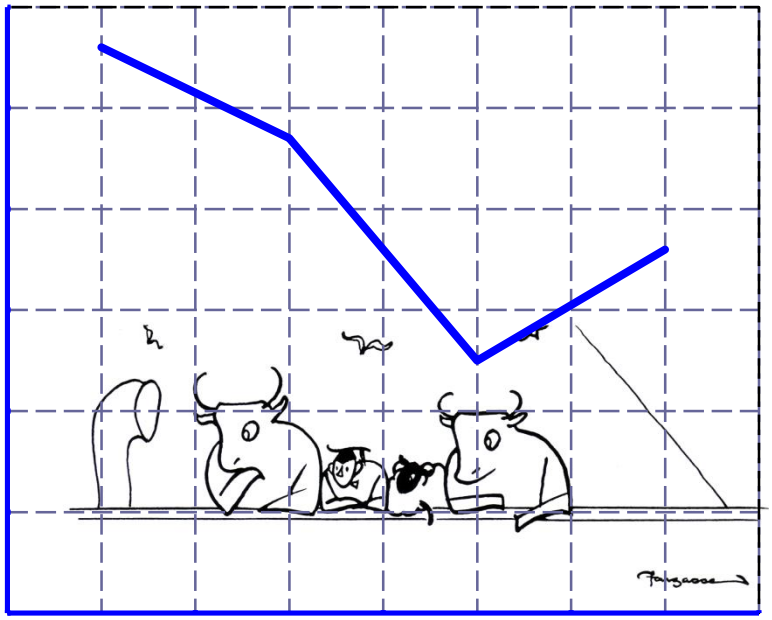
Recent advances in animal welfare science V



UFAW Animal Welfare Conference

23rd June 2016

The Merchant Adventurers' Hall, Fossgate, York, UK

UFAW
Established 1926

#UFAWYork16

Welcome to the UFAW Conference

The science of animal welfare is a cross-disciplinary field of research that aims to provide a sound basis on which to build guidance and find solutions to the challenges raised by our caring for and interactions with both kept and wild animals. As part of its on-going commitment to improving animal welfare through increased scientific understanding, UFAW is holding this, the fifth of our on-going series of one day conferences, to consider *'Recent advances in animal welfare science'*.

These conferences are intended to provide both a platform at which both established animal welfare scientists and others and those beginning their careers can discuss their work and a forum at which the broader community of scientists, veterinarians and others concerned with animal welfare can come together to share knowledge and practice, discuss advances and exchange ideas and views.

We hope that it achieves these aims and fosters links between individuals and within the community

Stephen Wickens, Robert Hubrecht and Huw Golledge
Organisers, UFAW

General Information

Organisers:

The Universities Federation for Animal Welfare (UFAW), the international animal welfare science society, is a UK registered scientific and educational charity that brings together the animal welfare science community, educators, veterinarians and all concerned about animal welfare worldwide in order to achieve evidence-based advances in the well-being of farm, companion, laboratory and captive wild animals, and for those animals with which we interact in the wild. UFAW works to improve animals' lives by:

- Promoting and supporting developments in the science and technology that underpin advances in animal welfare, eg through its programme of grants and awards.
- Promoting and supporting education in animal care and welfare, eg through its various scholarships and LINK scheme.
- Providing information, organising symposia, conferences and meetings, and publishing books, videos, technical reports and the international quarterly peer-reviewed scientific journal Animal Welfare.
- Providing expert advice to governments and other bodies and helping to draft and amend laws and guidelines.

UFAW is an independent registered charity and receives no funds from universities or government. UFAW relies on legacies, donations and member subscriptions to continue its work.

UFAW's philosophy: The importance of science to animal welfare

Ensuring good welfare is about more than ensuring good health. Animal welfare is about the quality of animals' lives: their feelings. It is now widely accepted, although it was not always so, that many species may be sentient - that is, they have the capacity to feel pain and distress, they can suffer and, conversely, be aware of pleasant feelings - and that this matters morally. But how do we assess, from the animal's point of view, what matters to them and how much? UFAW pioneered, and promotes and supports the scientific approach to gaining insight into what matters to animals, assessing their welfare and improving the quality of their lives through practical developments in all aspects of their care. Change for the better depends on knowledge, understanding and practical solutions. UFAW believes that good science can inform, motivate and facilitate that change - whether through developments in professional best practice, education or legislation – by providing a strong evidence base for changing attitudes and practices, and by creating practical and effective solutions to welfare problems.

For more details visit: www.ufaw.org.uk

Information about the Symposium venue:

The conference is being held in York, in the medieval Merchant Adventurers' Hall, Fossgate YO1 9XD, UK. Located next to the pedestrianised centre of York and built in 1357, the timbered Great Hall and Undercroft make up one of the best preserved medieval Guild Halls in the world.

The conference programme is a busy one and delegates are requested to take their seats in the Great Hall in plenty of time before the start of each session. These will start promptly at the time indicated and each speaker has been allocated five minutes for questions from delegates.

Delegates with any questions or queries should address these to the staff at the registration desk, by the main entrance on the ground floor of the Hall, in the first instance. Cloakroom facilities is available on request.

Catering:

Tea, coffee and other refreshments will be served in the Undercroft, where the posters are also displayed, at the times indicated in the timetable. Delegates are responsible, however, for making their own lunch arrangements. The centre of York, which is only a 2-3 minute walk to the north of the Hall, offers many different outlets serving a wide variety of foods.

Access to the wireless network:

The Hall has a wi-fi network for those who wish to access it. Codes as below:
Username: merchantshall
Password: time4tea

Safety:

In the event of a fire or other emergency, please leave via the nearest emergency exit. Emergency exits are clearly marked and are situated as follows:

Great Hall (2): 1. Main entrance and 2. Exit adjacent to the high dais.
Undercroft (4): 1 Main entrance, 2. North of Undercroft on the Piccadilly side, 3. Fossgate side adjacent to the Chapel and 4. Adjacent to the toilets.

Delegates should then go to the muster point, which is at the top of the steps leading from the garden to Piccadilly, and to which you will be directed to when exiting the building. A check that everyone attending the Symposium is present will then be made.

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Information on Presentations

Speakers:

All speakers must ensure that they have loaded a copy of their presentation on to the PC being used for the meeting in advance of the session in which they are to talk. This PC will be at the front of Great Hall on the 1st floor. As a guide, we would expect anyone speaking in the morning to have uploaded their talk during initial registration, which is from 8.30am, and the remaining speakers to upload their talks during the subsequent refreshment and lunch breaks.

All talks should be formatted to run on Microsoft PowerPoint and saved onto a memory stick. Each should be named so that they begin with the surname of the person presenting the talk.

Posters:

Posters will be displayed in the Undercroft, on the ground floor of the Hall. Access to set up a poster is from 8.30 am and all posters should be in place before the start of the conference at 9.15 am. All must be taken down before the end of the conference at 5.30 pm and preferably by the end of the afternoon refreshment break

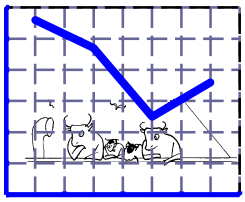
The poster boards that will be used for the UFAW conference in York will accommodate A0 portrait size posters (ie 1189mm high x 841mm wide) and will be mounted on these using velcro fastenings. Spare velcro will be provided for those who need it on the day

During the poster session, which is scheduled to begin at 1.30pm, authors have been asked to make themselves available to answer questions about their work. Accordingly those contributing posters are asked to ensure that at least one of the contributing authors is standing nearby their poster during this session.

Badges:

Delegates with a special role to play in the Symposium have been allocated a coloured badge, as follows:

Blue	**Organisers and helpers**
Yellow	**Speaker**
Pink	**Poster presenter**



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UFAW Animal Welfare Conference

York Merchant Adventurers' Hall UK, 23rd June 2016

Timetable

8.30 – 9.15 Registration and poster set up

9.15 – 9.25 Introduction to meeting		
	Hubrecht R UFAW, UK	Welcome and Introduction

9.25 – 10.50 Session 1 Chair: Prof A Tribe (University of Queensland)		
9.25	**Collins L** University of Lincoln, UK	Finding the individual in the crowd
9.50	**Di Giminiani P, EM Malcolm, A Scollo, F Gottardo, SA Edwards and MC Leach** Newcastle University, UK	Development of a piglet grimace scale to assess tail docking and castration pain
10.10	**Lund VP, LR Nielsen and B Forkman** University of Copenhagen, Denmark	Risk factors associated with dead-on-arrival broilers in Denmark
10.30	**O'Neill DG , S Jarvis, AJ Craven, C Boyd, DB Church, PD McGreevy, PC Thomson and DC Brodbelt** The Royal Veterinary College, UK	Undesirable behaviours in dogs: gaining new perspectives from primary-care veterinary clinical data

10.50- 11.30 Break: Refreshments

11.30 – 12.50 Session 2 Chair: Dr L Collins (University of Lincoln)		
11.30	**Liu NC, L Kalmar, E Troconis, V Adams, J Ladlow and D Sargan** University of Cambridge, UK	Computer directed objective assessment of brachycephalic obstructive airway syndrome allows improved accuracy in diagnosis and analysis of the condition
11.50	**Poirier C, A Thiele and M Bateson** Newcastle University, UK	Neurobiological assessment of well-being in adult laboratory macaques: effect of weaning age
12.10	**Collins S, CC Burn, JM Cardwell and NJ Bell** The Royal Veterinary College, UK	Improving the feasibility of welfare outcome assessments for dairy herds – Exploring the potential of 'iceberg indicators
12.30	**UFAW Award Presentations**	UFAW Medal for 'Outstanding Contribution to Animal Welfare Science' UFAW 'Young Animal Welfare Scientist of the Year'

12.50 – 14.30 Lunch – poster session from 13.30

14.30 – 15.55 Session 3 Chair: Prof L Green (University of Warwick)		
14.30	**Paul ES and MT Mendl** University of Bristol, UK	A natural history of animal sentience
14.55	**Goldhawk C, M Salois and R Cady** Elanco Animal Health, USA	Sustainability and animal welfare: example of antibiotic and anticocciostats use in US broiler production
15.15	**Herborn KA, JGA Braid, RG Nager, DEF McKeegan and DJ McCafferty** Newcastle University, UK	Thermal imaging as a novel, non-invasive tool for welfare assessment in hens
15.35	**Roe, E, GF Davies, BJ Greenhough, P Hobson-West and RGW Kirk** University of Exeter, UK	Developing a collaborative agenda for humanities and social scientific research on laboratory animal welfare

15.55– 16.30 Break: Refreshments

16.30 – 17.30 Session 4 Chair: Dr L Asher (University of Newcastle)		
16.30	**Goerlich-Jansson VC, EMA Langen and N von Engelhardt** University of Utrecht, The Netherlands	Subtle effects of the social environment on endocrine profiles in Japanese quail (*Coturnix c. japonica*)
16.50	**McMillan FD** Best Friends Animal Society, USA	Psychological harm of large-scale commercial breeding practices to adult breeder dogs and the puppies
17.10	**Gualtieri F, G Longmoor, JM George, DF Clayton, RB D'Eath, V Sandilands, T Boswell and TV Smulders** Newcastle University, UK	Developing and validating a practical screening tool for chronic stress in livestock

17.30 End

SCIENTIFIC PROGRAMME:

Speaker Abstracts

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FINDING THE INDIVIDUAL IN THE CROWD

LM Collins

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Animal welfare is at heart a science of the individual. The propensity of individuals to suffer is central to our understanding and quantification of welfare issues. However, the scales of the systems studied in animal welfare science can be wildly different – from individual dogs presenting with behavioural problems at a clinic, to problems across an entire species, breed, or line that can add up to billions of animals worldwide. At each level of measurement, there are complexities of appropriate indicators, their sensitivity, specificity and reliability across different or dynamic contexts. The scalar properties of welfare measurement at different levels have commonalities with natural fractal-like entities, such as a snowflake or a stretch of the Cornish coastline, with self-similar complexities apparent across magnifications. However, where there are differences, such as the difficulty in finding an indicator that is appropriate for measuring welfare at all levels within a species, can we use lessons from fractal analysis to help us decide where to look for the most appropriate indicators in future?

In this presentation, I will consider the welfare problems of the individual, discussing how developments in the field of animal personality have led us to uncover personality-related differences in response to welfare hazards, including the propensity for individuals to express pain. Measuring welfare at this level is a clear reminder that individuals are indeed individual, and assumptions of uniformity are unfounded. From here, I will 'zoom out' to look at groups, then eventually populations of animals, and consider how we can avoid losing the individual when considering welfare at scale. What issues do we encounter when we project up from one to a million, and what do we currently miss by doing so? I will discuss the dual philosophy of individuals in groups, the issues and benefits of a multi-scale perspective in animal welfare, and consider the ways in which we could approach an individualised approach to population-level measures of welfare.

DEVELOPMENT OF A PIGLET GRIMACE SCALE TO ASSESS TAIL DOCKING AND CASTRATION PAIN

P Di Giminiani [1], EM Malcolm [1], A Scollo [2], F Gottardo [2], SA Edwards [1] and MC Leach[1]

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[2] Dipartimento di medicina animale, Università degli studi di Padova, Padova, Italy
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The surge of interest towards the application of the mouse grimace scale to laboratory animals has prompted its recent adaptation to larger species. We have explored the development of a Facial Action Coding System to assess pain evoked by routing husbandry procedures in commercial pigs, with a particular focus on tail docking and surgical castration without pain relief.

Video recordings of 3-days old piglets undergoing tail docking by cautery (n=8) were obtained by confining the animals in pairs in a custom-built observation arena. Four high definition cameras were placed at equal distances around the arena and recorded the piglets at head-height. Video recording occurred before and immediately after tail docking with each recording session lasting 5 minutes. For the piglets undergoing castration (n=15), images were collected from 4-day old piglets before and immediately following the procedure, with the animals photographed while being held with support of the sternum and hindquarters.

At each time point, 4 clear photographs were extracted from the tail docking videos and were combined with 1 photograph of piglets undergoing castration to compile a scorebook, which was then distributed to 30 observers with different degrees of experience and knowledge on pigs. All observers were blinded to the details of the images.

For each photograph, the following 10 potential facial action units (FAUs), identified in a pilot study, were scored on a 3-point scale (0=absent, 1=moderately present, 2=obviously present, 9=unsure/not visible): temporal tension, forehead profile, orbital tightening, tension above the eyes, cheek tension, upper lip contraction, lower jaw profile, snout angle, snout plate changes and nostril dilation.

The median scores obtained from all observers for each action were compared pre vs. post-treatment with a Wilcoxon Signed-Rank test. Inter-rater reliability was assessed by interclass correlation coefficient (ICC) analysis.

Preliminary results indicate that "orbital tightening" may be the only FAU significantly changing after tail docking with all observers assigning a higher score post-docking ($p=0.041$). For both procedures, an average ICC of 0.93 was recorded, suggesting a generally high level of agreement among observers in terms of the scores provided.

The change in "orbital tightening" is consistent with previous findings in other species. The absence of significant changes in other FAUs warrants further analysis to evaluate whether alternative FAUs should be identified at this stage of development or whether the recorded units should be related to the individual variability in facial morphology of pigs within the first days of their lives.

RISK FACTORS ASSOCIATED WITH DEAD-ON-ARRIVAL BROILERS IN DENMARK

VP Lund, LR Nielsen and B Forkman

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In Denmark, 100 million broilers are annually transported to slaughter. Risk factors for Danish broilers being dead-on-arrival to the slaughterhouse (DOA) have not previously been investigated. The objective was to investigate the associations between high DOA prevalence (DOA %) and farm, transportation and slaughterhouse conditions.

We used a retrospective, longitudinal observational study involving all conventional broiler flocks transported to three broiler slaughterhouses (approx. 96% of all slaughtered broilers) in Denmark in 2011-2014. Production data collected from the hatchery and during the rearing period, harvesting and transport, meat inspection data and meteorological data were retrieved from the Danish Quality Assurance in the Broiler Production database (KIK) and the Danish Meteorological Institute. A multivariable generalized mixed effects model was developed to analyse the effects of these factors while taking into account the hierarchical data structure.

High DOA% was defined as the 15% highest DOA% observed (i.e. >0.342%). The results showed that broiler flocks not previously thinned (n=5,281) and transported to slaughterhouse B (OR= 2.9) or C (OR=3.9) had significantly higher odds of having a high DOA% compared to flocks transported to slaughterhouse A. Flocks transported in high average ambient temperatures, i.e. >20˚C (OR=3.9) or 15-20˚C (OR=1.8) or low temperatures, i.e. -5-0˚C (OR=2.4) or <-5˚C (OR=3.1) had significantly higher odds of having high DOA% compared to flocks transported in 0-15˚C. Longer distance travelled by road was strongly associated with higher odds of high DOA%. Significant predictors with less impact on the probability of high DOA% included: time of day of harvesting, time in lairage, mean wind speed, % broilers condemned for disease-related reasons, % broilers found dead in house at catching, % runts, as well as age-adjusted average bird weight at slaughter and parent flock age.

The farm level was the main variance component, indicating that herd level management plays an important role and that other farm-level factors not captured by the model contribute to the risk of high DOA%. Farm related risk factors (measured on the day of slaughter) generally had a lower effect on risk of high DOA% than transport and slaughterhouse factors (known prior to the day of slaughter). This suggests that prediction of high DOA% based on slaughterhouse and transport factors may be possible. However, our predictions for flocks slaughtered in 2014 based on the available data from 2011-2013 had low sensitivity (<0.20) at reasonable specificity (>0.94) varying according to slaughterhouse and between flocks subjected to thinning or not.

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UNDESIRABLE BEHAVIOURS IN DOGS: GAINING NEW PERSPECTIVES FROM PRIMARY-CARE VETERINARY CLINICAL DATA

DG O'Neill [1], S Jarvis [3], AJ Craven [3], C Boyd [3], DB Church [1], PD McGreevy [2], PC Thomson [2] and DC Brodbelt [1]

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Undesirable behaviours (UBs) in dogs include responses that humans dislike and that represent a welfare concern either because of the motivation underlying the behaviour or how the owner may elect to resolve the situation. UBs can be clinically normal or abnormal expressions of behaviour (e.g. vocalisation versus tail chasing) and their undesirability often reflect owners' perceptions on normality and appropriateness. UBs have been reported as the commonest cause of death/euthanasia in dogs aged <3 years and their manifestation may result from combinations/interactions between genetic (e.g. breed, bodysize) and environmental (e.g. neutering) effects.

Three approaches were taken to examine UBs using the large-scale collection of UK veterinary clinical data via the VetCompass Programme (with over 450 practices and over two million dogs).

1. A random sample of 2,924 dogs aged <3 years were selected. The prevalence of UBs was 17.9% (95% CI 16.5-19.3). Aggression was the most commonly reported UB overall: (8.6%, 95%CI 7.6-9.6). Rottweilers showed 2.3 times the odds (95%CI: 1.3-4.3, P=0.006) of UB compared with crossbred dogs. Male dogs had 1.8 times the odds of UB compared with females, and larger dogs had greater odds compared with smaller dogs.
2. The clinical records of 1,591 dogs that died and 1,113 dogs that were relinquished <3 years old were examined to assess outcomes from UB. Of dogs that died and had a reason recorded (n=1,421), 36.2% died because of UB. Staffordshire Bull Terriers had 2.1 times the odds (95%CI: 1.4-3.0, P<0.001) of UB-related death compared with crossbreds. Males had 1.5 times the odds (95%CI: 1.2-1.9, P<0.001) of UB-related death compared with females. Of the relinquished dogs with a reason recorded (n=307), 24.8% (95%CI 19.9-29.63) were relinquished mainly because of UB. Males had 2.2 times the odds of UB-related relinquishment compared with females.
3. A list of behavioural modification drugs was created and the VetCompass database was searched for dogs of any age that received at least one of these drugs. Of 104,233 dogs, 1.0% (95% CI 1.0-1.1) received psychopharmaceuticals at least once for a UB. The most common drugs prescribed were phenobarbital (30.0%), diazepam (29.6%) and acepromazine (10.0%). Male dogs had 1.3 times the odds (95%CI 1.1-1.6) of pharmacological behaviour therapy compared with females.

This investigation highlights UBs as an important component of the veterinary caseload, with a high prevalence and significant influence on death/euthanasia or relinquishment outcomes. Pharmacological measures to control UBs are relatively common in dogs.

COMPUTER DIRECTED OBJECTIVE ASSESSMENT OF BRACHYCEPHALIC OBSTRUCTIVE AIRWAY SYNDROME ALLOWS IMPROVED ACCURACY IN DIAGNOSIS AND ANALYSIS OF THE CONDITION

NC Liu [1], L Kalmar [1], E Troconis [1], V Adams [2], J Ladlow [1] and D Sargan [1]

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[2] Vet Epi Ltd., Birmingham Business Park, Birmingham, UK
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Brachycephalic Obstructive Airway Syndrome (BOAS) is a major welfare problem for a proportion of short skulled dogs, causing exercise intolerance, overheating, sleep disturbance, regurgitation and cyanosis. However, diagnosis is conventionally based simply on auscultation and clinical history, and this suffers from differences in interpretation between different veterinarians, so that some dogs will be regarded as normal by some vets but affected by others. We have published our use of whole body barometric plethysmography (WBBP) on unsedated French bulldogs to measure respiratory flow waveforms in dogs that had been graded for exercise tolerance, and developed a quadratic discriminant analysis (QDA) to categorise dogs as BOAS- or BOAS+ based on waveform characteristics.

Here QDA analysis for BOAS is extended to two further breeds. Groups of 100 pugs and 66 bulldogs with varying exercise tolerance, drawn both from clinical BOAS cases and from show dogs and other dogs in the pet population, together with control mesaticephalic dogs were used to train QDA using resting respiratory traces. These breed-specific respiratory QDA can distinguish BOAS unaffected (exercise tolerant, grade 0) dogs of each breed from mesaticephalic dogs and from the other two brachycephalic breeds tested. Breed specific QDA give >94% accuracy within breed in predicting discriminating BOAS+ from BOAS- dogs (as assessed using comparison with exercise tolerance data from the same animals). A "combined" QDA developed by comparing BOAS+ and BOAS- in any breed is only slightly less accurate than the individual breed QDAs (>91%).

We have now collected WBBP traces from more than 740 brachycephalic dogs of these three breeds and more than 100 mesaticephalic controls in body weight matched groups. We have used the QDA tools to develop a "BOAS Index", a quantitative measure of respiratory function, which can be used to track disease progress. We have used this group of objective BOAS assessment tools to demonstrate significant response to particular surgical interventions such as turbinectomy; to confirm the importance of stenotic nares and of obesity in functional BOAS; to show a number of conformational markers associated with BOAS in one or more breeds and to begin molecular genetic analysis of the condition using genome wide association studies.

After QDA validation of the exercise test for BOAS it has been adopted as a health screen by the UK French bulldog club, and we are trying to interest other brachycephalic breed clubs in its adoption.

NEUROBIOLOGICAL ASSESSMENT OF WELL-BEING IN ADULT LABORATORY MACAQUES: EFFECT OF WEANING AGE

C Poirier, A Thiele and M Bateson

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Depression in human beings is associated with a volume reduction of several brain regions including the hippocampus. Three recent post mortem findings suggest that a similar association is present in macaques. First, female cynomolgus macaques spontaneously displaying depressive symptoms (collapsed body posture with eye open, relative lack of responsiveness to environmental stimuli) are characterised by a reduced volume of the anterior hippocampus compared to non-depressed animals. Second, chronic social separation during adulthood induces an increase of depressive symptoms and a decrease of neurogenesis in the anterior part of the hippocampus of bonnet female macaques. Third, these latter changes can be fully prevented by administration of anti-depressant drugs. These findings validate the volume of the anterior hippocampus as a relevant biomarker of well-being in macaques. Volume of the hippocampus can be measured post-mortem or in vivo using non-invasive neuroimaging techniques, raising the possibility that anterior hippocampus volume could be used as a sensitive biomarker to monitor welfare longitudinally. Using magnetic resonance imaging (MRI), we tested the hypothesis that weaning age - a strong predictor of adult health and welfare outcomes in macaques - could influence the volume of the anterior hippocampus of adult monkeys. A multiple linear regression analysis revealed a significant correlation between weaning age (range: 6 to 18 months) and the volume of the right anterior hippocampus. This finding adds strength to previous research suggesting that anterior hippocampus volume could be a biomarker of welfare. Data on humans and rodents suggest that the hippocampus volume reflects not only the amount of stress experienced by a subject but also its susceptibility to future stress. The described weaning age effect is thus likely to reflect the impact of a major stressor (early weaning) but also the cumulative effect of consequent reduced health and welfare over the lifespan.

