

Recent advances in animal welfare science

UFAW Animal Welfare Conference

York Merchant Adventurers' Hall, 30th June 2010

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Health and welfare in organic laying hens

SJ Bridgewater and JE Lock (Hartpury College, UK)

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E Briefer and AG McElligott (Queen Mary University of London, UK)

Mother-young acoustic recognition in goats: A unidirectional or mutual process?

S Buijs, LJ Keeling, S Rettenbacher and FAM Tuytens (Institute for Agricultural and Fisheries Research, Belgium, Swedish University of Agricultural Sciences, Sweden and University of Veterinary Medicine, Vienna, Austria)

Glucocorticoid excretion in rabbits before and after transport – influence of environmental enrichment and cage size

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Pet protection during euthanasia: Recent advances in Italy

APM Crespo, JD Ferreira, L Tibério, APS Pereira and N Carolino (Escola Superior Agrária/Instituto Politécnico de Santarém, Jandim Zoológico de Lisboa and Estação Zootécnica Nacional, Portugal)

Environmental enrichment for cougars (*Puma concolor*) in Lisbon Zoo

L Deacon and L Healey (Waltham Centre For Pet Nutrition, UK)

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LM Dixon and JJ Cooper (University of Lincoln, UK)

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RD Donald, KMD Rutherford and AB Lawrence (Scottish Agricultural College, UK.)

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JL Edgar, CCA Clark, ES Paul and CJ Nicol (University of Bristol, UK)

Are ewes affected by castration and tail docking of their lambs?

S Evans and A Twigg-Flesner (Hartpury College, UK)

An investigation into the perception of herbal supplement use and safety amongst horse owners

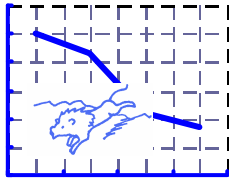


Science in the Service of Animal Welfare

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- Royal Society for the Prevention of Cruelty to Animals (Science Group)



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V Fajks (Hadlow College, UK)

Aetiology, extinction and prevention of an acquired operant stereotypy in a California sea lion (*Zalophus californianus*)

G Feenders and M Bateson (Newcastle University, UK)

How much does hand-raised change the behaviour of captive starlings?

L Forster, S Corr, CM Wathes and C Bessant

(Royal Veterinary College and Feline Advisory Bureau, UK)

Demographical features, rehabilitation and behavioural changes in client-owned domestic cats after limb and/or tail amputation

CA Hosie, TE Smith, R Coleman, LU Sneddon and A O'Bryan (University of Chester, UK)

Development of non-invasive techniques for assessment of stress in captive amphibians

JL Ireland, S McCall, P Clegg, S McKane and GL Pinchbeck (University of Liverpool, UK)

Owners perceptions of quality of life in geriatric horses

J Jamieson, SM Abeyesinghe, M Reiss, D Allen and CM Wathes (Royal Veterinary College, Institute of Education, London and RSPCA, UK)

Evaluating the efficacy of a one-off animal welfare education event; do attitudes and knowledge of school children alter and persist?

ML Jensvold, G Stadtner and J Buckner (Central Washington University, USA)

Measuring the quality of interactions between chimpanzees and caregivers

R Kay, C Hall, and G Starbuck (Nottingham Trent University, UK)

The use of heart rate variability as an indicator of positive emotion in horses

A Kerr and DCJ Main (University of Bristol, UK)

Development and evaluation of a new educational resource for farm health and welfare planning

J Kiddie, D Pfeiffer, D Mills, W Hayes, R Neville, D Morton and L Collins (Royal Veterinary College, University of Lincoln, University of Birmingham, UK)

Assessing quality of life in kennelled dogs

MC Leach, CA Coulter, CA Richardson and PA Flecknell (Newcastle University and Agenda Group, UK)

Looking in the wrong place – implications for assessing pain and distress in animals

S McMillan and M Beeching (University of Greenwich)

The elusive platypus: An investigation into the captive management of the Duck-Billed platypus (*Ornithorhynchus anatinus*) at 'The Australian Reptile Park' (ARP), NSW, Australia

J McNicholl (University of Adelaide, Australia)

Heat stress in canine athletes

AL Miller, J Roughan and P Flecknell (Newcastle University, UK)

A comparison of abdominal and scrotal approach methods of vasectomy in laboratory mice

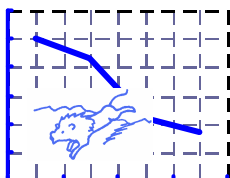
GC Miranda-de la Lama, W Sepúlveda, M Villarroya and GA María (University of Zaragoza, Polytechnic University of Madrid, Spain and Santo Tomas University, Colombia)

Livestock vehicle accidents in Spain: Causes, consequences and animal welfare



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EH Ormandy, DM Weary, CA Schuppli and G Griffin (University of British Columbia and Canadian Council on Animal Care, Canada)

Applying social science to animal welfare issues: The use of animals in science

CJ Phythian, MJ Clarkson, AC Winter, D Grove-White, P Jones, PJ Cripps, E Michalopoulou and JS Duncan (University of Liverpool, UK)

Repeatability of indicators for the assessment of sheep welfare

J Questier and M Beeching (Hadlow College, UK)

A comparison of the general public's and professionals' perceptions of aggression in the domestic dog

CA Richardson, PA Flecknell and M Bateson (Newcastle University, UK)

Assessing anxiety in mice using an automated home cage behavioural analysis system, the Intellicage®

S Rizvi and J Novak (Department for Environment, Food and Rural Affairs, UK)

Welfare assessment of broilers through post-mortem examination

EV Salt and AD Ellis (Nottingham Trent University, UK)

Preliminary investigation into management and condition of *Equidae* at livestock markets during a period of economic downturn

E Sayer and G White

An investigation into the effects housing has on the behavioural repertoire of the domesticated rabbit (*Oryctolagus cuniculus*)

A Swart and M Farrell (Hartpury College, UK)

The effect of straw quantity and frequency of provision on grower pig behaviour

DL Teixeira, G Miranda-de la Lama, M Villarroel, J Escos, S Alierta and GA María (University of Zaragoza, Polytechnic University of Madrid and E.T.S.I.A. Spain)

The effect of the straw bedding on the stereotypes and social interactions of light lambs

E Van Poucke, S Buijs and F Tuytens (Institute for Agricultural and Fisheries Research Belgium)

Effect of space availability and environmental enrichment on rabbit bone strength

CFI Watson, CA Caldwell and HM Buchanan-Smith (University of Stirling, UK)

Does the audio playback of conspecific chirp calls improve the welfare of captive marmosets (*Callithrix jacchus*)?

CA Weeks, SN Brown, A Butterworth, TG Knowles, G Richards and LJ Wilkins (University of Bristol, UK)

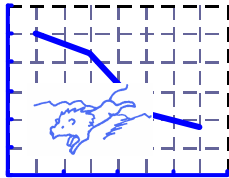
Development of a protocol for the assessment of hens for fitness to travel

ML Wiseman-Orr, EM Scott and AM Nolan (University of Glasgow, UK)

The development and testing of a novel instrument for the on-farm measurement of health-related quality of life of grower-finisher pigs

D Wolfenden, C Hosie and LU Sneddon (Reaseheath College and University of Chester, UK)

Does transport of ornamental fish cause stress?



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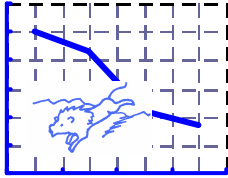
THE EFFECT OF AGE AND SEASON ON CORTISOL LEVELS DURING TRANSPORT OF OMANI GOATS

GS Al-Abry^{1,2}, IY Mahmood², SN Al-Bahry² and GE Mann¹

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While much is known about the physiological effects of transportation on farm livestock, little specific information is available on the effects of transport of goats in hot countries. In this study, carried out in Oman, goats of two ages (12 and 18 months) were transported during two seasons (hot and cold) for 4.5 hr in an open truck while control goats remained in shaded pens. Plasma samples were collected prior to loading, immediately after loading and at 90 min intervals during transportation. Blood samples were taken from the first group (n=20) in February 2007 (cold season, 1 yr old) and in May 2007 (hot season, 1.5 yr old) and from the second group (n=11) in May 2007 (hot season, 1 yr old) and in January 2008 (cold season, 1.5 yr old). Cortisol was measured by chemiluminescence immunoassay using the Beckman Coulter Access 2 immunoassay system and reagents and data analysed by repeated sample ANOVA with treatment, season and age as factors. Prior to transport, plasma cortisol concentrations were similar in both groups (overall mean 53.9 ± 2.3 nmol/l). As expected, in the transported goats concentrations of cortisol were elevated (103.4 nmol/l; $P < 0.001$) while in the control goats concentrations were reduced during the experimental period (33.0 nmol/l; $P < 0.001$). However, contrary to expectations, concentrations were higher in the 18 month old goats than in 12 month old goats (70.9 vs. 54.0 nmol/l; $P < 0.001$) and were higher in the cold than the hot season (65.7 vs. 59.2 nmol/l; $P < 0.05$). In this study, we have quantified the increase in cortisol seen during transport of Omani goats. While an increase was expected during transportation, the significant decrease seen in the rested control group was not expected. In addition, we have identified age related differences in cortisol concentrations that must be taken into account when assessing the impact of transportation. Furthermore, contrary to expectations, we found considerably higher concentrations of cortisol during the cold season suggesting that the goats were well adapted to dealing with any perceived heat stress during transportation.



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HEALTH AND WELFARE IN ORGANIC LAYING HENS

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Introduction and methods

Because there was no actual overview of animal health in organic poultry farms and the farmers were in need of practical clues for maintaining or improving animal health, a study was done among 49 flocks of organic laying hens on commercial farms. The flocks were visited at 50-60 weeks. From every flock 50 hens were scored for feather cover, skin wounds, foot wounds, breast bone deformations and body weight. From 35 flocks also information about the rearing period was available.

Results

A positive farmer's judgment for animal health was related to a higher growing speed during rearing (0-7 weeks) ($R^2=13$; $p=0.038$), better used the outdoor run ($R^2=18$; $p=0.003$), had a better feather cover ($R^2=15$; $p=0.019$) and were less fearful ($R^2=23$; $p=0.048$).

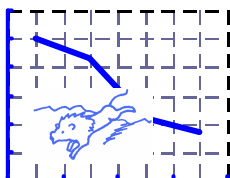
Infections with endoparasites were related to darker combs (t-test; $p=0.06$) and lighter coloured egg yolks (t-tests for diff. parasites, $p=0.035$ - $p=0.06$) than flocks without such infections.

68 % of the flocks had no or a little bit of feather pecking damage, 24 % had moderate damage and 8 % had severe damage. The more chickens of a flock used the outdoor area, the less feather pecking damage was seen ($R^2=49$; $p<0.001$). Less feather pecking damage was also related to a higher laying percentage ($R^2=49$; $p=0.004$). Rearing factors associated with less feather pecking damage during the laying period, were the age when litter ($R^2=59$; $p=0.012$) and perches ($R^2=59$; $p=0.033$) became available. The earlier, the lesser damage. Flocks with more mislaid eggs at 30 weeks of age showed more feather pecking and cannibalism at 50-60 weeks of age ($R^2=24$; $p=0.01$ resp $p=0.015$).

Cannibalism, defined as skin wounds, was seen on a mean of 13 % of the hens. Lesser skin wounds were seen if more chickens used the outdoor area ($R^2=18$; $p=0.002$), if the uniformity at 17 weeks was higher ($R^2=12$; $p=0.029$), if daylight was available ($R^2=15$; $p=0.024$) and the less fearful the hens reacted towards the farmer ($R^2=28$; $p=0.026$).

A mean of 21 % hens had breast bone deformations. More breast bone deformations were seen when round perches were used instead of angular ($R^2=19$; $p=0.05$), in aviaries instead of ground stables ($R^2=11$; $p=0.012$) and in stables with 'sufficient' daylight instead of no, little or much daylight ($R^2=13$; $p=0.024$).

A mean of 9 % hens had wounds on their foot soles. More wounds were seen in flocks that used the outdoor area more frequent ($R^2=14$; $p=0.025$).



