Bristol, UK)
Descriptive analysis of comments provided by assessors in the report of assured dairy farm assurance scheme

Lopez-Salesansk N, D Wells, L Whitfield and CC Burn (The Royal Veterinary College, UK)
Survey of potential olfactory effects on laboratory mouse behaviour and welfare

Mazlan N, CC Burn and DJ Wells (The Royal Veterinary College, UK)
The impact of different identification systems on laboratory mouse behaviour and welfare



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McAlpin L (Colchester Zoo, UK)
The use of mirror and artificial nest mounds to encourage breeding in Chilean Flamingos *Phoenicopterus chilensis* at Colchester Zoo

McLennan K, J Littlemore and W McCormick (Moulton College, UK)
The presence of a preferred partner improves dairy cattle's coping ability during short-term separation

Monte F, DC Main, J Pritchard and H Buller (University of Bristol and University of Exeter, UK)
Facilitation workshop: Promoting farmer / client interest in animal welfare

Morgan NK, C Walk, M Bedford C Perry and EJ Burton (Nottingham Trent University and AB Vista, UK)
Effect of dietary protein source on efficacy of phytase supplements to improve broiler leg health

Mucherek-Parramore I and E Burton (Nottingham Trent University, UK)
Feeding preferences in captive mixed enclosure domestic birds (*Melpsittacus undulatus* and *Nymphicus hollandicus*) specifically examining the consumption of sunflower seeds

Nedungadi M, JC Ellam, A Butterworth, JL McKinstry and CA Weeks (University of Bristol, UK)
The influence of environmental enrichment on the behaviour and welfare of commercial broiler chickens

Norris J (Hadlow College, UK)
An investigation into the display of abnormal behaviours in Thornback rays (*Raja clavata*)

Oxley JA, ARH Tibbott and N Blackie (Writtle College, UK)
Feather condition and production of two flock sizes in a deep litter system: A welfare perspective

Parker MO, FJ Combe, ME Millington and CH Brennan (Queen Mary, University of London, UK)
Housing affects reliability of high-throughput behavioural test in Zebrafish: Implications for welfare and The 3Rs

Paxton H, SA Corr and JR Hutchinson (The Royal Veterinary College and University of Nottingham, UK)
The locomotor design of the modern broiler: A biomechanical and anatomical perspective

Proctor H (World Society for the Protection of Animals, UK)
Advancing understanding of animal sentience

Sandford A (Hadlow College, UK)
Reducing stress in stabled horses using reiki

Scholey DV, P Williams and EJ Burton (Nottingham Trent University and AB Vista, UK)
Welfare implications for broiler chicks fed diets containing graded levels of potable alcohol yeast protein

Toscano MJ, LJ Wilkins, SN Brown and JF Tarlton (University of Bristol, UK)
Assessment of bird activity levels for a free range system

van Rooijen J (The Netherlands)
Is less short debeaking more humane than short debeaking?

White C and K Ellis (Nottingham Trent University, UK)
A preliminary investigation into the effect of summer turnout rugs on body surface temperature of grazing horses

Williams DL and H Inzani (University of Cambridge, UK)
Assessing welfare implications of visual dysfunction in dogs through an owner questionnaire and behavioural assessment of blind and sighted animals. A preliminary study

Wright AJ and CM Wathes (The Royal Veterinary College, UK)
Pig welfare assessment in veterinary education

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A SYSTEMATIC REVIEW OF THE ANIMAL WELFARE IMPACT OF GLOBAL WILDLIFE TRADE

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International wildlife trade is worth US$ billions each year. Wildlife trade impacts animal welfare in many ways but this has not been studied comprehensively. We reviewed the welfare impact of global wildlife trade, examining 196 papers and 96 reports, published 2006-2011, concerning domestic and international trade in terrestrial wild mammals, birds, reptiles and amphibians, and marine turtles.

'Welfare' was mentioned in 17% of the articles. Reported welfare impacts were allocated to five domains originally identified for assessing the impact of scientific procedures on experimental animals. Impacts in each domain were reported in ≤25% of articles. Reported impacts most often related to 'disease/injury/functional impairment', than other domains, suggesting a tendency to report more conspicuous welfare impacts, or impacts affecting the animal's suitability for trade. Welfare impacts were more often reported where trade involved live capture rather than killing in situ. Trade involving live capture, followed (at some point) by killing, was most often associated with 'food or water deprivation/malnutrition', 'environmental challenge/discomfort', or 'disease/injury/functional impairment', whereas trade involving live use of animals was most often related to 'behavioural/interactive restriction', and 'anxiety/fear/pain/distress'. Welfare was more likely to be discussed where animals were used alive.

Mammals were the group most frequently reported in trade but least often captured alive. Trade in birds, amphibians and reptiles was reported less often but these groups were more often reported to be taken alive, e.g. as pets or fresh meat. Trade in these groups may be under-reported and details of impacts on reptiles especially may be lacking. Welfare impacts were most often reported in domestic trade, legal trade, and trade in captive-bred animals, perhaps because these are easier to observe. Welfare impacts may be under-reported in international trade, illegal trade or trade in wild-caught animals. Wildlife was most often supplied by Asia and Africa. Key users were Asia, Africa, Europe and North America.

Only 2% of future recommendations involved specific welfare improvements.

Conservation was the most frequently reported lever for reducing wildlife trade. However animal welfare may provide a useful lever for tackling trade involving developed countries. The threat of emerging disease was a recurrent theme, and risks to human health could prove more persuasive in combatting trade in developing countries where animal welfare may not be a high priority.

A more structured approach is required in assessing and reporting the welfare impacts of wildlife trade, and recommendations with direct benefit for animal welfare need to be made.

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OWNER-PERCEIVED INDICATORS OF POSITIVE AFFECTIVE STATES IN COMPANION DOGS

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Owners are important proxies for veterinary, welfare and quality of life assessments; accurate owner identification of positive experiences is therefore necessary. As part of a larger investigation of canine positive affect (CPA), this study aimed to collate owners' perception on behavioural indicators of CPA and to examine relevant factors that may influence perception.

An internet survey of UK and Ireland dog owners (N = 447), distributed May-June 2011, examined descriptive behavioural signs that owners used to identify CPA, for both high and low arousal states. Data on owner experience, general owner mood, attachment to pet and other demographics were also collected and examined as possible influences on the citation of specific behavioural indicators using multivariate binary logistic regression.

Owners described a wide range of indicators believed to be associated with CPA; the most frequently reported (20-55% respondents) indicators of high arousal CPA (significant influences on indicator citation are given where appropriate; $p < 0.01$) were: barking, active, playful, 'wriggly' (decreased with dog age), alert, tail wagging fast (greater with ≥ 15 years owner experience) or held high, mouth open, 'smiling' or panting, eyes wide open or bright, head held high (decreased with dog age;) and ears pricked up (greater in Gundog; Utility and Toy Kennel-Club registered breeds than crossbreeds).

Low arousal CPA was most frequently (20-40% respondents) considered to be indicated by: sighing/huffing (increased with number of dogs owned) or no vocalisations (greater when respondents were owners only, i.e. did not also work with or breed dogs), calm, affectionate, sleepy, lying down, head resting, mouth closed or loose, eyes slightly closed, tail held low or relaxed (greater when respondents were owners only) and ears down or relaxed.

Overall, the range of owner reported signals of CPA varied greatly, particularly across levels of owner experience. Low arousal states were less well described, suggesting they may be less well understood or more difficult to interpret than high arousal states. The potential variation in owner's ability to accurately identify CPA requires further testing. CPA signal expression may differ by dog-related factors (e.g. individual, breed, age), and/or such characteristics may constrain accurate human identification.

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A VICIOUS CYCLE: DOG TAIL-CHASING AND HUMAN RESPONSES TO IT ON A FREE VIDEO-SHARING WEBSITE

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Tail-chasing is widely celebrated as normal canine behaviour in cultural references. However, all previous scientific studies of tail-chasing or 'spinning' have comprised small clinical populations of dogs with neurological, compulsive or other pathological conditions; most of these dogs were ultimately euthanased due to the severity of their conditions. Thus, there is great disparity between scientific and public information on tail-chasing. I gathered data on the first large (n = 400), non-clinical tail-chasing population, made possible through a vast, free, online video repository, YouTube™. I identified tail-chasing videos using the search term "dog chasing tail" on YouTube™, which returned 3340 hits in November 2009. Free online video repositories offer economical resources for obtaining large samples of rare, episodic phenomena that are otherwise difficult to observe, and this is the first large-scale, controlled study to use this resource. Camcorders and broadband are increasingly accessible to a diverse demographic, but in this study, nationality, age and sex are described, and any likely biases in the human and canine populations are discussed. The data were checked for inter- and intra-observer reliability. Approximately one third of tail-chasing videos showed dogs with clinical signs, including habitual (daily or 'all the time') or perseverative (difficult to distract) performance of the behaviour. These signs were observed across diverse breeds. Clinical signs appeared virtually unrecognised by the video owners and commenting viewers; laughter was recorded in 55% of videos, encouragement in 43%, and the commonest viewer descriptors were that the behaviour was 'funny' (46%) or 'cute' (42%). Habitual tail-chasers had 6.5+/- 2.3 times the odds of being described as 'Stupid' than other dogs, and perseverative dogs were 6.8+/- 2.1 times more frequently described as 'Funny' than distractible ones were. Compared with breed- and age-matched control videos, tail-chasing videos were significantly more often indoors and with a computer/television screen switched on. These findings highlight that tail-chasing is sometimes pathological, but can remain untreated, or even be encouraged, because of an assumption that it is 'normal' dog behaviour. The enormous viewing figures that YouTube™ attracts (mean+/-s.e. = 863+/-197 viewings per tail-chasing video) suggest that this perception will be further reinforced, without effective intervention.

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INVESTIGATING THE PERCEPTION OF HORSE OWNERS IN RELATION TO THE USE OF THE WORD VICE TO DESCRIBE STEREOTYPIC BEHAVIOURS DISPLAYED BY HORSES

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Whilst the majority of horse owners refer to crib-biting, weaving and wind-sucking as 'vice' behaviours, research generally uses the term stereotypic behaviour (STB). The word vice is defined as a bad habit or character weakness, and the Oxford dictionary specifically defines 'stable vices' as a neurotic habit of stabled horses, typically arising from boredom. However there is a general lack of evidence to confirm that the horse is capable of experiencing boredom. Current research suggests that rather than boredom, oral forms of these behaviours can manifest due to dysfunction within the basal nuclei which is initiated during repeated exposure to environments where the horse is unable to satiate certain biological needs. Locomotory STB is thought to originate in environments where there is increased activity that the horse cannot interact with. Within research, stereotypic behaviours are defined as repetitive behaviours, induced by frustrated attempts to cope, or central nervous system dysfunction. This switches the emphasis on the cause of such behaviours away from the horse and more towards the way in which it is managed. A number of horse owners employ gadgets such as weaving grilles and cribbing collars in an attempt to manage these behaviours and prevent the horse from displaying behaviours which are traditionally are as visually displeasing and problematic to the horse. The issue with prevention is that it does not rule out the biological motivation to carry out the behaviour, potentially increasing the frustration experienced by the horse. Additionally, very little research exists to quantify the problems experienced by the horse as a result of displaying STB. The current study aims to investigate the general horse owners' understanding of vice behaviours, to identify whether a change in the use of terminology may result in beneficial changes to improve overall welfare.