IMPROVING THE FEASIBILITY OF WELFARE OUTCOME ASSESSMENTS FOR DAIRY HERDS – EXPLORING THE POTENTIAL OF 'ICEBERG INDICATORS'

S Collins, CC Burn, JM Cardwell and NJ Bell

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Welfare outcome assessment is a highly valid means of assessing animal welfare. The process is very time-consuming to undertake, however, and this acts as a major barrier to its widespread use on-farm. The postulated existence of 'summary measures' of animal welfare (or so-called 'iceberg indicators') has been suggested as a possible means of improving welfare outcome assessment feasibility – in that, they could be used to replace lengthier multi-measure assessments without compromising overall assessment robustness. Research into the possible existence of such indicators, however, is currently very limited. The present study sought to identify potential iceberg indicators of dairy herd welfare by investigating whether any individual welfare outcome measures (e.g. herd mobility) could be used to predict the 'overall welfare status' of herds. To achieve this, a cross-sectional study of dairy herd welfare was undertaken on 51 dairy farms in the south/midlands of England. Comprehensive assessments featuring 96 individual welfare outcome measures were undertaken. Welfare outcomes data were summarised at the herd level (e.g. the percentage of lame cows) and then aggregated into a 'composite overall welfare score' using Principal Component Analysis. The extent to which the individual welfare outcome measures predicted the herds' composite overall welfare score was investigated using linear regression analysis. This revealed that 22 of the welfare outcome measures investigated were significantly associated with the herds' composite overall welfare score. The predictive performance of the different welfare outcome measures was then compared using categorical agreement statistics (Cohen's Kappa statistic and Kendall's coefficient of concordance). This analysis indicated that the percentage of lame cows and some Qualitative Behaviour Assessment measures were comparatively most successful at predicting the composite overall welfare score. Overall, however, absolute agreement (even for these measures) was at best only moderate. These findings, the methodological approach used, and the potential of the iceberg indicators concept for improving the feasibility of welfare outcome assessments, will be critically discussed. In particular, the many theoretical and practical challenges associated with the process of identifying iceberg indicators in practice – for example, our ability to accurately determine a dairy herds' overall welfare status – will be considered.

UFAW MEDAL FOR 'OUTSTANDING CONTRIBUTION TO ANIMAL WELFARE SCIENCE' AND UFAW 'YOUNG ANIMAL WELFARE SCIENTIST OF THE YEAR'

The **UFAW Medal for Outstanding Contributions to Animal Welfare Science** is a prize award to recognise the exceptional achievements of an individual scientist who has made fundamental contributions to the advancement of animal welfare over a number of years. The award is open to individuals whose research, teaching, service and advocacy has had international impact and significantly benefited the welfare of animals. Previous winners have been:

- 2015 Professor David Mellor (Massey University, New Zealand) and Professor Georgia Mason (University of Guelph, Canada)
- 2014 Professor Mike Mendl (University of Bristol, UK) and Professor David Fraser (University of British Columbia, Canada)
- 2013 Professor John Webster (University of Bristol, UK) and Professor Peter Sandøe (University of Copenhagen, Denmark)
- 2012 Professor Christine Nicol (University of Bristol, UK) and Professor Marian Stamp Dawkins (University of Oxford, UK)
- 2011 Professor Ian Duncan (University of Guelph, Canada)

The **UFAW Young Animal Welfare Scientist of the Year Award** is a prize that recognises the achievements of young scientists who have made significant contributions to improving the welfare of animals. The award is open to students who are currently studying for a doctoral degree and to individuals who are within six years of the end of their PhD work.

Previous winners have been:

- 2015 Dr Jasmeet Kaler (University of Nottingham, UK)
- 2014 Dr Lisbet Pluym (Ghent University, Belgium)
- 2013 Dr Nuno Franco (Institute of Molecular and Cell Biology, Porto, Portugal)
- 2012 Dr Charlotte Burn (The Royal Veterinary College, UK)
- 2011 Dr Lucy Asher (University of Nottingham, UK), Dr Emma Baxter (Scottish Agricultural College, UK) and Dr Lisa Collins (Queen's University Belfast, UK)

A NATURAL HISTORY OF ANIMAL SENTIENCE

ES Paul and MT Mendl

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Sentient creatures are ones that have a capacity for feeling; they have the potential to suffer and it is valid to be concerned about their welfare. But the problem with sentience is that it is difficult and problematic to make assumptions about. If we assume that a particular species is sentient, we can be accused of being unparsimonious in our explanations of its behaviour and anthropomorphic in our inferences. If we assume that it isn't, we may find ourselves denying the moral status of an ethically relevant being.

We argue here that one pragmatic assumption can and should be made about sentience – that it evolved. Taking this simple step allows us to think about sentience as a biological phenomenon that is present in humans and is likely to have antecedents in many other animal species. Even if a completely human-like sentience is not a part of the biological make up of many animals, facets of sentience may be present, and evidence for these facets can be sought.

In recent years, the study of human consciousness has grown exponentially. Experimental studies of the neural and functional correlates of people's subjective experiences have allowed researchers for the first time to start to develop an understanding of the neural architecture involved in some aspects of conscious processing, and of the functions these experiences may have in determining our behavioural choices. We propose a "natural history of sentience", arguing that certain human decision processes work, and work better, thanks to being done consciously rather than non-consciously. We go on to consider whether and in what forms such processes can be observed in non-human animals, and review how empirically-based conclusions about animal sentience may tally with socially constructed beliefs about sentience in scientists and lay observers alike.

SUSTAINABILITY AND ANIMAL WELFARE: EXAMPLE OF ANTIBIOTIC AND ANTICOCCIOSTATS USE IN U.S. BROILER PRODUCTION

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The projected increase in demand for animal protein, based on global population growth and dietary preferences, has elicited a plethora of debate over the sustainability of current food production systems. These debates include ensuring adequate safeguarding of animal welfare while considering other social, environmental, and economic factors. The discussion of sustainable food supply has been coupled with a rising consumer concern over how their food is produced and a global conversation about responsible use of antibiotics. To inform debates around sustainable food production, it is important to have robust evaluations of animal welfare, environmental, and economic considerations related to antibiotic use.

In this evaluation, the U.S. broiler industry was used as an example to evaluate components of animal welfare, environmental, and economic implications of complete removal of antibiotics & anticoccidiostats from poultry meat production, using industry data as well as a simulation model. Systems were defined as inclusive (ABCI) or 100% antibiotic-anticoccidiostat-free (ABCF; no antibiotics or anticoccidiostats used in production). Health was the main welfare parameter evaluated.

ABCF production, more birds were required to supply the same amount of meat, with a typical ABCF broiler house requiring 15,000-33,000 more broilers per year. Results indicated a 215% and 15% increase in the odds of corneal ammonia burns and burned feet, respectively, with ABCF production ($P < 0.01$). The use of ABCF production practices also required additional land, water, and feed, and produced more manure per broiler housing unit.

The current study is limited to comparison of the sustainability implications of use or elimination of antibiotics in broiler production within one geographic region. Responsible use of antibiotics is of utmost importance to safeguarding animal welfare in both current and future animal populations, due to the important role in supporting the prevention and treatment of disease, which in turn reduces the risk of suffering and distress. The results, however, highlight the dynamics of animal welfare relative to other sustainability considerations and the need for comprehensive management of food animals to ensure a sustainable food supply that safeguards animal welfare.

THERMAL IMAGING AS A NOVEL, NON-INVASIVE TOOL FOR WELFARE ASSESSMENT IN HENS

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Reliable measures of stress and affective states are essential to animal research, and to improving animal welfare. Stress and different emotions elicit physiological processes that alter the distribution of heat around the body, so body temperature measurement may be a valuable and underused tool in welfare assessment. Under acute stress, for example, body core temperature increases. Termed 'stress-induced hyperthermia' (SIH), this core warming is proportional to stressor intensity, allowing the objective quantification of stress, but at the welfare cost of inserting or implanting a thermal probe. Core warming, however, is in part due to the influx of warm peripheral blood that occurs with stress-induced vasoconstriction in the skin, which causes a simultaneous drop in surface temperature. And with recovery, excess core heat is dissipated through the skin. Inverse to core changes, acute stress should also, therefore, be observed as a drop, recovery and increase in skin temperature. As such, recent advances in thermal imaging technology, which allows skin temperature measurement in unrestrained and uninstrumented animals, open new and, importantly, non-invasive avenues in animal welfare research. We used chickens (*Gallus gallus domesticus*) as a model to demonstrate the potential of this new approach. Firstly, comparing skin temperature following a mild or more severe form of an acute handling stressor, we demonstrate, for the first time, that this skin temperature response is proportional to stressor intensity, thus not only indicates but can be used to quantify stress. Whilst there is an expected pattern in temperature change under acute stress, predictions with regards to chronic stress and affective states are contradictory and little explored. Thus secondly, we discuss inter-individual variation in baseline skin temperature, and how this correlates to personality, corticosterone levels and living in a barren versus enriched environments, to explore potential links with chronic stress. Finally, we examine acute changes in skin temperature during a rewarding versus frustrating foraging paradigm, to demonstrate the capacity of this technique to capture intensity in contexts with positive valence. As thermal imaging technology becomes more widely available, we anticipate that this novel, non-invasive and objective method will be applied broadly in pure and applied animal research.

DEVELOPING A COLLABORATIVE AGENDA FOR HUMANTIES AND SOCIAL SCIENTIFIC RESEARCH ON LABORATORY ANIMAL WELARE

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This paper proposes that progress in laboratory animal welfare will be facilitated by both scientific enquiry and studies in the humanities and social sciences. Scientific research provides the evidence to replace, reduce and refine (3Rs) procedures involving laboratory animals, while social science and humanities can help foster understanding of the social, political, economic and other processes that enhance or impede humane ways of knowing and working with laboratory animals. However, this work is currently distributed across disciplines and institutions with differing norms for framing questions, disseminating results and engaging users. In addition, humanities and social scientific research on laboratory animals is rarely visible to scientists and policymakers. To facilitate dialogue and future research at this interface, this paper will present the results of a collaborative process, led by the paper authors, identifying the top 30 questions concerning laboratory animal science and welfare, which can be met by new research in collaboration with the humanities and social sciences. Building on prior agenda-setting exercises in conservation ecology and science policy, an interdisciplinary group of 45 social and life scientists, humanities scholars, non-governmental organisations and policy-makers worked through a structured research prioritization process, based on principles of inclusivity, openness and deliberation. Participants were recruited, submitted questions and voted on their priorities before meeting. An interactive workshop, held in the UK, enabled participants to discuss all 136 questions submitted and define their 30 most important issues. The outcomes demonstrate a need for new research in the humanities and social sciences to inform emerging discussion and priorities in the practice and governance of laboratory animal research, including around the international regulation of laboratory animal research, openness and public engagement, 'cultures of care', harm-benefit analysis and the future of the 3Rs. The discussion this process generated underlines the value of interdisciplinary exchange for improving mutual understanding of different research cultures and identifies ways of enhancing the effectiveness of future research at the interface between the humanities, social sciences, science and policy aimed at furthering laboratory animal welfare.

SUBTLE EFFECTS OF THE SOCIAL ENVIRONMENT ON ENDOCRINE PROFILES IN JAPANESE QUAIL (*COTURNIX C. JAPONICA*)

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The social environment is a powerful modulator of behaviour and physiology, thereby setting the context for the welfare status of an individual. In birds, independent studies have shown that social density affects both circulating hormones in breeding females and deposition of hormones to the yolk. Yolk hormones influence the development of the offspring and represent an important pathway through which maternal effects are established, potentially preparing the offspring for the environment it is born in.

In this project we combined the above aspects to further explore in which way the social environment influences hormone mediated maternal effects and offspring phenotype in Japanese quail (*Coturnix c. japonica*).

The experiment followed four generations to test the scope of grand-/maternal effects and investigate whether the offspring phenotype was adjusted to the maternal environment. The two treatment groups in the parental generation (P0) consisted of one female and one male (pair treatment) or three females and one male (group treatment) housed together. The F1 offspring generation was housed under social conditions that either matched or differed from the maternal treatment, while birds in the F2 and F3 generation were all kept in groups. In each generation we performed behavioural (e.g., emergence test, tonic immobility) and physiological (e.g., stress protocol, yolk hormones, fecundity) tests to correlate phenotypes between mothers and daughters

Egg laying and fertilization rate were slightly higher in females kept in pairs, though the number of F1 chicks did not differ. P0 pair females had significantly higher baseline plasma concentrations of testosterone (T) and slightly elevated corticosterone (CORT), but did not respond differently to a stress challenge. Despite the elevated plasma T levels in pairs, average yolk T concentrations did not differ between treatments. We did not find correlations between maternal hormone levels and offspring behaviour nor did (grand-) maternal treatment predict offspring behaviour.

Our analyses show subtle effects of the social environment on female reproduction and hormonal state, though this does not seem to result in strong transgenerational effects. Japanese quail have been domesticated for decades, therefore might be coping well with different social conditions.

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PSYCHOLOGICAL HARM OF LARGE-SCALE COMMERCIAL BREEDING PRACTICES TO ADULT BREEDER DOGS AND THE PUPPIES

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Commercial breeding establishments (CBEs, also commonly referred to as "puppy farms" or "puppy mills") are large-scale facilities where dogs are confined in small enclosures for their entire reproductive lives with little to no exercise or positive human contact—for the sole purpose of mass-producing puppies to sell for profit through retail pet stores and via the Internet. We recently conducted two large-scale studies of dogs from CBEs – the adult breeding dogs as well as the puppies sold through pet stores.

Study 1: The adult breeding dogs – This study compared a wide array of psychobehavioural characteristics of 1,169 dogs formerly kept for breeding purposes in CBEs with pet dogs owned by members of the general public. The results showed a broad range of abnormal behavioural and psychological characteristics in the former breeding dogs, including: significantly elevated levels of fears and phobias, pronounced compulsive and repetitive behaviours such as spinning in tight circles and pacing, house soiling, and a heightened sensitivity to being touched and picked up. It was determined from this study along with an unpublished follow-up study that the psychological harm demonstrated in these dogs is severe and long-lasting and that while much of the harm is recoverable much is irreparable and will remain a continued source of suffering for years after the dogs leave the breeding facility, in some cases for the entire lifetime of the dog.

Study 2: The puppies – This study compared the psychobehavioural characteristics of 413 adult dogs that were purchased as puppies from pet stores with adult dogs purchased as puppies from small-scale, noncommercial breeders (NCBs). Compared with dogs obtained as puppies from NCBs, dogs from pet stores exhibited significantly greater aggression toward human family members, unfamiliar people, and other dogs; greater fear of other dogs and typical life events; and greater separation-related problems and house soiling. For no behaviour evaluated in the study did pet store dogs score more favorably than NCB dogs. The study showed that as compared to dogs obtained as puppies from NCBs, obtaining dogs from pet stores represents a significant risk factor for the development of a wide range of undesirable behavioural characteristics.

Overall, the evidence from the two studies showed conclusively that large-scale, mass-production breeding facilities are highly injurious to both groups of dogs, resulting in severe, extensive, and long-term harm to the animals' behavioural and psychological well-being.

DEVELOPING AND VALIDATING A PRACTICAL SCREENING TOOL FOR CHRONIC STRESS IN LIVESTOCK

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Poor animal welfare can be caused by an accumulation of many stressors over a long period of time and some measurements of acute stress responses like corticosterone levels might not reveal the real welfare state. In mammals, adult hippocampal neurogenesis (AHN) is suppressed by cumulative chronic stress, a process mediated by elevated corticosterone (Cort) levels. Positive experiences, on the other hand, increase AHN with a process that also involves elevated Cort levels. With this study our aims were i) to test whether AHN in poultry is also sensitive to cumulative chronic stress and ii) to develop a quick and reliable way to quantify chronic stress in poultry.

For this study 64 HyLine Brown hens, aged 19-26 week were used. Animals were assigned to the following treatments: Control-Water (CW), Control-Corticosterone (CC), Stressed-Water (SW) and Stressed-Corticosterone (SC). Randomized and unpredictable stressors were used for SW and SC and designated pens received Cort (20 mg/l) dissolved in drinking water. We measured a range of previously-used stress markers, markers of AHN and gene expression profiles in the hippocampus.

Blood from hens was collected at three time points (before, during and after Cort treatment). Cort treatment increased plasma Cort titres, but chronic stress did not. Cort treated animals also had higher Heterophil/Lymphocyte ratios, but this marker of the immune system's response to stress failed to show any effects of the stress treatment. Conversely, stressed animals had more prolonged durations of tonic immobility compared to the non-stressed group and this measure did not respond to the Cort treatment. We are currently still quantifying AHN in the hippocampus of these chickens and will present the results at the meeting. However, RNA sequencing of all genes expressed in the avian hippocampus identified a group of 5 genes whose combined expression levels allowed us to completely discriminate between stressed and control animals. These genes' functions are related to vascular inflammation. We need to validate this finding by quantifying these genes' expression levels independently, testing how they respond to Cort treatment, and verifying their anatomical expression patterns.

We conclude that the avian hippocampus is sensitive to chronic stress. Quantification of a small number of genes expressed in the hippocampus could represent an alternative, possibly more reliable, way to quantify chronic stress in poultry and potentially in other animals as well.

SCIENTIFIC PROGRAMME:

Poster Abstracts

The International Animal Welfare Science Society
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Posters:

- **Alabi OM, FA Aderemi, MO Ayoola and SO Akinoso** (Bowen University and University of Ibadan, Nigeria; University of Stellenbosch, South Africa)
  Alternative housing systems; influence on performance characteristics of egg-type chickens in humid tropics
- **Andre ES JH Guy, AP Beard, W Taylor and MA Velazquez** (Newcastle University, UK)
  Do episodes of maternal production disease have a negative impact on health and welfare of the offspring of dairy cows?
- **Arena L, F Wemelsfelder, S Messori, N Ferri and S Barnard** (University of Teramo and Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise 'G. Caporale', Italy; Scotland's Rural College and Queen's University Belfast, UK)
  Emotional state in shelter dogs: Using qualitative behavioural assessment as a welfare measure
- **Barnard S, L Candeloro, S Messori, P Dalla Villa and A Giovannini** (Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise 'G. Caporale', Italy)
  Development of an estimation method for free-roaming dog population in urban areas
- **Barrett LA and D Blache** (The University of Western Australia, Australia)
  Pre-laying behaviour of nest-laying and floor-laying Pekin ducks
- **Battini M, S Barbieri, A Vieira, G Stilwell, T Nunes and S Mattiello** (Università degli Studi di Milano, Italy; Universidade de Lisboa, Portugal)
  Relationship between risk factors and animal-based welfare indicators in intensive dairy goat farms
- **Belshaw Z, R Dean and LA Asher** (Universities of Nottingham and Newcastle, UK)
  Owners searching the internet: threat to vets or helping pets?
- **Blache D, C Duplessy, C Bin and C Dunlap** (The University of Western Australia, Australia)
  Identifying and reducing stress in alpacas (*Vicugna pacos*)
- **Bowman A , FJ Dowell and NP Evans** (University of Glasgow, UK)
  The effect of auditory stimulation on stress levels of dogs kennelled in a rescue centre
- **Brayley C and VT Montrose** (Hartpury College, UK)
  The effects of audiobooks on the behaviour of dogs at a rehoming kennels
- **Clark B, GB Stewart, LA Panzone and LJ Frewer** (Newcastle University, UK)
  Consumer willingness-to-pay and attitudes for farm animal welfare: A systematic review and meta-analysis
- **Clark CCA, R Crump, AL Kilbride and LE Green** (University of Warwick, UK)
  Membership of herd health and retailer schemes associated with greater compliance at DEFRA animal welfare inspections
- **Clifton R, LE Green and KJ Purdy** (University of Warwick, UK)
  The role of *Fusobacterium necrophorum* in sheep and the environment in the severity and persistence of footrot
- **Cobb ML, MD Marques, AC Lill and PC Bennett** (Monash University and La Trobe University, Australia)
  Measuring animal welfare – do you mean it? Introducing group based trajectories to the assessment of animal welfare

Posters (continued):

- **Corke MJ, KM McLennan, G Stilwell and D Lebelt** (Universities of Cambridge and Chester, UK; Technical University of Lisbon, Portugal; Havelland Equine Hospital, Germany)
  Assessment of pain in sheep, goats and horses
- **Dalla Costa E, F Dai, D Stucke, D Lebelt, R Pascuzzo, S Vantini, M Leach and M Minero** (Università degli Studi di Milano and Politecnico di Milano, Italy; Havelland Equine Hospital, Germany; Newcastle University, UK)
  The Horse Grimace Scale: A useful tool in veterinary practice?
- **Dobbs PJ, S Chapman and V Strong** (Twycross Zoo and University of Nottingham, UK)
  Veterinary care of elderly animals in a medium sized zoological collection
- **East A, C Douglas and F Da Mata** (Newcastle University and Hadlow College, UK)
  Comparing welfare of dogs in rescue shelters and owners homes using a pragmatic location-based cognitive bias task
- **Ellis CF, W McCormick and A Tinarwo** (Moulton College, University of Northampton and Hadlow College, UK)
  Rabbit relinquishment to two UK rescue centres and beyond
- **Fenn KL, MLD Fallon and AC Riach** (Askham Bryan College, UK)
  Is the olfactory enrichment-based technique, "Scent and Settle" beneficial to distressed dogs (*Canis lupus familaris*) when left on their own in a home environment?
- **Finka L, F Bazyari, Y Tzimiropoulos, I Merola and D Mills** (Universities of Lincoln and Nottingham, UK)
  Utilising recent advances in computer vision for the detection of pain in non-human animals: An exemplar using the cat
- **Freeman LM and CV Brigden** (Myerscough College, UK)
  Implications of the inclusion of a non-ejected adolescent for stallion-mare courtship and species fitness behaviours in a Hartmann's mountain zebra (*Equus zebra hartmannae*) herd
- **Garcia Pinillos R, MC Appleby, X Manteca, F Scott-Park, C Smith and A Velarde** (World Animal Protection, The Links Group and Farming Community Network, UK; Autonomous University of Barcelona and IRTA Monells, Spain)
  One Welfare - A platform for improving human and animal welfare
- **Gartner MC and AJ Baker** (Philadelphia Zoo, USA)
  Anticipatory behavior and choice by White-faced saki monkeys (*Pithecia pithecia*) and Mongoose lemurs (*Eulemur mongoz*) in a novel zoo trail system
- **Gaudy JD and LE Green** (University of Warwick, UK)
  Development of a farm specific lameness control plan for sheep flocks
- **Giebel K, LE Green and KJ Purdy** (University of Warwick, UK)
  Persistence of *Dichelobacter nodosus*, the causal agent of ovine footrot
- **Gómez Y, M Terranova, M Zähner, E Hillmann and P Savary** (Research Institute Agroscope and ETH Zürich, Switzerland; University of Hohenheim, Germany)
  Influence of milking parlour size on behaviour of dairy cows
- **Graham JM, JH Guy, EL Buckland, PD McGreevy, PC Thomson, DB Church, DC Brodbelt and D O'Neill** (Newcastle University and The Royal Veterinary College, UK; University of Sydney, Australia)
  Prevalence, risk factors and treatment of separation-related behaviour and noise phobia in domestic dogs

Posters (continued):

- **Graham JM, JH Guy, EL Buckland, PD McGreevy, PC Thomson, DB Church, DC Brodbelt and D O'Neill** (Newcastle University and The Royal Veterinary College, UK; University of Sydney, Australia)
  Prevalence, risk factors and treatment of separation-related behaviour and noise phobia in domestic dogs
- **Gray R, S Butler, C Douglas and J Serpell** (Newcastle University, UK; University of Pennsylvania, USA)
  Puppies from "puppy farms" show more temperament and behavioural problems than if acquired from other sources
- **Green JK, CL Witham and P Flecknell** (Newcastle University, UK)
  Exploring nocturnal behaviour as a measure of welfare in laboratory Rhesus macaques, *Macaca mulatta*
- **Harris C, P White and S Lomax** (University of Sydney, Australia)
  Electroencephalography for assessing pain and analgesia in sheep
- **Hatfield EJ, RJ Wilson and AC Riach** (Askham Bryan College, UK)
  Will the growth rate and welfare of intensively kept pigs (*Sus scrofa domesticus*) improve with the addition of a basketball as a new form of enrichment?
- **Hitchens PL, J Hultgren, J Frössling, U Emanuelson and LJ Keeling** (Swedish University of Agricultural Sciences and National Veterinary Institute, Sweden)
  Circus and zoo animal welfare in Sweden
- **Holmes L and A Moss** (Chester Zoo, UK)
  Multi-disciplinary evaluation techniques to assess the impact of new exhibits on captive animal welfare
- **Isaksen KE, NP Evans, P Hastie, J Orr and DEF McKeegan** (University of Glasgow, UK)
  Welfare assessment of sheep (*Ovis aries*) after single-stage ruminal fistulation surgery
- **Kahn S, P Dalla Villa, F De Massis and L Stuardo** (World Organisation for Animal Health; Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise 'G. Caporale', Italy)
  OIE guidelines on disaster management and risk reduction in relation to animal health and welfare and veterinary public health
- **Kahn S, F Galindo, T Tadich and L Stuardo** (World Organisation for Animal Health; National Autonomous University of Mexico, Mexico)
  Draft OIE standard on the welfare of working equids
- **Langridge AJ, B MacCallum and CC Burn** (The Royal Veterinary College, UK)
  Veterinary professionals report lack of education and confidence regarding pain scoring and analgesia for rabbits and guinea pigs
- **Laws GC and MO Cunningham** (University of Newcastle, UK)
  Investigating mother-pup interactions and *in vitro* electrophysiological analysis in cross-fostered rodents
- **Liu N, H O'Kane, J Kaler, E Fergusson and LE Green** (Universities of Warwick and Nottingham, UK)
  Farmers' attitudes to sanctions and rewards as motivators to reduce lameness in sheep
- **Lomax S, P White and C Harris** (University of Sydney, Australia)
  Topical anaesthesia reduces wound sensitivity following castration in piglets