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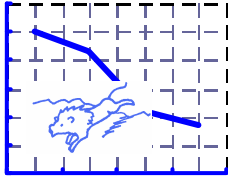
ANIMALS IN ART: A COMPARATIVE STUDY ON PERCEPTION OF ANIMAL WELFARE IN ART GALLERIES

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Throughout the history of humans, anthrozoological relationships have been documented in art, with the earliest record of man's close link with animals being illustrated in prehistoric cave painting. Since these origins, animals have consistently provided inspiration for artists, however, there is no information investigating the welfare of animals in art galleries. The aims of this study were to compare the perception of animal welfare in contemporary art between biological science and art students and investigate any difference in perception of welfare and the type of animal used. To fulfil the aims, a questionnaire survey was conducted on a sample size of 291 students (169 science students and 122 art students) and the data obtained was analysed utilising the non-parametric test of Chi-Squared. All of the results were significant, highlighting a difference in perception of animal welfare between science and art students. The biological science students demonstrated a higher concern for animal welfare than the art students and it is speculated that this may be due to variation in knowledge of the fields of art and animal welfare, amongst other factors. That art students were better at identifying potential causes of animal suffering, such as availability of food, but did not regard these as indicators of poor animal welfare. The results also showed an association between perception of animal welfare and the type of animal used, with both biological science and art students demonstrating more concern for the welfare of higher vertebrate companion animals compared to that of invertebrate species. This study shows the need for a greater level of education in animal welfare for artists potentially using live animals in gallery installations as well as for biological science students in visual assessment as evidence. It is recommended that ethical committee review protocol is established to evaluate animal welfare prior to use in art and that animal welfare guidelines are provided in order to reduce potential suffering of the animals concerned.



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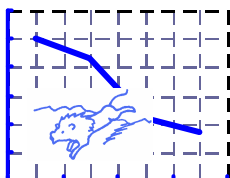
MOTHER-YOUNG ACOUSTIC RECOGNITION IN GOATS: A UNIDIRECTIONAL OR MUTUAL PROCESS?

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Parent-offspring recognition is essential for the reproductive fitness of parents in species where parental investment is high and for survival of the young. Recognition by acoustic cues seems particularly important in species living in large groups and giving birth to precocial neonates, as in most ungulate species. Mother-young relationships in ungulates are influenced by two main strategies for predator avoidance during early life. Follower young are mobile soon after birth and therefore rely on fleeing and maternal and group defence to avoid predation, whereas hider young spend most of their time hidden in vegetation to avoid detection by predators. These two widely divergent strategies have been hypothesized to affect the vocal recognition process between mothers and offspring. However, studies about mother-offspring recognition in ungulate are sparse and further investigations need to be extended and tested with ungulates that vary in their ecology, vocal repertoires and social complexity. We investigated mother-offspring recognition in goats (*Capra hircus*), a hider species in which an exclusive bonding to the neonate by the mother is developed within a few hours postpartum. We examined both the coding and the decoding process of individual identity between mother and offspring. Bleats of females and bleats of kids produced during their first 7 days and at 5 weeks old were analysed to determine whether they are individually distinctive and to find their potential individual signatures. Mutual recognition between mothers and kids was tested using playback experiments during weeks 1 and 5 after birth. We examine our results considering the evolutionary history and ecology of the species. Our findings are also compared with those for other species to bring about a better understanding of how knowledge of cognition is important for welfare.



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GLUCOCORTICOID EXCRETION IN RABBITS BEFORE AND AFTER TRANSPORT – INFLUENCE OF ENVIRONMENTAL ENRICHMENT AND CAGE SIZE

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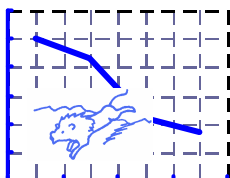
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Measuring glucocorticoid levels in faeces is a non-invasive way to assess stress levels in rabbits (Monclus, 2006). In the present study, corticosterone metabolites were measured in faeces of group-housed fattening rabbits kept at different stocking densities, with or without environmental enrichment. Transport was used as an acute stressor to assess the reactivity of the HPA-axis in the different groups.

Animals (aged 30 -76 days) were housed in groups of 8 in open-top wire cages. Cages were 100 cm long and 160, 107, 80, 64, 53, 46 or 40 cm wide. No siblings were present in any one cage, and a 50:50 sex ratio was used. The study consisted of 3 experimental rounds, and a total of 12 unenriched cages for each of the two smallest pen sizes, and 6 enriched and 6 unenriched cages for each of the five largest cage sizes. The enrichment consisted of a wooden structure (40 x 20 x 20 cm) that could be used as a shelter, gnawing substrate, and as a way to avoid contact with the wire floor. Physical space limitations meant that no enrichment was offered in the smallest two cage sizes.

At 75 days of age, animals were crated, transported in a van for 30 minutes, and then returned to their cages. Faeces were collected from boxes placed under the wire cage floor, from 18 to 8 hours before transport, and from 6 to 16 hours after transport (thus, at the same time of day). Samples were frozen (-20 °C) until analysis and subsequently homogenized and analysed in duplo using a 5 α -Pregnane-3 β ,11 β ,21-triol-20-one enzyme immunoassay (as described by Touma et al., 2003). Data was analysed on cage level, using duplos as repeated measures. Cage size, enrichment and their interaction were used as fixed factors and experimental round as a random factor. No interactive effects, nor cage size effects, were found. Metabolite concentrations in faeces collected before transport were lower for enriched than for unenriched cages (240 ± 27 vs. 303 ± 17 ng/g, $F_{1,116}=3.96$, $p=0.049$) and tended to be lower also after transport (313 ± 48 vs. 374 ± 43 ng/g, $F_{1,116}=3.65$, $p=0.058$). The response to transport (concentration before – concentration after) did not differ between cages ($F_{1,116}=0.01$, $p=0.928$).

The results show that environmental enrichment can decrease housing stress and suggest that measuring basal levels of corticosterone metabolites in faeces may be a useful tool to evaluate chronic stress in rabbits.



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DO PAINFUL AND STRESSFUL EXPERIENCES IN NEONATAL LAMBS LEAD TO PROLONGED ALTERATIONS IN PAIN SENSITIVITY?

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Data from laboratory animals and neonatal babies demonstrate that there is a critical window of vulnerability during which noxious stimuli cause long-term changes in pain processing¹. Interaction between the stress and pain pathways is also recognised, and application of stressors to neonatal rats can cause prolonged alterations in pain processing². Lambs are routinely castrated and tail docked without analgesia up to 7 days after birth, yet the potential for long term changes in pain sensitivity following these interventions has not been evaluated. The study aim was to investigate whether castration and tail docking of lambs, with or without application of concurrent stressors, caused increased pain sensitivity to an inflammatory challenge at 10 days, 8 weeks and 4 months of age.

Forty six male lambs were randomly allocated to one of four groups; control [handled only] (n=12), castration [castrated and tail docked with a rubber ring on day 3] (n=11), isolation and castration [isolation stress for 10 mins on day 2, castrated and tail docked on day 3] (n=12), LPS and castration [injected with LPS IV (0.2 µg/kg) on day 2, castrated and tail docked on day 3] (n=11). At 10 days, 8 and 16 weeks old all lambs were subjected to an inflammatory challenge with carageenan (0.1 ml, 1.5%) injected subcutaneously midline at the base of the sacrum. Pain sensitivity was tested before injection and for 5 hours afterwards, using Semmes Weinstein filaments around the site of carageenan injection and mechanical nociceptive threshold testing on the proximal tibia of the left hind leg.

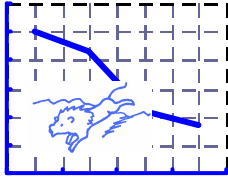
Injection of carageenan caused inflammation and swelling for approximately 12 hours. All animals became more sensitive to touch with the Semmes Weinstein filaments following carageenan, which was expected, but there were no significant differences between treatment groups in the magnitude of this effect. Mechanical nociceptive thresholds did not change relative to baseline in any treatment group.

Carageenan caused primary but not secondary hyperalgesia for at least 5 hours after injection. Relevant husbandry pain and stress stimuli applied to the lambs as neonates did not modulate this response. These data suggest that castration and tail docking, with or without concurrent stressors, did not cause long-term changes in pain sensitivity. This differs from data in rats, potentially because the quantitative sensory testing methods were too insensitive to detect changes or because nociceptive circuits are already fully developed at 2-3 days of age in lambs.

References:

¹Fitzgerald M (2005). The development of nociceptive circuits. *Nature Reviews Neuroscience*, 6, 507-520.

² de Medeiros CB, Fleming AS, Johnston CC, Walker CD (2009). Artificial rearing of pups reveals the beneficial effects of mother care on neonatal inflammation and adult sensitivity to pain. *Pediatric Research*, 66, 272-277.



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PET WELFARE: WHAT ITALY DOES

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A recent advance in Italian policies for animal welfare consists in the Draft law ratifying the European Convention for protection of companion animals (Strasbourg, 1987). After 22 years finally this important European document will be implemented in Italy too.

The Draft was born by the needs to realize a structured normative system protecting pets to cope with the emergencies that have been in Italy in the last year.

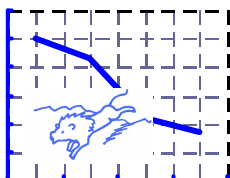
With this legislation will be introduced important changes to the Penal Code. In particular, the docking of tails, ears and other mutilations, not motivated by therapeutic needs, have become criminal offenses without the need to repeat the ban to do it every year with temporary Ordinances.

Moreover the Draft introduces the crime of illegal trafficking of dogs and cats with a tightening of penalties in case of puppies younger than eight weeks.

Finally there will be sanctions for anyone who introduces in the country dogs and cats not identified and lacking health certifications as required by law.

The key point of the future legislation is the responsibility of pets' owners against their own animals and society for all sanitary aspects.

This obligation is derived from their contributions to quality of life and thus their value to society.



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PET PROTECTION DURING EUTHANASIA: RECENT ADVANCES IN ITALY

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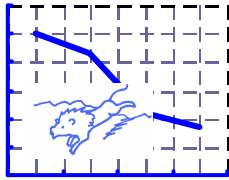
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Humans have the responsibility to protect all animals and to avoid them pain and no-motivated suffering. When an owner and veterinarian decide that a pet is suffering, euthanasia offers a way to end a pet's pain. A "good death" would be one that occurs with minimal pain and distress that cannot always be achieved. Anyway the painless death produced by a drug is one of most important factors for the approval as euthanasic drug by the European Community.

The most widely used euthanasic drug in Italy is Tanax[®] (T-61), a solution with three components: embutramide, mebenzonium iodide and tetracaine hydrochloride. It seems to cause unnecessary suffering especially in cat.

In evaluating methods of euthanasia with Tanax[®], Italy has introduced the following measures that modifies marketing authorisation (Official Journal no. 223 of September 25, 2009): i) induce loss of consciousness and death without pain, distress, and anxiety carrying out a general anaesthesia before injection; ii) and the exclusive use of the veterinary medicinal product by the veterinarian and no longer under its supervision.

The most of Italian veterinarians had just anticipated this "legal obligation" using routinely this procedure in realizing pet's euthanasia. This "special deontological" attention to the animal but also to the owner's sensibility is much appreciated by customers that have recognized the good quality of the Italian veterinarians professionalism according an assessment made through a questionnaire given them.



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ENVIRONMENTAL ENRICHMENT FOR COUGARS (*PUMA CONCOLOR*) IN LISBON ZOO

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³ Unidade de Investigação de Recursos Genéticos, Reprodução e Melhoramento Animal/Instituto Nacional dos Recursos Biológicos, I. P., Estação Zootécnica Nacional - Fonte Boa, 2005-048 Vale de Santarém, Portugal
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Animals in captivity often show less active behaviors than in nature, compromising their health. So, it is necessary to have processes that can change this issue. Environmental enrichment is a tool that can improve the life quality of certain animals by stimulating their senses, natural instincts, physical activity and domination of its habitat.

In order to improve the psychological and physiological well fare of a listless male and female Cougars (*Puma concolor*, Linnaeus, 1771), at the Lisbon Zoo a study of environmental enrichment (EE) was performed, during a four months period, from March to June 2009, with an overall of 100 hours of EE.

This environmental enrichment trial included preliminary observations for the preparation of an ethogram, which were followed by three distinct phases for data collection: base line, enrichment and end line. Several items of environmental enrichment were tested from which three were selected: two food enrichment's (cardboard box with meat, meat hidden in bushes or buried) and a sensory enrichment (camel fur).