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CAN HEART RATE VARIABILITY DISTINGUISH BETWEEN THE WELFARE QUALITIES OF DIFFERENT BEEF CATTLE HOUSING?

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The impact of environmental conditions on farm animal welfare has been assessed using a number of measurements, including the animal's behaviour, metabolism, stress reactivity, endocrinology and pathology. Although to date no single technique has fully quantified the welfare status of farm animals, new developments in the field of heart rate variability (HRV) shows promise. The technique allows the non-invasive objective measurement of chronic stress in free ranging cattle. This poster reports on a pilot study to use the Polar® heart rate monitor to compare chronic stress levels in two groups of fattening beef cattle (comprising 4 heifers and 4 bulls respectively from each pen of 15 cattle) before and 1 month after pens swapped between conventional beef fattening housing and a new purportedly welfare friendly building called the Roundhouse®. Using a cross over experimental design, to remove individual biological variation, individual HRV was compared with stress reactivity, shown by initial heart rate (HRi) on entering the crush and a water splash (WS) test under resting heart rate (HRr) conditions.

The HRr in both groups was significantly reduced 1 month after moving, suggesting cattle were becoming accustomed to the handling. All bulls showed significantly lower chronic stress levels, from increased HRV and reduced HRi, after 1 month in the Roundhouse. The heifers' response to changing housing was ambiguous with two showing increased and two decreased chronic stress levels from HRV and HRi. It is proposed that the heifers may have been protected from the more stressful conventional housing by positive preconditioning in the Roundhouse. All cattle had elevated heart rates in response to WS but due to an incomplete dataset no comparison could be made between groups. Although the Roundhouse appeared to be less stressful for beef cattle than conventional housing, these results may have been influenced by order error.

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DEVELOPMENT OF A TOOL TO ASSESS EQUINE WELFARE: SELECTION OF WELFARE INDICATORS

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There is a need to develop a standardised practical, reliable and validated tool to assess the welfare of horses living in the United Kingdom. Such a tool would assist veterinary surgeons and equine welfare organisations to make more objective and reliable decisions about the management, treatment and euthanasia of horses and support Inspectors' consistent enforcement of the Animal Welfare Act 2006. As part of a larger programme of work to develop an equine welfare assessment tool, this study sought to identify which animal-based welfare indicators should be included in a prototype tool.

Welfare Officers (N=11), Veterinary Surgeons (N=13) and Welfare Scientists (N=8) deemed to have expertise (using predefined criteria for each category involving appropriate qualifications and indications of experience) in the field of equine welfare assessment were invited to participate in a questionnaire-based study. Participants received the questionnaire by post or e-mail and reminders were sent one week before the deadline. Participants were asked to list the behavioural, physiological and pathological welfare indicators that they felt it was important to look for when assessing equine welfare.

Thirty two of 85 questionnaires were returned, giving a response rate of 38%. The most commonly cited welfare indicators were body condition (78% of all respondents), lameness (69%), presence of wounds, lesions, injuries or sores (66%), condition/state of the coat (63%), nasal discharge (63%), dental pathology/disease (56%), condition of the hooves (56%), dull/depressed demeanour (56%), diarrhoea (53%), and general behaviour and demeanour of the horse (53%).

Seventy three percent of Welfare Officers and 88% of Welfare Scientists suggested that signs of lameness were important to consider when assessing horse welfare, compared with only 54% of Veterinary Surgeons. Similarly, 82% of Welfare Officers and 88% of Welfare Scientists felt that wounds, injuries, lesions and sores were important welfare indicators, compared with only 38% of Veterinary Surgeons. Sixty nine percent of Veterinary Surgeons suggested that it was important to assess the general behaviour and demeanour of the horse compared to 45% of Welfare Officers and 38% of Welfare Scientists.

These results show that there is disparity in the welfare indicators that are considered important between different groups of experts, which may be due to the individual's previous experiences as well as the role they perform. The results support the need to develop a standardised tool to assess equine welfare in the UK.

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A BIRD'S EYE VIEW ON HOW A LITTLE ENRICHMENT CAN GO A LONG WAY

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The 3Rs – Replacement, Refinement and Reduction – are a widely accepted ethical framework when using animals in scientific research. As a result detailed housing guidelines for keeping different animal species in the laboratory environment has become a focus for academic funding and government in recent years. In the EU alone, birds make up approximately 25% of animals used in research and over 100,000 procedures are carried out on birds every year under the UK Animals (Scientific Procedures) Act 1986. Surprisingly few species-specific guidelines for housing birds have made it into scientific policy or legislation. Among birds, parrots are distinctive for their intelligence, anatomy, manipulatory abilities and strong exploratory tendencies. These characteristics make them one of the most popular companion animals in the world after dogs and cats. Moreover, confinement of parrots for research purposes are on the rise. The amount of exploration a captive animal displays is widely accepted to be a good behavioural indicator of its welfare and cognitive well-being. Therefore, we observed the exploratory behaviour of two captive groups of the social New Zealand red-fronted parakeet (*Cyanoramphus novaezelandiae*) in their home cages. We also tested individuals' cognitive performance on different behavioural tasks. Both groups received a baseline level of environmental enrichment and the same varied feeding regime, but one group received a wider variety of materials in their cage (e.g. saw dust, different perch diameters) and more 'causal problem-solving' toys were provided on a rotation basis. We found that the more enriched group explored for significantly longer and displayed a greater diversity of behaviours than the less enriched group. We also found that the enriched group showed greater cognitive performance on the individual behavioural tests. We believe this shows that (at least for psittacines) a few simple and economic changes in the captive research environment can have large positive effects on an animal's behavioural repretoire and cognitive well-being. It may also have implications for animal cognitive research methods. We will discuss the practical implications of how this enrichment can be put into effect and how it can be extended, particularly to other avian species.

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USING CONDITIONED PLACE PREFERENCE AND AVERSION TO ASSESS ANIMAL WELFARE: LIMITATIONS IN ITS APPLICATION

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Conditioned Place Preference (CPP) or Aversion (CPA) are potentially useful tools in animal welfare assessment because they permit measurement of the reinforcing properties of a treatment in the absence of the treatment itself. We used CPP/CPA techniques in a series of experiments to assess the preference of food restricted broiler breeders for increased food quantities in the absence of food rewards. In all experiments, 6-10 week old Ross 308 broiler breeders were housed in pens divided in half. Pen sides were visually differentiated and birds were trained with different stimuli on each pen side. To test if a preference for pen side had been formed, the pen divider was removed and no stimulus was present. The amount of time birds spent on the positive stimulus pen side was recorded. Each experiment had a factorial treatment structure (n = 10 per treatment combination) and data were analysed using Linear Mixed Models in Genstat. In experiment 1 (n = 90 pairs), birds were divided between three training regimes (pen side switched every 2, 4 or 6d) and three testing times (2, 6 or 24h after last feed). On one pen side the birds received the commercially recommended, restricted amount of food (R) and on the other pen side they received 2R. In experiment 2 (n = 60) and 3 (n = 40 pairs), birds were divided between CPP treatments with food stimuli (R vs 2R or 3R) and CPA treatments where birds were exposed to either unpredictable wind or social isolation on one side while the other side was neutral.

On average, birds on the 2 and 6d training regimes spent marginally more time on the positive pen side than birds on the 4d regime ($p = 0.044$) and birds on the CPP treatments spent more time on the positive pen side than birds on the CPA treatments ($p = 0.040$). Overall there was no evidence that birds formed strong preferences for locations associated with increased food rations or absence of aversive stimuli. The most consistent result was a strong preference for the pen side not previously housed on immediately before the test ($p < 0.001$ in all experiments). It appeared that birds were motivated to explore a location where they had not just been housed in an attempt to find food and this motivation seemed to overshadow any other effects. This series of experiments demonstrates some limitations of CPP/CPA techniques and problems with learning tasks in chronically food restricted animals.

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MODELLING FEEDING AND DRINKING MOTIVATIONS: A WAY TO IMPROVE WELFARE IN DOMESTIC RUMINANTS

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In ruminant farming systems, the interaction between animals and their feeding environment is of major importance for production, health and welfare concerns. Feeding and drinking behaviour could be used as one of the first indicators of the animal psycho-physiological state. As feeding and drinking behaviour depend on two competing motivations, *i.e.* the motivation to eat and the motivation to drink, we need to understand how these various motivations act and interact to better understand feeding and drinking behaviour. Modelling competing motivations, *i.e.* drinking and feeding motivations, could be an original way to understand and predict feeding and drinking behaviours, and therefore to improve animal welfare.

As a first approach, we assume that feeding and drinking behaviours result from two motivational systems. Each system could experience a greater or lesser deficit. Each deficit then determines a motivation, *i.e.* a tendency to act. The deficit and thus the motivation goes down as the corresponding behaviour is performed, which corresponds to a negative feedback loop. Performing the adequate behaviour also induces a positive feedback, *i.e.* an affective reaction due to the satisfaction to act and to respond to a deficit. The two motivational systems are interconnected by a cross-inhibition process, *i.e.* one motivation decreases the value of the other and vice versa. In the end, the animal could perform no more than one behaviour at a time, choosing the behaviour with the higher motivation; cross-inhibition may improve the efficiency with which animals switch between behaviours.

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HOW DO YOU ASK A CAT IF THEIR MISSING LIMB STILL HURTS? EXPLORING THE POSSIBLE EXISTENCE OF PHANTOM SENSATION AND POST-AMPUTATION PAIN IN FELINE AMPUTEES USING BEHAVIOURAL OBSERVATION.

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In humans, amputation of a limb may result in phantom pain in up to 80% of cases, depending on various factors, and the risk of suffering phantom sensation can approach 100%. Phantom phenomena appear to the individual to originate from the now absent limb, making alleviation of pain or unpleasant sensation difficult.