Posters (continued):

- **Lundmark F, J Hultgren, H Röcklinsberg and C Berg** (Swedish University of Agricultural Sciences, Sweden)
  Animal welfare non-compliance at Swedish dairy farms according to two different control systems
- **María GA, B Mazas, FJ Zarza and MJ Bernuz** (University of Zaragoza, Spain)
  People´s perception about bullfighting in Spain
- **McAlpin L** (Colchester Zoo, UK)
  The integration of five unrelated Red ruffed lemurs (*Varecia rubra*) females into one social group
- **McCarthy D, S Lomax and PJ White** (University of Sydney, Australia)
  The effect of a topical anaesthetic and a buccal non-steroidal anti-inflammatory drug on inflammation, wound healing and average daily gain of surgically castrated calves
- **McGowan RLJ and JE Lock** (University of Southampton, UK)
  An investigation into environmental enrichment: The effects of canopies on the behaviour of kennelled Hearing Dogs in training
- **McMillan FD** (Best Friends Animal Society, USA)
  Why social separation hurts in social animals: evidence for a neurocognitive overlap of physical and social pain
- **Milner IAL, AC Riach and JL Prebble** (Askham Bryan College, UK)
  An investigation identifying the influencing factors and the consumer choices that affect the adoption rates of dogs (*Canis lupus familiaris*) within a UK rescue centre
- **Nawroth C, L Baciadonna and AG McElligott** (Queen Mary University of London, UK)
  Human demonstrator facilitates detour performance in domestic goats
- **Newton JE** (University of Glasgow, UK)
  Welfare and enrichment in captive-reared amphibians: A behavioural and enclosure use study using the Trinidadian monkey frog (*Phyllomedusa trinitatis*)
- **O'Kane H, E Ferguson, J Kaler, A KilBride and L Green** (Universities of Warwick and Nottingham, UK)
  Associations between farmer opinions, emotions and personality and barriers to uptake of best practice by sheep farmers: The example of footrot
- **O'Neill DG , S Jarvis, AJ Craven, C Boyd, DB Church, PD McGreevy, PC Thomson and DC Brodbelt** (The Royal Veterinary College and Scotland's Rural College, UK; University of Sydney, Australia)
  Undesirable behaviours in dogs: gaining new perspectives from primary-care veterinary clinical data
- **Orritt R, TE Hogue and DS Mills** (University of Lincoln, UK)
  Identifying risk factors for human directed aggressive behaviour in dogs
- **Owles C, A Murton, J Harris and S Kelly** (University of Nottingham, UK)
  Investigating degenerative joint disease and pain in commercial pigs
- **Oxley JA, CF Ellis, A McBride and WD McCormick** (Moulton College and University of Southampton, UK)
  A review of handling methods of rabbits within pet, laboratory and veterinary contexts

Posters (continued):

- **Pettersson IC, CA Weeks and CJ Nicol** (University of Bristol, UK)
  Presence of a ramp reduces frustration-related behaviours when traversing levels in loose-housed hens
- **Pizzey R, S Prior, Z Logan, J Thompson and I Vincent** (The Royal Veterinary College, UK)
  The use of subcutaneous meloxicam injections in reduction of pain related behaviours and improvement of growth rates in neonatal lambs
- **Qureshi MZ and A Khan** (The Brooke Peshawar, Pakistan)
  Improving equine welfare through empowering women equine owners in Peshawar district, Pakistan
- **Reaney SJ, H Zulch, DS Mills, S Gardner and LM Collins** (University of Lincoln, UK)
  Personality, health and behaviour in the domestic dog
- **Rebelo CB, S Abeyesinghe and T Gibson** (The Royal Veterinary College, UK)
  Survey of electrical stunning systems used by small scale producer/processors for turkeys, ducks and geese in the UK
- **Ribikauskas V, V Macijauskiene and J Kucinskiene** (Lithuanian University of Health Sciences, Lithuania)
  Assessment of nervous activity type and status of horses
- **Roberts FG, AJ Lucas and P Alexandrin** (Integra Food Secure, UK; NSF International, USA)
  Implementation of welfare certification in a non-food sector: Inspection challenges
- **Samet LE and W McCormick** (Moulton College and University of Northampton, UK)
  The use of calming nutraceuticals in animal welfare: Sedative versus anxiolytic impact
- **Sousa NR, ACS Aguiar, SPPL Luna and JCP Ferreira** (Sao Paulo State University, Brazil)
  How animal science and veterinary medicine students from Sao Paulo University perceive animal moral status
- **Souza APO, LP Buss, LA Novo and CFM Molento** (Federal University of Paraná and Ministry of Agriculture, Livestock and Food Supply, Brazil)
  Broiler chicken welfare outcomes based on slaughter condemnation data in Brazil
- **Stavrakakis S, DA Sandercock, FE Watt, EF Paterson, SA Hall, JE Coe, S Kelly, SA Edwards and JH Guy** (Newcastle University, Scotland's Rural College and Universities of Oxford and Nottingham, UK)
  Validation of lameness and joint inflammatory response biomarkers in growing pigs
- **Studer BHP and J Volstorf** (fair-fish international, Switzerland)
  Ethology database for improvements in fish welfare
- **Tamioso PR, DS Rucinque, APO Souza, GP Silva, CA Taconelli, TC Bergstein and CFM Molento** (Federal University of Paraná, Brazil)
  Sheep perceive brushing as a positive stimulus: study of behavioural responses and nasal temperature
- **Tribe A and L Clay** (University of Queensland, Australia)
  Stress responses of dogs surrendered to the RSPCA animal shelter in Brisbane, Queensland
- **Wensley S, V Betton, R Casey and N Martin** (People's Dispensary for Sick Animals, UK)
  Promoting animal welfare and ethics in veterinary practice

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- **Williams CJA, LE James, CAC Leite, D Monteiro, MF Bertelsen and T Wang** (Aarhus University and Copenhagen Zoo, Denmark; University of São Carlos, Brazil)
  The physiological effects of morphine in the South American rattlesnake *Crotalus durissus*
- **Williams DL and D Bowles** (Universities of Cambridge and Nottingham, UK)
  Is this euthanasia acceptable? A questionnaire evaluation of opinions on euthanasia of dogs in different situations
- **Williams DL and S Cheshire** (Universities of Cambridge and Liverpool, UK)
  Differences in behaviour of blind and sighted Tawny owls (*Strix aluco*) in a raptor rehabilitation centre: Possible indicators of welfare compromise in blind birds?
- **Witham CL** (Newcastle University and MRC Centre for Macaques, UK)
  Face recognition: using techniques from computer vision to monitor welfare in macaques

Recent advances in animal welfare science V
UFAW Animal Welfare Conference
York Merchant Adventurers' Hall UK, 23rd June 2016

ALTERNATIVE HOUSING SYSTEMS; INFLUNCE ON PERFORMANCE CHARACTERISTICS OF EGG-TYPE CHICKENS IN HUMID TROPICS

OM Alabi [1], FA Aderemi [1], MO Ayoola [1,2] and SO Akinoso [3]

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The shift onto the use of alternative housing systems for egg-type chickens to eliminate stress and improve their welfare is gaining acceptance globally and this is extending to the tropics where battery cage is still the most widely accepted form of housing hens presently. With the recent move to create awareness on the need to join this global trend, commercial poultry farmers in the tropics need to be convinced well ahead of final adoption because there is presently dearth of information on the likely effect of this shift to alternative housing systems on some performance characteristics of hens under humid conditions of the tropics, hence this investigation carried out in a typical humid zone of Africa.

108,17-weeks old Super Black Layers(SBL) and 108,17-weeks old Super Brown Layers(SBR) were randomly allotted to three different intensive housing systems of Partitioned Conventional Cage (PCC),Extended Conventional Cage(ECC) and Deep Litter System(DLS) in a randomized complete block design with 36 hens per housing system each with three replicates. The experiment lasted 37 weeks. Parameters measured were initial body weight (IBW), final body weight (FBW), average daily feed intake (ADFI), hen-day production (HDP) and mortality rate. Data generated were subjected to statistical analysis of variance. The IBW and FBW of the hens were not significantly ($p>0.05$) affected by the housing system but by the strain. SBL hens had higher IBW and FBW significantly ($p<0.05$) than the SBR hens in all the housing systems. Moreover, ADFI and HDP were significantly ($p<0.05$) influenced by the housing system and strain. Hens on DLS consumed more feed significantly ($p<0.05$) than those on PCC and ECC while in all housing systems, SBL hens consumed more feed significantly ($p<0.05$) than the SBR hens. The housing system/strain interaction showed that SBL hens on PCC had the highest ADFI value of 126.95g while SBR hens on PCC had the lowest ADFI value of 111.61g. Meanwhile, hens on PCC and ECC laid more eggs significantly ($p<0.05$) than those on DLS while SBL hens had higher HDP significantly ($p<0.05$) than the SBR hens in all the housing systems. However, the mortality rate was highest with the SBR and SBL hens on DLS (11.11%) while SBR hens on PCC and ECC had the lowest rate of 5.55%.

The results of this experiment suggest that alternative housing systems can be adopted for egg-type chickens in humid tropics preferably extended conventional cage without negative effect on their performances while more work must be done in this region on how to improve their performances on deep litter and free range systems.

DO EPISODES OF MATERNAL PRODUCTION DISEASE HAVE A NEGATIVE IMPACT ON HEALTH AND WELFARE OF THE OFFSPRING OF DAIRY COWS?

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Cows suffering from production diseases such as mastitis can experience a significant degree of distress and pain. The dairy industry is an important agriculture sector in the UK, making a significant contribution to livestock output and food security. Mastitis is one of the most costly diseases in dairy cows, affecting on average more than 50% of cows in a herd. British farmers not only pay the costs of treating animals but also the losses associated with milk quality. Mastitis can occur several times during the life of a dairy cow, having a detrimental effect on the welfare of the cow and potentially also on the health and welfare of the developing foetus. The aim of our study was to determine whether episodes of production diseases, with emphasis on the occurrence of mastitis, during the prenatal period of lactating cows can affect subsequent offspring welfare and performance.

We analysed data from the NMR Database comprising production records of the dairy herd at Nafferton Farm, Newcastle University, Stocksfield, Northumberland. In our statistical model we intended to associate several variables of offspring performance (e.g. milk quality) with the occurrence of production diseases during *in utero* development. A database of key parameters for both the dam and her progeny through successive generations was established to integrate key production, health, welfare and fertility data.

This developmental programming approach will help us to determine whether a developmental window exists during which offspring are more susceptible to environmental challenges, making them more likely to develop production diseases such as mastitis later in life. This could potentially lead to the implementation of preventative strategies, particularly increasing the efficiency of the selection process of replacement heifers. This in turn could reduce the number of animals suffering from production diseases and thereby improving the welfare and reducing the pain experienced by cattle in dairy production systems.

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EMOTIONAL STATE IN SHELTER DOGS: USING QUALITATIVE BEHAVIOURAL ASSESSMENT AS A WELFARE MEASURE

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Previous research shows how long-term confinement can be deleterious for shelter dogs' welfare. Animal welfare is a multi-factorial dimension requiring the integration of physical, physiological and behavioural parameters. It is now accepted that to have good welfare, domesticated animals should experience more positive (pleasure, happiness) than negative (fear, pain) emotions. Animal welfare assessment would require tools sufficiently sensitive to detect subtle changes in an animal's state. Quantitative behavioural observations are routinely used in the assessment of sheltered dogs health and welfare. Qualitative Behavioural Assessment (QBA) is a combined qualitative and quantitative methodology that focuses on the whole animal, and characterises the animal's dynamic demeanour as an expressive body language using descriptors such as "friendly" or "fearful". Such terms have an expressive, emotional connotation, and provide information that appears relevant to animal welfare. The aim of this study was to investigate the suitability of QBA as a welfare indicator for sheltered dogs. A methodology called 'Free Choice Profiling' (FCP) was used to generate a set of descriptive terms based on the observation of a sample of dogs filmed in different shelter contexts. Thirteen observers from the faculty of veterinary medicine, with different levels of experience with sheltered dogs, were recruited. After observing 16 video clips (showing individual/group dogs with/without interaction with known/unknown person) recorded in 4 different shelters, observers were free to choose and write down their own descriptive terms for dog expression. Subsequently observers scored each descriptor using Visual Analogue Scales by marking it between "minimum" (0) and "maximum" (125). Generalised Procrustes Analysis, a multivariate statistical technique associated with FCP, showed a high consensus between observers' scoring patterns (75.7%; $p<0.001$) and generated three main consensus dimensions explaining 32.9%, 24.5% and 9.2% of the variation between clips. The terms generated by observers describing these consensus dimensions were semantically consistent, and characterised subjects as ranging: 1) from playful/sociable/curious to bored/uncomfortable/apathetic, 2) from relaxed/tranquil to nervous/alert/fearful and 3) from stressed/anxious to wary/timorous/hesitant. The use of QBA incorporates both positive and negative aspects of an animal's expressive repertoire. These results suggest that QBA may be a suitable method for assessing emotional state in shelter dogs in different types of confinement and may make a useful contribution to assess the animal welfare in a quick, reliable and non-invasive way. Further research is required to cross-validate and integrate QBA outcomes with other indicators in sheltered dogs' welfare assessment protocols.

DEVELOPMENT OF AN ESTIMATION METHOD FOR FREE-ROAMING DOG POPULATION IN URBAN AREAS

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Free roaming dogs (FRD) can represent an ecological, medical and social hazard and are still a prominent issue in several countries worldwide. The free roaming condition entails also risks for dogs' health and welfare. In order to control the FRD phenomenon, the understanding of the population size and dynamics is paramount. The aim of this study was to develop a statistical model to quantify and describe dog populations in urban areas. This model was based on empirical data collected by dog count on the territory, telephone interviews to citizens, and retrieval of regional dog databases (RDB) information on owned dogs.

Data collection was carried out in two Italian towns (Pescara, urban environment, and Isernia, semi-rural environment). Interviews reported that a proportion of owners failed in registering new-born puppies and/or declaring their dogs death to the RDB. Data concerning age, sex, and date of birth (and when available death) was extracted for all dogs (15,485, Pescara, and 1,540, Isernia) from RDB. Data were aggregated to the owners' responses and analysed to build a model. Firstly, the RDB data on the distribution of dog deaths per age classes (1 to >15yrs) was corrected based on the non-communication rate of death emerged from the interviews. The non-registration rate of new-born was also taken into account, allowing an estimate of the real number of dogs currently on the territory (18,677, Pescara, and 3,186, Isernia). Interviews showed that about 14% of dogs were allowed to roam unsupervised. Thus, the number of dogs potentially roaming on the territory was estimated and confronted to in-field count data. The number of FRD counted on the territory was lower than the attended in both areas (171 vs 23, Pescara, and 99 vs 49, Isernia). Based on the discrepancy, the roaming time that dogs spend in urban (i.e. Pescara) and rural (i.e. Isernia) areas was calculated applying the Bayes theorem. Results report that FRD population density differed significantly between rural and urban area.

The study showed flaws of the data contained in the RDB, suggesting that additional information would be needed to draw correct dog population estimates. Furthermore, data obtained from dog counting should be adjusted depending on the territory. Overall, these results provide important elements to consider when drawing FRD estimations. The developed model would prove useful in correcting available population counting, providing reliable estimates, which would serve as basis for establishing FRD control programmes and thus protect dog welfare.

PRE-LAYING BEHAVIOUR OF NEST-LAYING AND FLOOR-LAYING PEKIN DUCKS

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Breeding female ducks in commercial systems are typically provided with substrate-lined nest boxes at floor level to lay eggs in. However, eggs are also laid directly on the shed floor; this behaviour is known as floor-laying. Floor-laying is undesirable because a farm's production efficiency is reduced due to lost potential income from breakages, contamination or decreased hatchability. The Australian duck industry estimates that 20% of its eggs are floor eggs.

Floor-laying in ducks is not well understood. Pekin ducks prefer concealed nests, and birds that floor-lay due to nest box deprivation preferentially lay eggs in boxes once these are available. These findings suggest that ducks are highly motivated to lay in suitable nest sites; it is therefore possible that floor-layers experience poorer welfare due to thwarted nesting behaviour. A better understanding of floor-laying can help to determine whether this behaviour is a welfare cost to the birds, and improve production efficiency through enhanced management to mitigate the behaviour.

A breeding flock of Pekin ducks (51 females and 9 males, nest box ratio 1 box: 2 females) was video-recorded between 3am and 7am for 24 nights. Footage was analysed to quantify pre-laying behaviours, e.g. time spent in nest boxes, aggressive encounters, and nest-building. Behaviours were measured retrospectively for 1h prior to floor-laying or from the time a bird settled into a nest box. Behavioural patterns were compared between floor-layers (FL) and nest-layers (NL).

Only 46% of FL investigated and entered nest boxes (FL-I birds). Nest-building behaviour was performed exclusively in boxes by 97% of all NL and FL-I. No significant differences in nest-building or time spent in boxes were found between NL and FL-I birds ($p>0.05$). Only the location of nest-building differed between FL-I and birds that did not enter boxes (FL-O). FL-I birds had more aggressive encounters (median 35 vs 6 bouts, $p = 0.003$) and spent more time engaged in aggressive behaviour than FL-O (median 5.6% vs 0.61%, $p = 0.004$). Total aggression and box-associated aggression were similar between FL-I and NL birds. Incidences of multiple birds in a box was strongly associated with numbers of box-associated aggressive encounters (correlation coefficient = 0.81)

These results suggest that competition for nest sites is a contributing factor to floor-laying amongst birds that are attracted to nest boxes, whilst some birds have no interest in nest boxes. Further understanding of ducks' nesting motivation and preferences is required to develop practical industry solutions.

RELATIONSHIP BETWEEN RISK FACTORS AND ANIMAL-BASED WELFARE INDICATORS IN INTENSIVE DAIRY GOAT FARMS

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Animal welfare risk assessment has been carried out for several farmed species, following the EFSA guidelines, but no studies are currently available for dairy goats. We visited 60 intensive dairy goat farms (30 in Italy and 30 in Portugal) and carried out welfare evaluation using the AWIN prototype welfare assessment protocol, which consists of a set of 25 animal-based measures (ABMs), covering the 4 Principles and 12 Criteria set up by the Welfare Quality® project. For factor identification, information on design criteria (any aspect of the environment in relation to housing and management factors) expected to cause negative animal welfare effects were collected during on-farm visits. The results were used to compile a list of factors and identify a model to describe the relationships between factors and animal welfare. In this poster we explore the effect of Human-Animal Relationship factors. The population attributable fraction (PAF) for each of these factors was quantified, based on data from the 60 farms, in order to assign a priority within the considered population. We estimated the probability of the identified adverse effects measured by the ABMs collected using the AWIN prototype protocol in the considered population and the magnitude of the effects at an individual level. In this set of factors, workers workload showed a significant relation with fear-related ABMs like acceptance and contact with an estimated PAF of 4.33% and 1.31%. The outcome aims to be the first attempt to apply the risk assessment methodology to estimate the animal welfare risk for lactating dairy goats under intensive farming conditions.

OWNERS SEARCHING THE INTERNET: THREAT TO VETS OR HELPING PETS?

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Owners in the United Kingdom (UK) have a legal duty to protect their pets from pain, suffering, injury and disease. Traditionally the vets been the main source of information for owners about their pets' health. Many vets believe that owners are increasingly turning to the internet for the same information and in doing so are risking their pet's welfare. However, owner use of the internet could help pets if information is reliable and used in conjunction with veterinary advice. In contrast to human healthcare, use of the internet by pet owners is not well characterised. This study aimed to describe how and why owners of dogs with osteoarthritis in England and Scotland accessed the internet to look for information related to their dog's disease.

The Nottingham Dog Arthritis Project explores how decisions are made about osteoarthritic dogs' treatment and management. As part of this, during 2014, thirty-two semi-structured interviews were conducted with owners of thirty-five dogs with osteoarthritis recruited from seventeen veterinary practices. A purposive sampling frame ensured a wide range of owner ages and occupations. Owners were asked about their use of the internet in relation to their dogs' osteoarthritis. Interviews were audio-recorded and transcribed verbatim. Thematic analysis was performed to identify emergent themes; this study reports part of one theme.

Almost all interviewees had used the internet to perform at least one search related to their dog's osteoarthritis. Many owners recalled receiving limited information about medication and treatment alternatives from their vet. The internet was frequently used soon after diagnosis to improve their knowledge. Many sought information about safer alternative treatments and/or potential side effects of prescribed analgesics. Their motivation was typically to ensure that they were doing all they could to maximise their dog's quality of life and minimise pain. Owners described difficulty finding useful websites, several recalled being alarmed about what they read, and many were reluctant to trust online information. Most owners expressed a preference to be provided with more information by their veterinary surgeon rather than searching online.

Very few studies have reported use of the internet by UK dog owners. This study highlights the positive aspects of internet use and cautions against the negative. Given owner's motivation to gain information online, it is important to ensure reliable and easily accessible online information is available to help owners make informed pet care choices.

IDENTIFYING AND REDUCING STRESS IN ALPACAS (*VICUGNA PACOS*)

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Alpacas are social animals but their behavioural and cortisol responses to isolation or novelty, that triggers of stress response in other flocking animals such as sheep, have never been quantified. Seaweed extract of *Ascophyllum nodosum* has been linked to an overall reduction in stress in livestock and, an improved in heath and production.. We hypothesised that 1) the individual response to isolation and exposure to a novel object will vary between individual alpaca and 2) *Ascophyllum nodosum* (ANOD) added to the diet of alpacas would decrease their cortisol levels and behavioural response to a stressful situation and improved fibre growth and diameter, body condition score and body weight.

We tested alpacas for their individual reactivity to isolation and novelty using a modified open field test. The number of sectors crossed (motor activity) and the number of vocalisations were recorded duirng the 2 min test and used to generate a response index. We then selected 30 alpacas with high response index (HR; 31 ± 2.2 cross plus bleat) and 30 with low response index (LR; 12 ± 1.2 cross plus bleat). Half of each response group were given ANOD (2g/head/day) for 6 weeks and the other half did not receive the ANOD. Individual reactivity was then re-tested to assess the effect of ANOD. Blood samples were taken before and after each test to assess the cortisol response.

The individual response of alpacas to isolation and stress was variable but repeatable within individual. There was no effect of ANOD supplementation on body weight, condition score, fibre production or fibre diameter. Total motor activity was affected by responsiveness to stress ($p=0.012$) and over time by ANOD supplementation ($p=0.022$), with the ANOD alpacas recording a lower total motor activity (18.2 ± 2.43 sector crossed) than the control group (25.2 ± 2.74 sector crossed). Regardless of the responsiveness, plasma concentrations of cortisol were lower ($p=0.034$) in alpacas supplemented with ANOD (6.6 ± 1.04 ng/ml) than in the control group (11.3 ± 2.05 ng/ml). We concluded that ANOD can decrease stress in alpacas without affecting fibre production or their general well-being. However, the extent to which ANOD has the ability to decrease stress should be tested using other stressors known to negatively affect production and fibre quality, and elevate plasma cortisol levels in livestock, such as husbandry practices like shearing and transportation.