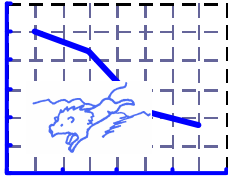
Variance analysis was done using the *Wilcoxon/Kruskal-Wallis* test from the PROC GLM (SAS).

The stimulus of EE increased behavioural diversity during the enrichment trials compared to the *base line*, with the persistence of this effect to the *end line* trials. During the enrichment trials, they exhibited an increment in activity, such as alert state related and not related to the EE item, interaction with the EE item, allo-grooming, forage, vocalization, and decreased in sleeping and resting, pacing, auto-grooming and abnormal behaviours.

The sex of the animals, the period of the day and the area they attend to influenced the behaviours registered. Though female showed more active behaviours than male and, by the opposite male evidenced more inactive behaviours. All the animals were more active in the morning. The type of EE stimulus affected behaviour as well, by increasing their diversity to one of the alimentary enrichment (meat meat hidden in bushes or buried). They preferred to stay outside in the playground which was related to the area where the EE was introduced.

In the overall, the cougars benefited from the enrichment by improving behaviour diversity and the interactions skills and by decreasing frustration, boredom, stress and aggressiveness.

Finally, the response to the EE by cougars suggests that enrichment programs on this animal should be further explored and the use of other items like objects and sounds should be considered taking into account long repetitions periods to avoid behaviours related to habituation and dullness, aiming the benefits on the animal behavior, on Zoo visitors and on conservation goals.



Recent advances in animal welfare science

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TRAINING THE RESEARCH ANIMAL TO NON-INVASIVE SOLUTIONS TO RESEARCH PROBLEMS

L Deacon and L Healey

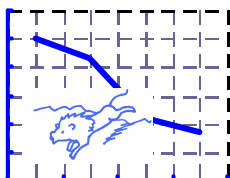
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Investment into animal care and welfare is believed to provide better science through high quality research data. Our aim is to provide healthy, confident animals for our studies, through a number of means, be it environmental enrichment to our extensive programmes of socialisation, training and play.

The way we care for and develop our dogs and cats for research, keeps them fit and healthy - both physically and mentally. Our methods are designed to represent what pets in the home may experience and therefore our animals behave and react as pets would in the outside world. They are constantly being habituated to research techniques, so are receptive to new training requirements, developing confident, adaptable research animals.

Placing ethical constraints on research can stimulate novel solutions to research problems; this poster will discuss some of these solutions, the training methods used, and the results obtained.



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ASSESSING THE MOTIVATION OF PET RABBITS USING CONSUMER DEMAND TECHNIQUES: ARE COMMERCIALY AVAILABLE HUTCHES TOO SMALL?

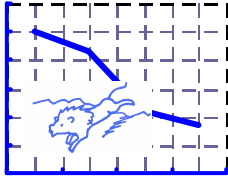
LM Dixon^{1,2} and JJ Cooper¹

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²Animal Behaviour and Welfare, Avian Science Research Centre, SAC, Auchincruive, Ayr, UK

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Rabbits kept in larger enclosures retain a similar behavioural repertoire as wild rabbits but this behaviour is restricted when kept in traditional rabbit hutches. The absence of a behaviour pattern does not, however, necessarily indicate suffering when the behaviour is not performed. If an animal is highly motivated to perform the behaviour and will work hard to gain access to an area where that behaviour is possible, this does suggest that the animal may suffer if not able to perform the behaviour. Rabbits kept in a home pen the approximate size of a standard commercial rabbit hutch (0.88m²) were asked to work for access to two different sized enclosures of additional space (1.68m² and 3.35m²) by pushing through weighted doors. This was compared to how hard the same rabbits would work for food as a yard stick measure to determine how important having access to additional space is to pet rabbits in general. Mixed model analysis using rabbits as the repeated measure found that rabbits worked hardest for access to food, followed by the larger space and they worked the least hard for the medium sized space. Overall, rabbits spent the largest proportion of time in the home pen as this was where the food, water and shelter were located, followed by the large enclosure and spent the least amount of time in the medium enclosure. As the amount of weight added to the doors (cost) increased, rabbits decreased the number of visits, decreased the proportion of time spent in resource pens and decreased the average duration of each visit to the resource pens. They did, however, increase the frequency of hops in each visit to the resource pens as the costs to access the pens increased, suggesting that the additional space was used primarily for locomotion. These results indicate that pet rabbits are motivated to perform a certain level of activity that is only possible in larger enclosures suggesting that some commercially available hutches are too small. Thus, providing access to increased space will help satisfy rabbits' behavioural needs, will reduce inactivity related problems such as obesity and bone injuries, and will improve pet rabbit welfare.



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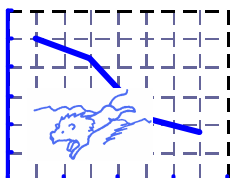
EFFECT OF AZAPERONE ON THE BEHAVIOUR OF PIGS IN AN ELEVATED-PLUS-MAZE

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The elevated-plus-maze (EPM) is a well-validated test of anxiety in rodents that has more recently been investigated in pigs with possible applications to assess welfare. However, in pigs, the validity of the test has only been tested in a limited fashion. Validation in rodents often involves reversing the behavioural indicators of anxiety with an anxiolytic drug treatment. The aim of this study was to examine the effects of 1.0mg/kg Azaperone (Stresnil®), a drug with anxiolytic-like properties in pigs, on the behaviour of fifty-two 6-week-old pigs in the EPM. There was no evidence from the results that the classical interpretation of anxiety toward the open arms applies to pigs. Azaperone treated pigs entered more frequently ($P=0.003$) and spent longer ($P=0.056$) in the closed arms than did saline-treated controls. Compared to controls, Azaperone-treated pigs spent more time walking ($P=0.003$) and rooting ($P=0.031$), and decreased their time standing ($P=0.003$), time spent alert ($P<0.001$) and frequency of vocalising ($P=0.01$). The results imply that, whilst anxiolytic treatment does alter pig behaviour in the EPM, unconditioned avoidance of the open arms does not determine pig EPM behaviour as it does in rodents. These data raise questions about the correct interpretation of pig EPM behaviour and the appropriateness of the EPM as a test of fear/anxiety in pigs.



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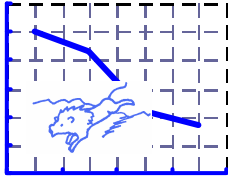
ARE EWES AFFECTED BY CASTRATION AND TAIL DOCKING OF THEIR LAMBS?

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Castration and tail docking are routine husbandry procedures that cause pain and stress in lambs. However, the response of mother ewes to the castration and tail docking of their lambs is, as yet, understudied. Ewes might be emotionally affected by the distress and/or pain of their lambs because (i) empathic responses are thought to have evolved to facilitate parental care and (ii) sheep are highly sensitive to the emotional responses of conspecifics, particularly when expressed through facial expressions. The aim of the current study was to assess whether ewes were affected by the castration and/or tail docking (C/TD) of their lambs. Behavioural (behaviour, ear-postures, vocalisations) and physiological (heart rate, heart rate variability, surface body temperature) parameters were continuously measured during a 10-minute pre-treatment period and a 10-minute post-treatment period whilst 20 ewes were exposed sequentially to each of four test conditions (Between 2 and 6 days after birth): 1) (Day 2) Control 1 (ewes left undisturbed with their lambs, pre-C/TD), 2) (Day 3) Handling (H) (lambs weighed), 3) (Day 3) C/TD (lambs castrated and/or tail docked using a rubber ring) and 4) (Day 6) Control 2 (ewes left undisturbed with their lambs, post-C/TD). H and C/TD had no effect on heart rate, heart rate variability and eye temperature of ewes. Both H and C/TD induced an increase in ear pinna temperature, lamb-directed behaviour (sniffing, nudging, licking lambs) and number of ear posture changes, and the behavioural response was significantly greater following C/TD than H. Low-pitched bleating and proportion of time spent with an asymmetrical ear posture increased only in response to C/TD. Although the discrepancies between the behavioural and physiological responses of the ewes makes it uncertain whether ewe welfare is reduced by C/TD, the presence of behavioural changes indicates that ewes are responsive to their lambs' exposure to handling and a painful procedure. It can be concluded that when performing potentially painful or stressful husbandry procedures on lambs, consideration should be given to the impact these might have on the ewe, in addition to the welfare of the lambs.



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AN INVESTIGATION INTO THE PERCEPTION OF HERBAL SUPPLEMENT USE AND SAFETY AMONGST HORSE OWNERS

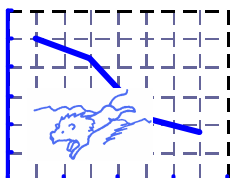
S Evans and A Twigg-Flesner
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Natural remedies are gaining popularity amongst horse owners; this has led to a boost in the use of herbal feed supplements. The absence of conclusive research within the area of herbal supplements for horses means that caution should be taken when these herbal supplements are administered to the horse.

The aims of this study were to quantify the use of equine herbal supplements; whilst identifying the horse owning public's awareness of potential dangers these herbal supplements may pose to the horse. A survey was conducted on 86 horse owners by the use of interviewer administered questionnaires.

Results indicated that herbal supplements were perceived to be very safe to moderately safe by (97%) of the sample population. There was a significant association between people who fed herbal supplements and people who thought they were safe to use ($P<0.05$). The majority of respondents (71%) thought that adequate research had been conducted on herbal supplements for horses. There was also a significant association ($P<0.05$) between whether participants fed herbal supplements and how much research participants thought had been conducted on these herbal supplements.

More research needs to be conducted into the subject of the bioavailability of herbal supplements to the horse. It is essential that safe and effective dosages are formulated for specific herbal supplements in relation to the horse. It is important that any trials conducted on herbal supplements for the horse and the results of these are disseminated to the lay person to allow them to make informed choices about what they feed their horse.



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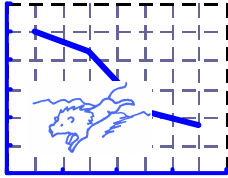
AETIOLOGY, EXTINCTION AND PREVENTION OF AN ACQUIRED OPERANT STEREOTYPY IN A CALIFORNIA SEA LION (*ZALOPHUS CALIFORNIANUS*)

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Stereotypies have been used as an indicator of poor animal welfare by researchers and zoos alike, however, researchers have seen the extinction of stereotypic behaviours as a problem to solve rather than to understand (Rushen & Mason 2006). This report investigates the aetiology (causation), extinction and prevention of a stereotypic behaviour in Harley, a California Sea Lion based at Chessington Zoo, which has the added complication of being an acquired operant stereotypy (reinforced through a combination of operant and classical conditioning). Evidence proved, via empirical data, when and where the stereotypy occurred, with experimentation, through reasonable manipulation of the environment, to reduce or cease the stereotypy within proven bout periods, thereby implying aetiological factors. Anecdotal evidence was collected and used to substantiate the implicit aetiological factor/s, of the stereotypy, whilst experimentation with such reached an explicit factor. Re-training, extinction and enrichment programmes were recommended and statistics were used to test the significance of the extinction, comparing data collected (prior to re-training) to data collected whilst re-training. Results of the T-test proved a very high significant difference ($p < 0.05$) in the reduction and possible future extinction of the stereotypy at $p=0.007$; achieved synergetically, in not reinforcing the stereotypy with the identified aetiology, thereby informing trainers of how to shape their own behaviour, when training Harley in sessions and presenting him in shows. Whereas re-training remains a work in progress, the results appeared to be promising in the extinction of Harley's stereotypy (an update will be included within the final presentation). Whether other training organisations have the same issue as Chessington Zoo is uncertain, however, it was possible to significantly reduce a stereotypy, by re-training, **especially** when the aetiological factor is known and prevention of the stimulus, provoking the stereotypy, is achieved.



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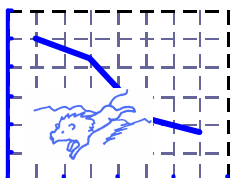
HOW MUCH DOES HAND-RAISED CHANGE THE BEHAVIOUR OF CAPTIVE STARLINGS?