Contributing theories towards phantom sensation and phantom pain include peripheral sensitisation and neuroma formation, central sensitisation, and reorganisation of the somatosensory cortex. The theories of sensitisation and their contribution to pain are well-established, however the theory that reorganisation of the somatosensory cortex explains phantom sensation is more recent; areas previously used for the now absent limb are recruited by adjacent areas of the cortex, and stimulation of these areas are registered as a sensation in the absent body part.

In the field of animal welfare we take care not to anthropomorphise; although the consequences of limb amputation in humans can be extremely debilitating, it is speculation to assume other animals suffer to the same degree. However both sensitisation and reorganisation of the somatosensory cortex occur in domestic species, suggesting the processes that are thought to lead to phantom limb phenomena in humans also take place in animals. If the basic neurophysiology in both humans and non-human mammals is so similar, we might expect both to be at risk of phantom limb phenomena. The challenge is: how can we test for the existence of phantom pain and sensation in non-verbal animals?

Cats are likely to be the most common species a first opinion veterinary surgeon will see for therapeutic amputation of a limb. The general belief in the veterinary profession is that cats have an acceptable quality of life after amputation, and amputation of a hindlimb probably causes fewer issues than amputation of a forelimb, however these are assumptions based on anecdotal information. We have shown that most owners are satisfied with their cat's quality of life, but there are concerns over persistent post-amputation pain. We have also shown that, according to owners, forelimb amputees experience a similar quality of life to hindlimb amputees.

Many owners voluntarily reported that their cat performs unusual behaviours, such as attempting to use the absent limb, often months or years after the amputation. Are these behaviours a common feature of amputee cats? Could they be indicative of some degree of phantom sensation, or simply persistent reflexes? Are there other behaviours occurring that may be indicative of pain or discomfort? The ability to be able to infer what amputee cats experience using specific behavioural indicators offers us a chance to monitor and improve their welfare beyond the routine treatment of post-surgical pain.

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EFFECTS OF AGE AND CASTRATION METHOD ON PLASMA CORTISOL AND HAPTOGLOBIN CONCENTRATION IN GROWING CALVES

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Castration is a widespread husbandry procedure usually performed by physical methods (e.g. banding, cut and pull). Physical methods used to castrate calves vary between countries and management systems. In the United States it is usually performed without anaesthesia. All methods induce physiological, neuroendocrine, and behavioral changes suggesting a "stress" response. Remarkably, there is the need to identify reliable welfare indicators to assess the levels of pain and distress caused by castration. It has been suggested that the cortisol response may be influenced by the age of the animal and the castration method. Acute phase proteins, such as haptoglobin, aid in the regulation of inflammation after tissue damage and are expected to increase after physical castration. In dogs, serum levels of haptoglobin are considered useful markers for monitoring the postoperative period after castration and their determination facilitates early detection of postoperative complications. In cattle, limited data are available.

The aim of the present study was to measure cortisol and haptoglobin plasma levels in calves of different age undergoing two castration methods, namely "banding" (e.g. application of a latex band around the scrotum using an elastrator tool) and "cut and pull" (scrotal incision and pulling and twisting the testicles until the spermatic cords rupture). Forty intact male calves were randomly assigned to one of four experimental groups: calves < 6 weeks old undergoing "banding" castration (n=10), calves < 6 weeks old undergoing "cut and pull" castration (n=10), 6 months old calves undergoing "banding" castration (n=10) and 6 months old calves undergoing "cut and pull" castration (n=10). Blood samples were collected at baseline (T0 immediately before castration) and ten time points after castration for cortisol assay (5min, 10min, 20min, 30min, 40min, 50min, 60min, 120min, 240min, 480min after castration) and four time points for haptoglobin assay (120min, 240min, and 480min after castration).

Preliminary statistical analysis provides no differences on haptoglobin concentrations comparing castration groups within a given time and comparing times within each age group at different castration methods. This finding could be related to the delayed haptoglobin response onset compared to the selected time points. Cortisol response was impacted by the age of the calves; the younger animals showed lower cortisol concentrations than older animals. This finding could be associated to an age-related difference in stress response. Future research should focus on the development of effective methods of pain alleviation to utilize in common livestock procedures such as castration and dehorning.

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SHORT TERM HOUSING ENRICHMENT IMPACTS COGNITIVE MARKERS OF WELFARE IN THE SYRIAN HAMSTER (MESOCRICETUS AURATUS)

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Recent developments in animal welfare research have resulted in the 'cognitive bias' model of animal welfare. Cognitive biases have been widely studied in humans and describe the way in which affective disorders such as anxiety and depression may be characterized by biases in information processing. People suffering from clinical levels of anxiety or depression, for example, have an increased expectation of negative events, and interpret ambiguous information negatively, compared with non-anxious or non-depressed people. In addition, depressed individuals have a reduced expectation of positive events. By contrast, positive wellbeing is associated with enhanced expectation of positive outcomes and reduced expectation of negative outcomes. A number of studies have revealed that mood-congruent cognitive biases for ambiguous information may be measured in a range of animal species using a spatial judgement task, typically with either a change in responses to ambiguous cues to reward, or a change in responses to ambiguous cues to punishment. Here, we describe the first spatial judgement task developed for use with hamsters (*Mesocricetus auratus*). Hamsters were initially trained on a Go/No-Go task, in which they learned to approach a drinker at one of two locations for a sugar water reward, and to resist approaching a drinker at the other location which contained an aversive Quinine Hydrochloride solution. In testing sessions, the drinker was presented at each of three intermediate (ambiguous) locations. We measured proportion of approaches to the drinker at the intermediate locations when hamsters had received a week of environmental enrichment, or a week following removal of enrichment. Hamsters approached the intermediate drinker locations closest to the sugar and QHCl locations significantly more often following a week of environmental enrichment than they did a week following removal of enrichment. Interestingly hamsters showed no difference in approaches to the central drinker location. These are the first experimental data to demonstrate that environmental enrichment simultaneously influences responses to ambiguous cues to both reward and to punishment in any species of animal. We discuss these findings in light of potential underlying mechanisms and implications for the management of laboratory hamsters.

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THE EQUINE MEAT INDUSTRY: A COMPARISON OF INFORMATION AVAILABLE IN THE UNITED KINGDOM AND CANADA. UNDERGRADUATE RESEARCH AND INQUIRY BASED LEARNING.

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A collaborative undergraduate student project between Guelph University, Canada and Nottingham Trent University, U.K was undertaken to investigate the availability and quality of information and data on equine slaughter and the equine meat industry.

Students were given a number of tasks designed to progressively encourage research skills, communication and critical evaluation. The first task given to undergraduate students at both institutions was to research the availability and quality of resources available on the topic.

As part of the second task, students were then required to submit a précis of their findings to the other institution and this was then compared to their own findings. Communication was facilitated via online discussion boards which encouraged critical review and further questioning of issues raised. From this, recommendations and best practice were presented using Microsoft Live meeting which facilitated a live conference and discussion forum.

Areas of interest that students found included the size of the industry, the amount of legislative procedures in both countries and the effects of neighbouring countries on practices. These will be summarised in the poster and where relevant, recommendations made.

From this initial research, it is clear that there were several areas where research and information was lacking or in a number of cases, information presented was biased and subjective.

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FAT ALL YEAR ROUND - THE WELFARE CONSEQUENCES OF CONTINUOUS EQUINE OBESITY

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Obesity in horses is associated with many health and welfare problems. The relationship between obesity, insulin resistance, hyperglycaemia, and a predisposition to laminitis, a severe, debilitating systemic condition of the hoof, is becoming well documented.

The upward trend in human, feline and canine obesity in recent years is paralleled by an increase in equine obesity. Prevalence estimates in western countries are highly variable and range from 1.4% in the US, to 45% in Scotland.

Previous prevalence studies have been conducted solely during the summer months. It is known that body condition in horses is intensely seasonal, with horses and ponies storing body fat during the summer for use during harsher winter months. Current estimates are therefore not an accurate representation of the true variability of this condition throughout the year. We describe a study that will go some way in assessing whether this predicted seasonality still exists in managed populations.

It was found that within herd living horses and ponies in North Somerset, the prevalence of obesity (Henneke body condition score, BCS, 7-9/9) varied seasonally between 27.56% (95% CI 19.79% - 35.32%) at the end of winter and 34.53% (95% CI 26.63% to 42.43%) at the end of summer. A crude linear association was found between winter BCS and percentage seasonal change in belly girth using the chi-squared test for trend ($X^2 = 17.23$, df = 1, p = <0.001). As winter BCS increases, percentage change in belly girth between season's decreases. There appears to be a partial threshold effect in line with clinical obesity (BCS 7-9), which suggests seasonality is being lost in clinically obese animals. Risk factors affecting seasonal variation in body condition were explored.

Arguably outdoor living animals, with the opportunity for spontaneous exercise, should be a low risk equine group; therefore such high prevalence measures in this population are a welfare concern. It is not yet known whether year-round adiposity is more damaging than summer obesity followed by natural winter weight loss. Future work should perhaps consider the seasonality of outdoor living horses and ponies when attempting to understand and manage obesity and obesity related disorders in UK equines.

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TAMING ANXIETY THROUGH HANDLING IN MICE

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Handling may be a major source of unexplained variation in the responses of laboratory animals because of profound – but variable – effects on anxiety and stress. Although it is at present common practice to pick up mice by the tail, recent evidence suggests that this procedure induces aversion towards the handler and high anxiety, whereas use of a home cage tunnel or open hand leads to voluntary approach, low anxiety and acceptance of physical restraint. However, it is not yet understood how these methods may be best implemented from a practical perspective across laboratories. Practical aspects of these methods need to be elucidated to ensure practicality and thus feasibility in laboratory animal practice. We will discuss how practical aspects of handling may influence the responses of mice. We focus on prior familiarity with the handling tunnel and the effect of handling duration on behavioural response.

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DEVELOPMENT OF A WELFARE ASSESSMENT FRAMEWORK FOR LABORATORY-HOUSED BEAGLES

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Over 4000 beagle dogs were used in scientific procedures in the UK in 2010, primarily for toxicology (safety testing). We have an ethical obligation to ensure their welfare is maximized, and that the most reliable and valid scientific results are achieved from their use in such pharmacological research. Whilst the link between good welfare and good scientific output is often made we lack good evidence. In a collaborative project between academia and industry we are examining the link between Refinements in dog rearing, housing and husbandry and quality of scientific output, measured in terms of repeatability of data and between-dog variability. In this first study of the project, we utilise measures of behaviour though observation and testing (i.e. behavioural challenges and cognitive bias), physical health (i.e. food consumption) and cardiovascular data (i.e. heart rate and blood pressure) obtained from implanted telemetry to identify measures which are indicative of welfare changes and quantify the resultant impacts on quality of scientific output. The results will be used to form a welfare assessment framework for use in dog welfare research and to provide evidence-based measures of welfare for use by staff in a laboratory setting.