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THE EFFECT OF AUDITORY STIMULATION ON STRESS LEVELS OF DOGS KENNELED IN A RESCUE CENTRE

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During kennelling dogs are faced with a number of stressors including novelty, social/spatial restriction and increased noise levels. Furthermore, the kennel is a physically barren environment, devoid of sensory cues which fails to satisfy the basic physiological and behavioural needs of the dog thus compromising their welfare. Listening to music has powerful effects on humans from simply enhancing mood to alleviating stress and pain. The physiological/psychological benefits of music, particularly classical, have also been documented in elephants, gorillas and dairy cows. In our previous study, physiological and behavioural changes in response to listening to classical music were detected in dogs housed in a ScottishSPCA rescue centre in Dumbarton. Dogs were observed under 7 consecutive days of silence and 7 consecutive days of classical music (10:00-16:30). Stress levels were assessed through analysis of heart rate variability (HRV), salivary cortisol and behavioural data. HRV is considered a marker of autonomic activity; values of HRV increase and decrease during periods of parasympathetic and sympathetic dominance, respectively. Consequently higher values of HRV are indicative of reduced stress. Statistical analysis revealed that listening to classical music was associated with a significant increase in HRV, time spent lying and reduced barking. Dogs appeared to habituate to the music as values of HRV/lying decreased and barking increased following 7 days of treatment. In an attempt to reduce habituation, a follow on study was conducted in which dogs received a wider variety of genres including classical, motown, pop, reggae and rock. A different group of dogs at the same centre were exposed to five consecutive days of music with two silent control periods either side of auditory enrichment. Analysis of HRV data using mixed effects linear models revealed a significant increase in HRV parameters such as RMSSD, pNN50 and SD1 during auditory enrichment. The effect of different genres was limited but, generally, dogs respond more positively to the 'Soft Rock' genre. During all auditory treatments dogs spent significantly more time lying and significantly less time standing relative to both silent control periods. Finally, logistic regression of barking behaviour revealed a non-significant decrease in the odds of barking whilst listening to soft rock, pop and reggae and a significant increase in odds of barking during the second control period. The physiological and behavioural effects of different genres of music were less pronounced in comparison to effects of classical music in our previous study. This may, in part, be explained by the fact that this group of dogs were significantly less stressed to begin with than those who took part in the classical music study. However, musical genre is complex and further study is required to determine the most appropriate of auditory stimulation for dogs housed in recue centres.

THE EFFECTS OF AUDIOBOOKS ON THE BEHAVIOUR OF DOGS AT A REHOMING KENNELS.

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Domestic dogs are frequently kept in kennel environments such as rescue, boarding, quarantine and laboratory kennels. Kennels are often stressful environments due to restricted space and social interactions and high noise levels. These stressors can lead to behavioural problems and compromised welfare. Environmental enrichment is often used in captive environments to enhance behavioural diversity and decrease frequencies of abnormal behaviour. Auditory stimulation such as music has been demonstrated to enhance animal welfare in a range of species, however despite suggested benefits in humans the potential of audiobooks as auditory enrichment for animals has not been investigated. The present study aimed to investigate the effects of audiobooks upon the behaviour of 31 dogs housed in the Burford Blue Cross rehoming centre, Burford, Oxfordshire, UK. The dogs were exposed to five auditory conditions (audiobook, classical music, pop music, psychoacoustically designed dog music and no auditory control) for 2 hours with an intervening period of 2 days between conditions. The dogs' behaviour was recorded every 5 minutes throughout the 2 hour auditory conditions using instantaneous scan-sampling. The findings from the present study indicate that exposure to audiobooks significantly influences the behaviour of kennelled dogs. Audiobooks resulted in dogs spending more of their time resting than when exposed to any of the other auditory conditions (Control: $Z = -4.807$, $P < 0.001$; Pop: $Z = -4.791$, $P < 0.001$; Classical: $Z = -4.732$, $P < 0.001$; Psychoacoustically designed dog music: $Z = -3.911$, $P < 0.001$). Dogs also spent less time displaying sitting or standing vigilant behaviour when the audiobook was played compared to all other conditions (Control: $Z = -4.579$, $P < 0.001$; Pop: $Z = -4.504$, $P < 0.001$; Classical: $Z = -3.450$, $P = 0.001$; Psychoacoustically designed dog music: $Z = -3.514$, $P < 0.001$). This study suggests that exposure to audiobooks can enhance the welfare of kennelled dogs due to their calming influence on dog behaviour. Use of audiobooks provides a simple yet practical tool that can be readily used in many kennel environments to enhance dog welfare and potentially increase the likelihood of successful rehoming of dogs.

CONSUMER WILLINGNESS-TO-PAY AND ATTITUDES FOR FARM ANIMAL WELFARE: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Some view productivity and animal welfare appear as two conflicting pressures of modern animal production. Efficiency gains in production are primarily thought to be due to the intensification of production, and this has been associated with in increased incidence of production diseases, which can negatively impact upon farm animal welfare (FAW). Consumers and/or citizens concerns about intensive production systems, including production diseases, may represent potential barriers to acceptance of their increased use. Understanding public perceptions may therefore play an important role in addressing potential misconceptions and increasing public trust in modern livestock production. While there is a considerable body of research focused on consumer attitudes and willingness-to-pay (WTP) for improved animal welfare, it is not clear whether this relates specifically to a reduction in diseases related to animal production systems. Therefore two systematic reviews were conducted to establish the publics' WTP and attitudes for FAW.

Four databases were searched to identify relevant studies. Following a two stage screening process using a set of pre-determined inclusion criteria 54 and 80 studies were included in the final analysis for the WTP and attitudes studies respectively, with the strength of evidence and uncertainty for each study being assessed. Meta-analysis, in the form of meta-regression was conducted on the WTP data, based on random effects meta-analysis to explore heterogeneity in relation to animal species, welfare measures, socio-demographic and socio-economic characteristics, with AIC used to minimise over fitting. Sensitivity analyses were conducted to explore the risk of bias where appropriate. A cumulative meta-analysis was also conducted to establish changes in WTP over time. A qualitative thematic analysis was used to explore public attitudes in relation to FAW.

A positive WTP for FAW was demonstrated, varying in relation to a number of factors including animal type, region, age, income, education and gender. The public were concerned about modern animal production, and again this varied in relation to age, gender, income and also familiarity with farming. Both zoocentric and anthropocentric concerns were raised, with the latter primarily being in relation to food safety and less to FAW. Consumers' demonstrated ambivalence and a number of coping strategies were identified that enabled consumers to continue eating animal products in spite of their concerns. An evidence gap was highlighted in relation to attitudes and WTP for specific animal production diseases associated with the intensification of production, although concerns were raised about the use of antibiotics in intensive systems.

MEMBERSHIP OF HERD HEALTH AND RETAILER SCHEMES ASSOCIATED WITH GREATER COMPLIANCE AT DEFRA ANIMAL WELFARE INSPECTIONS

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At EU and UK government levels there is a commitment to reduce the regulatory burden on farmers. One recommendation is to use a targeted risk-based system to select farms for inspection. In a previous study, farms in assurance or organic certification schemes were twice as likely to be compliant with legislation at animal welfare inspections conducted by the Animal and Plant Health Agency (APHA) than those not known to be in a scheme. Since 2012, members of such schemes have had a reduced likelihood of risk-based inspections by APHA. At a consultation in 2011 it was suggested that membership of herd health or retailer schemes, data from non-welfare on-farm inspections by the paying agencies, and data collected at abattoirs by the Food Standards Agency (FSA), might be associated with compliance with animal welfare legislation and so also be included in selection of farms for risk based inspections.

The aim of this study was to investigate whether these additional factors were associated with compliance at APHA welfare inspections.

All farm assurance (FA), organic certification (OC), herd/flock health (HH) and retailer schemes in GB were invited to participate in this study. Relevant data from the paying agencies and FSA were also obtained. Data were matched using county parish holding number, or postcode, to APHA animal welfare inspection records from 2007–2013 (54,201 inspections to 11,800 farms). Multivariable mixed effects binomial logistic regression models were used to investigate associations between compliance at inspections and the variables of interest, accounting for autocorrelation and confounding variables.

In total 9/10 FA, 5/6 OC, 7/10 HH and 1 retailer scheme (added to FA category) provided data. Membership of any scheme was once again associated with a twofold greater compliance with animal welfare legislation: FA odds ratio 1.77 (1.59-1.96), OC 2.05 (1.43-2.93), HH 1.82 (1.49-2.23). There was no association between paying agency data and welfare inspections. FSA data did not match with sufficient numbers of farms in the dataset and so was not included in the modelling.

We conclude that adding membership of herd health schemes and the participating retailer scheme to the selection of farms for risk-based inspection by APHA would reduce the burden of inspection on these more compliant farmers.

THE ROLE OF *FUSOBACTERIUM NECROPHORUM* IN SHEEP AND THE ENVIRONMENT IN THE SEVERITY AND PERSISTENCE OF FOOTROT

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Footrot is an infectious dermatitis of the ovine interdigital skin that causes lameness and poor welfare, and costs the UK sheep industry £80 million per annum. The causal agent of footrot is *Dichelobacter nodosus*. *Fusobacterium necrophorum* is closely associated with footrot but its role in disease initiation and persistence is not fully understood. *F. necrophorum* is assumed to be a ubiquitous environmental bacterium, but there is little evidence for the continuous presence of *F. necrophorum* on pasture or in sheep faeces. It has however been detected on healthy feet and in mouths of sheep. This project uses bacterial load to study the microbial ecology of ovine footrot and its relationship with disease.

A two month pilot study was conducted sampling 10 sheep (feet and oral cavity) and their environment (soil, grass and faeces). All sheep were examined for evidence of footrot and disease scored according to severity on each visit. Local climate data were also collected for the trial period. Quantitative PCR (qPCR) data from this study confirmed the presence of *F. necrophorum* at all sites but not all time points, and also demonstrated variation in load of *F. necrophorum* over time and with disease. A more detailed longitudinal trial was then conducted using a group of 40 sheep over a period of 20 weeks from February to July 2015. The methodology for this trial was consistent with the pilot study except that faeces samples were collected directly from sheep rather than from the pasture.

Data from this study will provide information as to where *F. necrophorum* persists in the environment of sheep, and how this relates to incidence, prevalence, severity and chronicity of disease in the flock. This will greatly increase our understanding of the epidemiology of this disease and will inform on novel approaches to disease management.

MEASURING ANIMAL WELFARE – DO YOU MEAN IT? INTRODUCING GROUP BASED TRAJECTORIES TO THE ASSESSMENT OF ANIMAL WELFARE

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Assessment of animal welfare aims to reflect the welfare experience of animals, which can vary highly between individuals. However, group averages typically used in research conceal the manner in which animal responses differ, often oversimplifying conclusions made with regard to the welfare experience of the individual animal. Group-based trajectory modelling has been used in human health and psychological sciences for the past decade, allowing examination of subpopulations sharing common patterns of response (trajectories) within a larger group. We examined the physiological responses of young working dogs entering a training kennel facility, approximately half of which were exposed to a structured enrichment program. A sample of 67 potential guide dogs (Mean age = 14.24 months, SD = 1.26 months) had saliva collected at baseline (in their puppy raising home, 14 days prior to kennelling), then two days, and 15 days after entering training kennels. Analyses using latent class growth analysis identified distinct trajectories of response in salivary Cortisol and salivary Immunoglobulin A. These trajectories provide additional detail about the physiological response patterns within the group of dogs entering kennels. In this case study, relation of trajectories to training outcomes and suitability as working dogs is discussed. Individual characteristics such as dog breed, colour and age did not predict trajectory membership. Trajectory modelling presents a new way to assess the welfare experience of animals that offers more accurate representation for the ways individuals can differ in their responses to shared environments and stimuli. Methodological implications for researchers wishing to use group-based trajectory modelling are discussed. This method may be an integral step to informing research that enables more accurate assessment of animal welfare states.

ASSESSMENT OF PAIN IN SHEEP, GOATS AND HORSES

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Assessment of pain in animals is challenging due to stoic or stress related behaviours, which can compromise pain management by animal keepers and veterinarians. An EU funded project, the Animal Welfare Indicators (AWIN) project, explored novel biomarkers of pain in sheep (Cambridge group), goats (Lisbon group) and horses (Havelland group). Animals with naturally occurring diseases known to be associated with pain (footrot in sheep, hoof overgrowth in goats) were sampled before treatment and after resolution of the disease. Horses were assessed before and after surgical castration. Lame sheep showed less head movement and less arching of the lower back when walking, compared to lame goats. Thermal imaging of the feet of sheep with footrot showed increased surface temperature in the interdigital region compared to normal control sheep. Thermal imaging of lame goats with overgrown hooves showed increased surface temperature around the proximal inter-phalangeal joint of that leg, which resolved following foot trimming indicating the initial lameness was due to pain and inflammation. Facial expression scoring systems (FESSs) were developed for pain in sheep and horses. The FESSs showed good relationships with lameness and lesion scores of footrot in sheep, and for surgical pain in horses, with good intra- and inter- observer reliability. FESSs may be used to train animal keepers and veterinarians to recognise pain in sheep and horses, thus facilitating better pain management and improved animal welfare.

THE HORSE GRIMACE SCALE: A USEFUL TOOL IN VETERINARY PRACTICE?

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Pain in horses is a crucial health and welfare issue that can lead to considerable suffering and distress. In horse veterinary care, the assessment and treatment of pain is still suboptimal because there is no 'Gold Standard' form of pain assessment and, similarly to other prey species, horses may suppress the exhibition of obvious signs of pain in the presence of potential predators (i.e. humans). The Horse Grimace Scale (HGS), a pain coding system based on six Facial Action Units (FAUs), was shown to be a valid and reliable indicator of postoperative pain in animals undergoing castration. The aims of this study were to refine statistical analysis of HGS data in order to: 1) investigate whether treatment, observer and horse itself affect the score of each FAU; 2) evaluate the overall relation between variables and 3) define a classifier able to estimate the pain condition of the horse. Forty-six horses were divided in the following treatment groups: undergoing surgical castration (pain group) or undergoing non-invasive indolent procedures under general anaesthesia (control group). Pictures of each horse face were captured before and 8 hours post-procedure (N=126) and then scored, using the HGS, by five trained observers blind to the experimental condition. Data were analysed with Analysis of Variance (ANOVA) with treatment as fixed effect and observer and horse itself as random effect. Multiple Correspondence Analysis (MCA) was used to evaluate relations between variables, Linear Discriminant Analysis (LDA) and Discriminant Correspondence Analysis (DCA) were used to find a classifier. Our results showed that treatment (pain VS control) significantly affected the scores of all the FAUs ($P<0.001$). Furthermore, the scores of stiffly backwards ears, orbital tightening, tension above the eye area, and prominent strained chewing muscles significantly contributed to the classification of the horses in the correct category (pain VS control) and to the definition of a classifier cut-off value. To date, the HGS has only been used as a research tool, our results suggest that it is possible to define a classifier and cut off values, thus advancing its applicability in horse veterinary care.

VETERINARY CARE OF ELDERLY ANIMALS IN A MEDIUM SIZED ZOOLOGICAL COLLECTION

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With better husbandry, welfare and veterinary care zoo animals are living longer just like domestic animals. This means some diseases that we may not have seen before in captive species are now becoming apparent. Some of these diseases can be managed with the help of veterinary medication or husbandry modification.

Twycross Zoo's current collection of animals comprises of 15% elderly animals. We define animals as elderly when they reach 75% of their longevity in the wild. If no data is available on longevity in the wild then captive longevity is used.

We manage our elderly population at Twycross Zoo through regular health checks and close keeper monitoring. When an animal reaches an elderly age we discuss with the relevant team leader about the feasibility/ethics of performing a health check. If agreed between the teams they then have a health check which involves clinical examination, full bloods, radiographs of thorax/abdomen/stifles, ultrasound of abdomen and heart, rectal swab and any relevant treatment. This health check is then repeated every 12 months as a routine. This has allowed us to identify patterns of diseases in certain species particularly in primates.

This poster will show how we manage our elderly population at Twycross Zoo. It will highlight the common diseases affecting elderly animals at Twycross Zoo. The protocol has developed greatly over the 4years it has been running and this is reflected in the number of new cases and keeper observations. It is constantly reviewed and amended as required.

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COMPARING WELFARE OF DOGS IN RESCUE SHELTERS AND OWNERS HOMES USING A PRAGMATIC LOCATION-BASED COGNITIVE BIAS TASK

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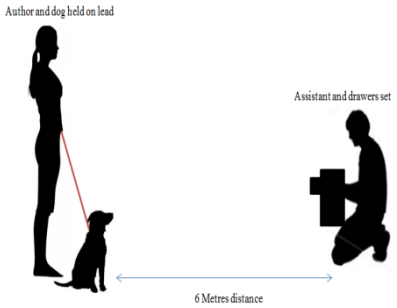
Introduction: Cognitive bias tasks, originating in human psychology, have been used to indicate welfare in rats, starlings, sheep, pigs, rabbits, with difficulties in dogs. It is an expanding research area as it can measure the presence of positive emotional states, which are becoming recognised as important in animal welfare assessment. The rationale is that affective (emotional) state can influence cognitive processing: positive states associated with 'optimistic' biases; negative with 'pessimistic'. Measuring an animals' classification of ambiguous stimuli indicates whether it's "glass is half-full or half-empty". Our aim was to determine whether dogs could be trained and assessed in a simple location-based task, and whether this could be used to compare affective state in dogs housed in rescue shelters and owner-homes. We hypothesised that shelter dogs would have more pessimistic bias.

Method: Ten dogs from each environment (varying breed, age, sex, time in environment) were trained on a go/no-go task using a small set of 3 drawers. Once they discriminated between the positive cue of opening the top drawer (food-reward if the dog approached) and a negative (opening the bottom drawer, no reward), their go/no-go and latency response were tested to an ambiguous cue (opening of middle drawer, neither positively nor negatively reinforced). Dogs were trained and tested individually in a familiar field belonging to the shelter, or owners' garden.



Results and discussion: Dogs could be trained, but no significant differences between the housing groups were found (see table, P=0.27). Older dogs took longer to approach (r=0.56 p<0.001). We suggest that either this shelter environment promotes a similar affective state to a home environment (in the shelter dogs have their own space, daily conspecific social contact and 1-3 walks) or the test situation is stimulating a positive affective state. Refinements could include testing dogs in the first few days when they come to the shelter, hypothesising they are more stressed, this could explore the sensitivity of the test and if it indeed assesses cognitive bias. Also test in the home pens / house, automated to remove any associations (positive or negative) with humans.

	go	no-go
Housed		
observed	4	6
expected	5.5	4.5
Shelter		
observed	7	3
expected	5.5	4.5
Chi-Squared	0.91	
p-value	0.27	

Conclusion: Dogs can be trained to this small, mobile cognitive bias task, as such it has potential for use in cognitive bias studies in dogs and perhaps other animals, its benefits include limited equipment, movement or handling.

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RABBIT RELINQUISHMENT TO TWO UK RESCUE CENTRES AND BEYOND

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Rabbits are a popular pet in the UK with an estimated one million being kept. Concern has been raised about the standards of care afforded to pet rabbits and a 2012 survey suggested that 67,000 rabbits are handed over to rescue centres each year, possibly due to owners losing interest. To determine reasons for rabbit relinquishment a survey was conducted of two UK rescue centres that take rabbits. For a one year period (2013) the centres reported information about the rabbits individual characterises (gender, age, neutered status, colour) and reasons that were given for relinquishing the rabbit. As rescue centres are not the only method used to relinquish rabbits, a public, online survey collected data from 1250 participants to determine how common it was for pets to be relinquished and what methods of relinquishment were used. A small sample of participants (n=19) answered further questions on their experiences in giving up rabbits specifically. Results show the most commonly used source for rabbit relinquishment was to a 'friend/family member/colleague' (60%) rather than to rescue centres, a similar finding was found for relinquished cats and dogs. The most common reason for relinquishment to the rescue centres ('too many rabbits / unplanned litter' 30.3% of 122 rabbits) were different to reasons given by respondents to an anonymous online survey (behaviour issues 46% of 26 rabbits). Risk factors for pet rabbit relinquishment are also presented.

IS THE OLFACTORY ENRICHMENT-BASED TECHNIQUE, "SCENT AND SETTLE" BENEFICIAL TO DISTRESSED DOGS (*CANIS LUPUS FAMILARIS*) WHEN LEFT ON THEIR OWN IN A HOME ENVIRONMENT?

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There are currently 8.5 million dogs kept as pets in the UK with increasing numbers of them being left home alone for extended periods usually due to owner work commitments. There has been an accompanying rise in behavioural problems in dogs when left in the home such as destruction, howling and urinating. Scents such as lavender and camomile are well known for their sedative and de-stressing properties in humans. However, there is limited research surrounding such scents and their use as olfactory enrichment in dogs, particularly in the home environment. The aims of this study were to find out if the "Scent and Settle" technique is a beneficial method to prevent dogs becoming distressed when left in a home environment and to determine if dogs become habituated to such enrichment over a period of time. 20 individually housed dogs were separated into four groups, lavender, camomile, rescue remedy and control, with owners blind to which group their dog was in. This was accomplished by the owners not being told what scents were being used and all the scents being placed in identical containers. Each dog was observed over a four week period during which they were assessed for their baseline behaviour with no olfactory enrichment (1 week), when the scent was added into the environment (2 weeks) and then without the scent (1 week). The owners were also asked to take part in a questionnaire to establish if they felt there was a difference in their dog's behaviour. There was some evidence of a difference between the scents, although all the scents showed that the dogs seemed more settled in the two weeks the dogs were observed with the scent. This demonstrates that there is scope to use olfactory enrichment to improve the welfare of domestic dogs left on their own.

UTILISING RECENT ADVANCES IN COMPUTER VISION FOR THE DETECTION OF PAIN IN NON-HUMAN ANIMALS: AN EXEMPLAR USING THE CAT

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Pain is defined as an unpleasant sensory and emotional experience associated with actual or potential damage to bodily tissue. Thus pain is more than a physical sensation, and involves affective and cognitive processes as well. In non-human pain research the affective components of pain are often overlooked, with sensorial aspects in clinical situations being the primary focus of many studies, e.g. lameness scoring or response to thermal stimulation in the laboratory setting. A recent review of pain assessment tools in the domestic cat highlighted various limitations in relation to their reliability and validity, with most measures being context-specific (i.e. focusing only on post-operative pain), and not providing clear distinction in relation to the onset of acute and chronic pain; these criticisms apply to the instruments used in many other species too. Since one of the features of emotions is that they have a communicative dimension, it is hypothesised that the face may be a particularly useful area to attend to when trying to assess the affective quality of pain. Spontaneous and involuntary facial expressions associated with the contraction of specific muscular groups have been linked to changes in emotional arousal, and are being used to help individuals infer pain in a range of species. Objective comparison of the facial expressions of subjects suffering from a painful condition and following recovery provides a method to define these motor elements. Utilising new machine learning systems within the field of computer vision, we have developed a system devoid of human error, which classifies the faces of cats as either in pain or not in pain. The system corrects for pose variation, enabling data to be taken from various angles/distances, before learning to identify common patterns within visual cues (taken from still video images), which collectively suggest the presence or absence of pain. Using images from cats with agreed painful conditions, the system is currently reaching a correct classification rate of 67%. This compares favourably to two experienced veterinarians who classified only 55% and 58% of images correctly. This system has the potential to produce a first-of-its-kind tool that can facilitate the practical and more reliable assessment of pain via non-invasive means, having major implications in relation to the rapid detection and effective treatment of painful conditions in a wide range of species.

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IMPLICATIONS OF THE INCLUSION OF A NON-EJECTED ADOLESCENT FOR STALLION-MARE COURTSHIP AND SPECIES FITNESS BEHAVIOURS IN A HARTMANN'S MOUNTAIN ZEBRA (*EQUUS ZEBRA HARTMANNAE*) HERD

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Introduction: Hartmann's mountain zebra (*Equus zebra hartmannae*) reproduce most efficiently within a stable group and therefore whole groups should be considered rather the core stallion-mare relationships when considering reproduction dynamics. Whilst the stallion's evolutionary strategy is complete monopolisation of the females, other herd members' behaviour could have a negative effect on maintenance behaviours and reproductive success. Inappropriately sized or managed captive herds can result in the significant re-deployment of energy, which is detrimental to captive species fitness. This aim was to assess the impact of a non-ejected adolescent on behaviours within a captive herd.

Material and Methods: The behaviour of a small herd of captive Hartmann's mountain zebra was studied for 60 hours (January 2015 to May 2015). Maintenance behaviours of both stallion and mare were recorded in the presence of a non-maternally related sub adult zebra, and following its removal. Data were analysed using Minitab 17® software with Spearman's Rank Correlations, Kruskal-Wallis and Mann-Whitney tests to determine any significant changes in behaviour after removal of the juvenile.

Results: The stallion was more alert (W=1047.6; P<0.05) and foraged less (W=603.0, P<0.05) in the presence of the juvenile; and rested more (W=809.0; P<0.05) and walked less (W = 1073.5, P < 0.05) following its removal. The female rested more (W=700.0; P<0.05) and walked less (W=1041.0, P<0.05) after removal of the juvenile. The occurrence was noted of a stereotypic behaviour abnormal to the expected behavioural repertoire of a Hartmann's mountain zebra, which correlated positively with time (r_s=0.553, n=13, p=0.05).

Discussion: Greater understanding of natural herd behaviour should improve reproductive performance in captive conservation collections. Female Hartmann's mountain zebra are naturally monoandrous, remaining tightly bonded to one stallion, resulting in the lack of harassment from multiple males. In this research the unnatural herd dynamic of one stallion plus one sub-adult bachelor increased the chance of harassment, which could ultimately lead to increased alertness, increased locomotion, decreased rest and a reduction in foraging behaviour. Conservation breeding programs should conserve genetic information, but also protect the true nature of the species. By modifying specific evolutionary herd dynamics through untimely management practices and convenient placement, captive collections of zebra could become less effective in protecting biodiversity.