G Feenders and M Bateson

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The revision of EU directive 86/609 on the use of animals in research strongly discourages the use of wild-caught animals. However, previous studies have shown that captive-bred or raised animals exhibit increased stereotypic and other abnormal behaviour when compared with wild-caught conspecifics. Stereotypic behaviour is usually regarded as a sign of poor welfare, so this change in policy potentially has serious implications for ethological research on non-domestic species. Here, we evaluate the effects of hand-raising on the behaviour of captive European starlings (*Sturnus vulgaris*), using age-matched, wild-caught starlings from the same population as a control group. We measure the general behaviour of starlings in their home-cages, using automated tracking and pattern-detection software, to obtain indicators of general activity as well as abnormal behaviour (route-tracing stereotypies and abnormal cage locations). We find that hand-raised birds, compared to the wild-caught group, have an altered daily activity profile by being less active. We also find that abnormal cage locations that are seen to be related to escape attempts are used more often by the wild-caught birds than the hand-raised ones. The results shed light onto (a) the sensitivity of the starlings' ontogeny to hand-raising, (b) potential mechanisms underlying the development of stereotypies and other abnormal behaviour patterns, and (c) potential limits in the validity of hand-raised starlings as a model for ethological and cognitive studies.



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DEMOGRAPHICAL FEATURES, REHABILITATION AND BEHAVIOURAL CHANGES IN CLIENT-OWNED DOMESTIC CATS AFTER LIMB AND/OR TAIL AMPUTATION

L Forster¹, CM Wathes¹, C Bessant² and S Corr¹

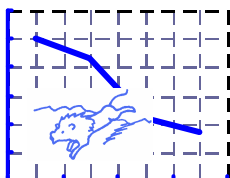
¹ Royal Veterinary College, North Mymms, Hertfordshire, UK

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Amputation of all or part of a limb or tail may be necessary in cats due to neoplastic disease, severe trauma, ischaemic damage, congenital deformity, refractory orthopaedic infection or peripheral nerve damage. In some countries elective onychectomy is carried out in domestic cats. Anecdotal reports suggest cats adapt well and suffer few complications following amputation. There has been little investigation into the demographic features of the UK feline amputee population, or into owner perception of speed of rehabilitation and changes in behaviour following amputation. A questionnaire-based survey of UK owners of feline amputees was carried out July-October 2009. The questionnaire was posted to 1000 UK veterinary practices selected at random from a list of practices that treat cats provided by the Royal College of Veterinary Surgeons (RCVS), requesting that the practices pass copies onto clients who owned amputee cats. In response to letters in *The Veterinary Record* and the *Veterinary Times* additional veterinary staff contacted the investigator for copies of the questionnaire to pass on to clients. In addition the questionnaire was published in the October 2009 issue of *CatCare* (Feline Advisory Bureau, FAB).

To date 234 responses have been analysed. The majority of feline amputees were domestic shorthairs (n=182), the majority were male (n=146) and most were under 36 months of age at the time of amputation (n=143). Hind limbs were amputated most often (n=130) than fore limbs (n=75) or tail (n=41). There was no difference between the prevalence of left vs right amputations. Respondents could provide multiple reasons for amputation. The most common reason cited for amputation was broken bone (n=137) and nerve damage was the second most common reason provided (n=64). Of 227 respondents 207 reported that their cat now had a normal quality of life; time taken to return to a normal quality of life ranged from 0-730 days (median 28 days). Over-grooming correlated significantly with owner perception of pain (p=0.001); cats that groomed more following amputation were four times more likely to be perceived to be in pain. The limitations in relying on owner perception of pain and behaviour are noted. Further results and analysis of the full set of responses will be presented.



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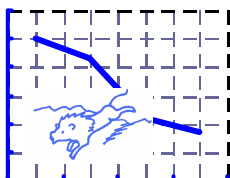
DEVELOPMENT OF NON-INVASIVE TECHNIQUES FOR ASSESSMENT OF STRESS IN CAPTIVE AMPHIBIANS

CA Hosie, TE Smith, R Coleman, LU Sneddon and A O'Bryan
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The literature assessing physiological correlates of stress in amphibians is very limited. Many authors identify that much more work is needed, particularly as recent estimates suggest that up to 50% of the world's amphibian species are declining in the wild— often with no obvious cause. Non-invasive techniques for assessing stress are clearly desirable/essential but are currently unexplored for amphibians. They are, however, being developed for fish in captivity, with whom amphibians share similar endocrine features. The application of these approaches, combined with very recent new understanding about amphibian endocrinology, provides an opportunity to develop and validate novel biochemical techniques to attempt to detect and quantify stress in two amphibians from different taxonomic groups. An anuran: *Xenopus laevis*, which is a well-studied 'lab' subject, on which there is a good literature base. The other subject is *Tylotriton spp*, one of a group of urodeles (tailed amphibians) of high conservation importance: they are endangered in the wild and involved in captive breeding projects.

Corticosterone (a glucocorticoid) production is regulated by the hypothalamic-pituitary-adrenal (HPA) axis which acts to minimise the effect of stressors. Certain stressors have been shown to cause an increase in corticosterone in several amphibian species, but using invasive techniques. Our initial work is currently focussed on developing the assay using standard amounts of appropriately conditioned water in which individuals of the two species have been housed (under standard conditions). Once established, this technique will be used for non-invasive measurement of corticosterone under different 'enrichment' conditions. Behavioural observations will also be made during the experimental period to assess whether other indicators may be linked to varying levels of corticosterone.

We hope that this preliminary work will lead to the establishment of valuable techniques to assess stress and improve welfare in a currently understudied taxonomic group. Investigation of the welfare of 'lab' animals should clearly include amphibians. Moreover, assessing stress in animals destined for, or involved in, captive breeding projects can only be of benefit to those individuals and the persistence of the species.



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OWNERS PERCEPTIONS OF QUALITY OF LIFE IN GERIATRIC HORSES

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The decision for euthanasia in equine companion animals may be difficult both for owners and veterinary surgeons. There is very little published information on this decision making process in horses but it may be particularly difficult for long term owners of geriatric horses. Currently there are no formal methods to aid the decision for euthanasia (for example quality of life (QoL) scores) in geriatric horses. This study aimed to evaluate some aspects of the decision making process by owners of geriatric horses. We obtained data on owner's perceptions of factors affecting their horse's quality of life and those which may contribute to the decision for euthanasia. Further we explored how these responses changed as horses aged.

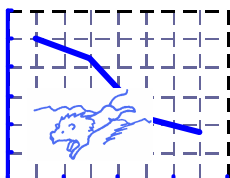
A postal questionnaire was mailed to 1144 owners of geriatric horses aged ≥ 15 years as part of the "Leahurst Equine Geriatric Health Study". A section of this questionnaire contained 16 questions about the horse's quality of life and factors influencing decisions on treatment, utilising a mixture of open ended, 5 point Likert scale and ranking questions.

The majority (over 90%) rated their horse's quality of life as good or excellent on an average day. When asked how different types of problem would affect their animal's quality of life, 78% of owners reported that a disease which did not cause pain would not affect their horse's quality of life at all or only by a little, whereas 82% of owners thought that diseases which cause chronic/recurrent pain would have a major effect on their horse's quality of life.

Owners were asked to rate the importance of factors which might influence the options for treatment of a severe illness or injury, and the two highest ranked were "quality of life after treatment" and "whether this was a life-threatening disorder". Veterinary advice was ranked above a painful/stressful procedure and period of recovery, highlighting the need for veterinary surgeons to have access to all available research on quality of life and outcomes of treatment programmes in geriatric horses.

For many of the Likert questions, responses changed as the horse's age increased. Overall ratings of quality of life and the owner's satisfaction with general health decreased as the horse aged. Owners of older horses more frequently reported that "age and/or pain limits him/her in normal daily activities".

In conclusion, most owners considered that their geriatric animals enjoyed a high quality of life but age corresponded negatively with many of the health-related quality of life factors.



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EVALUATING THE EFFICACY OF A ONE-OFF ANIMAL WELFARE EDUCATION EVENT; DO ATTITUDES AND KNOWLEDGE OF SCHOOL CHILDREN ALTER AND PERSIST?

J Jamieson¹, SM Abeyesinghe¹, M Reiss², D Allen³, L Asher⁴, and CM Wathes¹

¹ Royal Veterinary College, London

² Institute of Education, London;

³ RSPCA, Horsham

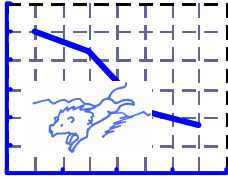
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There is current debate as to whether brief one off education events are effective in shaping long term attitudes and knowledge of children. Despite this uncertainty, animal welfare education, when offered within the school curriculum, predominantly takes this format. Further evaluation of success has generally focussed on immediate knowledge and enjoyment orientated benefits, which are potentially short-lived and may not necessarily translate into long term behaviour patterns likely to be beneficial to animal welfare. Identification of a successful programme of education on animal welfare is thus problematic.

A science-based educational event at the Royal Veterinary College on animal welfare was used to assess the temporal efficacy of an inoculation intervention approach. Year nine students from three schools (n=41) attended 'Inside Chicken Run' in October 2009. The event's aims were to obtain a positive change in attitude towards chickens and raise awareness of issues surrounding animal welfare. Pre- (B), immediately post- (IA) and three month post-event (P3M) questionnaires were used to identify any shifts in attitude, factual knowledge or behavioural intent resulting from the intervention. These were supported by in-depth interviews of a subsample of respondents at P3M. To aid comparison control students (n=20) from the same schools also completed both questionnaires and interviews.

Overall, the singular experience of 'Inside Chicken Run' improved students' factual knowledge of chickens and chicken welfare. However the initial positive increase in knowledge diminished over time and so may only be transient in nature; knowledge scores increased from B to IA ($p < 0.001$), but decreased from IA to P3M the event ($p < 0.001$). Though no clear influence was apparent on students' attitudes, an interesting pattern relating to phylogenetic proximity to humans is evident. Such patterns, found in the range of attitude assessments used (fireman test, money allocation, importance of welfare considerations to various species) are discussed, along with implications of this research for educating children about animal welfare.



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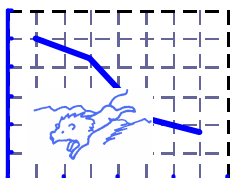
ENVIRONMENTAL FACTORS AND PATTERNS OF BEHAVIOUR IN ZOO-HOUSED SUMATRAN TIGERS, *PANTHERA TIGRIS SUMATRAE*

K Jayne

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Captive environments are associated with increased predictability and keeping animals within such restricted surroundings can encourage abnormal behaviour. This study investigated what elements of environmental predictability may impact collectively upon behaviour, such as husbandry scheduling and enclosure complexity. A difficulty studying predictability is the need to collect a large quantity of behavioural data over an extended period of time, and therefore this study piloted a measure called 'Busyness' that would measure animal activity and could be used by numbers of inexperienced observers to increase data collection. Observations were conducted on the behaviour of two zoo-housed Sumatran tigers, *Panthera tigris sumatrae*. Graphical analysis revealed patterns in the data such that the tigers showed increased Busyness scores leading up to the fixed time that they were taken off-show and therefore this may indicate anticipation of this event. In addition, both animals were observed to display stereotyped pacing behaviour. The female tiger showed increased pacing leading up to the time she was taken off-show, whereas the male showed the opposite pattern. Both animals were also observed to pace within specific sections of the enclosure. Suggestions have been made to explain differences in behaviour in relation to environmental events and personal history as well as proposals for future research.



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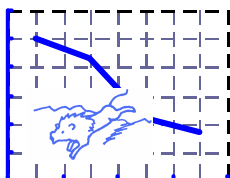
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MEASURING THE QUALITY OF INTERACTIONS BETWEEN CHIMPANZEES AND CAREGIVERS

ML Jensvold, G Stadtner and J Buckner

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The relationships between captive primates and their caregivers are critical ones and can affect animal welfare. Friendly relationships can improve quality of life; adversely, agonistic relationships can decrease quality of life. Caregivers in and of themselves should not be stressful to their charges, instead the caregiver's behaviours and the nature of their interactions with captive primates is likely the basis for the stress. This presentation systematically explores the interaction between caregivers and chimpanzees – specifically the effect of caregiver's use of species-specific chimpanzee behaviours during interactions with their charges. In two studies caregivers used chimpanzee behaviours or not in daily interactions. Some days of data collection (Chimpanzee Behaviour Condition) the caregiver presented chimpanzee behaviours and vocalizations. For example upon greeting the caregiver would present a pronated wrist and breathy pant and in play interactions she would present a playface and playslaps. On other days of data collection the caregiver presented only human behaviours and avoided using chimpanzee behaviours (Human Behaviour Condition). Conditions were presented randomly and the interactions were videotaped. Reliable data coders recorded the behavioural contexts for each chimpanzee as they occurred on the videotape and the time that each context began. This produced durations of each context and the distribution of seconds was compared between the conditions. All of the chimpanzees discriminated between the conditions and were more friendly and interactive in the Chimpanzee Behaviour Condition. These two datasets provide strong support that chimpanzees are quite sensitive to the non-verbal behaviour of their caregivers and respond to species-specific behaviours in positive ways. These findings are supported by other studies showing that when caregivers use species-specific behaviours, monkeys, kangaroos, and cattle are more friendly and cooperative. When caregivers show species-specific behaviours, they are exhibiting postural congruency. In human dyads postural congruency is correlated with high rapport between the partners. There is physiological and behavioural evidence that friendly relationships can improve quality of life and this study demonstrates a way to attain this. These data provide strong support for caregivers' use of chimpanzee behaviours to improve animal welfare and presents a methodology that can be used in other animal welfare research.