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NATURE VERSUS NURTURE: EXPLORING ASSOCIATIONS BETWEEN BREED, GENDER AND BEHAVIOUR PROBLEMS IN UK LEISURE HORSES

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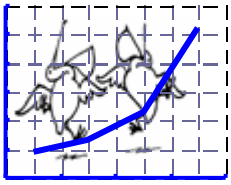
Relationships between environmental risk factors and equine behaviour problems have been the subject of a growing body of equine welfare research and it is now generally accepted that some husbandry practices, such as individual stabling and restricted feeding, are sub-optimal for welfare. However, the effect of a horse's breed and gender on their likelihood of expressing behavioural problems has received less attention despite them being potential confounding factors in previous studies as well as the subject of numerous superstitions, and sometimes very strong opinions, in the horse sector itself.

As part of a larger study that employed internet surveys to explore risk factors associated with the expression of behaviour problems in UK leisure horses, logistic regression analyses were conducted to investigate if breed and gender were associated with an increased likelihood of different behaviour problems being expressed. Data were generated from a convenience sample of leisure horse owners. Only data from respondents that had completed all three of the surveys in the series were put forward for analysis (N~400; the exact number varied between analyses due to item nonresponse). In comparison to native breeds, thoroughbreds and thoroughbred crosses were associated with an increased likelihood of displaying locomotor and pre-feeding sterepotypies as well as unwanted behaviour during handling. Arabs and arab crosses were also associated with an increased likelihood of displaying handling-related problems, as well as behaviour indicative of discomfort under saddle. Mares were associated with an increased likelihood of displaying problems when being handled, locomotor stereotypies and frustration behaviour compared to geldings or stallions.

The findings have implications for empirical research studies on equine behaviour. It is not always possible to use a homogenous group of equine subjects in research studies and as a result many studies employ horses of mixed breed and gender. While using disparate groups may be unavoidable, an awareness of the potential for differences in behavioural responses between breeds and sexes is critical for the accurate interpretation of the study findings. Our findings suggest that mares maybe more likely to exhibit certain behaviours than geldings or stallions and that the breed of the horse may also increase the likelihood of particular problems being displayed.



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DO ADOLESCENTS CARE ABOUT FARM ANIMAL WELFARE, AND DOES IT MATTER?

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Education may improve a consumer's knowledge about, and attitudes towards farm animal welfare (FAW), but without corresponding consumer behaviour no direct effect on welfare standards can occur. Adolescents in the UK (and elsewhere) are the next generation of consumers, yet their views about FAW are largely unknown. To address this and investigate improvement in which factors (e.g. attitudes or knowledge) via education are likely to promote relevant behaviour, a cross-sectional survey of year 10 (14-15 year olds) UK adolescents was conducted. Knowledge of, beliefs regarding, attitudes towards and behavioural intention relevant to FAW (sheep, pigs, cows and chickens) was assessed, incorporating an extended version of the theory of planned behaviour. Except for chickens, adolescent knowledge of welfare problems affecting farm animals or welfare-relevant product labels was limited. However, many (64.5%) cared about and half (49.4%) had concerns for FAW, with the majority agreeing with fundamental welfare principles such as the absence of (unnecessary) pain and suffering (93%) and the provision of space (92%). The theory of planned behaviour constructs 'attitude towards the behaviour' (its usefulness, importance etc) and 'subjective norm' (what others think), and the attitudes to FAW themes 'consumer responsibility / ability' and 'importance of FAW' had the greatest (hierarchical regression, respectively βs between 0.219 and 0.274; ps < 0.001) and positive influences on behavioural intention to identify the welfare standards of food consumed, as did, to a much lesser extent, gender and knowledge of FAW (females and those with greater knowledge scoring intention more positively; βs = 0.075 and 0.068; ps < 0.05). Despite this, overall, intentions to identify welfare standards were weak; out of a maximum score of 7 (most positive intention), median (IQR, Min - Max) behavioural intention score attributed was 4.00 (3.25 – 5.00, 1 - 7). This result may be because, as with adults, adolescents had limited belief in their own power and responsibility as consumers (78% holding a weak or negative belief in personal responsibility / ability), shifting responsibility for farm animal welfare to other stakeholders such as the Government and farmers. Thus, if positive attitudes are to be expressed through behaviour, the issues of responsibility and power must be addressed. Education incorporating social influence and utilizing peer culture, shown to successfully affect other consummation behaviour such as alcohol use, may increase the number of adolescents making an effort to identify the welfare standards of their food and empower them to claim more responsibility for FAW.

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ASSESSING DOG OWNER'S AWARENESS OF THEIR PET'S NEEDS, REGARDING THEIR ENVIRONMENT, DIET, BEHAVIOUR, LEVEL OF COMPANIONSHIP AND HEALTH AS SET OUT IN THE ANIMAL WELFARE ACT 2006

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The Animal Welfare Act 2006 introduced a duty of care for all pet owners to meet the needs of their pets. But there is currently no means of identifying, assessing, monitoring and improving the wellbeing of companion animals. Therefore, a cross-sectional questionnaire based survey was carried out in the UK to assess dog owner's awareness of their animals needs with regards to the Animal Welfare Act 2006. The survey was designed to check whether owners meet the five welfare need of dogs: suitable place to live, a proper diet, including fresh water, the ability to express normal behaviour, for any need to be house with or apart from other animals and protection from, and treatment of illness and injury. Across a sample of 150 respondents, it was revealed a quarter (25%) of dog owners were not aware of the Animal Welfare Act 2006, with general opinions reasoning lack of public knowledge due to government advertisement.

Travel safety concerns are highlighted, 38.7% of dogs are being allowed to travel without a seat belt, in the boot without a dog guard or on the car floor. Sleeping arrangements showed better results, 51.7% of owners ensuring that their dog sleeps in their own bed with only 26.5% allowing their dog to sleep on either their or a family members bed. Issues of dog obesity emerged, 56.5% of owners stating that they use their own common sense or past experience when determining food quantity for their dog, only 29.7% follow manufacture instructions or advice from a professional. Inadequate training and socialisation featured concern, merely 32.7% attending classes on either a regular or infrequent basis. Fear behaviour towards fireworks rated highest at 25.3% with 44% of owners reporting their dog to have no fears. Outcomes for levels of companionship were strong, 71% of dogs living in multi-dog or animal household and 81.3% in mixed gender human household. Kennel Cough vaccination showed to be central problem area, only 31.3% of dogs being vaccinated against the highly contagious virus.

The results from this study disclose welfare concerns mainly in the area of travel methods, food quantity and Kennel Cough vaccinations. This emphasises the importance of dissemination of information about the Animal Welfare Act 2006 throughout the UK.

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BEHAVIOURAL RESPONSES OF WILD-CAUGHT AND HAND-REARED EUROPEAN STARLINGS (*STURNUS VULGARIS*) TO LABORATORY HUSBANDRY

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To enhance the welfare of laboratory animals there has been a change in European Union legislation that places restrictions on the use of wild-caught animals in scientific procedures: animals are to be bred in the laboratory or hand-reared to increase habituation to the captive environment, and to minimise impact on wild populations. However, the beneficial effects of captive breeding are still much debated. Indeed, there is some evidence to suggest that natural rearing may actually have a protective effect against the development of captivity-induced, abnormal behaviour, such as stereotypies. The aim of this study was to examine the impact of rearing environment upon behavioural responses to potential laboratory stressors. We explicitly address the question of whether hand-reared individuals display increased or decreased fear responses to husbandry routines compared with wild-caught counterparts. We conducted our study on European starlings (*Sturnus vulgaris*) which represent the most-widely used non-domesticated passerine species in scientific research, and quite possibly the most widely used non-domestic animal. The majority of starlings used in research are currently caught from the wild, meaning that the impending change in legislation will imply costly changes in current procedures that need to be justified by proven welfare benefits. The behaviour of our experimental birds was monitored before, during and after a daily cage cleaning routine. We focussed on responses that are assumed to be indicators of escape reactions, namely general activity levels and time spent on the cage walls. While all birds displayed escape behaviour jumping to the cage walls, the hand-reared birds showed more general activity than the wild-caught birds both immediately before husbandry and during experimenter presence. In contrast, the wild-caught birds took longer to calm down after the experimenter had left the room. We discuss our results with reference to the welfare of laboratory passerines and guidelines for sourcing laboratory birds.

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THE USE OF SOCIAL NETWORK ANALYSIS TO PROVIDE NOVEL INSIGHTS INTO ANIMAL WELFARE PROBLEMS

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Social network theory provides a formal framework to study complex social relationships. Although originally developed to study human social groups, it has become increasingly common to use social network analysis to understand social organization in animals. It gives the specific advantage of looking beyond dyadic interactions by considering whole networks of social relationships in which the behaviour of one individual may, through direct or indirect paths, affect the behaviour of all other individuals within a group. This provides a novel way to investigate which factors influence the social environment of group-living animals that can be applied to animal welfare problems.

Problems like injurious aggression between conspecifics and the development of abnormal behaviour can be observed in many captive animals, including those housed in zoos, laboratories, and on farms, as well as in animals kept as companions – and these welfare problems are often socially-derived. Social network analysis of animal groups can help to examine the reasons and sources of these problem behaviours. For example, social groups are frequently disrupted by separations, reintroductions and/or mixing with unfamiliar individuals, and this can be a major source of social stress. Measuring the global or local centrality of individuals within a network allows us to search for key individuals that might need to be removed or retained, and allows us to generate predictions on how such interventions may influence the group. Here, we will describe how social network analysis can be used to identify why some problem behaviours appear in one population but not others, and how these behaviours might spread. Specifically, using data derived from a long-term study of replicate fish social networks as a model system, we will report on how this novel approach can be applied to animal welfare problems, and how it can be used to suggest potential interventions and solutions.

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EVALUATING 3 METHODS OF CAPTURE IN IMPALA (*AEPYCEROS MELAMPUS)* TO REDUCE THE RISK OF CAPTURE MYOPATHY

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Capture myopathy is a degenerative muscle condition seen in wild animals due to extreme muscle exertion and overheating during their capture. The key feature of capture myopathy in earlier stages is hyperthermia. Other signs include increased breathing rates, heart rates and abnormal partial pressure of oxygen (pO_2 levels) in the blood. In severe conditions, it can lead to death in wild animals.