ONE WELFARE - A PLATFORM FOR IMPROVING HUMAN AND ANIMAL WELFARE

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The concept of 'One Welfare' recognises the interconnections between animal welfare, human wellbeing, biodiversity and the environment. It provides a platform for fostering interdisciplinary collaboration to improve human and animal welfare globally. One Welfare could help promote key global objectives such as supporting food security, reducing human suffering (e.g. abuse of vulnerable people) or increasing resilience and security for communities in developing countries, among others. It extends the approach of (and partially overlaps) the One Health theme used for human and animal health.

A One Welfare approach promotes the direct and indirect links of animal welfare to human welfare and environmentally friendly animal-keeping systems. This concept could provide a basis for promoting farming and science industries, and also increasing resilience and security for rural communities in many countries.

One Welfare encompasses a range of multidisciplinary areas where different professions and disciplines can work together to achieve common goals and improve both human and animal wellbeing. For example: the reduction in animal and human abuse; more efficient disciplinary approaches across Government departments; improved life chances; improved animal and farmer welfare; improved animal welfare and food safety; improved animal welfare and improved food security and resilience; and positive impacts between improved conservation and human wellbeing.

Adopting the One Welfare concept within the scientific community would have the added benefit of helping in identifying research outputs with added value and mutual benefit between animal welfare, human wellbeing, biodiversity and/or the environment by introducing the key search term One Welfare.

ANTICIPATORY BEHAVIOR AND CHOICE BY WHITE-FACED SAKI MONKEYS (*PITHECIA PITHECIA*) AND MONGOOSE LEMURS (*EULEMUR MONGOZ*) IN A NOVEL ZOO TRAIL SYSTEM

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The measurement of anticipatory behavior has been used to assess well-being in laboratory studies of rats with impressive results, but it has rarely been used in zoo environments. Because anticipatory behavior is tied to both the dopaminergic and opioid systems in the body, the behavior itself confers good well-being when it is experienced. This study measured anticipatory behavior in two primates, White-faced saki monkeys (*Pithecia pithecia*) and Mongoose lemurs (*Eulemur mongoz*), to begin to assess whether animals value access to a novel trail system at the Philadelphia Zoo. In addition, as choice can be a primary tool for improving and assessing animal welfare, the animals were given the option to access the trail or not. Both species showed anticipatory behavior, indicated in both species by an increase in activity, following a cue that indicated impending access to the trail system. Both species also displayed consummation of the anticipatory behavior by choosing to access the trails. These results indicate that expectation of trail access stimulates the anticipatory system for a direct positive impact on well-being and, more broadly, that the study subjects value the trail system.

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DEVELOPMENT OF A FARM SPECIFIC LAMENESS CONTROL PLAN FOR SHEEP FLOCKS

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Lameness is one of the most important economic and welfare challenges facing the sheep industry, costing ~£24 million per year. Lame sheep are less productive and lose condition, suggesting their welfare may be compromised. In 2013, the average level of lameness in flocks in England was approximately 5%. A study in 2006 found that individual treatment of lame sheep within 3 days reduced the level of lameness from 8% to 2% in one flock and gave an economic gain of £6 per ewe put to the ram (current value £10 - £15 per ewe). The majority of lameness in sheep in GB is footrot caused by *Dichelobacter nodosus*. Footrot presents as both interdigital dermatitis and severe footrot. There are several other important causes of lameness, including contagious ovine digital dermatitis (CODD), toe granulomas and white line abscesses.

Management plans have been proposed to control footrot, but many are very rigid with no accounting for a farmer's management capabilities or a flock's disease situation. Therefore, our goal has been to design a holistic lameness plan that addresses the six most common causes of lameness in sheep that is tailored to an individual farmer and flock through facilitated discussion and incremental improvement in control. In August 2014 we recruited 41 farms in England with a flock size of 100-600 breeding ewes and ≥5% reported average lameness to participate in a stepped-wedge trial. Farms were paired and randomly assigned to either the treatment or control group based on their date of entry into the study, flock size and location, yielding 21 treatment farms and 20 control farms. Treatment farms received advice in the form of visits every 3 months, a tailored plan that was reviewed every 6 months, and a booklet outlining managements and details of how to put these into practice. Control farms were visited every 3 months, but did not receive any advice until shortly before the fourth visit. All farmers were asked to record all lameness cases treated, and lameness prevalence was monitored by conducting locomotion scoring of a representative sample of each flock at each 3-month visit. The study ends on April 2016.

Uptake of recommendations has ranged from complete uptake to selected uptake, yielding varying levels of improvement. Overall, there has been a decrease in the prevalence of lameness in the treatment group in the first year. In the second year, both groups are seeing a decrease in the prevalence of lameness.

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PERSISTENCE OF *DICHELOBACTER NODOSUS*, THE CAUSAL AGENT OF OVINE FOOTROT

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Ovine footrot (FR) is an economically important disease that causes lameness and affects sheep flocks worldwide. FR reduces sheep welfare and productivity. Detrimental effects on welfare include pain and discomfort, weight loss in ewes and reduced growth rate in lambs. FR is characterized by interdigital skin inflammation with, or without, separation of the hoof horn from the underlying tissue. The primary causative agent is the gram-negative anaerobic bacterium *Dichelobacter nodosus*, which colonizes the hoof and is transmitted indirectly through the environment via contaminated surfaces such as pasture or bedding. Transmission of *D. nodosus* outside the host is thought to be dependent on a moist environment and temperatures above 10 °C. In countries with periods of hot and dry weather, periods of apparent zero prevalence of FR in a flock are followed by disease occurrence when climatic conditions become favourable for pathogen transmission. This suggests that there are sites were *D.nodosus* persists. These sites might include the feet and oral cavity of the sheep, faeces or the environment. This project investigates persistence of *D. nodosus*, by investigating possible sites of survival, using a longitudinal study design.

A flock of 120 Suffolk x Wiltshire-horn ewe lambs was screened for FR and 40 animals without FR lesions were selected randomly and moved to the study pasture. The study group and pasture were examined and sampled weekly for five months from February to July 2015. Swabs were taken from the interdigital skin of the foot (n=160) (any FR lesions were noted and scored for severity) and from the oral cavity (n=40) at every visit. A faecal sample (n=40) was also taken. Surface soil samples (SSS) (n=11) and soil core samples (CSS) (n=11) were collected weekly from designated low and high traffic areas (LTA, HTA respectively) and a grass samples were taken when present at these sites (n=9). Real-time PCR and was used to detect and quantify *D.nodosus* in the samples and multiple locus variable number tandem repeat analysis (MLVA) was used to determine strain differences in *D. nodosus* within and between sample types.

Flock disease prevalence was 2% and *D.nodosus* was detected on interdigital skin, in the oral cavity and in soil (SSS, CSS, LTA, HTA) and grass samples but not in faeces throughout the trial. Initial results confirm that the environment plays an important role in the transmission of ovine FR and it is possible that *D.nodosus* may be more ubiquitous than previously thought.

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INFLUENCE OF MILKING PARLOUR SIZE ON BEHAVIOUR OF DAIRY COWS

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Between 1993 and 2013, mean body size of cows increased due to breeding selection for higher milk yield by 5cm and 11cm for Brown Swiss and Holstein, respectively. However, the size of the milking parlours has not been adjusted so far. Therefore, the available milking stall space per cow is reduced and could negatively influence animal well-being during milking.

Our goal was to investigate the influence of different space allowances in milking parlours on the behaviour of dairy cows.

On 15 Swiss farms, we collected data on parlour and cow size by measurements. Additionally, we randomly selected 10 cows per farm and observed the behaviour of these cows during milking (hind- leg activity, maximum peaks of hind- leg accelerations, elimination, rumination and latency to entering the milking stall). We calculated a so-called space ratio length (SR_{length}) by dividing milking stall length by cow length and a space ratio width (SR_{width}) by dividing milking stall width by cow width. A space ratio >1 means that cow lengths or widths are smaller than milking- stall length or width. We analysed the effect of these two space ratios on behaviour using linear mixed-effects models.

Due to a significant correlation between SR_{length} and SR_{width}, only SR_{length} was used for the final models. With increasing SR_{length}, more cows tended to ruminate during milking ($\chi^2_1 = 3.253$; $P = 0.071$). The statistical analyses indicated neither a significant effect of SR_{length} on hind- leg activity, nor on maximum peaks of hind- leg accelerations, nor on latency to entering milking stall (activity: $F_{1,62} = 0.735$; $P = 0.395$; accelerations: $F_{1,92} = 1.210$; $P = 0.274$; latency: $F_{1,130} = 0.382$; $P = 0.538$). Due to the rare occurrence of elimination, with no events recorded for Tandem, three for Herringbone and nine for Side-by-Side milking parlours, no analysis was conducted.

A significant effect of milking parlour could be detected only for the latency to entering the milking stall with longest latency in Side-by-Side parlours and shortest in Tandem parlours ($F_{2,17} = 8.544$; $P = 0.003$).

These findings demonstrate that cow comfort can to some extent be negatively affected by improper milking- stall dimensions changing cow behaviour. They highlight the importance of further investigations on behavioural effects due to improper milking- stall dimensions, in particular their lengths, relative to the size of cows for improvement of good milking performance and an economically beneficial milking routine. Furthermore, the results show that parlour type can affect cow behaviour, but future research is necessary to identify the factors leading to this parlour type effect.

PREVALENCE, RISK FACTORS AND TREATMENT OF SEPARATION-RELATED BEHAVIOUR AND NOISE PHOBIA IN DOMESTIC DOGS

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Separation-related behaviour (SRB) and noise phobia (NP) are reported to be common in domestic dogs. Separation from an owner or exposure to loud noises, such as fireworks, can trigger heightened, prolonged and repeated anxiety in some dogs, as evidenced by altered behavioural responses. These behavioural problems are therefore serious concerns for dog health and welfare, especially since they often remain undiagnosed and may co-occur with other behavioural or health problems. Veterinary practices should be well placed to provide owners with advice on all aspects of animal health and welfare, including behavioural problems. However, to date, few studies have explored how commonly owners seek advice from veterinary practitioners about these problems. Therefore the aims of this study were to estimate the prevalence, risk factors and treatment of SRB and NP in dogs attending primary-care veterinary practices in England.

The prevalence of recorded SRB and NP amongst a study population of 104,233 dogs recorded via the VetCompass Programme[1] was 0.095% and 0.25% respectively. The most common clinical signs reported for SRB were destructiveness (33%), vocalisation (24%) and inappropriate urination (9%), whilst for NP they were trembling/shivering (19%), panting (16%) and hiding (13%), but clinical signs were reported by only 44% and 17% of cases for SRB and NP respectively. Demographic data were reported and used in multivariate logistic regression modelling for risk factor analysis. SRB cases were more likely to be male, and aged less than 1 year old ($P<0.05$). NP cases were more likely to be neutered and of heavier (larger) breeds ($P<0.05$). Staffordshire Bull Terriers were more likely to be NP cases than crossbred dogs. Co-occurrence of SRB and NP was 0.004%. Commonly used treatments for SRB included behavioural modification advice (41% of cases), referral to a behaviour specialist (37%) and the prescription of drugs (39% of cases), whereas for NP fewer cases received behaviour modification advice (15%) or were referred (7%) but there was a greater use of drugs (87%).

This study suggests that prevalence of SRB and NP cases identified at veterinary practices is low and may be underreported, leading to under-treatment of the underlying fear and anxiety associated with these behavioural problems. There may be certain risk factors associated with the development of SRB and NP and further research is required to underpin the mechanisms. Increased reporting of diagnosis, clinical signs and treatment of SRB and NP is required to improve the data available for behavioural epidemiology.

[1] http://www.rvc.ac.uk/VetCOMPASS

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PUPPIES FROM "PUPPY FARMS" SHOW MORE TEMPERAMENT AND BEHAVIOURAL PROBLEMS THAN IF ACQUIRED FROM OTHER SOURCES

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Introduction: Puppies from commercial breeding establishments (UK "puppy farms") have increased morbidity and mortality, but there has been little research into their temperament as an adult when acquired from an irresponsible breeder. Even if puppies are homed during the socialisation period, they may be affected by pre-partum and early experience. Our aim was to compare adult dogs' temperament and behaviour based on where they were sourced.

Method: We used the validated Canine Behaviour And Research Questionnaire CBARQ™ developed for owners/behaviourists to report typical responses of their dogs to common stimuli. It comprises over 100 behaviour questions, with answers on 5 point ordinal scales either relating to intensity (e.g. aggression 0=none; 4=serious) or frequency (e.g. separation related behaviours 0=never; 4=always). Scores are calculated for each behavioural category (see below) using CBARQ protocol (e.g. mean of 5 related questions), a high score is less favourable except for trainability. There were 11 extra questions (with optional free text): source (small breeder, pet store, puppy farm); if the mother was seen and seen interacting with her puppies; concern for puppies/bitches' welfare; number of litters available; was the owner caring and responsible; suitability of accommodation; were the puppies in the owner's home; were health documents seen; and the age at which the puppy was purchased. These formed the groupings for suggested "responsible" and "irresponsible" breeder (>3 concerns = irresponsible, unless there was an overriding statement of concern in the free text). The survey was distributed via internet breed forums and dog charity tweets, targeting the three popular breeds below. It conforms to BPS ethical guidelines. Analysis was by Mann-Whitney U-tests in SPSS 21.

Results: Where statistically significant differences were found they indicated more favourable behaviour traits in the dogs acquired from more responsible breeders. Medians are presented, responsible breeder first, $P<0.05$ (those results with * remained significant at $P<0.05$ level after sequential Bonferonni adjustment). **Chihuahua**: (n=50; n=35): Aggression to familiar dog (0.3;0.8), unfamiliar dog (1.3;1.5), strangers (0.6;1.1), owner (0;0.3)*; Stranger directed fear (1.3;1.5)*; Touch sensitivity (0.8;1.8)*, Separation anxiety (0.6;0.9)*; Chasing (1.1;2.1)*. **Pug**: (n=85; n=40): Fear of dogs (0.5;1.0), strangers (0;0), other fear (0.5;1.0); Separation anxiety (0.5;1.4)*; Familiar dog aggression (0.3;0.8); Excitability (2.0;2.3)*; Energy (2.0;2.8)*. **Jack Russell** (n=150; n=75): Trainability (2.5;2.1)*. Further analysis suggests that puppies bought <8 weeks old showed more aggression* and separation anxiety* behaviours. Where more than one litter was offered by the breeder, dogs had more fear* and aggressive* traits as adults.

Conclusion: Puppies from less responsible breeders had less favourable behavioural traits as adults, which may affect their success as a companion animal. This presents another reason not to acquire puppies from breeders who do not adhere to the ethos of e.g. RSPCA, BVA and AWF's puppy contract.

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EXPLORING NOCTURNAL BEHAVIOUR AS A MEASURE OF WELFARE IN LABORATORY RHESUS MACAQUES, *MACACA MULATTA*

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Improving welfare amongst laboratory primates is not only an ethical imperative, it also helps promote good science. Although a variety of welfare measures exist, many involve invasive techniques or require specialist training to conduct; thus there is a need to develop new methods of assessing welfare. Nocturnal behaviour has been almost entirely neglected as a tool for detecting stress in captive primates, despite the physiological similarities between humans and monkeys and the well-established finding that sleep disruption can be related to stress and depression in humans. This study explored whether nocturnal behaviour could potentially be used as an objective measure of welfare in laboratory Rhesus macaques (*Macaca mulatta*). The aim was to compare sleep behaviour on weekday and weekend nights. We hypothesised that the monkey's sleep patterns would be disrupted during the week because of activities taking place in the unit, such as research procedures, that would cause stress to the animals. We predicted that they would have a longer latency to sleep onset and would wake up more frequently on weekdays than on weekends. Two pilot studies were conducted using high definition infra-red sensitive cameras to record the nocturnal activity of seven female, pair and group housed Rhesus macaques at a primate laboratory facility. Standard behavioural scoring methods were used to analyse sleep patterns. The results did not support the prediction that nocturnal activity differs between weekday nights and weekend nights but did show that sleep behaviour patterns changed after isolated, acutely stressful events. Although no firm conclusions can be drawn from this pilot study, we show that monitoring nocturnal behaviour in laboratory primates has the potential to be a novel, non-invasive, effective tool for monitoring welfare and suggest this approach warrants further study.

ELECTROENCEPHALOGRAPHY FOR ASSESSING PAIN AND ANALGESIA IN SHEEP

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Numerous painful husbandry procedures are performed routinely within the Australian sheep industry. The assessment of analgesia is limited by current pain detection methods such as behaviour and observation. The use of electroencephalography (EEG) in relation to therapeutic efficacy is used in human medicine (pharmaco-EEG), and offers potential as an effective and practical way of measuring pain response and efficacy of analgesia in livestock. The aim of this study was to evaluate the electroencephalographic response of conscious sheep with and without the administration of the non-analgesic sedative midazolam. The EEG responses for two ewes and two wethers (n=4) were recorded prior to and post administration of midazolam for a minimum of 5 minutes. Raw data was band-passed filtered offline between 0.1-40Hz and visually inspected with traces containing significant movement artifacts discarded. The maximum power frequency (f_{PM}) was calculated using LabChart Version 7 software (AD Instruments) and analysed using restricted maximal likelihood regression (REML) for linear mixed models analysis in Genstat (V16). Preliminary results indicate administration of midazolam resulted in a significant reduction in f_{PM} ($p<0.001$). The results suggest that pharmacoEEG shows potential for use in assessing therapeutics for analgesia in livestock.

WILL THE GROWTH RATE AND WELFARE OF INTENSIVELY KEPT PIGS (*SUS SCROFA DOMESTICUS*) IMPROVE WITH THE ADDITION OF A BASKETBALL AS A NEW FORM OF ENRICHMENT?

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Housing pigs in slatted systems is the most broadly used and economical method of rearing growing pigs in the European Union (EU). Producers need to improve animal welfare while increasing production to meet growing demands. This investigation examined whether the use of a basketball as enrichment, would improve the welfare in terms of aggressive behaviours as well as the growth rate of intensively farmed pigs. A total of 24 pigs were examined, 12 in two separate pens. Both pens had hanging chains as enrichment but one group had additional enrichment in the form of a basketball. Each pig was weighed on the same day once a week from its arrival to slaughter over 13 weeks. Behavioural observations were also recorded for one hour per week as well as the frequency of interactions with the enrichments. There was no significant difference between the growth rate of the control group and the enriched group ($P>0.05$). However, pigs in the enriched pen interacted with enrichments significantly more ($P<0.001$). Tail biting was only observed in the control group with less enrichment. This study does not show basketballs used as enrichment have any economic benefits however, providing two enrichments simultaneously may improve welfare.

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CIRCUS AND ZOO ANIMAL WELFARE IN SWEDEN

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This study investigated the occurrence and risk factors for poor welfare from official animal welfare control for circus and zoo animals in Sweden from 2010 to 2014. Analyses of control site information as well as outcomes from inspections on the 18 points (animal-, resource- and management-based measures) on the circus checklist and 31 points on the zoo checklist were performed.

A total of 52 circuses and 224 zoos were registered with the Swedish Board of Agriculture in 2014. There were 42 inspections at 38 circuses and 318 inspections at 179 zoos. Multiple inspections were conducted over the five years; there was one inspection at 35 circuses and 117 zoos, two inspections at 2 circuses and 35 zoos, three inspections at one circus and 13 zoos, and four or more inspections at 14 zoos.

The reasons for inspections were normal routine (n=14 and 61; circus and zoo animal inspections, respectively), because of a complaint (n=11 and 89), follow-up on deficiencies identified at a previous inspection (n=6 and 55), and application for a permit to conduct commercial activities (n=11 and 113).

For animal-based measures at routine inspections of circuses and zoos, respectively, 9.1 and 14.3% did not comply with requirements for general care of hooves/claws and coat, 10.0 and 8.6% for body condition, and 0 and 1.7% for cleanliness. In addition, the zoo checklist assessed appropriate social contact, finding 17.0% non-compliant inspections.

The most frequent non-compliances for resource- and management-based control points at normal routine inspections at circuses were for space (41.7%) and exercise (38.5%) requirements. For zoos, 29.4% of normal routine inspections did not comply with space requirements, followed by 28.8% for enrichment.

In multivariable logistic regression of data pertaining to zoos, with non-compliance with one or more of the four animal-based measures used as a binary outcome, factors associated with poor zoo animal welfare included inadequate or unsafe housing and space design, nutritional requirements that were not met, and inadequate bedding materials.

A larger sample size, particularly for the circus checklist, will allow conduct of more in-depth analysis of risk factors. The highest percentages of non-compliances were found on the control point for social contact at zoos, as well as space requirements on both checklists. Improvements to the checklists that better capture the behavioural and/or physical state of animals are recommended. Lastly, benchmarking of trends over time will be possible with continuation of this control program.

MULTI-DISCIPLINARY EVALUATION TECHNIQUES TO ASSESS THE IMPACT OF NEW EXHIBITS ON CAPTIVE ANIMAL WELFARE

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In the modern world zoos and aquaria aim to connect people with nature, conserving the world's biodiversity through environmental education, active collaboration with field conservation organisations and excellent animal welfare standards in captivity. From the design and build of an enclosure, through to the care and monitoring of individual animals, the ultimate aim is to promote best practice in animal husbandry and care using scientific methods to provide useful evidence for management decisions.

Chester Zoo houses over 500 different animal species and it's our mission is to be a major force in conserving biodiversity worldwide. In 2015 Chester Zoo opened 'Islands', the largest zoo development ever seen in the UK, replicating the habitats of six South East Asian islands over 15 acres and contains over 600 animals. Many of the animals housed within the new exhibit moved from existing enclosures within the zoo creating a unique opportunity to study the impact of the move on animal welfare and to evaluate the design of the new enclosure spaces.

Since 2013 we have been collecting behavioural and physiological data for five key species prior to their move over to Islands (Rhinoceros hornbills, Southern cassowaries, Sulawesi macaques, Sumatran orangutans and Sumatran tigers), as well as recording measures of enclosure use, visibility and visitor attitudes/perception of the species. Further data collection is currently underway to monitor how the animals are adapting to their new environments and to monitor any changes in visitor behaviour as a result of this new immersive exhibit design. This presentation will highlight the range of methods used to conduct an extensive evaluation of this exciting new development and demonstrate the importance of monitoring animal welfare and visitor perception of species housed in captivity.

WELFARE ASSESSMENT OF SHEEP (*OVIS ARIES*) AFTER SINGLE-STAGE RUMINAL FISTULATION SURGERY

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Studies examining the welfare impact of surgical procedures on adult ruminants are rare. We used behavioural and physiological approaches to assess welfare in four ewes (*Ovis aries*) undergoing a single-stage ruminal fistulation procedure. Standard clinical analgesia (meloxicam) was given before surgery and again one day later. Behaviour analysis from video recordings was based on observations every 10 minutes between 0600h and 1830h four days pre-surgery and 17 days post-surgery. Time spent standing and eating was significantly reduced during the first three days after surgery, compared to pre-surgery observations (standing: $P = 0.025$, eating: $P = 0.015$), while time spent lying increased ($P = 0.052$). Time spent lying and ruminating was also affected by human disturbance throughout the study period (lying: $P = 0.015$, ruminating: $P = 0.016$). Heart rates were recorded in three ewes, twice before surgery and five times after. Heart rate variability (HRV) was significantly lower on day 1 post-surgery when looking at time-domain variables (mean RR: $P = 1.1 \times 10^5$, SDRR: $P = 0.045$, RMSSD: $P = 0.0053$, pNN50: $P = 0.049$). LF/HF ratio was significantly higher on day 1 post-surgery ($P = 0.022$), indicating parasympathetic nervous system dominance and increased stress. SD1 and SD2 variables indicating short and long term HRV showed no difference from pre-surgery. Faecal cortisol concentration was highly significantly increased the day following surgery compared to pre-surgery ($P = 1.3 \times 10^5$). These behavioural and physiological findings indicate a negative impact of the procedure on the welfare of the animals, likely due to pain and stress caused by the surgical procedure and associated handling. There is a strong indication that the surgical intervention significantly affected sheep welfare, supporting the requirement for further refinement of analgesic management for this procedure in this species.

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OIE GUIDELINES ON DISASTER MANAGEMENT AND RISK REDUCTION IN RELATION TO ANIMAL HEALTH AND WELFARE AND VETERINARY PUBLIC HEALTH

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The World Organisation for Animal Health (OIE) is responsible for setting intergovernmental standards and guidelines relevant to animal health, including zoonotic diseases, and animal welfare. The OIE standards and guidelines are based on scientific evidence and the recommendations of internationally recognised experts, including representatives of governments, academia, NGOs and stakeholders. The OIE standards are democratically adopted by the governmental representatives of 180 Member countries. While the OIE guidelines are not the subject of a formal process of adoption, their elaboration follows a similar process of consultation with Member countries and stakeholders, with various opportunities for review and comment during the development of texts.