Recent advances in animal welfare science

UFAW Animal Welfare Conference

York Merchant Adventurers' Hall, 30th June 2010

THE USE OF HEART RATE VARIABILITY AS AN INDICATOR OF POSITIVE EMOTION IN HORSES

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Despite a domestication process spanning over 6000 years, the horse (*Equus caballus*) remains a highly social flight animal. Disparity between their natural and domestic environments may compromise welfare. Recently, animal welfare research has sought to understand an animals' emotional state, a topic not extensively researched in horses. This study investigated heart rate variability (HRV) recording alongside behavioural observations when attempting to assess emotion in horses.

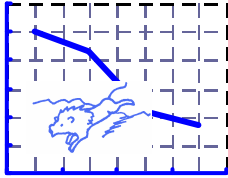
HRV refers to beat-to-beat alterations in heart rate. Healthy individuals exhibit periodic variation in R-R intervals at rest. Several human studies suggest a link between negative emotions and reduced HRV but few studies exist using HRV to assess equine emotion.

Twelve mature geldings were used: three pairs lived at grass (outdoor); three pairs stabled during daytime & turned out overnight (indoor). One horse from each pair underwent a pre-conditioning process to associate an audible cue (door bell) with the arrival of the 'paired' horse in a crew yard. Conditioned horses were fitted with a Polar Equine RS800 Heart Rate Monitor, isolated in a crew yard for 60 minutes, the cue then activated and after 5 minutes their companion horse released to interact freely with the conditioned horse. Behavioural footage was recorded using a digital video camera. Data were split into three 5 minute treatment periods: pre-cue (PC), anticipatory behaviour (AB), and post-reward (PR). Time domain analyses from mean R-R interval data (Standard Deviation of inter-beat intervals; SDNN) and total durations of behavioural states were calculated for analysis.

Regardless of treatment period, indoor horses spent less time standing still ($p=0.04$) and more time walking ($p=0.06$) than outdoor horses. During the PR period indoor horses performed more interactive behaviour with their paired companion, and had greater SDNN ($p=0.052$), than outdoor horses.

During confinement horses may experience a rise in internal motivation for exercise, reflected as increased locomotor activity when given the space to move around freely. Greater HRV and interactive behaviour were recorded for indoor horses during social interaction; remaining in close proximity, and play-fighting behaviour. Human studies suggest a link between positive emotions and increased HRV implying that physically and socially isolated horses may experience a positive emotion when physical movement and interaction with conspecifics are permitted.

HRV measurements could form a valid contribution alongside behavioural observations when detecting affective states in horses, and serve as a tool to enhance well-being, aid welfare assessment, gauge reaction to management practices and aid development of appropriate domestic environments.



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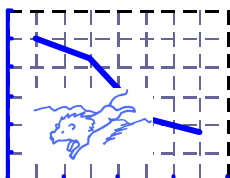
DEVELOPMENT AND EVALUATION OF A NEW EDUCATIONAL RESOURCE FOR FARM HEALTH AND WELFARE PLANNING

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A teaching resource (Simple Templates for Everyday Planning and Support) was created to illustrate the dynamic process of farm health and welfare planning and was available at www.vetschool.bris.ac.uk/steps. The STEPS website may be used to undertake routine health and welfare planning or in response to a specific problem on farm. The framework involved five steps; *STEP 1 farm history and goals*, *STEP 2 farm policies and protocols*, *STEP 3 measurement*, *STEP 4 management* and *STEP 5 monitoring*. The last three steps were the main actions listed in the DEFRA farm health planning initiative. Within each of these steps there was an introduction, template of prompting questions, farm case examples, links to resources and a list of predicted outcomes. The resource also contained a teaching section that provided guides and case examples for discussion.

This resource was used in a teaching seminar held for two groups of fourth year veterinary students over a two year period. Students answered a questionnaire prior to and following the teaching seminar which revealed that the majority of participants believed the new resource had increased their knowledge of and ability to undertake farm health and welfare planning. Students also completed one of four species-specific case examples which were evaluated by the author. Sixty-seven essential farm health planning factors were divided between the four case examples. The majority of students (90.7%) included at least half of the essential farm health planning factors in their case example submission. Twenty six of these essential health planning factors were included by at least 80% of study participants. Six essential health planning factors received less than 20% of the student response rate. The traditional veterinary skills which involve the management of individual animals, such as an assessment of the severity of lesions, were well represented in all of the case examples. However, the monitoring step of farm health planning, such as the use of intervention levels, was the least well answered by the student population. In conclusion, the research study found that the STEPS seminar was successful in introducing many of the main principles of farm health and welfare planning to two groups of fourth year veterinary students.



Recent advances in animal welfare science

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ASSESSING QUALITY OF LIFE IN KENNELLED DOGS

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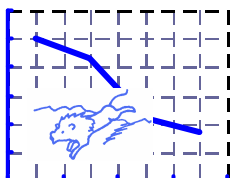
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There is currently no objective, quantified and validated system for scoring Quality of Life (QoL) in dogs that are kennelled in rehoming centres. The aim of this project is to develop such a system, based on the theory outlined by Morton (2007), using a wide range of behavioural, physiological and physical parameters. Once validated, the scoring system will be used to compare the QoL of kennelled dogs in the two types of kennel environment employed by Dogs Trust rehoming centres.

Twenty dogs from Harefield Dogs Trust rehoming centre were each tested on 11 days, over a 34 day period (a total of 220 test days). On each of the sampling days mid-flow, free-flow urine from the first urination of the day was collected for subsequent analysis. Saliva was collected on every sampling day, using cellulose swabs placed in the cheek of the dog. Physical condition was assessed based on body, eye, nose, and coat condition scoring systems. Core body and facial temperatures were also measured. Video cameras were placed in the test dog's kennel on each of the sampling days for 2.5 hours to record all behaviour, activity levels and interactions within that period.

Urine samples were assayed for thiobarbituric acid reactive substances (TBARS), thiobarbituric acid (TBA), malondialdehyde (MDA), 8-iso-prostaglandin F_{2α} (all of which assay long term stress and oxidative damage), cortisol-creatinine ratio (measuring short term arousal), and serotonin, dopamine and catecholamine metabolites (to assess affective state by proxy). Finally, urine pH was recorded as this can be an indicator of infection with certain diseases, such as cystitis. Saliva samples were assayed for ferric reducing antioxidant power (FRAP) and diphenyl-picrylhydrazyl (DPPH), both of which assess antioxidant activity. Heart rate variability was measured non-intrusively using Polar W.I.N.D.Link technology, to analyse changes in sympathovagal balance related to psychological and environmental stressors.

The measured variables were analysed for between-measure correlations. Principal components analysis was applied to all physiological measures, in addition to behavioural and physical measures of welfare in order to determine the key factors for assessing quality of life in kennelled dogs.



Recent advances in animal welfare science

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LOOKING IN THE WRONG PLACE – IMPLICATIONS FOR ASSESSING PAIN AND DISTRESS IN ANIMALS

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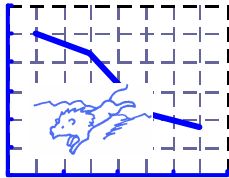
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Considerable advances have been made in assessing pain in animals through the evaluation of behavioural and postural changes. Successful implementation of such assessments depends on establishing which behaviours and postures indicate pain and distress and which areas of the body (head, body, ears, eyes etc.) to focus on to observe these indicators. Failure to observe all relevant body areas will prevent successful use of behaviour-based assessment techniques.

This study used video sequences of rabbits in varying degrees of pain and distress (none, mild, moderate & severe) following routine ovariohysterectomy to assess the observation patterns exhibited by experienced and inexperienced participants (n=151). Eye tracking equipment was used to identify the latency to observe the face, ears, abdomen, back and hindquarters and how frequently and for how long each area was observed. Data was normally distributed with homogenous variance and analysed using ANOVA and Student's t test.

Observers' focus first, more frequently and for longer on the face compared to the abdomen, ears, back and hindquarters ($P=0.000$ for all comparisons). The abdomen was focused on next, more frequently and for longer than the ears, back and hindquarters ($P=0.000$ for all comparisons) with no differences between the remaining body areas. For example, the time spent observing the areas were; face 11.5+/-5s, abdomen 3.8+/-2s, ears 2.6+/-2s, back 1.6+/-1s and hindquarters 1.8+/-1s. Latency to first observing each area or on observation duration was unaffected by experience. However, experienced observers focused more frequently on all areas of the body than non-experienced observers ($P=0.000$). Participant gender and background did not affect any of the observations.

Observing the face is not useful for assessing abdominal pain in rabbits. If similar biases in attention are seen with other species they may seriously impair our abilities to recognise signs of pain. Funded provided by VETO, Switzerland.



Recent advances in animal welfare science

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THE ELUSIVE PLATYPUS: AN INVESTIGATION INTO THE CAPTIVE MANAGEMENT OF THE DUCK-BILLED PLATYPUS (*ORNITHORHYNCHUS ANATINUS*) AT 'THE AUSTRALIAN REPTILE PARK' (ARP), NSW, AUSTRALIA

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Various media reports have claimed that the duck-billed platypus (*Ornithorhynchus anatinus*), is a difficult and problematic species, and therefore cannot be maintained within captivity). Furthermore, captive breeding programmes have also had limited success; consequently researchers have called for further empirical studies in order to increase the knowledge and understanding of this species, facilitating recommendations to enhance welfare within a captive environment.

The aim of this study was to investigate two captive platypus at 'The Australian Reptile Park' and to assess whether the application of environmental enrichment would affect their behavioural repertoire. In addition, to investigate the husbandry management practices of the Platypuses at the ARP and other exhibiting institutions.

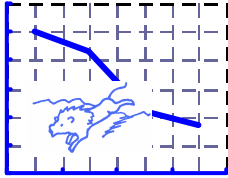
In order to investigate the behaviour of a male and female platypus at 'The Australian Reptile Park' (ARP) an infra-red CCTV video camera was set up in both enclosures for six days continuous recording. Combinations of video and visual behavioural observations were conducted for two days (12x1 hour sessions each day); an enrichment device (a hosepipe to simulate a water-jet) was then added to both enclosures. Observations continued for another two 24 hour periods, and then the device was removed. The behaviour was then observed for a further two days (12x1 hour sessions). The total observation time was 96 hours per platypus.

Data analysis was carried out using a Kruskal Wallis statistical test, and the results revealed that before the addition of enrichment the male displayed abnormal behaviour (e.g. route tracing). Data analysis was carried out using a Kruskal Wallis test, and during the application of environmental enrichment, the male results showed a significant difference between abnormal behaviour before, during and after introduction (underwater route tracing $p \leq 0.01$ and water-surface route tracing $p \leq 0.001$). In addition, the results demonstrated that the male did not appear to become habituated to the enrichment device over the two days.

In contrast the female showed no abnormal behaviours and the result showed that there was no significant difference ($p > 0.05$), between any behaviour of the female platypus before, during or after the introduction of environmental enrichment.

The results from the questionnaire, illustrate that ARP are generally consistent with ARAZPA guidelines and other institutions husbandry and management practices and whilst this would require further work, this provides a cross-comparison between zoological institutions.

This study has highlighted that the application of enrichment may be effective at reducing the presence of abnormal behaviour in the captive platypus and could potentially enhance well-being. In addition, the results also showed that variables such as housing method, enclosure design and style, and method of acquisition may influence the behaviour patterns and therefore, enhance welfare provision.