During July 2011, 36 impalas (*Aepyceros melampus*) were captured in the northern province of South Africa, using three different methods: dart (n = 12), net (n = 12) and boma (n = 12). Evaluation of 3 capture methods in Impalas was done in order to find the most suitable method of capturing. Recording of physiological parameters for individual impala including respiration rate (RR), heart rate (HR) and pO_2 value revealed significant differences between capture groups. Respiration rate and heart rate was found to be significantly higher ($p < 0.001$) with the use of boma (mean RR = 99.50b/m, HR = 134.33b/m), as compared to net (mean RR = 58.83b/m, HR = 72.92b/m) and dart (mean RR = 41.00b/m, HR = 97.67b/m). pO_2 was found to be significantly lower ($p < 0.001$) with the use of dart (mean pO_2 = 47.67 torr), as compared to net (mean pO_2 = 72.25 torr) and boma (mean pO_2 = 77.00 torr). No significant differences ($p > 0.05$) were found for rise in temperature among the 3 different capturing groups.

We conclude that dart is the most suitable method for capturing impalas, as it has least deleterious effects on the heart rate and respiration rate. Boma has the highest risk of increasing heart rate and respiration rate and eventually leading to capture myopathy and death in impalas.

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DESCRIPTIVE ANALYSIS OF COMMENTS PROVIDED BY ASSESSORS IN THE REPORT OF ASSURED DAIRY FARM ASSURANCE SCHEME

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Farm assurance schemes have been developed in the UK that ensure the safety, quality and traceability of food and welfare of livestock to consumers. The standards of assurance scheme may focus on inputs, such as housing conditions and husbandry practices and outcome of those inputs on animal welfare. An approach of assessing animal based parameters, such as the physical condition or behaviour of animals, is thought to better measure animal welfare and help scheme to identify potential husbandry problems.

This study focused on the Assured Dairy Farm (ADF) standards set by the Assured Food Standard (AFS) organization, known as Red Tractor. The aim of this study is to examine the use of outcome based observations and their reporting within in Assured Dairy Farm assessment reports. The sources of the reports were from three major certification bodies which inspect farms. The evidence that the assessors provided in comment box of the report supporting their decisions were defined as outcome or resource based comments. A questionnaire was also conducted to know about the assessors' understanding of outcome-based welfare assessment and their attitudes towards the practice of outcome assessment.

The average usage of outcome comments within each report, ranged between 1.6 to 4.14 outcomes comments from the three certification bodies. There was also variation in the use of outcome comments in reports between different assessors. It was often unclear on how outcome-based information influenced the certification process. Also, a total 35 assessors provided information on their preferred method of completing 7 selected questions from the ADF reports. Assessors were asked to write down an example comment that they usually put. Assessors reported using suitable outcome parameters but many (23/35) considered that current reports do not contain sufficient detail on outcome parameters.

With the current assessment, outcome measures are often included in inspection reports; however, it is not clear how this information is used. A more formalised approach to welfare assessment in farm assurance schemes is currently being evaluated within the Red Tractor scheme.

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SURVEY OF POTENTIAL OLFACTORY EFFECTS ON LABORATORY MOUSE BEHAVIOUR AND WELFARE

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Mice are by far the most commonly used animal in research worldwide (Commission of the European Communities 2007). Olfaction plays a crucial role in mouse communication by providing information on genetic identity (sex, kinship) and physiological status (reproductive status, health, dominance) (Latham & Mason 2004). Some odours have been shown to produce stress and defensive responses that could confound experimental research and impact on mouse welfare. For example, certain solvents cause strong aversion behaviour in mice (Anderson & Anderson 2003; Deacon 2011), and hair-dye used to non-invasively identification mark mouse fur has been associated with a subordinate social status (Lacey et al. 2007). As well as affecting mouse welfare, differing olfactory profiles across laboratories could help to explain variation in results between laboratories, despite their attempts to standardise experimental procedures (Crabbe et al. 1999).

A survey was sent by email to 65 animal research units in the UK to identify the most common scents associated with husbandry procedures, including cleaning products, glove materials, and odours from other species present in animal units. Animal care workers and researchers using the mice were invited to comment on which, if any, of the odours in their laboratories appear to affect mouse welfare and/ or experimental standardisation.

A preliminary analysis showed that 69 % of institutions always wear gloves for handling mice, with Nitrile being the most common glove material (89%).

Trigene is the most common cleaning product (68%) and 40% of the respondents think that cleaning products are likely to have some effect on mouse behaviour.

The rat is the most common species housed in the same animal units that house mice (90%). 79% of the units change gloves between working with mice and other species, but only 30% have specie specific gowns.

In 90% of the cases non-breeding male and female mice are housed in the same room as each other, with 77% reporting that hands are not washed and gloves are not changed when handling male and female mice.

These results will be used to inform follow up studies, including preference and avoidance tests using the most common odours present in UK animal units to investigate fear responses, aversion behaviour, and individual variability in mice. Understanding how these smells affect mouse welfare will help to refine mouse husbandry and experimental procedures through practical recommendations, to improve the quality of life of laboratory animals and the experimental data obtained.

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THE IMPACT OF DIFFERENT IDENTIFICATION SYSTEMS ON LABORATORY MOUSE BEHAVIOUR AND WELFARE

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A number of different methods exist for identifying mice but there has been only limited investigation of the welfare consequences associated with each method. Given the huge number of mice used in experimental procedures annually and the need for the majority of them to be unambiguously identified, there is potential for making significant welfare changes according to the method utilized. A wide range of methods have been used to identify individual mice. These include ear notch, ear punch, ear tag, toe clip, tattoo and implantation of a transponder chip. Temporary identification can be achieved by the use of hair dyes or indelible marker pens. All procedures involve restraint of the animal which is itself stressful (Cinelli et al. 2007) although it may be possible to modulate the degree of distress through the use of alternative handling and restraint methods (Hurst & West 2010). In addition, restraint may be necessary to read the identification system causing additional stress. The current project aims to test the hypothesis: "Identification systems can be ranked by their welfare consequences allowing an informed choice of the best method(s)". A survey of animal research units in the UK has been launched to determine the most commonly used systems for identification and, in the case of genetically modified mice, for genotyping. The survey results have been collected, analyzed and are currently used to prioritize the identification systems for detailed examination. Current plans are to assess the consequences of identification by removal of part of the ear pinna (ear notch or ear punch), marking using marker pen, microchipping, and identification by ear tagging. Effects on the mouse will be assessed using a number of measures including acute and chronic behavioural responses, faecal glucocorticoids level, local histology and activation of nociceptors.

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THE USE OF MIRROR AND ARTIFICIAL NEST MOUNDS TO ENCOURAGE BREEDING IN CHILEAN FLAMINGOS *PHOENICOPTERUS CHILENSIS* AT COLCHESTER ZOO

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Breeding a bird that naturally lives in flocks, often numbering tens and thousands of individuals, is difficult in captivity as these numbers are not practical or even possible to house. In 2010, Colchester Zoo took the first steps to encourage breeding in its flock of 15 Chilean Flamingos *Phoenicopterus chilensis* by installing six two-metre high mirrors along the edge of a lake in the flamingo enclosure. The purpose of the mirrors was to create the illusion of more flamingos, in effect increasing the flock size from 15 to 30. After the mirrors were installed, previously unseen behaviours were observed: courtship displays, the successful construction of four nest mounds and nest maintenance activities. The mirrors also benefited the overall welfare of the birds by increasing social stimuli and therefore stimulating a larger array of natural behaviours and increasing flock security by creating the illusion of more individuals. Colchester Zoo plans to establish a successful breeding program for Chilean Flamingos and to increase public awareness of flamingo conservation, thus helping to secure the future of this popular bird.

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THE PRESENCE OF A PREFERRED PARTNER IMPROVES DAIRY CATTLE'S COPING ABILITY DURING SHORT-TERM SEPARATION

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Cattle are highly gregarious and need to be in the presence of others. During management there are times however, when animals are separated off for a short period of time. This may be for foot trimming, holding for the vet or when being held for regrouping. This separation from the rest of the group can be stressful. The presence of a companion has been seen to aid an animal's ability to cope with such a stressful situation but there is a lack of knowledge on the strength of the relationship with the companion animal. The aim of this study was to investigate the impact of the presence of a preferred partner on heart rate during short-term separation compared to a known random individual. Six focal animals, previously identified as having a preferred partner (PP) (11 individuals in total making six pairings) were separated off from the rest of the group for 30 minutes in a holding pen, either with their preferred partner or with a random individual. Observations were carried out between May to July 2010 at milking (0430-0900 and 1600-1800). The study was completed in three stages; 1. Focal animal A separated with their PP B (PP); 2. Focal animal A separated with a random individual C whilst B is released back to the home group (PR); 3. Animal B separated with a random individual C whilst focal animal A is released back into the group (RP). The heart rates of focal animal A during stage 1 and stage 2, and animal B during stage 3, were monitored using an Equine POLAR® ProTrainer5^{TM} (RS800) heart rate monitor, adapted for the use in cattle, at 15 second intervals in beats per minute. Mean values per minute for each individual was calculated and a paired t-test performed to analyse the differences in heart rates between PP and PR. A two-sample t-test was used to analyse the differences in heart rates between PP and RP, and a Mann-Whitney to analyse the differences in heart rates between PR and RP. Focal animals had significantly lower heart rates ($P<0.001$) when separated with their preferred partner (80.2 $\pm$ 1.67 bpm) compared to being separated with a random individual (82.6 $\pm$ 1.85 bpm). Interestingly, the partners heart rates were lower (79.87 $\pm$ 1.17 bpm) than the focals both when focals were separated with their preferred partner although this was not significant ($P=0.42$), and when separated with a random individual (82.6 $\pm$ 1.85 bpm) which was significantly different ($P<0.001$). From these results it can be suggested that some individuals seem to benefit from having their preferred partner present during a potentially stressful situation. It could also be suggested that some individuals are more sensitive to stressful situations compared to others.

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FACILITATION WORKSHOP: PROMOTING FARMER / CLIENT INTEREST IN ANIMAL WELFARE

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Promoting the interest of animal owners in the welfare of their working or companion animals is crucial when it comes to promoting action to improve the animal welfare.

To further explore this issue we conducted an investigation using qualitative design and data collection methods in the form of facilitator-led discussion groups. These were chosen as they give participants the opportunity to share experiences and to express their ideas and understanding on the topic of discussion.

A workshop was developed with the aim to define best practice methods that promote owner's interest in the welfare of their animals. This was run with groups of people that are in direct contact with the animal owners and play a major role when it comes to influence owner's attitudes and interest in animal welfare.

Two groups of welfare assessors taking part in a farm assurance scheme, two groups of fifth year veterinary undergraduates undertaking their elective studies in communication skills and farm animal science and one group of staff from re-homing centres took part in the workshops, which were carried out on three separate occasions for each of the five participant groups.