Although there are national and international guidelines relevant to animals affected by disasters, experience has shown that the health and welfare of animals is sometimes overlooked when managing disasters. With this in mind, in 2014 the OIE started to develop Guidelines for Veterinary Services (VS) of the Member Countries on disaster management and risk reduction in relation to animal health and welfare and veterinary public health. The objectives for VS in a disaster situation are to protect animal health and welfare, safeguard human and environmental health and help to restore economic and societal conditions in the shortest possible time. The Guidelines aim to strengthen the capacity of VS to achieve these objectives. They recommend a framework, processes and procedures that cover all phases of the Disaster Management Cycle (Mitigation/Prevention > Preparedness > Response>Recovery) and should be applied in conjunction with existing international, regional and national instruments (both technical and legal) relevant to disasters. Programmes for the management and avoidance (risk management) of disasters should be continuously reviewed and updated in response to the evolution of hazards, technologies, standards and legal requirements.

During each stage of a disaster, it is recommended to address issues relating to public health, animal health and animal welfare. Critical factors for success in disaster management and prevention are the implementation of risk analysis procedures; attention to planning and training, including the conduct of simulation exercises; adequate allocation of resources; communication within and between agencies; and a focus on cooperation between government agencies, NGOs, the private sector and other stakeholders.

The application of these Guidelines can help to strengthen the VS' participation in and contribution to whole-of-government programmes for disaster planning, management and response. Moreover, they provide an important, previously lacking basis for the development of operational manuals and Standard Operating Procedures, the adoption of new technologies and the implementation of new legal and administrative rules for intervention teams.

It is expected that the Guidelines will be published on the OIE website by June 2016.

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DRAFT OIE STANDARD ON THE WELFARE OF WORKING EQUIDS

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The World Organisation for Animal Health (OIE) is responsible for setting intergovernmental standards relevant to animal health and welfare. The development of animal welfare standards was included in the OIE Strategic Plan in 2002 and in 2004 the OIE Member countries adopted a scientific framework and guiding principles on animal welfare. OIE standards are based on the recommendations of internationally recognised experts, including representatives of governments, academia, NGOs and stakeholders. The standards are democratically adopted by the governmental representatives of 180 Member countries before official publication in the Terrestrial Animal Health Code and the Aquatic Animal Health Code. To date, the OIE has adopted eleven standards on the welfare of terrestrial animals and four on the welfare of farmed fish. In June 2014 the OIE started writing a standard on the welfare of working equids. These animals, primarily used in transport and traction, play an important socio-economic role in many developing countries. Unfortunately, governments largely overlook the contribution of working animals, whose health and welfare is often seriously compromised. Veterinary care is not easily accessible for many poor communities and working equids consequently suffer from health and welfare problems; in some cases there are increased human health risks due to zoonotic diseases.

The OIE recognises the need to raise awareness about the socio-economic importance of working animals to livelihoods and to encourage governments to invest in raising public awareness and educating those who own and use working animals on their health and welfare needs. Many problems could be addressed through the provision of basic advice on health and husbandry. The veterinary profession should take a leadership role in improving the health and welfare of working animals, with an emphasis on collaboration between governments, academia, the private sector and NGOs.

This poster presents the draft OIE standard on the welfare of working equids destined for and used in traction, transport for the generation of income. Equids used in sport, competition, leisure or research are excluded. The draft standard covers the provision of shelter, feed and water; foot care; the management of disease and injuries; handling practices, including harnessing, work-load and mutilation; animal behaviour; veterinary care; and management of equids at the end of their working life. The OIE will continue to receive comments on the draft standard until 8 January 2016. If there is general support from Member countries, the draft standard could be proposed for adoption at the OIE General Session in May 2016.

VETERINARY PROFESSIONALS REPORT LACK OF EDUCATION AND CONFIDENCE REGARDING PAIN SCORING AND ANALGESIA FOR RABBITS AND GUINEA PIGS

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Rabbits and guinea pigs are popular pets, but are regarded by the veterinary profession as 'exotic' species. The aim of this study was to explore veterinary professionals' knowledge of, and confidence with, rabbit pain scoring and analgesia usage compared with that of dogs, cats and guinea pigs. An online questionnaire was answered by 82 practising veterinary surgeons (n=60) and registered veterinary nurses (n=22) in the UK between August 2014 and February 2015 of which 79% were female, 50% were within 4 years of graduating while 6% had over 20 years' experience. Most respondents felt they lacked resources and confidence relating to pain scoring of rabbits and guinea pigs. For example, only 6.25% had access to pain scoring protocols for rabbits and 3.75% for guinea pigs, compared with 47.50% for dogs and 46.25% for cats. Compared with cats and dogs, 74% of respondents stated that they were less confident choosing analgesia for rabbits, and 100% stated that they were not at all confident choosing analgesia for guinea pigs. In response to more detailed questions about rabbits only, 29% of respondents felt they were not using analgesia enough to manage rabbit pain, and 69% felt they had not received sufficient teaching and information on rabbit welfare and behaviour to manage pain properly. Furthermore, respondents felt analgesia was underused in rabbits for reasons including lack of self confidence in the correct use of analgesia, deficiency of resources, lack of education and information, and lack of owner support and funds. No significant differences between respondent demographic groups, e.g. professional role or time since graduating, were found. Key approaches to improving competency in this area include scientific research into rabbit and guinea pig pain signs and management, and an increase in veterinary education at university and in the workplace.

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INVESTIGATING MOTHER-PUP INTERACTIONS AND *IN VITRO* ELECTROPHYSIOLOGICAL ANALYSIS IN CROSS-FOSTERED RODENTS

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Introduction: Cross-fostering is a commonly used husbandry procedure whereby neonatal rodents are reared by a non-biological dam for the duration of the pre-weaning period. Cross-fostering reduces the cost associated with breeding animals on a large scale, however it is potentially stressful to dams and pups. The effect cross-fostering has on dams' behaviour towards pups and the subsequent mechanisms by which this induces stress in offspring have not been elucidated. Cross-fostering has been implicated as an early life stressor in rats as cross-fostered offspring exhibit specific entorhinal gamma rhythmogenesis deficits (30-80Hz), involved in cognitive processing and paralleled in animal models of psychosis. Cross-fostering induced deficits are coupled with a paradoxical increase in parvalbumin (PV)-containing interneuron expression. PV-containing interneurons are critical in the generation of gamma rhythmogenesis. Kv1.3, a delayed rectifier involved in the repolarisation phase of the action potential, regulates PV expression. Kv1.3 function following cross-fostering is undetermined.

Aims: We aimed to examine stress and maternal behaviour in dams post cross-fostering and investigate Kv1.3 function in cross-fostered offspring.

Methods: Duration of maternal licking, contact, arched-back nursing, passive nursing, number of nests and time pups spent out the nest were quantified in Wistar cross-fostered litters (n=3) and natural litters (n=4) over the pre-weaning period. Corticosterone concentrations were determined using ELISA of faecal samples collected on postnatal day 1 and 3. *In vitro* electrophysiology of hippocampal-entorhinal slices from cross-fostered (n=6) and natural offspring (n=6), assessed margatoxin antagonism of Kv1.3.

Results: Cross-fostering did not alter maternal investment but maternal care was fragmented. Cross-fostered pups weighed 2.18±0.48g less than natural pups on postnatal day 6 (p=0.0004), were gathered in more nests (p=0.049) and spent more time out of the nest within the first postnatal week (p=0.02). Dams' cross-fostering pups exhibited a 1.984±0.03ng/ml ratio increase in faecal corticosterone ($p=0.019$). Cross-fostering increased Kv1.3 sensitivity, suggesting altered Kv function could affect PV regulation.

Conclusion: Cross-fostering may be stressful to dams, thus questioning the routine use of cross-fostering procedures. Additionally, the potential of cross-fostering to induce early life stress and psychopathology in adulthood in offspring remains a welfare issue.

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FARMERS' ATTITUDES TO SANCTIONS AND REWARDS AS MOTIVATORS TO REDUCE LAMENESS IN SHEEP

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The aim of the current study was to investigate farmers' attitudes to sanctions and rewards as drivers to reduce the prevalence of lameness in sheep. The Welfare of Farmed Animals (England) Regulations 2007 make it an offence to cause or allow unnecessary suffering to animals and highlights that farmers have a duty of care for their animals. Despite this, the current average prevalence of lameness in sheep in England is 5%; i.e. ~750,000 lame sheep at any time.

Approximately 1% of farms are inspected each year by Defra. Inspecting farms is resource intensive and Government would prefer farmers to self-regulate. Self-regulation could be done by farm assurance or retailer schemes and could lead to sanctions for high percentages of lame sheep or rewards for low percentages of lame sheep.

In this study, farmers' opinions towards official inspections, acceptable prevalence of lameness and attitudes on outcomes from inspections were investigated using a self-administered questionnaire. Membership of assurance schemes, experience of official inspections, knowledge of legislation, current management of lameness and farmer and flock descriptors were also recorded.

A total of 43/102 English sheep farmers responded to the questionnaire, with median flock size of 500 ewes and geometric mean prevalence of lameness 2.8% (95% CI 2.3%-3.5%): 35 farmers were members of ≥1 assurance scheme and had been inspected 1 – 9 times between January 2011 and December 2014.

Farmers considered 5–7.5% an acceptable prevalence of lameness. They were least tolerant of farmers who rarely treated lameness and most tolerant when farmers used best practice to manage lameness. Farmers tended to prefer sanctions to farmers with high prevalence of lameness than rewards to farmers with low prevalence of lameness. Sanctions were considered "fair" with a prevalence of lameness ≥10% and rewards appropriate when the prevalence of lameness was ≤2%. When these figures are overlaid onto recent responses from 1200 randomly selected farmers, 24.6% flocks had ≥10% lameness and 32.5% flocks had ≤2% lameness.

This is the first study to investigate farmer opinions including welfare measures within official inspection frameworks. These results can be used to evaluate whether, and how, official inspections can be used to reduce the prevalence of lameness in sheep and inform on the role of sanctions and rewards in welfare of sheep generally.

TOPICAL ANAESTHESIA REDUCES WOUND SENSITIVITY FOLLOWING CASTRATION IN PIGLETS

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Piglets undergo several husbandry procedures within the first week of life including ear notching, castration, tail docking and teeth clipping. These procedures are painful, however practical and affordable options for the amelioration of pain are largely unavailable in both the Australian and international pig industries.

The current study investigated the efficacy of a topical anaesthetic on the pain sensitivity of castration wounds in piglets. The study was conducted using 40 x 3-5day old piglets (mean piglet weight 2.7 ± 0.45kg). Treatments were blocked across and 6 litters x 3 days. Piglets were randomly allocated by weight and litter to 1 of 4 treatment groups: (1) Sham castration (SHAM) (*n=10*) – piglets handled as but no incision was made; (2) castration with no anaesthetic intervention (CAST) (*n=10*); (3) Castration with post-operative topical anaesthesia (TA) (*n=10*) (4) castration with pre-operative lignocaine injection (LIG) (*n=10*) – the scrotal site was infiltrated with 2mL lignocaine 5 minutes prior to incision. For TA application 1-2mL of TA was applied directly to each wound using a sterile 1mL pipette. The pipette was inserted along the spermatic cord, inside the tunica to ensure that all retracted tissue was coated in anaesthetic. Von Frey (VF) monofilaments (4g and 300g), and an 18G needle were used to determine skin and wound sensitivity at 5 pre-determined sites in and around the castration wound. Involuntary motor responses were graded on a scale of 0 (no pain) to 3 (severe) at 1min prior to procedure, 1min, 30min, 1h, 1.5h, 2h, 2.5h, 3h, 3.5h and 4h post procedure. Score data was analysed using ordinal logistic regression in AsREML to produce event probabilities.

There was a significant interaction between Treatment x wound stimulation ($P<0.001$), with piglets more likely to have severe responses to needle stimulation of the wound compared to VF. Responses of TA treated piglets did not differ from SHAM piglets in response to any stimulation. The Treatment x Time interaction was significant ($P<0.001$). Severity of response increased over time in castrated piglets. TA and SHAM were less likely to have moderate or severe responses than LIG and CAST piglets from 1-4hr post castration. LIG and CAST piglets had similar responses from 1-4hr post castration, indicating lignocaine was no longer effective.

This data suggests TA was effective at reducing wound pain following castration in piglets for up to 4hr, and presents an option for practical, farmer-applied pain management.

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ANIMAL WELFARE NON-COMPLIANCE AT SWEDISH DAIRY FARMS ACCORDING TO TWO DIFFERENT CONTROL SYSTEMS

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Today, farmers often have to comply with private standards in addition to the official animal welfare legislation. Different standards may complement, reinforce or contradict each other. In this study we compared results from the official control (County Admin. Board, CAB, n=599 control cases) with audits based on the private standard 'Arlagården' (administered by the dairy company Arla Foods; n=665 cases) from 2010 to 2013 at dairy farms in the county of Västra Götaland. Our aim was to analyse the most frequent non-compliances and what risk factors for non-compliance were most decisive in these two control systems. The risk of one or more non-compliances per case was modelled by mixed-effects logistic regression for CAB and Arla separately.

Non-compliances were found in 58% (CAB) and 51% (Arla) of all control cases. The most common non-compliances identified by CAB were dirty animals (24% of the cases), followed by inadequate ventilation alarm systems, inadequate housing of calves, wet and dirty lying areas and overstocking. Arla auditors mainly identified non-compliances related to dirty cowsheds (18%), followed by dirty animals, inadequate feed and water supplies and cows that were not clipped properly. Tie-stall cow housing, as opposed to cubicle housing, increased the risk of non-compliance in both CAB (OR=2.60, P=0.001) and Arla (OR=1.79, P=0.005) systems. The odds of non-compliance were lower at organic than at conventional farms in Arla (OR=0.46, P=0.006), but not CAB. The odds of non-compliance were higher during winter (December to February) than summer (June to August) in both CAB (OR=4.46, P=0.005) and Arla (OR=3.27, P<0.001).

Current EU legislation prescribes official control to be risk based, i.e. farms with a high risk of non-compliance should be identified in the control plan. According to the present study, information about affiliation to private standards, type of cow housing system and time of year can be relevant when designing a risk assessment tool. Although the overall animal welfare levels and requirements were similar we identified differences in the results of controls carried out by official inspectors and Arla auditors. There may be several reasons behind these differences, e.g. different measurements used, different weights put on requirements and differences in the competence profiles of the inspectors/auditors. We conclude that in order to create transparent control systems it is important that different stakeholders are aware of similarities and differences between such systems. Overlap in requirements between different systems may not be compatible with an efficient animal welfare control.

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PEOPLE´S PERCEPTION ABOUT BULLFIGHTING IN SPAIN

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Due to the deeply rooted traditions of bullfights in the Spanish population and the growing concern about animal welfare recently observed, especially among younger participants, we decided to conduct a survey to solicit people's opinions about bullfighting (TE) in Spain. The survey asked about liking and approving; culture, art and identity; socio-economic aspects; emotional perception and animal welfare. The hypothesis proposed that the perception of bullfights may be affected by gender, age, occupation, origin and nationality of the persons surveyed. The hypothesis was confirmed. The majority of people surveyed do not like bullfights and a great majority does not attend or watch such events. Two extreme clusters were described: one representing favorable attitude towards bullfighting and other against bullfighting. The proportion of indifferent persons was important. Women and younger participants showed a more favorable attitude towards animal welfare issues associated with these events. Rural people were more accepting bullfights than urban people. Students were more anti-taurine than those in other occupations. Additionally, technical economic factors made people favor more bullfights. The results obtained in this study showed that the attitudes to bullfights differ with respect to the sex, age, profession, origin and nationality of the respondents. Any kind of action to be taken should consider this fact. The population of respondents presented three main clusters. Two extreme clusters were described. One represents the favorable attitude towards bullfighting and bullfighting related events, and the other represents the persons who are against bullfighting and the other events associated. The proportion of indifferent persons was important and should be monitored in the future. In general, women and younger participants showed a more favorable attitude towards animal welfare issues associated with these events, demonstrating more concern for all aspects of animal suffering. Rural people were more accepting of TE than urban people. This aspect was also evident when Spaniards were compared with foreigners. Students were more anti-taurine than those in other occupations. Additionally, technical economic factors made people favor more TE, and this is probably linked to the economic crisis. The target person with anti-taurine attitude should be a young, female student of urban origin. In comparison, the target person with pro-taurine attitude should be an older Spanish man, retired, of rural origin.

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THE INTEGRATION OF FIVE UNRELATED RED RUFFED LEMURS (*Varecia rubra*) FEMALES INTO ONE SOCIAL GROUP

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Red ruffed lemurs (*Varecia rubra*) have a stable captive population that is breeding. However as females are dominate in lemur society they need to move out of their family group but integrating them in to established groups is very difficult. To overcome this, the idea of creating an all-female group was proposed by the Prosimian Taxon Advisory Group and Colchester Zoo took on the task of housing unrelated females to form an all-female group. Over a year four females joined Colchester Zoo to be mixed along with a resident female who was born at the Colchester Zoo. The mixing was done in five stages. The first stage was no physical contact but the lemurs could see, hear and smell each other. Aggression was observed at the mesh barrier and lessened over time. Once the level of aggression reduced the second stage would proceed. The second stage was controlled mixing. The females would have full access to each other and would be supervised by the keeping staff. The third stage saw the females left alone during mixing with the keepers checking in regularly throughout the day. The females would be mixed after the main morning meal and separated for the night before their main evening meal. Any food presented during the day was given to all the females together. Once aggression was at low levels stage four started where full physical contacted was allowed during the day and night. All of these stages happened within the lemur indoor area. For stage five the females would have access to the outside. By conducting the first four stages inside it allowed the keepers to separate the females off easily if aggression was high as well prevent any female from being forced to stay outside. The length of each stage was dependant on each individual female, with some females completing one for more stage quicker than others. The levels of aggression were rated 1-5 with 1 being very low levels of aggression to 5 which was very high levels of aggressions. The findings showed that mixing two lemurs was quicker and had more positive interactions. When mixing more than two higher levels of aggression where seen over longer periods of time but could lead to a successful mix. Furthermore mixing younger females together was more successful than introducing older females. When aggression levels were high with no sign of improving, the mixing was called off.

THE EFFECT OF A TOPICAL ANAESTHETIC AND A BUCCAL NON-STEROIDAL ANTI-INFLAMMATORY DRUG ON INFLAMMATION, WOUND HEALING AND AVERAGE DAILY GAIN OF SURGICALLY CASTRATED CALVES

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This investigation aimed to assess the use of a topical anaesthetic (TA) and a buccal non-steroidal anti-inflammatory drug (NSAID) as effective and practical forms of pain relief for incorporation into routine surgical castration of beef calves. The experimental protocol was conducted under institutional animal ethics committee approval. Fifty Angus bull calves, 3 months of age, were randomly allocated to (1) sham castration / control (CON, n = 10), (2) surgical castration (C, n = 10), (3) surgical castration with the pre-operative administration of a buccal NSAID (CN, n = 10), (4) surgical castration with the post-operative application of a topical anaesthetic (CTA, n = 10) and (5) surgical castration with the pre-operative administration of a buccal NSAID and the post-operative application of a topical anaesthetic (CNTA, n = 10). Measurements for assessment of inflammation, wound healing and average daily gain were taken immediately prior to treatment and 1, 2 and 6 days post treatment. Inflammation and wound healing were assessed through measurement of scrotal temperature, scrotal swelling and plasma haptoglobin, and observational wound scoring on a numerical rating scale. There was no effect of treatment on average daily gain (P = 0.71). Scrotal size of all castrated calves increased significantly in comparison to CON calves (P = 0.004). TA and the buccal NSAID had no effect on scrotal size. C calves had significantly higher plasma haptoglobin than all other calves except CN calves which had an intermediate concentration. Scrotal temperature and wound scores are still being analysed.

AN INVESTIGATION INTO ENVIRONMENTAL ENRICHMENT: THE EFFECTS OF CANOPIES ON THE BEHAVIOUR OF KENNELLED HEARING DOGS IN TRAINING

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Hearing dogs are housed in kennels during the daytime when they are receiving training. Within a kennel environment physical and psychological wellbeing can be compromised, however environmental enrichment has been shown to relieve the effects of stress. Recently Hearing Dogs for Deaf People have introduced canopies (a layer of material situated above the kennel beds), a novel form of environmental enrichment. This study investigated the effect of canopy presence on the behaviours of dogs housed in group kennels, as indicators of dog welfare. Active and non-active behaviours of nine dogs were observed without canopy presence for two weeks and with canopy presence for four weeks.

Canopy presence was found to significantly decrease the amount of time spent in sleep and increase time spent vocalising, scratching and laying down. When grouped together, canopy presence was found to decrease non-active behaviours and increase active behaviours. Vocalisation and scratching, additionally to several of the behaviours included in the active category have previously been used as indicators of stress suggesting that the canopies had an adverse effect on behaviour. However, incidence of these behaviours were low with dogs spending the majority of the observations sleeping. This indicates that the presence of the canopies increased the behavioural repertoire exhibited by the dogs. This could indicate a positive effect of canopy presence. These conflicting results imply that further investigations of the effects of canopies in kennelled dogs are required.

WHY SOCIAL SEPARATION HURTS IN SOCIAL ANIMALS: EVIDENCE FOR A NEUROCOGNITIVE OVERLAP OF PHYSICAL AND SOCIAL PAIN

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Research in humans and nonhuman animals has provided compelling evidence that social pain and physical pain rely on shared neurobiological substrates. Substantial neuropsychological and neuroimaging research in humans has revealed that the dorsal anterior cingulate cortex (dACC) and anterior insula, brain regions known for their role in processing the affective unpleasantness of physical pain, are also activated during the unpleasant experience of social separation. The dACC has also been shown to relate to social pain distress in nonhuman mammals. For example, ablating the dACC in squirrel monkeys eliminates the production of distress vocalizations, and lesions of the ACC in macaques leads to decreases in affiliative behaviour. Conversely, electrical stimulation of the dACC leads to the production of distress vocalizations in rhesus monkeys. Furthermore, in animals and humans, physical and social pain are alleviated many of the same interventions. Studies provide evidence that human individuals highly sensitive to physical pain also show an enhanced sensitivity to social pain. Perhaps most intriguing, acetaminophen – a drug effective in alleviating physical pain – has recently been found to alleviate social pain in humans.

With evidence that in humans and animals social pain can actually be more distressing than physical pain, these findings have profound consequences for the well-being of all social animals. But of special concern is social pain in the domestic dog. It is now generally assumed that domestication in dogs enhanced the dependency on and attachment to humans, which current evidence suggests would involve a strengthening of the social bonding emotions – both positive and negative. Such psychological changes would increase the likelihood that social pain may be more intense in socially deprived dogs than in other species.

A better understanding of the neuropsychology of physical and social pain facilitates the development of improved methods of care for social animals as well as new therapies to alleviate the emotional suffering association with social deprivation.

AN INVESTIGATION IDENTIFYING THE INFLUENCING FACTORS AND THE CONSUMER CHOICES THAT AFFECT THE ADOPTION RATES OF DOGS (*CANIS LUPUS FAMILIARIS*) WITHIN A UK RESCUE CENTRE

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In the UK several welfare organisations care for thousands of dogs each year, but the rehoming of these dogs can be a difficult and lengthy process. This study aimed to identify factors influencing the length of time a dog spends in kennels before being rehomed using data from one of the largest dog rehoming organisations. The Dogs Trust provided records on 20,245 dogs rehomed between 2010 and 2014 from all sixteen of their re-homing centres. This data showed that the mean time spent in kennels for all dogs was 28 days ± 0.354. Whether the dog was a cross breed or purebred had no significant impact on the time spent in kennels (P= 0.169). However, the variables that were found to influence the time spent in kennels were age, size, sex, breed group and reason for relinquishment. The study then attempted to identify potential reasons why these factors had an influence. A questionnaire to potential adopters explored the factors considered when deciding to adopt a rescue dog. The results of the questionnaire suggested why these factors were important when deciding to adopt a rescue dog but also identified further variables that may determine how long a dog spends in a shelter.

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HUMAN DEMONSTRATOR FACILITATES DETOUR PERFORMANCE IN DOMESTIC GOATS

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A detailed comprehension of the socio-cognitive abilities of livestock is necessary for understanding their diverse behaviours, and to improve human-animal interactions on farms and elsewhere. Previous studies have found inconclusive results for horizontal information transfer in ungulate livestock utilising conspecific individuals as demonstrators. In addition, it is not clear if these livestock are able to socially gain information from a human demonstrator. We assessed spatial and social problem-solving abilities of goats using a detour task, in which food was placed behind a V-shaped hurdle. We tested their ability to solve this task using varying spatial configurations (inward vs outward V-shaped hurdle), and the impact of human demonstration on performance of the task (inward V-shaped hurdle with, and without human demonstrator). Goats were assigned to one of three experimental groups (inward non-social; outward non-social; inward social). We found an effect of experimental group ($p < 0.001$) on latencies of goats to solve the detour. For the spatial component ('inward non-social' vs 'outward non-social'), goats in the outward detour group took significantly less time to solve the task than subjects in the inward detour condition ($p < 0.05$ for all trials). For the social component ('inward non-social' vs. 'inward social'), a single presentation of a human solving the detour resulted in an overall decrease in the latencies of goats to solve the task ($p < 0.05$ for all trials). Furthermore, 8/9 goats that observed a human demonstration used the same route ($p = 0.04$). No improvement in subsequent performance was found over all experimental groups, indicating either a ceiling effect or poor individual learning abilities (all $p > 0.4$). Our results demonstrate that ungulate livestock such as goats utilise information provided by a human demonstrator in a spatial learning task. These findings will lead to advances in animal welfare in the long term by providing important insights on new ways to improve handler interactions on farm settings.