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HEAT STRESS IN CANINE ATHLETES

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Greyhounds are expected to race in a broad range of climatic conditions in both hemispheres and Heat Stress is recognised as a risk factor for greyhounds undertaking strenuous exercise during the summer months in Australia. Veterinarians officiating at greyhound race meetings have identified high environmental temperatures as an issue of concern for greyhound welfare. Following the deaths of 8 greyhounds in Arizona in 1983, Bjotvedt *et al.* (1984) carried out a limited study of 7 greyhounds racing in a temperature of 42 C. The authors concluded that strenuous exercise in such conditions represented a health hazard for greyhounds and that factors such as gender, body weight and intensity of effort could influence susceptibility to heat illness.

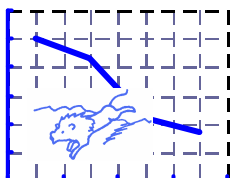
Anecdotal reports from racetrack veterinarians in Australia indicate that greyhounds may suffer from heat strain after racing in temperatures over 35^o C. It is hypothesised that strenuous exertion in hot conditions leads to significant levels of muscle breakdown. Urine produced by greyhounds in the immediate post race period is frequently very dark and gives a positive haemoglobin/myoglobin reading on standard commercial dipsticks but the incidence or significance of this in racing greyhounds has not been established.

The controlling authorities in the Greyhound Industry are committed to ensuring the welfare of greyhounds and the States and Territories have implemented a variety of policies regarding racing in hot weather. However these have been formulated without any validated evidence and variation exists between jurisdictions.

A prospective study of the population of greyhounds in training in South Australia comprising approximately 1,275 animals will be undertaken. The aims of this study are

1. To determine the prevalence of hyperthermia in greyhounds performing strenuous exercise in South Australia.
2. To determine the circumstances under which significant hyperthermia occurs.
3. To develop a predictive index for the risk of heat strain in greyhounds.

Documentation of the body temperatures achieved by a representative sample of racing greyhounds under a range of environmental conditions and accurate recording of the numbers of dogs suffering from heat induced illness will enable controlling authorities to develop and implement appropriate policies for the management of greyhounds in hot weather and thereby improve their welfare.



Recent advances in animal welfare science

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A COMPARISON OF ABDOMINAL AND SCROTAL APPROACH METHODS OF VASECTOMY IN LABORATORY MICE

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Vasectomised mice are needed as part of the production of GA animals. The BVAAWF/FRAME/RSPCA/UFAW Joint Working Group on Refinement recommended that vasectomy should be performed via the scrotal approach, where the vas-deferens are accessed through an incision in the scrotal sac, rather than via laparotomy. They assumed that since the scrotal approach does not involve incision through the abdominal wall musculature, it will be the less painful of the procedures. However the scrotal approach requires dissection and tearing of the peritoneum. This study was undertaken to assess which approach caused the least degree of post-operative pain.

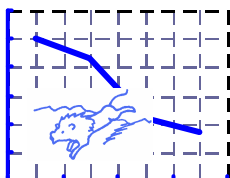
Thirty-six CD1 mice underwent isoflurane anaesthesia and vasectomy via either the abdominal or scrotal approach. The mice were individually filmed for 15-minutes on the day prior to surgery and at 1, 24 and 48 hours post-surgery. Data were obtained using HomeCageScan, an automated behaviour analysis system. Analgesia was administered pre-emptively.

A comparison of behaviours at each time point was made between the abdominal and scrotal groups, and the pre and post-operative behaviours were also compared. The frequency or duration of various normal exploratory behaviours including rearing, walking and sniffing were significantly reduced in both groups whereas the duration of grooming was significantly increased. When monitored over 48-hours these behaviours returned towards pre-operative score but in some cases the scores remained significantly lower than prior to surgery.

Various significant differences were found between the two groups, in particular at 1-hour post-op. The frequency of rearing and jumping and the duration of walking and turning was significantly greater in the scrotal group in comparison to the abdominal group. The duration of grooming was found to be significantly greater in the abdominal group at 1-hour post surgery.

Overall, limited behavioural differences were seen between the two approaches. If the changes in post-operative behaviour that occurred were caused by pain, then these results suggest that the two approaches caused similar degrees of pain. We therefore propose that the best method of vasectomy would be the one in which the surgeon has the most experience, since this would be likely to minimise the degree of tissue trauma and consequently minimise the severity of pain.

Acknowledgements: This work was funded by BBSRC and Pfizer Global R&D



Recent advances in animal welfare science

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LIVESTOCK VEHICLE ACCIDENTS IN SPAIN: CAUSES, CONSEQUENCES AND ANIMAL WELFARE

GC Miranda-de la Lama¹, W Sepúlveda², M Villarroel³ and GA María¹

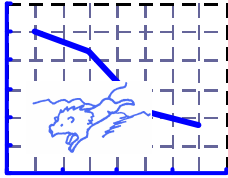
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In Spain, approximately 70 million livestock are transported by road per year. This strategic activity requires appropriate planning and infrastructure to avoid accidents and maintain high standards of animal welfare. Little is known about the characteristics of livestock accidents, even though the current tendency is for the number of journeys to increase per animal (during its productive life) and for journey times to increase (due to the decreased number of abattoirs). Livestock vehicle accidents are rare but involve significant economic, human and animal losses. In this study, information accident location, characteristics, animal's involved and human injury was obtained from insurance company's reports about 76 livestock vehicle accidents in Spain from January 2000 to December 2008. Most accidents involved pig transport (58%), followed by bovine (30%), poultry (8%) and sheep (5%). Driver mortality was not high (6%) and most accidents involved an overturned (64%), involved only the livestock vehicle (76%), on a straight road transect (51%). To identify the relation between the cause of the accidents, species and vehicle type, we used multiple correspondence and cluster analysis with data of the pigs and cattle accidents, which represented 88% of all accidents (n=66). SPSS were used to analyse the data. Multivariate analysis of the data suggests two types of accidents depending on the species transported. The first cluster contains 95.3% of accidents with pigs. Among those accidents, 60.5% and 39.5% involved articulated and rigid vehicles, respectively, associated with 72.1% over-turnings during the day (88.4%). In 79.5% of the cases, the animals survived the accident and were found wandering freely on the highway. Approximately 22% of the animals died and 2% were injured and slaughtered *in situ*. In the second cluster, 94.4% of the accidents were cattle transport, in small vehicles (44.4%), followed by articulated (33.3%) and rigid (22.2%). The cause was either over-turning or collision, in almost equal proportion, and equally distributed during the day or night. In 20.5% of those accidents, there were animals wandering freely on the highway, 12.2% mortality and 14.7% animals injured and slaughtered on site. The results of this study indicate that the characteristics of livestock vehicle accidents vary according to species. Prevention and rescue protocols should be developed to take this into account. One of the main causes of accidents is driver fatigue, which is due to several factors such as intense work days, poorly designed route plans, or high levels of pressure from companies.



Recent advances in animal welfare science

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APPLYING SOCIAL SCIENCE TO ANIMAL WELFARE ISSUES: THE USE OF ANIMALS IN SCIENCE

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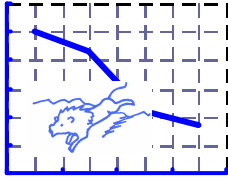
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Understanding public attitudes towards the use of animals in science is important: the public often funds animal-based studies (directly or indirectly), and are often beneficiaries. As such, it is important to explore public values, alongside scientific knowledge and expert opinion, when developing policy in this area. The majority of previous research on people's views towards genetic modification has focused on food production animals, but there is almost no information on people's views towards the use of genetically modified (GM) animals in science.

In the past decade the number of GM animals used in science has more than doubled. Furthermore, the rising use of these GM animals is driving an increase in overall numbers of animals used in science. This challenges the accepted ethic, and regulatory basis, of animal experimentation, which aims to replace, reduce and refine the use of animals.

Our paper describes research on people's attitudes, values and concerns towards the use of GM animals in science. The first phase of our research used an interactive web-based survey to examine whether people's willingness to support the use of animals in science is affected by having regulation in place. Support declined when animal-based studies went from non-invasive to invasive or involving GM animals. However, more survey participants were willing to support both the invasive and GM studies if regulation was in place. Participants clearly defined their reasons for not supporting invasive animal-based studies (i.e. the impact to the animals outweighed the benefits of the research), giving details on what can be practically implemented in policy to address people's concerns. However, participants were less clear about their reasons for not supporting studies involving GM animals. Consequently, in the second phase of our research we plan to use interviews to explore people's attitudes, values and concerns about the use of GM animals in science.

Overall, we seek to provide information on what types and components of regulation (if any) may need to be developed to address public concerns about the use of animals in science. Our research is intended to help to provide a basis for developing socially acceptable policy; results to date suggest that higher levels of regulatory oversight may be required when animal research is invasive or requires the use of GM animals.



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REPEATABILITY OF INDICATORS FOR THE ASSESSMENT OF SHEEP WELFARE

CJ Phythian, MJ Clarkson, AC Winter, D Grove-White, P Jones, PJ Cripps, E Michalopoulou and JS Duncan

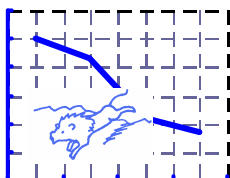
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Introduction: Compared with other farmed animal systems, sheep farming is frequently perceived to be a “green” and “natural” method of animal production. There is, however, great diversity within the sheep farming industry, varying from extensive flocks with minimal management through to very intensive management of indoor-housed sheep. On-farm welfare issues are associated with both scales of production. Ideally the welfare of sheep would be assessed using a gold standard measure that was both scientifically robust to the diverse nature of sheep farming and feasible for application under on-farm conditions. To date there are no scientifically validated methods for this purpose. Therefore the aim of this project is to develop valid, repeatable and practical measures for the on-farm assessment of sheep welfare.

Materials and Methods: A scientific review of the literature review together with expert consultation was used to identify the potential on-farm welfare issues and indicators of welfare for sheep in England and Wales. Animal-based indicators identified by these methods were tested on fifty sheep farms of varying management type, located in the North of England and North-Mid Wales region. A pool of observers (n=10) of varying experience, occupation and training was established. Multiple observers independently assessed a sample of sheep (n= 24-120) on each farm at both a group and individual animal level. Data was analysed to determine the level of inter-observer agreement using Cronbach’s alpha, percentage agreement and kappa analysis.

Results: Multiple observers independently assessed animal-based welfare indicators on a total of 1159 adult sheep and 977 neonatal and young lambs. Specific data from the cross-sectional study will be presented during the meeting. Preliminary inter-observer repeatability results indicate a good to fair level of agreement for many of the tested indicators. Although an effect of observer training and experience on the levels of agreement for some specific indicators is apparent.

Conclusions: This study established inter-observer agreement for potential indicators of sheep welfare. Preliminary results and on-farm experience suggests that certain indicators may be more suitable for group-level assessment, whilst others may require closer examination of individual sheep.



Recent advances in animal welfare science

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A COMPARISON OF THE GENERAL PUBLIC'S AND PROFESSIONALS' PERCEPTIONS OF AGGRESSION IN THE DOMESTIC DOG

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Dog aggression is considered to be a significant danger to the public, with biting incidents posing a serious problem worldwide. As a result, it could be suggested that the welfare of both people and dogs is currently compromised. It is believed that the first step in tackling this situation is to gain an understanding of how dog aggression is perceived.

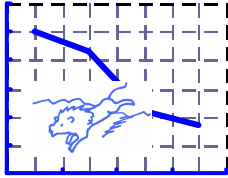
This study was designed to establish if there is any significant difference between the perceptions of the general public and dog professionals in regard to aggression in the domestic dog. Data was collected via a questionnaire which was completed by members of the public, vets and pet behaviour counsellors. Questions elicited information regarding breed differences in aggression; euthanasia as an option for aggressive dogs; the media's portrayal of dog aggression; and behavioural indicators of aggression.

Statistical analysis by means of Kruskal Wallace tests revealed that there was a significant difference between the perceptions of the general public and dog professionals in regard to dog aggression towards people, but not in regard to aggression towards other dogs. The most significant differences in perceptions, identified by Chi Squared tests, were for the Staffordshire Bull Terrier, Cocker Spaniel and Bull Terrier in terms of aggression towards people, possibly as a result of media influence and education.