Participants were divided in small groups of four or five and were asked to answer, with keywords and bullet points, the following two questions consecutively: "WHAT WORKS for you when promoting discussion with farmers/clients/dog owners on the management of their animals" and "WHAT IS DIFFICULT for you when promoting discussion with farmers/clients/dog owners on the management of their animals". After the initial small group work, a discussion took place with the whole group to define how the keywords that participants generated could be grouped together in main themes.

The common themes that emerged from the keywords for "what works" were: positive relationship/empathy, benchmarking/data/evidence, personality and attitude, consultation/inspection process & communication and good feedback. For "what is difficult": lack of empathy, failing to build a relationship, bad attitude, unsatisfactory inspection process for "what is they find difficult".

The results show that diverse groups of people who work in a variety of roles with animals came up with very similar key themes, strategies and issues in relation to what works and what is difficult when promoting discussion with animal owners/carers on the welfare of their animals.

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EFFECT OF DIETARY PROTEIN SOURCE ON EFFICACY OF PHYTASE SUPPLEMENTS TO IMPROVE BROILER LEG HEALTH

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Leg problems and lameness are common in broilers, particularly as they have been subjected to intense genetic selection for heavy body weights and fast growth; growth rates have increased by over 300% in the past 50 years. Dietary phosphorus is essential for development and maintenance of the skeletal system and particularly important in avoiding lameness in broilers. Therefore, bone mineralisation is traditionally used to assess skeletal status of poultry. Approximately two thirds of the phosphorus in cereals and leguminous plants is stored in the form of phytate-P (IP6), which cannot be digested by non-ruminants due to lack of a meaningful endogenous phytase enzyme. Consequently, poultry diets are often supplemented with phytase enzymes to enhance phosphorus availability, but it is possible that interaction between phytase and other dietary components may reduce its efficacy. As a result, phytate-P is not readily dephosphorylated and phosphorus bioavailability is reduced, increasing risk of phosphorus deficiency and, subsequently, lameness. The aim of this study was to investigate whether dietary protein source influences the efficacy of phytase in increasing bone mineralisation.

192 Male Ross 308 birds were fed one of six diets; 3 based on wheat soya and 3 on wheat rapeseed supplemented with 0FTU, 500FTU or 5000FTU of phytase from day 0-28. The right tibia and femur of each bird was removed post mortem on day 28, autoclaved, de-fleshed and oven dried prior to ashing in a muffle furnace to determine mineral content. Statistical analysis was performed via ANOVA using SPSS version 19.

Results (Table 1) showed that there was an interaction between phytase inclusion and protein source on bone mineralisation in the tibia but not in the femur. Phytase inclusion had a significant effect on bone mineralisation but protein source did not.

Table 1: Effect of protein source on efficacy of phytase in improving bone mineralisation in poultry

Diet protein source with phytase supplementation level	**Femur mean % mineral content (+/-S.E.)**	**Tibia mean % mineral content (+/-S.E.)**
Soyabean Meal + 0FTU	44.631 (+/-0.276)	45.110 (+/-0.259)
Soyabean Meal + 500FTU	46.383 (+/-0.377)	47.597 (+/-0.466)
Soyabean Meal + 5000FTU	48.662 (+/-0.211)	49.350 (+/-0.326)
Rapeseed Meal + 0FTU	43.900 (+/-0.338)	43.306 (+/-0.420)
Rapeseed Meal + 500FTU	46.364 (+/-0.352)	47.914 (+/-0.400)
Rapeseed Meal + 5000FTU	48.580 (+/-0.213)	50.242 (+/-0.352)
Factors	**Femur P Value**	**Tibia P Value**
Protein Source	0.288	0.527
Phytase Inclusion	< 0.001	< 0.001
Protein Source*Phytase Inclusion	0.466	0.003

In conclusion dietary protein source examined had an impact on the effect phytase supplementation has on tibia bone mineralisation in broilers. Phytase is more efficient at increasing tibia bone mineralisation in rapeseed meal based diets than in soyabean meal based diets. Further analysis is needed to decipher the key factors that influence the efficacy of phytase at improving bone strength.

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FEEDING PREFERENCES IN CAPTIVE MIXED ENCLOSURE DOMESTIC BIRDS *(MELPSITTACUS UNDULATUS AND NYMPHICUS HOLLANDICUS)* SPECIFICALLY EXAMINING THE CONSUMPTION OF SUNFLOWER SEEDS

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Introduction - Budgerigars (*Melopsittacus undulates*) and cockatiels (*Nymphicus hollandicus*) are commonly kept in captivity and most often fed seed mixes. The problem with seed mixes is that selective feeding can take place resulting in unbalanced dietary intake: mineral and vitamin deficiencies and obesity, this obviously impacts on welfare.

Aims of the study -

- Record seed intake specifically sunflower seeds
- Conclude whether a seed preference was observed

Methods - One aviary was used containing 25 birds. These were fed on a budgerigar mix and a parakeet mix. Sunflower seeds within the parakeet mix were at normal proportion for week 1 and the consumption recorded. In week 2 the proportion of sunflower seeds was decreased by 50% and in week 3 the proportion of sunflower seeds was increased by 50%. The consumption of sunflower seed, all other seed types and all seed were measured by weighing back the seed provided.

Results and Discussion -

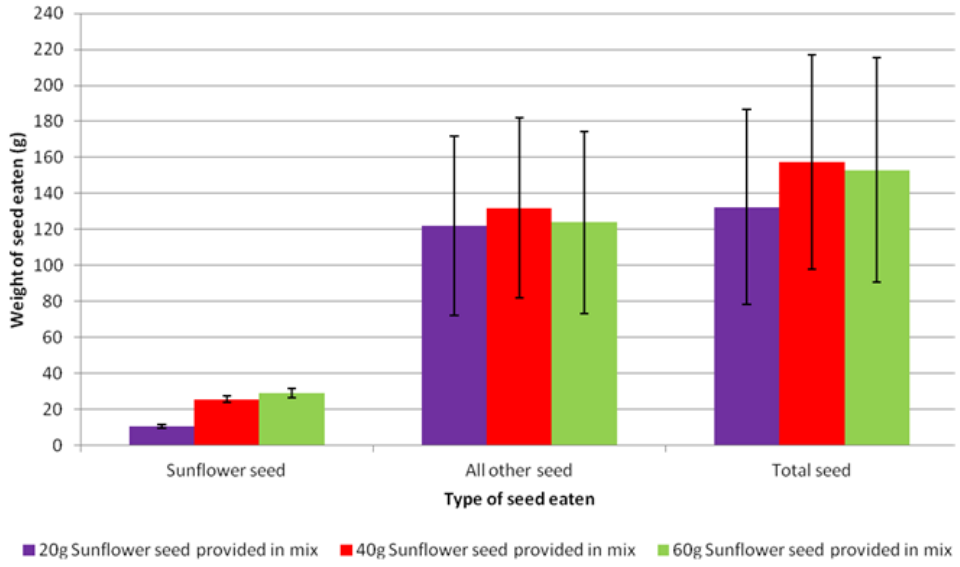

Figure 1- Mean weight of sunflower seed, all other types of seed and total seed eaten each week

The results show a significant ($p = >0.001$) decrease in sunflower seed removal when less sunflower seeds were provided. Other changes in seed removal lacked significance, this data suggests no preference to sunflower seeds. This study suggests that increased energy required for searching for seed affected the proportion removed by the birds. So the birds may be given a healthy diet but not consume a well-balanced diet due to reduced accessibility which may affect welfare. Further studies into seed accessibility would aid animal welfare.

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THE INFLUENCE OF ENVIRONMENTAL ENRICHMENT ON THE BEHAVIOUR AND WELFARE OF COMMERCIAL BROILER CHICKENS

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There is little published information on the effects of changing the housing environment on broiler welfare. Lewis and O'Connell (2011) reported that natural light and provision of bales improved the levels of activity and leg health of commercial broilers. The poultry industry is increasingly providing 'environmental enrichments' in the form of windows, perches, bales and various objects for birds to peck at. This study examined the effects of these on broiler welfare using several outcome measures.

Four houses on one commercial broiler farm were trialled, each containing approximately 30,000 mixed-sex birds of the same breed simultaneously reared under similar conditions to 35 days of age. The two treatment houses had four A-frame perches, 30 bales, pecking objects (C.D.'s and 'pecka-blocks') added; the other two houses acted as controls, although all houses had windows. Qualitative and quantitative data were collected by two observers over two days per week from weeks 2-5. All measurements were made in several areas of each house and included environmental records plus numerous behavioural measures. Flocks (n > 120) were gait scored at 3 and 5 weeks. Footpad dermatitis and hockburn were measured at slaughter using established scoring methods and production records were compared.

Broilers were more active in treatment houses where the birds lay significantly less than control flocks ($p<0.001$). They tended to interrupt resting birds more, which might affect welfare. There was a trend for control flocks to walk or run less often. Flock average gait scores at 5w were 1.3 with a non-significantly lower average score for pododermatitis in treatment flocks. Both weight gain and feed conversion appeared improved in treatment flocks.

Treatment birds approached a novel object quicker (40s v 140s at 4w) and in higher numbers, suggesting greater confidence. This is supported by QBA results: treatment birds were found to score higher on the category encompassing measures such as friendliness and confidence ($p<0.001$), which may have beneficial effects for bird welfare in terms of management, catching and slaughter.

Further research is needed to optimise design and layout of 'enrichment' objects. For example perch design could be modified to enable young birds to access them. At 2 weeks of age around 50% of the birds that tried to get on the perch failed while this decreased to 10% at week 5. Similarly birds were able to access the bales more with age.

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AN INVESTIGATION INTO THE DISPLAY OF ABNORMAL BEHAVIOURS IN THORNBACK RAYS (RAJA CLAVATA)

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There has been much debate as to touch or stroke sea life in recent years, particularly within zoo organisations and aquariums. Many zoos and aquariums house Thornback Rays, and due to their placid characteristics, the public are often encouraged to touch them. This raises questions when the Rays start performing behaviours which are not part of their natural behavioural repertoire. The abnormal behaviours that the Rays perform, such as spiralling and interaction with transparent boundaries, could be due to many different reasons: they could be learnt, due to human interaction, taken from the wild and housed in captivity and lack of enrichment.

This study focuses on the amount of human interaction the Rays come across and aims to show whether or not there is a relationship between interactions and abnormal behaviours. It was hypothesised that the more visitors there were around a typical Ray enclosure, the more abnormal behaviours would be shown. Three adult Thornback Rays (originally from the wild) and two juveniles (bred in captivity) were studied, using a quantitative approach with behavioural observations and standard deviations, over four days.