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WELFARE AND ENRICHMENT IN CAPTIVE-REARED AMPHIBIANS: A BEHAVIOURAL AND ENCLOSURE USE STUDY USING THE TRINIDADIAN MONKEY FROG (*PHYLLOMEDUSA TRINITATIS*)

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Environmental enrichment is a technique used to improve the captive environment for animals and in turn promote good welfare. However there is a distinct lack of research into enrichment techniques for amphibians despite the large numbers that are housed in captivity. The effect of three different tank set-ups (horizontal, vertical & vertical and shelter) on behaviour and enclosure use was investigated in a population of 12 captive-reared Trinidadian monkey frogs (*Phyllomedusa trinitatis*). The frogs were randomly split into three groups of four and allocated to one of the three treatments. Each tank was filmed overnight for five consecutive nights and reviewed to record the behaviour and location of each frog at five minute intervals throughout the footage. The groups were then rotated around the three tanks (over the course of three weeks) until each group had received each tank treatment. Climbing and moving behaviours were significantly increased in the vertical tanks in comparison to the horizontal treatment, as well as the use of branches. Shelter use was almost non-existent. It appears that the use of a vertical tank encouraged natural climbing behaviours in this species, and if continued to be significant has the potential to be applied to the housing of related species within captive breeding programmes. Welfare implications include an increase in the overall interest and research into amphibian enrichment and application.

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ASSOCIATIONS BETWEEN FARMER OPINIONS, EMOTIONS AND PERSONALITY AND BARRIERS TO UPTAKE OF BEST PRACTICE BY SHEEP FARMERS: THE EXAMPLE OF FOOTROT

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Farmer behaviour and decisions with respect to management of livestock can influence welfare outcomes for the animals in their care. We extend the theory of planned behaviour (TPB) to investigate the relationship between farmer attitudes, emotions and personality and management of livestock disease using the example of footrot in sheep.

A one-year retrospective questionnaire was sent to 4000 sheep farmers in May 2013 capturing data on lameness prevalence, management of footrot, farm/flock descriptors, and five farmer-orientated themes: barriers to treating footrot, opinions about footrot, knowledge of footrot aetiology, empathy and personality. Principal component analyses (PCA) were conducted on the first three themes to produce composite variables representing farmers' attitudes and emotions. The Big-Five personality domains (extraversion, agreeableness, conscientiousness, emotional stability, openness) were measured using a Ten Item Personality Inventory (TIPI). Latent class (LC) analysis was used to subgroup farmers, based on nine managements of FR.

Multinomial logistic regression was used to investigate associations between LC and composite variables. Negative binomial regression was used to investigate associations between the proportion of lame sheep and PCA and TIPI variables.

The useable response rate was 32% and 97% of farmers reported having lame sheep. The geometric mean prevalence of lameness (GMPL) was 3.7% (95% CI 3.51%-3.86%).

Farmers grouped into three latent classes; LC1 (best practice, 11%), LC2 (slow to act, 57%) and LC3 (traditional treatments, 32%). GMPL was 2.95%, 3.60% and 4.10% respectively.

Farmers reporting the production cycle as a barrier to treating sheep with footrot were more likely to be in LC2 (RRR 1.36) than LC1. Negative emotions towards footrot were associated with higher risk of being in LC3 (RRR 1.39). Traditional methods of treating lameness were associated with a higher risk of being LC2 (RRR 2.94) and LC3 (RRR 2.17). Knowledge about footrot transmission was associated with lower risk of being in LC2 (RRR 0.64) compared with LC1.

Farmers who reported production cycle barriers to treating sheep were associated with increased risk of lameness (IRR 1.13), as were farmers reporting negative emotions (IRR 1.13) or feelings of hopelessness (IRR 1.20) towards footrot. Conscientiousness (IRR 0.95) and understanding the importance of farmer response to lameness (IRR 0.76) were associated with reduced lameness risk.

We conclude that emotions and personality are associated with differences in farmer management of footrot and prevalence of lameness. Further understanding on how personality and emotions influence change in behaviour is key to increasing uptake of best welfare practice.

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IDENTIFYING RISK FACTORS FOR HUMAN DIRECTED AGGRESSIVE BEHAVIOUR IN DOGS

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Aggressive behaviour is one of the primary reasons for relinquishment of dogs to rescue centres and euthanasia of pet dogs. Human directed aggressive behaviour (HDAB) has been extensively researched, but often exclusively targets behaviour that results in serious or fatal injury. As a result, the extent and nature of less severe HDAB is not known, limiting opportunities to address this welfare problem. To target the full range of behavioural severity, this study targeted all dogs that were considered a 'problem' by owners in terms of HDAB, and compared them to owner-identified 'non-problem' dogs.

An online survey was completed by dog owners between July and August 2015. Participants answered a broad cohort of questions about themselves and their dogs, management and training, environmental context and specific behaviour. As some participants had owned both a 'problem' and a 'non-problem' dog, a matched case-control sample was achieved (n=654), in addition to independent groups of non-problem and problem dogs (n=1941).

McNemar's analyses of the case-control sample highlight a number of risk and protective factors for HDAB. These include: number of specific fears, type of fear, gundog breeds, dog sex, dog origin, history of neglect or cruelty, owner response to unwanted behaviour, dog role within family, type of play engaged in by owner and dog, attendance at puppy training classes, and off lead walking. The strength and direction of the relationship of these variables to HDAB will be discussed. Further details of owner and environment specific factors (which are partially controlled for in the case control sample) were provided in the univariate and multivariate analyses of the independent groups of non-problem and problem dogs. These analyses showed overall agreement with the risk factors identified in the McNemar's analyses, but also identified new risk factors for future research. These include owner experience, house size and house type.

The design of this study and the methods of analysis used allow interpretation of some risk factors with relative confidence, compared to the results of previous studies of HDAB risk factors. The risk and protective factors identified could be used to help pair prospective owners with rescue dogs, reducing the likelihood of HDAB in newly adopted dogs that can lead to relinquishment or euthanasia.

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INVESTIGATING DEGENERATIVE JOINT DISEASE AND PAIN IN COMMERCIAL PIGS

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Lameness affects an estimated 20% of commercial pigs. This raises not only animal welfare concerns but also has an economic impact on the industry as lameness can reduce productivity of breeding animals and lead to animals being sent for slaughter at an earlier age. Degenerative joint disease (DJD) is a major cause of lameness particularly in older sows and is found in up to 88% of animals at slaughter. DJD presents with pain behaviours such as lameness but how this relates to joint pathology is poorly characterised. Understanding the relationship between histological and biochemical markers of joint disease in the knee and the severity of pain could have important implications for animal welfare and the economics of the pig industry.

Ex-breeding Landrace x Duroc x Large white sows (n=7, weight 200-260kg and approximate age 3.5 years) were observed for leg weakness traits. Pain behaviour was assessed using a visual analogue scale (VAS) which scored factors including lameness, willingness to ambulate and response to human interaction. Observations were made daily for 5 days. The knee joint surface integrity was assessed post-mortem using a photographic chondropathy scoring system (PCS). A section of cartilage and subchondral bone (approximately 2cm sections) from the femoral condyle was collected for histological assessment of cartilage thickness.

Leg weakness traits observed in the pigs indicating an involvement of the knee joint included O-shaped hind legs (a varus malignment) and sickle-hocks. 5/7 pigs showed lameness (score ≥ 2) at some point during the study and lameness strongly correlated with other pain behaviour scores such as willingness to ambulate and response to human interaction (spearman's rank correlation r^2=0.874, p=0.05 and r^2=0.724, p=0.076 respectively). Lameness and photographic chondropathy severity positively correlated (spearman's rank correlation r^2 = 0.879, p=0.009), indicating an association between joint disease severity and pain behaviour. Average articular cartilage thickness was 1.06mm (range 0.67-1.36mm). There was no significant correlation between the cartilage thickness and pain behaviour or chondropathy score; however this could have been due to sections of cartilage not necessarily being taken from areas showing chondropathy.

These findings suggest there is a direct relationship between the degree of joint degeneration and the extent of pain experienced by these pigs. Further biochemical and histological studies will increase understanding of the mechanisms driving this relationship which will have the potential to improve animal welfare, improving treatments and reducing the economic burden to the pig industry.

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A REVIEW OF HANDLING METHODS OF RABBITS WITHIN PET, LABORATORY AND VETERINARY CONTEXTS

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Rabbits are considered to be the third most frequently kept pet in the UK as well as being utilised for medical and veterinary research. Despite this, little research has been conducted on rabbit handling methods. A literature review was conducted that focused directly on proposed handling methods of rabbits within different contexts. This included books where specific handling sections could be identified which were produced for pet owners, veterinary staff and laboratory staff. A range of textbooks were selected between the years [2000 – 2015] that were available on both Google books and Amazon. To identify the recommended handling methods and evaluate information available the following was recorded; number of handling and restraint methods described, justification for suggested methods, identification of inappropriate handling methods and relevant details, word count, use of images and any recommended equipment and its use (e.g. towel to avoid kicking or reduce stress). In total 20 books were reviewed, ten pet rabbit, seven veterinary animal/rabbit and three laboratory animal/rabbit books**.** Results indicate that recommended handling methods differ between contexts and that there is some confusion about the use of some methods, such as scruffing and 'Tonic Immobility', which have been noted to potentially be stressful. Some methods, such as picking a rabbit up by the ears, were consistently considered inappropriate. The authors describe research currently being undertaken and highlight the need for further research such as investigating handling methods and associated educational material provided by rescue centres and pet shops before, during and after the point of purchase/rehoming.

PRESENCE OF A RAMP REDUCES FRUSTRATION-RELATED BEHAVIOURS WHEN TRAVERSING LEVELS IN LOOSE-HOUSED HENS

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Poorly designed hen houses may inhibit movement by providing barriers that are physically difficult for hens to negotiate. In free-range houses the hens have to move down at least one level to access the litter and range area so problems traversing these changes in height could reduce welfare. This study aimed to look at whether birds traversing an essential height change (raised slats to litter) did so with hesitation or signs of frustration, and the influence of design on behaviour.

The sample consisted of 14 free-range flocks with varying house setups (4 multi-tier, 10 single-tier). Observations were taken of focal birds moving from slats (or first tier) to litter in four areas of the house. Seven single-tier farms had a full width ramp at this level change and so for these flocks many birds walked down rather than jumped.

Focal observations of 24-35 birds (maximum of 10 per area within 10 minutes) were studied per flock and percentages calculated. Latency from first head orientation to landing or moving away was recorded. The number of instances of the following behaviours was also recorded: head orientation towards litter, crouching, pacing along the edge and stepping on the spot. Crash landings were also recorded.

Average latency to either jump or move away was 10.08s (±4.90). On average, 17.56% (±12.28) of birds moved away from the edge without jumping or using the ramp. Some 1.89% (±2.84) crashed on landing.

The data were then split into two groups, those with full length ramps (n=7) and those without (n=7). Non-normal variables were log transformed to achieve normality where possible and independent t-tests performed. Flocks in houses without ramps had higher percentages of birds that exhibited 2 or more head orientations (29.65% vs 12.08%) crouched (80.60% vs 48.93%) and paced (17.93% vs 7.28%) (df: 12, $p<0.05$ in all cases). Mann Whitney U tests were performed where variables could not be transformed and the percentage of birds that stepped on the spot was also significantly higher for non-ramp flocks (9.16% vs 3.11%) ($p<0.05$).

This research suggests that the presence of a full length ramp from the slats to the litter reduces behaviours indicative of frustration and difficulty when birds move down to the lower level. This could inform future housing design.

THE USE OF SUBCUTANEOUS MELOXICAM INJECTIONS IN REDUCTION OF PAIN RELATED BEHAVIOURS AND IMPROVEMENT OF GROWTH RATES IN NEONATAL LAMBS

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Castration and tail docking by placement of tight rubber rings (elastration) on lambs is common husbandry practice on UK farms. Tail docking is carried out to reduce the risk of fly strike and castration is performed to prevent unwanted matings. It is a procedure that is commonly considered to be painful but legally does not require any anaesthetic or pain relief up to seven days of age. Currently no analgesics are licensed for use in sheep in the UK. This study aimed to investigate whether administration of subcutaneous meloxicam (Metacam®, Boehringer Ingelheim UK) prior to elastration could decrease observed pain behaviours.

Texel x and Suffolk x Mule lambs were selected for the study. Lambs were between 24 and 48 hours old. They were castrated and tail docked in the case of male lambs (n=63), or tail docked if female (n=59). All lambs were weighed before half of both gender groups were randomly assigned to either receive or not receive a 0.5mg/kg dose of meloxicam two hours prior to elastration. This dose rate was chosen following consultation with Boehringer Ingelheim UK based on the safe therapeutic dose licensed for use in other ungulates.

Lambs were observed at one hour prior to elastration to provide a behavioural baseline and given an identifying spraymark. Observations were then carried out at 1h, 2h, 4h, 6h, 8h, 12h, 36h and 48h post elastration. Weights were recorded at 1d, 2d, 7d, 14d, 28d and 70d post elastration.

Observers were not told the treatment status of the individuals they were monitoring and were assigned the same lambs throughout the trial. A subjective numerical score on a scale of 1-10 (1= no pain, 10= severe pain) was recorded for each lamb at each observation.

Specific pain-related behaviours were identified as suitable to record. These were: tail wagging, kicking/stamping, gait quality, amount of movement, abnormal vocalisation and lying posture.

All monitored pain behaviours increased after castration and tail docking. Results showed trends towards reduction in pain-related behaviours in those lambs treated with meloxicam. During the first 48 hours daily live weight gain of untreated lambs was significantly lower than their treated counterparts. This was consistent with observed pain-related behaviours interfering with normal suckling behaviour. The dose of meloxicam did not completely obliterate all pain related behaviours associated with castration and tail docking thus showing further research into alternative analgesic strategies is indicated.

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IMPROVING EQUINE WELFARE THROUGH EMPOWERING WOMEN EQUINE OWNERS IN DISTRICT PESHAWAR PAKISTAN

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Introduction: In Peshawar District, majority of equines are kept in homes of owners, where their husbandry and management, including stable cleaning, feeding, watering and related care, is usually addressed by their female owners. Brooke Peshawar teams has formed community groups, mainly engaging male equine owners, with limited networking with women owners due to cultural constraints of male staff members directly approaching women. Therefore, the need was felt to combat equine welfare issues through empowering these women by some appropriate channel, mainly through female field staff.

Aim: To improve equine welfare by improving Knowledge, Attitude and Practices (KAP) of women equine owners

Methods: A project was piloted in which Government Female Veterinary Assistants (FVAs) were trained to mobilize women equine owners and create awareness among them regarding basic managemental practices (BMPs). A memorandum of understanding was signed with Livestock Department, Khyber Pakhtoonkhwa Province, who employs 35 FVAs. It was mutually decided that Brooke would build capacity of four FVAs, who would then work in coordination with Brooke to improve KAP of women Equine Welfare Groups (WEWGs) in selected areas. Three days training was organized for four FVAs, comprising of BMPs, equine welfare, and conducting KAP Study. After training completion, two FVAs organized 2 WEWGs comprising of 54 women equine owners and started organizing meetings on BMPs including grooming and foot cleaning, water awareness, feeding, stable cleanliness and wounds management. KAP Study before and after intervention was carried out by involving 30 women randomly.

Results: KAP Study results showed that 90 % women equine owners were offering low quality feed, 80 % were not cleaning stables daily, 90 % were offering water only once in a day and 100 % women were not taking care of wounds. Re-KAP Study showed remarkable improvement in the management practices of WEWGs i.e. 60 % of women started offering good quality feed, 70 % started cleaning stable daily, 80 % offering water more than three times a day and 85 % women are taking proper care of wounds.

Interpretation: Improved KAP of women equine owners leads towards improved equine welfare. WEWGs realized the impact of improved management practices on animal's health. Improved awareness among WEWGs regarding BMPs increased the working efficiency of their animals. There is great need to organize more WEWGs to improve equine welfare. Brooke Peshawar can address this need by training more FVAs and organizing WEWGs in different areas.

PERSONALITY, HEALTH AND BEHAVIOUR IN THE DOMESTIC DOG

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It has long been established that in humans, behaviour, health and personality interact. In animals, this interaction is relatively understudied. A plethora of research has made links between human personality and the expression of health problems, ability to cope with health-related conditions (e.g. pain) and the impact of treatment on recovery. Previous research with animals has shown that personality interacts with stress responses and pain expression, and in dogs, that owners see changes in their pet's behaviour and demeanour during chronic pain. However, it is unclear whether differences in demeanour and behaviour occur in all dogs, or whether personality impacts how dogs express their health conditions.

The aim of this study was to determine if it would be possible to differentiate dogs with and without experience of pain conditions by personality and behaviour. It was expected that an increase in owner reports of aggressive behaviour would be associated with the dog having or having had a painful condition. In addition it was expected that specific aspects of personality would be associated with both painful conditions and aggressive behaviours. A survey was designed to collect information from dog owners about their dog's breed, gender, age, neuter status, and past and current medical record, how frequently their dog performs certain behaviours, and finally, the positive and negative activation scale (PANAS) for dogs as a measure of personality.

Binomial logistic regressions were carried out, with pain-causing condition experience as the dependent variable and personality factors, age and total aggression as independent variables. The results showed that lower scores for the personality traits 'positive affect' older age and aggression scores were associated with experience of a pain causing condition.

These results provide novel findings for an association between pain and personality in dogs and support previous research demonstrating a link between pain and aggression in dogs. Furthermore, the two possible explanations for the results are discussed; namely whether dogs with certain personality traits are more likely to be diagnosed with painful conditions compared with the possibility that a dog owner's judgement on their dog's personality may be affected by their dog's health conditions.

SURVEY OF ELECTRICAL STUNNING SYSTEMS USED BY SMALL SCALE PRODUCER/PROCESSORS FOR TURKEYS, DUCKS AND GEESE IN THE UK

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There is limited information on current poultry and waterfowl stunning/slaughter practices in small scale processing plants, farms and abattoirs in the UK. Specifically, no detailed evidence on the techniques, equipment and settings used for the head-only/head-to-body/head-to-shackle electrical stunning of turkeys, ducks and geese in the UK currently exists. Stunning poultry before slaughter is a legal requirement (EU 1099/2009 and WATOK 2015) adopted to improve animal welfare during slaughter. In Europe the minimum electrical current for head-only electrical stunning is 400 and 240 mA for turkeys and chickens, respectively. There is, nevertheless, an urgent need for up-to-date research and information on the head-only/head-to-body/head-to-shackle electrical stunning of waterfowl, as there are no minimum required currents under (EC) 1099/2009 for ducks or geese and little published peer-reviewed information on the effectiveness of head-only/head-to-body/head-to-shackle (non-waterbath) stunning in these species. In addition, it is anecdotally recognised for ducks and geese that low voltage head-only electrical stunning (with commercially available constant voltage devices) is ineffective, constituting a serious threat to the animal welfare. Some producer-processors still use this method, however the exact numbers are unknown.

To address this deficit, face-to-face interviews with staff/managers at UK poultry and waterfowl processing plants were undertaken to investigate current practices and issues experienced by the industry. Interviewees were recruited by telephone/email message and by industry contacts. Where interviews were not possible, a paper version of the questions in survey form was posted with a stamped addressed return envelope. The survey was structured focusing on technical aspects of the stunning parameters used, technical details of the handling and restraining methods used, meat quality of slaughtered birds, staff training and experience, as well as the industry attitudes towards improving the current system.

The information from the interviews will help identify potential areas for the refinement and development of existing and new stunning systems, and to improve animal welfare and performance whilst minimising negative impacts on product quality, processing costs and ensuring industry relevance.

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ASSESSMENT OF NERVOUS ACTIVITY TYPE AND STATUS OF HORSES

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The study was aimed at developing methodical guidelines for equine behavioural studies for horse breeders and specialists. The prepared methods were tested in three horse breeding centres of northern Lithuania with the native horses of the Žemaitukai and saddle breeds (Lithuanian saddle, Baltic Hanoverian, Thoroughbred). The methods are based on the five horse senses (taste, smell, hearing, sight and touch) and their sensitivity assessment by using novel irritants in the habitual environment for the horse. A combination of six tests is used. Every horse is tested individually. The results of each test are scored on a five-point scale. The minimal and maximal scores for a horse after six testing's could be, respectively, 6 and 30 points. The highest score is given to the horse, the response of which to the novel irritant in 5 seconds was positive, the horse did not lose its balance, did not show indifference or fearfulness. The instinctive responses of a young horse and the data summary could be used to judge about the inherent abilities and the temperament of a horse, whereas those of an older horse could show the status of its nervous activity. Experimental tests in three herds indicated that the methods allow to assess not only the type of the nervous activity, but also indicate the welfare of a specific herd and the status of an individual horse in the herd. Almost all the horses tested met the criteria for a very strong or strong nervous type or status and revealed a relatively high level of horse welfare. Further studies with the horses from different herds and of different age groups will be carried out.

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IMPLEMENTATION OF WELFARE CERTIFICATION IN A NON-FOOD SECTOR: INSPECTION CHALLENGES

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The value of 'Animal Welfare' as a stand-alone aspect of the consumer offer provided by retail and food service companies is now well-established. Similarly, the commercial merit to demonstrating adherence to prescribed standards increasingly underpins producer engagement with inspection and certification schemes globally. Consumers wishing to make informed food purchases rely on product certification in what is an increasingly segmented market place. In contrast, the idea of 'Animal Welfare' in non-food sectors such as textile manufacture, is comparatively underdeveloped but nevertheless the increasing consumer awareness of emerging issues has the potential to leave the end user highly exposed to negative and damaging publicity.

The Traceable Down Standard was developed following consultation with key feather producers, NGOs, Textile Manufacturers and overseen by NSF sustainability (with significant input from Integra Food Secure; a division of NSF with specific expertise in animal welfare inspection protocols and standards). The initial drive was concern to demonstrate that specific practices were excluded from the supply chain either as a primary aspect of feather production e.g. live plucking or a secondary activity e.g. force feeding of those birds used principally for meat/foie gras production. The scheme differed from existing 3rd party certification standards in that it covered the whole chain (parent stock, hatchery, raising farm, slaughter and feather processing) rather than just looking at practices from the raising farm onwards. Between April and October 2015 inspections were carried out in Poland and Hungary across 5 separate integrations as follows:

Sector	Parent Flock	Hatchery	Raising Farms	Seasonal Paddocks	Slaughter and Processing
Number of Inspections	55	17	167	4	10

Three integrations that had a small number of inspections the previous December as part of the 'proof of concept' phase, but were still comparatively unfamiliar with the process while two were naïve to both this process and the general requirements of any certification inspection, including the fact that birds and the relevant processes at each stage e.g. take-off at a hatchery have to be observed in real time. An overview of findings will be presented indicating that a lack of process understanding rather than fundamental deficiencies in animal welfare practice is potentially the greatest barrier to engagement and compliance.

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THE USE OF CALMING NUTRACEUTICALS IN ANIMAL WELFARE: SEDATIVE VERSUS ANXIOLYTIC IMPACT

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The use of calming nutraceuticals in commercial animal feeds has increased steadily in the UK over the last ten years. The term "nutraceutical" relates to those foods which support health upon intake and many feeds now additionally offer support for psychological wellbeing (*e.g.* reduction of stress and anxiety). Many of the products commercially available are backed through testimonial claims rather than scientific investigation. As a result this brings into question the actual impact of said products on an animal's health and welfare. As part of a larger study into herbal nutraceuticals, an online questionnaire was publicised to those in the companion animal veterinary/behavioural field wishing to participate in the discussion on the signs of sedation versus reduced anxiety in companion animals. Preliminary findings from the first 39 participants that took part suggested, in large part, support for the use of calming nutraceuticals, with most common use in cats and dogs. On the subject of sedative versus anxiolytic impact, when asked to categorise behavioural responses, over half of the participants skipped the question. For those that did answer only four behaviours (out of 34) were agreed on as indicating either an increase or decrease in sedative or anxiolytic effect. Only one behaviour (social interaction with owner/s) was present that was suggested to show sedative effects alone (and not anxiolytic effects also). These preliminary findings suggest the importance of further scientific investigation into anxiolytic nutraceuticals fed on a long term basis and the potential for unreliability in owner reporting of pet response to calming nutraceuticals in testimonial trials of calming feeds sold commercially. Discussion of ethical implications of a) not knowing the exact impact and b) the long term effects on an animal's welfare is hoped to further the conversation on the long term use of calming supplements and nutraceuticals within captive animal welfare, and provide interest in further research.