It was also found that the majority of respondents across all three groups disagreed with the idea of euthanasia as an option for aggressive dogs, although more respondents agreed with it if the scenario involved a person being bitten. Additionally, the findings reveal that the majority of respondents agreed that the media exaggerates certain breeds as being aggressive and has created stereotypes of certain breeds. However, whether or not the creation of stereotypes is necessarily a bad thing is open to interpretation.

Lastly, it is suggested that the general public may be less adept than dog professionals at recognising behavioural indicators of aggression. With statistics indicating that many people are bitten by dogs annually; this is an area which should be addressed as a potential means of reducing the number of incidents.

Dog companionship has become an integral part of life for many people but, inevitably, this is intertwined with conflict. Perhaps if an understanding of how people perceive dog aggression could be gained and consequently shaped by means of education, then the welfare of both people and dogs could begin to be improved.



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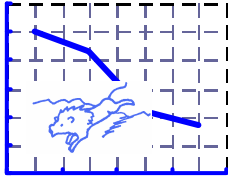
York Merchant Adventurers' Hall, 30th June 2010

ASSESSING ANXIETY IN MICE USING AN AUTOMATED HOME CAGE BEHAVIOURAL ANALYSIS SYSTEM, THE INTELLICAGE®

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Emotional states including anxiety and depression are typically studied in rodents using standardised behavioural tests such as the elevated plus maze. There are both welfare and scientific concerns with these tests, as individual testing may be a stressor for the animal and standardisation between laboratories can be problematic. The capacity to assess anxiety in socially housed mice would therefore be a considerable advance. Here we examine how baseline measures that can be obtained from an automated home cage behavioural analysis system, the IntelliCage® may relate to traditional measures of anxiety such as performance on the elevated plus maze. To study animals in the IntelliCage®, mice are implanted with small R.F.I.D transponders under a brief general anaesthetic then housed and studied in the automated cage system. The system is based on two large mouse cages, each cage consisting of four programmable learning corners with two water bottles and transponder antennae to identify individual animals. Baseline parameters from the IntelliCage® that are consistent within individuals over time and correlated to performance in standardised behavioural tests may provide information concerning the emotional state of animals. Automated home cage behavioural analysis systems such as the IntelliCage® may therefore allow us to study states such as anxiety over long periods of time without potentially stressful and confounding handling effects that could occur from traditional standardised behavioural tests. The capacity to program these systems to respond differentially to individual animals and either display different stimuli (pattern/colour of LED lights), give positive reinforcement (access to sugar water) or give punishment (exposure to an air puff) may also allow us to develop improved measures of emotional state through examination of animals' cognitive biases.



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WELFARE ASSESSMENT OF BROILERS THROUGH POST-MORTEM EXAMINATION

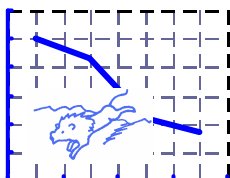
S Rizvi and J Novak

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Council Directive 2007/43 (Directive), laying down the minimum rules for the protection of chickens kept for meat production, requires Member States to evaluate post mortem inspections to identify indications of poor welfare conditions. However, there are increased costs associated with the detail of measurements made in the slaughterhouse. A study is being conducted ahead of the Directive implementation in June 2010, to assess the benefits of measuring post-mortem indicators in broilers when compared with animal welfare measured on farm and to identify evidence based trigger points for a follow-up farm inspection.

The study started on September 2009 and will last until March 2010 to account for seasonal effects. 122 farms will be visited prior to flock depopulation and on-farm welfare assessment will account for all of the requirements under the Directive. Post-mortem indicators and mortality rates will be recorded at final depletion, using existing Meat Hygiene Service (MHS) reporting procedures. Eight post-mortem conditions that are currently checked in the slaughterhouse have been identified as being potential indicators of on-farm welfare; dead on arrivals, emaciation, ascites/oedema, joint lesions/arthritis, cellulitis and dermatitis, footpad dermatitis, respiratory problems, and total rejection rate.

Preliminary analysis will be done after 3 months from the start of the pilot (November) when associations between welfare assessments on farm and post mortem findings will begin to be examined, and correlations between total mortality rate, cumulative daily mortality rate and threshold trigger levels for a follow-up farm inspection will be analysed. Trigger levels will additionally be set for values for "house mortality to date" and "cumulative daily mortality rate" and will account for farm, bird breed, and stocking density. Trigger levels will be revised and amended and periodically revisited after the Directive has been implemented in June 2010. A sequential approach to statistical evaluation is being used, allowing ongoing data evaluation throughout the study and, if necessary changes to inspection process during the trial to optimise the procedures and protocols followed. Results will determine best value post mortem recording protocol that meets the Directive's requirements and predicts welfare assessment on-farm.



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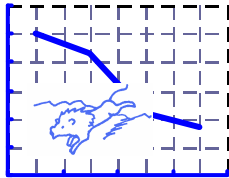
PRELIMINARY INVESTIGATION INTO MANAGEMENT AND CONDITION OF *EQUIDAE* AT LIVESTOCK MARKETS DURING A PERIOD OF ECONOMIC DOWNTURN

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Auctions are, potentially, a stressful environment that compromises the welfare of horses. Many markets are primarily livestock markets, and so staff may not be trained to handle horses which will react very differently to cattle, sheep or pigs. The aim of this study was to investigate the management and condition of *equidae* (horses, ponies and donkeys) at auction, and to evaluate economic trends over a period of 8 months. Implications of these factors on equine welfare were evaluated. Three auctions (York, Derby and Melton Mowbray) were visited 6 times each between January and September 2009. Assessing an animal's welfare can become anthropomorphic and subjective. Therefore it was important to choose visual indicators of welfare that were quantitative and repeatable rather than more qualitative behavioural observations. The condition score, obvious injuries, lesions, scars, abnormal respiration, sweating, pawing and pacing, aggression, stereotypic behaviours and body tension of each horse were recorded. Access to water and hay, condition of pens, rough handling (using sticks or whips) and the price achieved at auction were also recorded. A total of 1000 horses, ponies or donkeys (n=4) were observed. The majority of horses and ponies (85%) were in good body condition, only 3.8% were classed as thin, and 11.2% were classed as obese. Only 7.6% showed signs of wounds and scars. Many of the results did not support pre-conceived opinions of welfare of *equidae* taken to auctions. However, once at auction, over 96% did not have access to water while penned waiting for the auction, and over 65% did not have access to forage. Horses can arrive from 9 am, with the first auction taking place at 12.00 noon. This is a clear welfare issue, significantly increasing risk of gastro-intestinal disorders, especially when taking travelling distances into account. Economic data showed that horse numbers decreased towards the end of the period. The lowest price achieved was 10 Guineas for a Dartmoor yearling and the highest price achieved was 2700 Guineas for a large adult riding horse. Further longitudinal research into the effect of the introduction of equine passports and micro-chipping as well as the effect of the current recession is planned.



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AN INVESTIGATION INTO THE EFFECTS HOUSING HAS ON THE BEHAVIOURAL REPERTOIRE OF THE DOMESTICATED RABBIT (*ORYCTOLAGUS CUNICULUS*)

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In the last few decades the popularity of the pet rabbit has increased and has become the UK's third most popular pet, with over 1.4million people owning a rabbit in 2008 (PFMA, 2008).

Nevertheless RSPCA statistics show that rabbits are often the most neglected pets resulting in the animals living in solitary confinement, in small hutches without the opportunity to satisfy their basic fundamental needs. As a result, these unwanted rabbits are often abandoned or cruelly treated (RSPCA, 2009).

Investigations carried out in different industries such as farmed and laboratory rabbits conclude that welfare is lacking due to poor husbandry techniques, lack of companionship or enrichment (Love, 1994; Gunn and Morton 1995).

Within these industries both government and non-governmental organisations aim to improve welfare by introducing guidelines or codes of conduct for practitioners to follow. Nevertheless, there is some variance in the standardisation of husbandry procedures that are applied, particularly when stating recommended cage size.

The aim of this study was to better understand the effect hutch size had on the behavioural repertoire of the domestic rabbit in a pet housing situation, with particular focus on undesirable behaviours such as aggression and stereotypic.

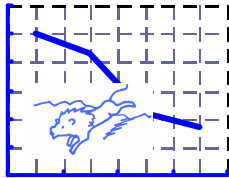
Six rabbits were paired together and placed in one of three different sized hutches. Using scan sampling, individual behaviour and position in hutch was recorded for an hour in the morning and in the afternoon for a period of ten days. The rabbits were then rotated between hutches giving thirty days worth of recordings.

Results showed that as hutch size decreased, the frequency of aggressive and stereotypic behaviours increased. Although some individual differences were noticed, T-tests prove that there was a statistical difference between the frequency of undesirable behaviours shown in the largest and smallest hutch.

From information gathered from this and previous research (into farmed and laboratory rabbits) It is concluded that rabbit welfare is inflicted under intensive housing conditions, due to fundamental needs not being met and the inability to express natural behaviours.

Growing concern and introduced legislation aims to improve welfare within different industries, however guidelines set by leading organisations (DEFRA, CoE and the Home Office) don't appear to satisfy the fundamental behavioural needs of the animal.

If the rabbit is to increase in popularity the results obtained from this investigation hope to inspire a positive change in the housing for the companion rabbit, via stricter guidelines or the encouragement of natural behaviours, which will inevitably improve welfare.



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THE EFFECT OF STRAW QUANTITY AND FREQUENCY OF PROVISION ON GROWER PIG BEHAVIOUR

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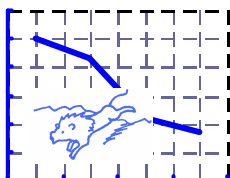
The growing concern for intensively farmed animals has resulted in a change in legislation and the subsequent compulsory provision of a rootable substrate to pigs since January 2003. Straw is a practical and functional method of environmental enrichment as it stimulates natural behaviours (exploration and foraging) in intensively housed grower pigs and can provide bedding and nutritional value, thereby enhancing production system profitability.

However, uncertainty regarding how much straw to provide has arisen due to different production systems, i.e. different flooring, husbandry schedules and substrate availability. This study therefore aimed to discern between two levels of provision frequency and straw quantity in order to determine the minimum quantity required to effectively decrease adverse and pen-mate directed behaviours and increase straw-directed behaviours.

Four groups of grower pigs maintained on a straw-flow systems incorporating solid flooring, were exposed to one of four treatments (20g of straw/pig/day; 10g of straw/pig twice daily; 70g of straw/pig/day; and 35g of straw/pig twice daily) over a period of three weeks. Straw-directed, exploratory, maintenance, inactivity and pen-mate directed behaviours were recorded using instantaneous scan sampling and continuous focal sampling.

Groups provided once daily with straw, regardless of quantity, rooted more, compared to treatments provided twice daily with straw which performed less straw-directed behaviours. This implies that a once daily provision of straw is more beneficial and will sufficiently occupy pigs in the morning when provided, and still increase activity levels in the afternoon. While no significant differences were found with regard to the frequency of straw-directed behaviours between the treatments, there was a positive correlation between the frequency of straw directed behaviours observed and larger quantities of straw. In addition, the treatment group receiving 20 g of straw per pig spent significantly more time performing adverse and pen-mate directed behaviours compared to the other treatments indicating that treatments offering larger quantities of straw were more beneficial in reducing unwanted behaviours.

In conclusion, the provision of either 35g or 70g of straw per pig once in the morning was found to decrease adverse and penmate directed behaviours and increase straw-directed behaviours, and can subsequently be recommended in straw-flow systems incorporating solid flooring.