Results show that there was no relationship between the number of visitors and number of times abnormal behaviours were shown. However, it was found that the juveniles displayed no abnormal behaviours throughout the study, yet the adults displayed abnormal behaviours throughout 49% of the study. It is therefore determined that abnormal behaviours may have developed due to being taken from the wild.

The results of this study can influence how we gain possession of our animals, whether as pets or for zoo and aquarium use. Animals being bred in captivity could prevent behavioural problems rather than influence them. Is it that the juvenile Thornback Rays started their life in captivity and therefore know no difference? It is possible that this statement is true, as the juveniles would not have experienced the stress of capture and transport, along with their environmental boundaries.

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FEATHER CONDITION AND PRODUCTION OF TWO FLOCK SIZES IN A DEEP LITTER SYSTEM: A WELFARE PERSPECTIVE

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The aim of this study was to identify any differences in feather, foot and gait conditions and egg production rate between two commercial flock sizes. To acquire such information feather, foot and gait condition and production rates, including total eggs were recorded in two barns over an approximate one month period. The two barns studied contained two flock sizes of 3,315 and 7,050 hens and had a stocking density of 6.29 and 6.40 birds per square meter respectively. To record feather, foot and gait conditions three different scoring systems were used and production was recorded. The findings were that no significant difference was found between two flock sizes and feather condition. Gait scores revealed that the overall majority received the lowest score suggesting little or no problems regarding gait. Mortality rates were also low in the two flocks with the lowest rate being 3 and the highest being 12 birds over the period of the study. Regarding production there appeared to be no drastic difference between egg production rates. However, as expected both production of hatching eggs decreased over the period of this study. In conclusion, this study found that there is no significant difference in feather condition between two commercial flock sizes suggesting, other factors may be of higher importance than flock size regarding feather pecking/condition.

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HOUSING AFFECTS RELIABILITY OF HIGH-THROUGHPUT BEHAVIOURAL TEST IN ZEBRAFISH: IMPLICATIONS FOR WELFARE AND THE 3Rs

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Zebrafish are a widely utilised animal model in developmental genetics, and owing to recent advances in our understanding of zebrafish behaviour, their utility as a comparative model in behavioural neuroscience is beginning to be realised. One widely reported behavioural assay, argued to represent novelty stress, is the tank-diving assay. Briefly, when zebrafish are introduced to a novel environment, they show a stereotypical diving response, gradually rising to the upper portions of the tank during the course of a 5 or 6 minute trial. In addition, often results from control groups in published studies vary wildly both within and between laboratories. Despite its wide utilisation, and various validations against anxiolytic drugs, in general, reporting of pre-test housing has been sparse in the literature. As zebrafish are a shoaling species, we predicted that housing environment may affect their stress reactivity and, as such, their response in the tank-diving procedure. In our first experiment, we found that individually housed fish show a reduced time bottom dwelling during the test than group housed individuals. We also demonstrated that ethanol appeared to have an anxiolytic effect for individually housed fish but not those that were group housed. We tested various aspects of housing (paired, visual contact, olfactory contact) and found that the key factor seems to be the degree of visual contact with conspecifics. This presents a conundrum, as individually housing a shoaling animal may compromise its welfare. However, removing the fish from its group causes a different response to the procedure, and therefore serves to increase the numbers of animals required in order to test hypotheses, this may also be problematic in terms of the 3Rs. In conclusion, housing appears to be a crucial factor in obtaining reliable data from this methodology, and should be considered by researchers interested in comparative models of anxiety in zebrafish in order to refine and reduce their use of the animals. Future studies may examine other aspects of husbandry, such as group density and human-animal interactions, as these factors may also be important in terms of producing more reliable results.

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THE LOCOMOTOR DESIGN OF THE MODERN BROILER: A BIOMECHANICAL AND ANATOMICAL PERSPECTIVE

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It is apparent that genetic selection for production traits in the modern broiler chicken (e.g. feed efficiency and growth rate), have played a crucial role in increasing production efficiency and boosting overall returns. However, undesirable traits have also arisen, with lameness/ poor walking ability a major welfare concern. This issue of poor walking ability appears to raise the same fundamental question: is the impaired walking ability of the modern broiler more related to a problem of conformation/ rapid growth (changed primarily to enhance market weight) and/ or a problem associated with pathology or pain. From a biomechanical perspective, the extreme conformational changes and rapid growth are intrinsically linked. Forces that the skeleton experiences during locomotion are an important determinant of structural design and a change in body conformation in the modern broiler has been linked to a change in gait pattern. This may affect bone development and therefore be the underlying cause for some skeletal disorders as well as other pathologies. Here, we investigate how the selective breeding of the modern broiler chicken has influenced locomotor design and determine whether artificial selection has produced broilers with biomechanical constraints that compromise their walking ability. We suggest that if biomechanical constraints prevent broilers from walking economically or stably, then a better relationship between these economic traits and 'healthy' locomotor-related traits could be achieved through artificial selection.

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ADVANCING UNDERSTANDING OF ANIMAL SENTIENCE

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The science of animal sentience underpins the entire animal welfare movement. Demonstrating objectively what animals are capable of is key to achieving a positive change in attitudes and actions towards animals and a real, sustainable difference for animal welfare. The World Society for the Protection of Animals is committed to promoting animal sentience as a mainstream and credible science. To enable this, WSPA is developing a unique platform dedicated to promoting and sharing research on animal sentience. Targeting any sector which impacts animals, the Sentience Mosaic seeks to demonstrate the relevance and importance of animal sentience science to academics, scientists and students across the globe.

Through both the Sentience Mosaic and other avenues of work, WSPA will be working with various organisations and sectors to promote the field of animal sentience as a credible scientific study, demonstrate its relevance beyond animal welfare, increase humane research in the field and help create the animal sentience champions and scientists of the future within all sectors affecting animals.

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REDUCING STRESS IN STABLED HORSES USING REIKI

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Interest in the use of Reiki on animals is growing. Despite its use in human clinical settings (Miles, 2007) and many anecdotal reports describing the benefits for animals receiving Reiki, there has been very little scientific research. (Baldwin and Schwartz, 2006; Baldwin, *et al.*, 2008)

To strike a balance between common practice of Reiki on horses and research conditions, three groups of six horses were put into an internal loose box a barn used to carry out husbandry tasks associated with equine management. Each of the three groups was observed for ten minutes before and after differential treatment (Rietman, *et al.*, 2004). Differential treatments were: control group: nothing done except 30 minutes of observation, placebo group: treated for 30 minutes with placebo Reiki, Reiki group: treated for 30 minutes with Reiki. Only the final 10 minutes of the treatment time was used for statistical comparison to the before and after periods. This gave 20 minutes for the PNS to respond. (Marrongelle, 2011).

Focal Ethogram was used to record behaviour time budgets. Heart rate variability (HRV) was recorded as a more sensitive measure of stress than heart rate alone. Mean heart rate (HR) and HRV were recorded by use if non-invasive Polar Equine Science monitor, downloaded and analysed using Polar Software and Kubios programme. This replaced the telemetric implant used by Baldwin, *et al.*, (2008)

A significant drop was found in the overall time budget of feeding behaviour in the Reiki group after treatment $P<0.05$. Behaviours such as lick and chew, sigh and yawn, reported to be linked to the influence of Reiki were seen more often during treatment with Reiki than in either the control or placebo group but there was insufficient data to statistically analyse it. HR increased in the Reiki group after treatment in contrast to that of the control and placebo groups. HRV trend in the Reiki group showed a continuous move towards parasympathetic nervous system activity in contrast to the control group that trended towards sympathetic nervous system activity. This was not statistically significant $P>0.05$.
There was insufficient statistical evidence to definitively support the influence of Reiki by these measures; there were trends to suggest that further research is necessary to investigate the differential findings in the Reiki group, specifically the dynamic of the relationship between the Reiki practitioner and horse (Bayley, 2002).
The significance and relevance of "Reiki behaviours" also requires further investigation. Larger sample size is recommended on horses that are in competition or racing environments.

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WELFARE IMPLICATIONS FOR BROILER CHICKS FED DIETS CONTAINING GRADED LEVELS OF POTABLE ALCOHOL YEAST PROTEIN

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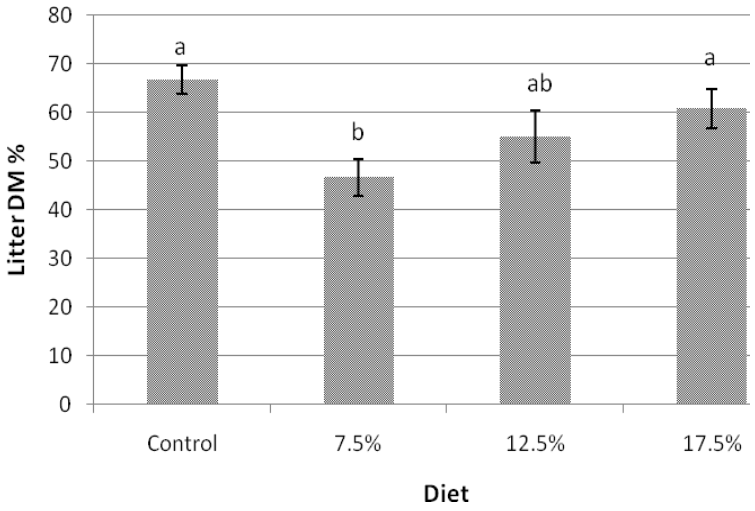
Demand for renewable fuels has encouraged the differentiation of co-products from both bioethanol and potable alcohol industries. A novel yeast protein concentrate has been separated[1] from DDGS which appears to be an acceptable feed ingredient for broiler chicks[2]. However for any new dietary ingredient, welfare implications must be considered. Litter moisture is a major issue in broiler chicken production as wet litter increases the incidence of pododermititis and is an indicator of the presence of anti-nutritional factors in the diet. For yeast a further issue is the high nucleic acid content which could cause an overproduction of uric acid.

In this study, 192 broiler chicks were fed graded levels of potable alcohol-derived yeast protein (0, 7.5%, 12.5%, 17.5%) incorporated into iso-nitrogenous diets from day 1 to day 22. Birds were kept in 0.64m^2 pens bedded on wood shavings in groups of 4 birds per pen. Food and water was available ad libitum. Litter in each pen was sampled at D21 and dried for 3 days at 105^{o}C to assess litter moisture. Blood samples were collected by venepuncture post mortem on day 22 and serum frozen at -20^{o}C. Serum uric acid was measured by an Amplex red assay (Invitrogen) read at 560nm. Data were analysed by one way ANOVA with Duncan post hoc testing, using SPSS v19.