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HOW ANIMAL SCIENCE AND VETERINARY MEDICINE STUDENTS FROM SAO PAULO UNIVERSITY PERCEIVE ANIMAL MORAL STATUS

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INTRODUCTION: Animal welfare and animal rights have been getting more attention from the general public in the past few years. Pets are even considered members of the family by some owners. Unfortunately, the same status is not extended to wild or production animals. A better understanding of these species can provide better moral values to these species.

METHOD: A questionnaire, using Google docs, was elaborated with closed questions to investigate the perception of animal science and veterinary students and professionals to certain animal species. The questionnaire was applied to 53 veterinary medicine and animal science students and former students from Sao Paulo University. The aim of the questionnaire was to evaluate how students perceived the importance different animals, as well as to access if there was a difference in these parameters between students that undertook the optional discipline of Animal Welfare and Ethics and those who did not.

RESULTS: 57% of all participants were consumers of organic or free range products, from which 55% attributed this decision to animal welfare and rights. 29% of all participants did not consume some animal product. 43% of participants that attended the discipline did not consume some animal product, against only 23% of those who did not attended. When asked how to grade from 1 to 5 how concerned they were about animal's necessities, personal pets received an average of 4.8, followed by strays, lab and production animals (4.3), fish (4.0) and street rats (1.9). Participant's pets were considered the closest to humans by 88%, while neighbour's pets by 46%. Production and lab animals, fish and rats were classified as having very low proximity, with 79% of participants declaring they had no proximity whatsoever, and fish and lab animals by 45%. When asked about how much right they should be entitled to, 90% marked the highest grade to almost every species, except for rats, which received the highest grade by only 49% of subjects and 19% stated they should not be entitled to any rights. Average score was generally higher among those who undertook the discipline.

CONCLUSION: Moral value attributed to animals depends on their proximity to the subject and how much knowledge they have about the species. This study shows that animal welfare classes can increase the importance attributed to and awareness regarding welfare of every species.

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BROILER CHICKEN WELFARE OUTCOMES BASED ON SLAUGHTER CONDEMNATION DATA IN BRAZIL

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Brazil is the third largest broiler chicken producer in the world. In 2015, about 5.2 billion broiler chickens were slaughtered in establishments under Federal Inspection Service (SIF) of the Ministry of Agriculture, Livestock and Food Supply (MAPA), and there is a projection of a 46.4% increase in chicken meat production by 2023. In face of higher demand for information about farm animal welfare (AW), governmental monitoring actions are increasing worldwide. Condemnation data is already in use by competent authorities in European Union to monitor AW at the slaughterhouse. In Brazil, the MAPA undertakes meat inspection at slaughterhouses, but such outcomes have not yet been used for AW assessment. This study aimed to assess condemnation data from broiler chicken slaughterhouses in Brazil to evaluate their potential use as indicators in an AW governmental monitoring program. We collected condemnation data from the official database available at the MAPA website, from January 2010 to December 2015, considering all 18 States that slaughtered broiler chickens under SIF. Following the literature, assessment considered total and partial rejections for AW target indicators contusion, bruises, fracture, emaciation, dehydration, ascites, septicaemia, abscess, hepatitis, pericarditis, inadequate bleeding, contact dermatitis and dead on arrival (DOA). All indicators, except dehydration, were reported on inspection data. We identified significant variability among States, mainly on type of condemnation and terms used to describe indicators, thus reported values seem underestimated. For example, contusion, that was the main cause of partial condemnation (88.5%), was recorded in only 16 States and presented high variability on results, with median condemnation of 1,638.5 (0.013 – 46,167.1) per 100,000 birds. Carcass parts condemned for contusion were not identified. Pericarditis and hepatitis data were available in six States. Footpad dermatitis was reported only in data from the State of Goiás. In six States there was condemnation for birds 'found dead', which may be related to DOA. Federal Inspection has played an important role on meat inspection, complying with rigorous international standards. The inclusion of an AW view on condemnation information is a new concept to be included to SIF in order to obtain reliable data. Results suggest the need to establish a working group to set specific AW outcomes to be monitored, to standardize recording procedures among States and to integrate condemnation, DOA and flock data.

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VALIDATION OF LAMENESS AND JOINT INFLAMMATORY RESPONSE BIOMARKERS IN GROWING PIGS

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Introduction Lameness is a significant animal welfare and production issue in commercial pig farming, characterised by deviation from normal gait/posture which may indicate pain/discomfort when standing/walking. Degenerative joint disease, which includes osteochondrosis (OC), is a major cause of lameness in growing pigs as well as a predisposing factor for further locomotor problems later in life. OC arises from the degenerative failure of cartilage formation in young animals. Presently the incidence and severity of OC lesions can only be reliably confirmed by post-mortem examination, which is costly and results in the loss of breeding animals. Serum biomarkers of cartilage synthesis and degradation, respectively collagen II propeptide (CP-II) and collagen II cleavage product (C2C), have been validated in human joint disease, as well as cytokine interleukin 6 (IL-6), an inflammatory response biomarker. Therefore this project aimed to validate the use of selected behavioural, clinical and molecular biomarkers as indicators of OC severity and associated pain in growing pigs.

Materials and methods Two cohorts of pigs were utilised, managed under local/national guidelines on the use of animals in research. Cohort I was cross sectional, comprising 32 female pigs (weighing 60-65 kg) which were scored for clinical musculoskeletal symptoms and gait, before euthanasia and determination of joint pathology: number and severity of OC lesions, cartilage and serum samples. Cohort II was longitudinal, comprising gait parameters (e.g. step-to-stride length ratio, SSLR, a key indicator of propensity to develop subsequent lameness) and serum samples from 84 pre-breeding gilts. Serum concentrations of CP-II and C2C, and IL-6 in synovial tissue were measured by commercially available, validated ELISAs.

Results and discussion For pigs in Cohort I, 9% showed reduced weight-bearing lameness, 19% showed gait stiffness whilst 72% were classed normal. Prevalence of OC lesions was 60% (31% mild, 22% moderate and 6% moderate/severe). Although levels of cartilage biomarkers were not associated with OC lesion prevalence, CP-II levels were reduced in pigs with gait stiffness ($P<0.05$). Synovial IL-6 concentrations were significantly lower in the mild and moderate/severely affected OC groups compared with normal pigs ($P<0.05$). For Cohort II, serum C2C levels were higher in pigs which subsequently developed lameness ($P<0.01$). CP-II levels were negatively correlated with SSLR, thus lower CP-II values were associated with increased stepping asymmetry and greater risk of subsequent lameness ($r = -0.512$, $P<0.05$). These results indicate that, with further validation, CP-II and C2C could represent a useful tool for health diagnostics and management of pigs.

ETHOLOGY DATABASE FOR IMPROVEMENTS IN FISH WELFARE

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How can we judge whether a fish farming method is species-appropriate? We first need to know how a species behaves in its natural habitat and which of its needs are satisfied there. And this is precisely the problem: ethological studies of fish in the wild are still few and far between.

In order to bridge this gap, the fish ethology database "FishEthoBase" has been developed. Based on a set of ethological categories and a comprehensive review of all available studies carried out so far, FishEthoBase depicts the ethological profile of a species as detailed as possible by summarising the findings, indicating research gaps to academia and interpreting the results in the form of recommendations for the field.

Ethological observations in captivity, especially in the form of comparisons of different farming systems can indeed provide pointers for the improvement of the keeping of fish. In order for studies on captive fish not to lead to circular reasoning, however, they need to be "calibrated": by studies in the habitat from which the species in question originates. That is why we place special emphasis on findings in the wild.

Our project
In a project currently schedule for seven years, fair-fish international is committed to establish FishEthoBase to complement the leading fish database FishBase.org, warmly welcomed by its coordinator Dr. Rainer Froese (IFM Geomar, Kiel).

Step by step, all ethological knowledge to be found on fish in the wild and in captivity should be available here – especially on the 450 species that are already being raised in aquaculture today and about whose species-specific needs the fish farmers still know very little.

For the time being, the ethological profiles of four species are published: Atlantic salmon, Nile tilapia, Gilthead sea bream and Whiteleg shrimp: http://fishethobase.fair-fish.ch/en/

Three new profiles are in progress: Sea bass, European perch and Pikeperch; further species to be profiled are already identified. Given the elaborateness of the task and the limited means at hand, we currently produce four new profiles per year.

The goals of FishEthoBase are a) to highlight the research gaps and encourage further research and b) to enable ethologically-based answers to questions from practitioners and policymakers.

SHEEP PERCEIVE BRUSHING AS A POSITIVE STIMULUS: STUDY OF BEHAVIOURAL RESPONSES AND NASAL TEMPERATURE

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Research on positive affective states in animals has increasingly contributed to their welfare. Events that may elicit positive emotions include play, feeding and, recently, positive judgment towards tactile interactions have been demonstrated in farm animals. We investigated whether sheep perceive brushing as positive, through behavioural and temperature responses. Twenty-seven Dorper and White Dorper sheep were brushed by a familiar observer in three body regions: ventral neck, lateral chest and withers. We performed 3 min focal assessments at pre, during and post-brushing phases. Vocalization, ear changes and postures, presence of half-closed eyes and tail wagging were assessed. We also recorded nasal temperature with an infrared thermometer, twice at each phase. Data were analyzed using descriptive and nonparametric methods, in addition to marginal and linear mixed models. The models considered sex, breed and phase as fixed effects, as well as the random effect of animal for linear mixed models and a correlation structure for marginal models. Vocalization was not frequent throughout the phases. Regarding ear changes, no significant effect was found ($p>0.05$). Sheep changed ear postures 10 (1/42), 6 (0/26) and 7 (0/39) times pre, during and after brushing, respectively. We identified three main ear postures frequently performed: horizontal (H), raised up (R) and backward (B) postures. In relation to the estimated probabilities for the occurrence of ear postures, we observed important breed and phase differences, when comparing B x H ($p<0.05$). During brushing, sheep tended to show a higher proportion of B posture in comparison with H postures. In this case, a frequent performance of B posture may be an indicator of an appeasing state. Comparing R x H postures, we noted a longer duration of R posture pre than during brushing ($p<0.05$). Sheep showed a higher proportion of half-closed eyes during and post-brushing, when both phases were compared to pre-brushing ($p<0.05$). Only four male sheep wagged their tails, mostly during brushing (median: 7.50s; minimum: 4.38s; maximum: 9.03s). Post-hoc pairwise comparisons indicated important differences for mean nasal temperatures pre (33.46±1.87) and post-brushing (34.12±1.58) ($p<0.05$) as well as during (33.25±2.02) and post-brushing ($p<0.05$). No significant differences were noted pre and during the stimulus ($p>0.05$). Our findings suggest that the animals perceived brushing as positive. Ear postures and half-closed eyes have shown to be useful tools for assessing emotional states in sheep. Furthermore, although there is a need for validation, nasal temperature may be a promising measure of emotions in sheep.

STRESS RESPONSES OF DOGS SURRENDERED TO THE RSPCA ANIMAL SHELTER IN BRISBANE, QUEENSLAND

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Dogs that are surrendered to an animal shelter are exposed to a range of novel stimuli that can affect them in a positive or negative way often causing severe stress. This in turn can affect their behaviour and so jeopardise their chances of being of being rehomed. The aim of this study was to develop and refine data collection methodologies to better assess the stress response of dogs surrendered to the RSPCA animal shelter in Brisbane, Queensland to facilitate the identification dogs which are likely to be unable to cope with the shelter environment. A secondary aim was to identify the most appropriate time for the RSPCA staff to conduct behavioural assessments on newly surrendered dogs to be able to more effectively identify 'at-risk' animals and so apply appropriate behaviour modification strategies to assist them.

Forty surrendered dogs were used for this study. They were initially behaviourally assessed by shelter staff as being either potentially suitable for rehoming or likely to be unsuitable and hence destined for euthanasia. Data were collected over a five day period from the day of admission and this included observations of 35 separate behaviours and the collection of saliva samples to assess cortisol concentrations.

The results indicated that all dogs had a gradual increase in cortisol concentration over the five day study period and that while there was considerable variation amongst individual dogs for both behaviour and cortisol concentrations there were significant differences between the dogs which were destined for adoption and dogs destined to be euthanased ($P < 0.05$). In particular the latter group showed higher cortisol levels and these were significantly correlated with behaviours associated with stress such as tail tucked and low, ears back, low body posture, tense body postures, and stiff tail.

The study provided valuable information about the behavioural and physiological effects of the shelter environment on surrendered dogs, and indicated the need to recognise that some dogs are unable to effectively adjust to this environment. However, it did confirm that the RSPCA behavioural assessments are effective in identifying these dogs, and their need for further behavioural modification. Future development into a longitudinal study of dogs with more detailed behavioural observations and physiological parameters would give further insight into the impact of the shelter environment and the strategies that might be used to ameliorate these effects.

PROMOTING ANIMAL WELFARE AND ETHICS IN VETERINARY PRACTICE

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The UK veterinary charity PDSA provides free veterinary treatment to the sick and injured pets of people in need through 51 pet hospitals and over 380 partner veterinary practices. It also promotes responsible pet ownership and undertakes the largest annual survey on whether the UK's pet dogs, cats and rabbits are having their five welfare needs met. Following increasing media and outreach activity by PDSA on companion animal welfare and owner education, the charity created a national internal Pet Wellbeing Task Force (PWTF) to ensure animal welfare and ethics were also given explicit focus across its network of charitable hospitals. Populated by hospital-based PDSA staff from across the UK, and from across a range of job roles, the PWTF considered ways in which veterinary practices could promote high standards of animal welfare, to create a vision of "good animal welfare and ethics in veterinary practice". Pet wellbeing champions were recruited in each PDSA hospital, according to a role description, and were also consulted on the vision. The champions ensure effective two-way communication between the hospitals and the national PWTF – they lead on national pet wellbeing initiatives at the hospital level (e.g. recruiting participants to PDSA's annual pet obesity campaign, Pet Fit Club, and delivering practice-based quality of life assessments) and gather thoughts and ideas on pet wellbeing issues from their hospital colleagues for the PWTF to explore and progress. For the last two years the PWTF has surveyed each hospital's animal welfare and ethics activities, according to the agreed vision. Areas identified for further exploration have been nominated as topics for an annual pet wellbeing champions' day and discussed by the champions and invited expert speakers. Through this staff-led animal welfare surveillance system, the charity has developed new internal positions and policies on topics including pain assessment, four month neutering of kittens, approved accreditations for pet behaviourists and trainers, and euthanasia of small pets (e.g. rodents). Additionally, the champions have helped gather patient case studies to support awareness-raising media stories and collaborative campaigns with other animal welfare charities. To support their role, the champions receive information about CPD in animal welfare for themselves and their colleagues, such as webinars and Massive Open Online Courses (MOOCs). Future plans include developing an evidence-based approach to ethics-based discussions at the hospital level. This approach to animal welfare and ethics provides a potential model for other veterinary practice settings, including private practice.

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THE PHYSIOLOGICAL EFFECTS OF MORPHINE IN THE SOUTH AMERICAN RATTLESNAKE *CROTALUS DURISSUS*

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Although morphine represents the gold-standard for analgesia in mammals, an effective opioid remains to be demonstrated in snakes; no reliable anti-nociceptive effect was reported for thermal nociceptive stimulation in corn snakes, and morphine does not appear to exert significant analgesia upon subcutaneous capsaicin injections in ball pythons. Here we investigate the physiological effects of morphine, including measuring corticosterone and heart rate as potential nociceptive indicators, in a species of snake used extensively in anti-venom production and scientific research – *Crotalus durissus* – the South American Rattlesnake.

Anaesthesia was induced in secure transparent boxes until the snakes lost reflexes and could be intubated for mechanical ventilation on isoflurane (2-3% in air; 100 ml kg^{-1} min^{-1}) at 30 °C. The experimental group (n=6), received an intramuscular (IM) injection of 10 mg kg^{-1} morphine, while another six control snakes received a matched volume of saline. Bupivicaine (2 mg kg^{-1}) was applied as local analgesia to the surgical site in both groups. An intra-arterial catheter was placed in the vertebral artery 3cm cranial to the heart, allowing measurement of mean arterial pressure (MAP) via a pressure transducer, derivation of heart rate (HR), as well as withdrawal of blood samples for determination of corticosterone concentration. To further quantify the effects of morphine in resting snakes, a second group had morphine (n=6), or saline (n=5) IM administered 48 hrs after surgery.

Morphine administration caused a tendency towards tachycardia throughout surgery and recovery (linear mixed model, effect of morphine administration ($\chi 2(1)= 1.28$, $p=0.256$). Corticosterone concentration also tended to be higher in the morphine-treated snakes (morphine, 0 hr [corticosterone] 479 ± 187 ng ml^{-1}, 48 hr [corticosterone] 410 ± 175 ng ml^{-1}), while the control group showed the expected tendency for postoperative decrease in corticosterone concentrations (control, 0 hr [corticosterone] 410 ± 175 ng ml^{-1}, 48 hr [corticosterone] 211 ± 121 ng ml^{-1}). There was a significant tachycardia in snakes when morphine was administered post operatively (effect of morphine treatment, linear mixed model: F 3.019031 p = 0.0025), with significant differences ($p<0.05$) at 3 and 7 hrs after administration (e.g., 38 ± 11 versus 22 ± 7 beats min^{-1} in control and morphine treated snakes, respectively, at 7 hrs). This corroborates previous findings in ball pythons.

In conclusion, morphine at 10 mg kg^{-1} did not reduce heart rate or corticosterone concentrations in South American rattle snakes when administered pre-operatively, but was associated with a significant tachycardia when administered at rest.

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IS THIS EUTHANASIA ACCEPTABLE? A QUESTIONNAIRE EVALUATION OF OPINIONS ON EUTHANASIA OF DOGS IN DIFFERENT SITUATIONS.

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Many dogs are euthanased in veterinary practices each year for various reasons from relief of pain and suffering in life-limiting conditions, through irresolvable behaviour problems to owner's inability to care for their pet. Euthanasia is a morally complex issue and often leads to stressful circumstances especially where the opinions of owner and veterinarian differ on the appropriateness of euthanasia. Here we assessed opinions of a number of veterinary surgeons, veterinary students, veterinary paraprofessionals and members of the public with regard to the appropriateness of euthanasia in a number of different situations.

Participants were asked to define the opinion on the acceptability of euthanasia in five situations, scored on a Likert scale from +1 (acceptable) to -1 (unacceptable).
a. Euthanasia through financial limitations when treating an ill dog
b. Euthanasia as owner is unwilling to treat a dog despite having finances to do so;
c. Euthanasia through financial limitations when treating a dog with a curable disease;
d. Euthanasia because of financial limitations with a healthy dog;
e. Euthanasia of an aggressive dog over concerns that someone will be injured
f. Euthanasia of an unwanted healthy, well-tempered dog.

The results are as shown in the table below

	No.	a	b	c	d	e	f
Overall	132	0.31±0.50	-0.01±0.60	-0.16±0.54	-0.61±0.48	0.44±0.50	-0.80±0.32
Gender							
Female	74	0.30±0.51	0.04±0.55	-0.18±0.48	-0.6±0.38	0.45±0.42	-0.83±0.27
Male	52	0.34±0.51	-0.11±0.67	-0.11±0.62	-0.55±0.59	0.43±0.59	-0.76±0.38
Occupation							
Vet	12	0.59±0.37	0.35±0.49	0.08±0.37	-0.5±0.38	0.83±0.18	-0.75±0.28
Vet Student	39	0.33±0.38	0.01±0.46	-0.03±0.48	-0.63±0.38	0.35±0.50	-0.78±0.27
Para-professionals	15	0.41±0.39	0.15±0.70	-0.21±0.54	-0.58±0.49	0.58±0.33	-0.80±0.31
Lay	63	0.22±0.59	-0.14±0.65	-0.25±0.58	-0.60±0.56	0.40±0.53	-0.81±0.36
Age							
Under 16	15	-0.02±0.64	-0.36±0.70	-0.22±0.54	-0.31±0.74	0.46±0.52	-0.96±0.06
16-25	51	0.34±0.40	-0.06±0.48	-0.08±0.49	-0.66±0.39	0.34±0.50	-0.79±0.31
26-35	15	0.49±0.44	0.19±0.69	-0.06±0.56	-0.68±0.37	0.66±0.35	-0.89±0.16
36-45	7	0.31±0.41	-0.12±0.32	-0.15±0.42	-0.83±0.21	0.42±0.54	-0.89±0.12
46-55	25	0.34±0.51	0.15±0.60	-0.31±0.56	-0.64±0.45	0.43±0.51	-0.75±0.32
56-65	6	0.40±0.23	0.38±0.39	0.07±0.55	-0.25±0.51	0.66±0.31	-0.57±0.29
Over 65	10	0.42±0.72	-0.02±0.84	-0.25±0.75	-0.59±0.65	0.47±0.56	-0.60±0.65

These results showed no gender bias in opinions on euthanasia, nor a clear change with age apart from under 16 year olds who were uniformly less accepting. Veterinarians were more accepting of euthanasia in each case than were students or paraprofessionals. Lay members of the public were least accepting of any euthanasia. These data demonstrate for the first time opinions of a range of individuals within and outside the veterinary profession on acceptability of euthanasia of dogs.

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DIFFERENCES IN BEHAVIOUR OF BLIND AND SIGHTED TAWNY OWLS (STRIX ALUCO) IN A RAPTOR REHABILITATION CENTRE: POSSIBLE INDICATORS OF WELFARE COMPROMISE IN BLIND BIRDS?

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Many owls are injured in road traffic collisions, rescued by members of the public and rehabilitated. A relatively high proportion of these birds, however, have ocular injuries resulting in blindness either unilaterally or bilaterally. These individuals can be cared for in captivity and feed well but cannot be considered fit for release. They may have significant welfare concerns and since they do not function as they do in the wild many would say that they cannot have a good life or even a life worth living. Others point to such birds surviving in captivity and argue that euthanasia is inappropriate. Here we compared the behaviour of blind and sighted birds, assessing whether there are significant differences which may impact on their welfare.

Eighteen Tawny owls (*Strix aluco*) from an avian rehabilitation unit, 7 with ocular defects and 11 normally sighted, were observed through the day over one week and through the night using an LTL Acorn scouting camera providing infra-red motion detection. Behaviour was quantified to determine what proportion of the time was spent perching, flying, eating, interacting with other birds or motionless. Here we report the number of flights taken daily and their nature as a key feature of their behaviour, together with behaviour when interacting with humans in the facility.

Average number of flights per day by visual birds was 3.2±0.9 while blind birds flew 2.7±1.1 flights per day. While the number of flights performed daily by blind and sighted birds did not vary significantly ($p=0.42$) their nature was substantially different. Birds with visual impairment circled, hit their intended target often or flew only at ground level, while visual birds flew directly to the target and landed without mishap. Another key difference was that blind birds did not make alert calls when approached and were more disturbed by human contact than were sighted birds, although such differences were difficult to quantify.

While it is impossible directly to gauge how these birds cope with their visual impairment, these differences in their flight patterns, a key feature of normal avian behaviour, provide significant indirect evidence that their welfare is likely to be suboptimal. Having said that, comparison of the flight patterns of normally sighted owls in captivity with the behaviour of owls in the wild where owls normally fly considerable differences each night, would suggest that even their welfare does not compare well with that of wild birds.

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FACE RECOGNITION: USING TECHNIQUES FROM COMPUTER VISION TO MONITOR WELFARE IN MACAQUES

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Monitoring behaviour is an important part of monitoring animal health and welfare. Behaviour monitoring is particularly important for primates due to a lack of robust, objective welfare measures. Manual observation of behaviour is time consuming and can require considerable staff training. In recent years automated methods of monitoring behaviour have been used for a wide variety of species, ranging from GPS tracking in wild animals to video based behaviour identification in laboratory rodents. Automated monitoring of monkeys presents particular challenges due to the size of the groups, the complex nature of the enclosures and the difficulty in attaching any external devices (such as collars) to the monkeys. My aim is to develop an automated system for monitoring macaque behaviour that is non-invasive, affordable (using readily available equipment) and flexible.

I will present data from my project developing an automated video analysis system for use with group-housed Rhesus macaques. This system uses off the shelf equipment (a camcorder and PC) and uses recently developed computer vision algorithms. The monkeys are housed in large indoor enclosures in breeding groups of 5-10 females, 1 male and their offspring (up to 26 individuals in a group). I will show that it is possible to use face recognition to identify individual monkeys in a group and discuss what factors influence the reliability of identification. I will then discuss how the face recognition can be linked with social network analysis to produce useful information for colony management and welfare monitoring.

Figure: Face recognition applied to a single video frame