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THE EFFECT OF THE STRAW BEDDING ON THE STEREOTYPES AND SOCIAL INTERACTIONS OF LIGHT LAMBS

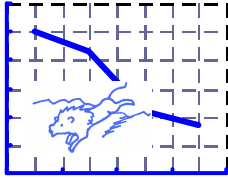
DL Teixeira¹, G Miranda-de la Lama¹, M Villarroel², J Escos¹, S Alierta¹ and GA María¹

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Spain is the second largest producer of sheep in the European Union and the production system is becoming more intensive. New systems include an intermediate step between the farm and the abattoir at cooperative classification centres (CC). Since the cost of straw has increased, feed lot managers aim to avoid the use of straw during this stage. The aim of this study was to analyze the use of straw as an enrichment material in light lambs ($n=24$). The experimental design included two treatments and two replicates with six male Rasa Aragonesa lambs each (17.2 ± 0.2 kg live weight and approximately 60 days old). In treatment 1, lambs had straw (either to lie on or eat) and in treatment 2 no straw was available. The animals were housed in 5.6m^2 feed lot pens, with *ad libitum* commercial concentrate and water. Each pen was observed using a continuous digital video camera system (08:00 to 20:00 h) on five different days (1, 7, 14, 21 and 28 at the CC). The behaviours recorded (stereotypes, aggressive and affiliative interactions) are presented as mean events per animal per day and were analysed using the minimum square techniques. Over all, lambs with straw showed less stereotypes (26.5 ± 1.6 vs. 43.9 ± 1.6 ; $p < 0.01$), less aggressive interactions (22.1 ± 2.1 vs. 29.6 ± 2.1 ; $p < 0.01$) and less affiliative interactions (28.6 ± 2.5 vs. 39.3 ± 2.5 ; $p < 0.01$) than the lambs without straw. Furthermore, on days 7 and 21, lambs with straw showed more stereotypes (at least 61.7%; $p < 0.01$) than on days 1, 14 and 28, while lambs without straw showed more stereotypes ($p < 0.001$) from day 1 to 21 and on day 28 returned to values observed on day 1. For lambs with straw, 14 days after the beginning of the experiment, aggressive interactions decreased by 51.4% ($p < 0.01$), however, the aggressive interactions in lambs without straw decreased almost gradually from day 1 to day 28 ($p < 0.001$). There were less affiliative interactions on days 1, 14 and 28 than on days 7 and 21 for lambs with straw (at least 40.9%; $p < 0.05$). Lambs without straw showed a similar pattern (at least 30.1%; $p < 0.05$). The results suggest that providing straw could be useful to improve animal welfare.



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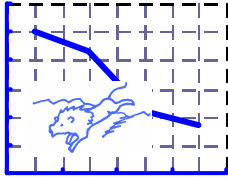
EFFECT OF SPACE AVAILABILITY AND ENVIRONMENTAL ENRICHMENT ON RABBIT BONE STRENGTH

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The amount and quality of space allocated to confined animals may influence their bone strength indirectly through changes in activity patterns. The effect of space availability and environmental enrichment on rabbit bone strength was determined by housing groups of 8 weaned rabbits in cages of 0.4, 0.46, 0.53, 0.64, 0.8, 1.07 or 1.6 m². Per round (3 in total, n=224 per round), 28 cages were used, i.e. 2 enriched and 2 barren cages per cage size. A wooden U-shaped enrichment offering the possibility to gnaw, hide and rest, was placed in the centre of the wire mesh cages. Because of practical constraints (lack of space), the 2 smallest cages were only available in the non-enriched form. At 72 days old, all rabbits were slaughtered and carcasses were stored at -20°C. Afterwards, the left and right tibiofibulae were measured in 4 ways. One test was done on defrosted and defleshed bones (shear strength, SF). Three tests were performed on boiled, defleshed and dried bones: shear strength (SD), weight/length index (WL) and robusticity index (ROB). SF was measured on half of the animals (4 animals per cage) of round 1, 2 and 3 (n=336); SD, WL and ROB were measured on half of the animals of round 2 and 3 only (n=224). Results were analysed using linear mixed models with side as repeated factor (SAS 9.1). First, the influence of enrichment was analysed on the data excluding the 2 smallest cage types. Cage size, enrichment and their interaction were included as fixed effects, round was included as random effect. Second, all data were used and cage size, sex and their interaction were included as fixed effects and round as random effect. Enrichment and its interaction with cage size had no effect on any of the measurements. This was also the case for sex and its interaction with cage size. Cage size did not affect SF and SD. However, both WL (P=0.02) and ROB (P=0.02) improved with increasing cage size. It is plausible that the enrichment did not induce a (sufficient) increase in rabbit activity in order to affect bone development. As WL and ROB measure bone weight in relation to bone length, the results indicate that bone density (mass of the material per volume of bone) and/or bone thickness increased with increasing space availability. However, cage size did not have the expected effect on shear strength.



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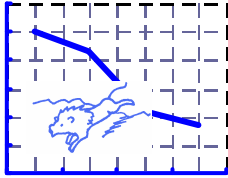
DOES THE AUDIO PLAYBACK OF CONSPECIFIC CHIRP CALLS IMPROVE THE WELFARE OF CAPTIVE MARMOSETS (*CALLITHRIX JACCHUS*)?

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Efforts to improve the welfare of captive animals generally focus on structural changes to the physical housing environment, or improvements in husbandry through changes to social groupings and feeding routines and similar. Whilst some studies have investigated auditory stimulation on animal welfare, no studies to our knowledge have investigated whether animal welfare can be improved through playback of positive conspecific vocalisations. There is good reason to believe that this may be effective. Previous studies with primates indicate that the spontaneous affiliative vocalisations of neighbouring groups have a positive effect on the welfare of nearby conspecifics, an effect apparently mediated by social contagion. We have since replicated this finding in marmosets, the most frequently used New World primate in laboratory research and testing in the UK. The current study investigated whether affiliative calls played back to marmosets would have a similar effect to that of spontaneously produced neighbour calls. More specifically, we asked whether the playback of an above average rate of pre-recorded conspecific chirp calls to socially housed marmosets is associated with an increase in affiliative social behaviour, and thus an improvement in captive marmoset welfare. In the current study, both the contingent effect on marmoset behaviour, during 5 minutes of chirp playback (immediate) and the longer-term effect on behaviour, after eleven days of 180 minutes of daily chirp playback (post) were investigated. Observations were recorded by continuous focal sampling. The behaviour of 16 focal marmosets in the immediate and post playback conditions was compared with their own baseline behaviour, observed prior to any playback, and with that of 16 matched-pair focal individuals in a control condition in which playback was of recorded silence. The playback of pre-recorded chirp calls represents a potential means of improving captive marmoset welfare that would be both practical and economical to implement.



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DEVELOPMENT OF A PROTOCOL FOR THE ASSESSMENT OF HENS FOR FITNESS TO TRAVEL

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The European Council Regulation (EC) No. 1/2005 on the protection of animals during transport requires that animals are fit to transport, but also acknowledges that sick or injured animals may be considered fit for transport if 'slightly injured or ill' and if transport would not cause additional suffering.

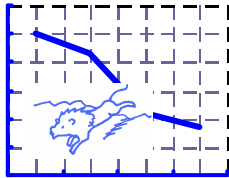
We are currently developing methodologies to assess the fitness to travel of end of lay hens at both individual bird and whole flock level. In practice, whole flocks of several thousand hens are transported with only limited time to consider the fitness of individual hens during depopulation, although this can and should be done before they are transported.

Our approach includes an initial appraisal of general behaviour and health by walking through the flock and noting the presence of any 'sick' or lame birds, plus the use of outdoor areas by free-range flocks. Individual hens are then randomly sampled from the flock (at all levels of the house/cages) for systematic clinical examination using defined 3 point scoring systems, and are weighed. Feather cover is scored on a 5 point scale based on industry protocols, as this is particularly relevant for thermal comfort during transport. Among the areas specifically examined are the eyes, nares, feet, skin and keel (for body condition and indication of previous trauma).

The method of examining and scoring of single hens serves not only to assess their individual fitness, but may also indicate the variation and overall levels of health indicators and body condition within the flock, when sampled appropriately. These methods are also being used to compare at post-mortem the condition of hens which survive the transportation process with those that are dead on arrival (DOA) or rejected.

Multi-level statistical models will be used to determine which variables are the best predictors of fitness to travel, with the aim of developing a simplified protocol for practical use. To better predict flock fitness, additional data, such as productivity and health records, will be also be modelled together with national records relating levels of DOA and rejects with husbandry system, age, genotype and other pertinent variables. It is likely, for example that the length of journey and weather conditions will be associated with the birds' ability to withstand transport, as has been found for broilers.

Acknowledgement: We are grateful to Defra for funding this work as part of AW0941



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THE DEVELOPMENT AND TESTING OF A NOVEL INSTRUMENT FOR THE ON-FARM MEASUREMENT OF HEALTH-RELATED QUALITY OF LIFE OF GROWER-FINISHER PIGS

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This research sought to develop a novel instrument for the welfare measurement of farmed pigs that would have high utility for use on-farm by farmers and stockpersons. It was intended to provide a valid and reliable measure of welfare on a positive-negative continuum: a measure of health-related quality of life (HRQL).

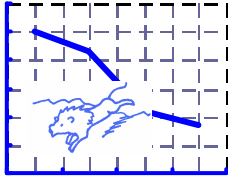
A psychometric approach to instrument development was taken. Health Related Quality of Life (HRQL) for herd animals was defined in order to identify clearly the object of measurement: *HRQL is a combination of the individual's circumstances, which include health status, and its affective response to those circumstances.*

A large number of potential items for the purpose of on-farm measurement of HRQL of pigs (and a range of utility considerations) were identified by means of in-depth interviews with 21 experienced farmers and stockpersons across Scotland. Thereafter, an expert group that included experienced farmers and stockpersons, pig veterinary specialists and animal welfare scientists contributed to instrument item selection by helping to identify the most commonly endorsed items from the initial item pool. The expert group was subsequently involved in scaling the items selected in order to establish a valid scoring mechanism for the instrument.

The resulting HRQL instrument includes multi-item subscales containing a total of 128 items. 98 items are intended to capture causal variables which reflect a variety of potential and independent impacts upon quality of life within a Five-Freedoms framework and with an appropriate emphasis on health status, that are readily observable in the course of daily welfare assessment (e.g. 'thriving', 'tail bitten', 'bullied'). The remaining 30 items are intended to capture indicator variables which contribute to the direct measurement of how an individual feels about its circumstances (e.g. 'alert', 'listless', 'nervous'). Each causal or indicator item has an associated HRQL score derived from the expert group scaling exercise. These are used to obtain a score for each domain or sub-domain of HRQL, by methods that accord with whether the contributing variables are causal or indicator for HRQL.

Pre-testing of the prototype instrument was carried out on commercial pig units by 13 stockpersons with a range of experience, and results indicated that the instrument has high utility and face validity. For construct validation purposes, field testing of the instrument was conducted on 4 commercial pig units (n pigs=157). Preliminary results appear to indicate that the instrument can discriminate known groups amongst grower-finisher pigs in a commercial environment.

Acknowledgements: BBSRC grant reference number BBSRC BB/C518965/1 provided funding for this research, which could not have been done without the farmers, stockpersons, veterinary specialists and welfare scientists who participated in instrument creation and testing.



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DOES TRANSPORT OF ORNAMENTAL FISH CAUSE STRESS?

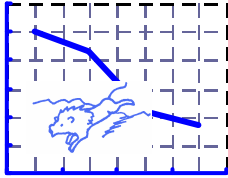
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The trade in ornamental marine fish involves hundreds of thousands of animals annually (UNEP/WCMC, 2003). The majority of these fish are wild-caught, with only a fraction being captive-bred. Whether captive raised or wild caught, the majority of fish are subjected to potentially stressful transport practices over prolonged periods, with wild caught specimens generally being subjected to the most stressful conditions. Relatively little research has been conducted on the welfare consequences of 'pet' fish transport. Due to the distances involved in transporting from place of capture to the consumer, individual fish may experience adverse conditions leading to stress. Confinement in bags with deteriorating water quality for many hours or days does result in occasional mortality during transit, and it is widely accepted by professional aquarists that many fish subsequently experience stress-related health problems following transport. Despite attempts by some suppliers of ornamental fish to reduce the stress levels of fish during transport, there are few studies providing evidence that may improve the welfare of the fish. This study investigated the effects of simulated transport on the behaviour and physiology of a popular ornamental marine fish, the clownfish *Amphiprion ocellaris*. The effects of bagging and transport duration were evaluated by behavioural observations, ventilation rate and non-invasive water cortisol measurements for comparison with water quality parameters within the bag. Holding fish in bags in a small volume of water of course imposes a confinement stress that is known to affect fish physiology and subsequent behaviour. Fish were held under simulated transport conditions for periods of 2 hours up to the recommended maximum of 48 hours to determine how behaviour, physiology and water quality change with duration of transport. Water concentrations of cortisol were correlated with individual ventilation rate, behavioural measures and water quality to precisely gauge to what degree this transport method affects fish welfare. The results were also compared with non-stressed fish held under standard tank conditions. These results are being used to inform improvements in the welfare of ornamental marine fish during their transportation by further studies.



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