Letters denote significant differences at the $p < 0.05$ level

There were no significant differences between serum uric acid levels between any of the diets, which confirms that the level of nucleic acid nitrogen present in the yeast protein is not a welfare issue for the broiler chicks up to a 17.5% inclusion level. The litter dry matter was significantly lower ($p = 0.016$) for the 7.5% yeast protein inclusion compared with the control diet. There were no significant differences between the control diet and the other inclusion levels of the yeast protein. This implies that the yeast protein does not reduce litter quality at higher dietary inclusion levels. The 7.5% yeast protein diet appeared to be the most palatable and the birds had a higher intake and growth rate on this diet (data not shown). The larger birds and greater intake goes some way towards explaining the higher litter moisture recorded on this diet. From this study potable alcohol yeast appears to be a suitable protein replacement for soya in the diets of broiler chicks in that it does not induce wet litter conditions for the birds or raised blood uric acid levels.

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ASSESSMENT OF BIRD ACTIVITY LEVELS FOR A FREE RANGE SYSTEM

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Keel fractures in free range laying hens is a major welfare and economic issue that appears to be worsening as the industry moves towards compliance with the EU 2012 ban of battery cage housing. Free-range and barn systems confer potential benefits to animal welfare in comparison with standard battery cages but are associated with increased numbers of keel fractures as reported within the UK and across mainland Europe, likely a result of increased opportunity for movement and collisions with hazardous housing structures. Typically, greater activity would be expected to benefit bone health and reduce keel fractures, though such benefits are not easily tested in large commercial settings where activities of individual birds is highly variable .

In order to address this problem, our group has been working to develop a monitoring system using tri-axial accelerometers attached to legs of individual birds which can move freely while data is collected. The current work was performed as part of a pilot study calibrating the accelerometers with visually recorded motion. For this study, four Lohman-Brown hens were housed in two small pens (2 birds/pen, age = 35 weeks) (4X4m) and after a 3-day period of acclimatization, activity was simultaneously recorded for four, 90 minute periods by the accelerometers and manually from video recordings collected from cameras mounted overhead. Statistical analysis was performed by calculating the R^2 value between the two measures for various session intervals and indicated values between 0.55 and 0.70 suggesting a moderately successful correlation.

Improved correlation can likely be achieved with improved filtration of background noise generated by the accelerometer and more accurate identification of specific bird behaviours that could not be distinguished from overhead such as ground scratching. Nonetheless, following refinement and further validation to ensure accuracy of detecting motion, we believe our system offers potential to monitor individual bird activity within large scale commercial settings, providing information on activity at the bird level previously not possible.

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IS LESS SHORT DEBEAKING MORE HUMANE THAN SHORT DEBEAKING?

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To establish whether "less short" debeaking is more humane than "short" debeaking an experiment is performed. ISAbrown hens were raised in 28 compartments with 45 hens each. In four compartments hens remained untrimmed. In 12 of the compartments hens were trimmed at three and in 12 at six weeks. In each group the hens of six compartments were trimmed less short and in the other six short. The beaks of eight hens per compartment were measured. Thus, 48 hens with less short, 48 hens with short and 24 hens with untrimmed beaks were compared. At three weeks 67.5% (short) or 51.2% (less short) of the bill was removed. At six weeks these values were 66.3% and 46.7% respectively (at three weeks there is more opportunity for regrowth). These differences were significant at both ages: the trimmer was indeed able to make a distinction between short and less short trimming. At 16 weeks 24 hens from each compartment were placed in battery cages (four hens pro cage).

Less short trimmed beaks often developed the appearance of a black bird beak. For laypeople it seemed as if only the bill tip, without nerves, was removed by touching. To be effective, however, such "touching" should be repeated every 14 days and should, therefore, be not only time consuming but would also be stressful. With short as well as less short trimming sense organs and nerve cells are removed and neuroma may develop. In this respect no difference in welfare damage seemed present between both trimming methods. We developed a method to score the quality of the beak on basis of 10 characteristics. The beaks of short trimmed hens had, at 16 and 42 weeks, a significantly lesser quality. This will decrease welfare in short trimmed hens. However, the plumage, scored on nine places, was at these ages significantly better at short trimmed hens than at the less short trimmed hens (the plumage of untrimmed hens being the worst). Short trimming had, thus, a better effect on the welfare of cage mates than less short trimming.

During the first week after trimming food intake and growth were significantly different for both groups (food intake short: 80.3%; less short: 83.9% of the untrimmed birds) (growth short: 66.5%; less short: 74.5%): trimming was a major intervention. With respect to welfare a better solution than trimming seems to be to adapt the genotype and the environment.

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A PRELIMINARY INVESTIGATION INTO THE EFFECT OF SUMMER TURNOUT RUGS ON BODY SURFACE TEMPERATURE OF GRAZING HORSES

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Summer rugs have risen in popularity over the past few years however very little is known about their effects on a horse's thermoregulatory status. When considering the numerous styles and types of rugs available to horse owners, it is perhaps surprising to note that there are no clear guidelines as to which rugs are the most suitable for use or even whether rugs are truly necessary.

The horse regulates temperature via several mechanisms and heat exchange with the surrounding environment takes place across the body surface. If a rug is placed on a large proportion of the body, the amount of surface available for heat exchange to take place decreases. This may lead to a situation where the horse sweats in order to control body temperature , perhaps leading to thermal discomfort.

A preliminary study was undertaken to investigate the effect of summer turnout rugs on surface body temperature in horses during grazing periods. Following a pilot study to identify the most appropriate site for attachment, data loggers (HAXO 8 Log Tag) were secured to the underside of each rug on the flank region of the horse and temperature (°C) was recorded during the trial.

Nine thoroughbred horses (age 8 ±3.5 yrs) wore each style of rug in a latin square design study over a period of 9 days. The rugs used in the study consisted of three varieties of lightweight rugs, all of the same colour which the horses wore for three consecutive days.

Rug A was a rain sheet (light blue in colour) Rug B was a fly rug which has a fine mesh appearance and a "control" rug; Rug C was a wide holed anti-sweat rug which was used as it allows the horse to be in as natural an environment as possible but allows for the data logger to be attached.

Data was tested for normality of distribution using the Kolmogorov Smirnov test and the surface body temperatures from each of the three rugs were compared using one way ANOVA with Bonferroni post hoc test. In all cases, significance was accepted at $p < 0.05$.

Significant differences ($p<0.001$) in temperature between the rain sheet and the anti-sweat and fly sheets were found with the rain sheet recording mean temperature of 35.6 ± 2.06 °C. The "control" rug recorded a mean temperature of 27.7 ± 1.05 °C.

This preliminary study identifies interesting results which are worthy of further research to investigate the effects of rugging, particularly in relation to comfort and welfare of the horse.

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ASSESSING WELFARE IMPLICATIONS OF VISUAL DYSFUNCTION IN DOGS THROUGH AN OWNER QUESTIONNAIRE AND BEHAVIOURAL ASSESSMENT OF BLIND AND SIGHTED ANIMALS. A PRELIMINARY STUDY

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Many owners of blind dogs question what the quality of life (QOL) of the dog will be without vision. Yet there is little evidence of the welfare implications of blindness in dogs. Here, through an owner questionnaire and a behavioural assessment of blind and sighted dogs, we attempt to assess the welfare implications of blindness in dogs.

Through a questionnaire of behavioural changes after blindness we sought to evaluate owners' assessment of their dog's QOL when blind. We asked questions concerning behaviour when interacting with other dogs and with familiar and unfamiliar people and behaviour in familiar and unfamiliar environments. Answers were summated to give a score of loss of quality of life (LoQol). 50 dogs were evaluated; 20 with blinding ocular disease, 20 with ocular disease leading to partial visual disturbance and 10 sighted dogs.

To determine welfare implications from the animals' own perspective, we evaluated the behaviour of blind and sighted dogs over a ten minute period in a clinical examination room. Initially behaviours of sighted dogs were described and then durations spent undertaking each of twelve behaviours (sitting, standing, lying, wandering, looking, staring, sniffing, tail wagging, ear raising, interacting with the observer, whining and barking) were documented in fifteen blind and fifteen sighted dogs. The attitude of the dogs was described, being defined as friendly, curious, playful, alert, subdued, aggressive and anxious.

LoQol scores were 1.7±1.3 for sighted dogs, 5.6±6.5 for partially sighted dogs and 14.4±5.8 for blind dogs. Blindness led to a reduced owner perception of quality of life, as demonstrated by a high LoQoL score ($p = 0.02$). Partially sighted dogs had a varying score overlapping with those of fully sighted and blind dogs ($p = 0.08$ compared to partially sighted dogs and 0.06 compared to blind dogs). Blind dogs had wide ranges of scores, suggesting either a variation in the success of coping with blindness or alternatively a wide variation in how owners perceived their dogs to be coping. This variation might be associated with the duration of blindness – anecdotal evidence suggests that dogs do become well adapted to their blind existence quite rapidly. The LoQoL scores were thus compared as a function of time the animal had been blind. While a trend was noted for the LoQoL score to become nearer to that of the visual dog as duration of blindness increased this was not statistically significant.

Durations spent undertaking different behaviours were only statistically significantly different for tail wagging ($p = 0.008$) and ear raising ($p = 0.03$). Subjective assessments showed a trend for blind dogs to be deemed less friendly and more anxious but larger numbers of animals need to be evaluated and observers need to be masked as to the visual status of the animals, although this is difficult.

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PIG WELFARE ASSESSMENT IN VETERINARY EDUCATION

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This project introduces two novel approaches to establishing the welfare status of farmed pigs: analysis of animal-based indictors using principal component analysis to establish pig-types (thus giving a greater understanding of what the animal may be experiencing); and, introduces the use of iceberg indicators - more specifically the tail status of the pigs - to simplify and streamline the assessment process.

Part of a BPEX funded studentship veterinary students were educated in animal welfare and then trained to assess welfare, using the RVC welfare protocol (developed with input from Bristol University by permission to incorporate animal-based welfare indicator components of the Bristol Welfare Assurance Plan in the RVC WP). The RVC WP measured animal-based parameters, resource provision and herd and health factors (Wright et al., 2009).

After training, the veterinary students assessed the welfare of pigs using the RVC WP whilst on their Animal handling extra-mural studies (two week) pig farm placement. One hundred and eighty four farms were included in the study, resulting in 337 assessments (10,000 individual animals assessed) of four production stages: outdoor sows; indoor sows; indoor weaners; and indoor grower-finishers. Results from this cross-sectional epidemiological study explore animal-based parameters and their predictors (using MLR) both as individual parameters and 'pig-types' established using PCA. It then explores the use of tail-status of pigs as a putative iceberg indicator.

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