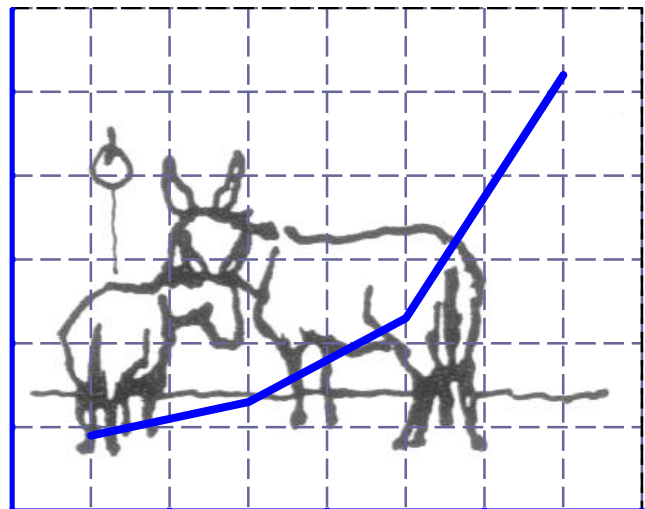


Recent advances in animal welfare science IV

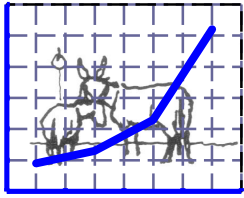


UFAW Animal Welfare Conference

26th June 2014

The Merchant Adventurers' Hall, Fossgate, York, UK

UFAW
Established 1926



Recent advances in animal welfare science IV

UFAW Animal Welfare Conference

York Merchant Adventurers' Hall UK, 26th June 2014



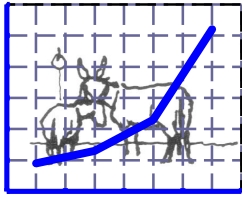
Welcome to the UFAW Conference

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

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

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

Stephen Wickens and Robert Hubrecht
Organisers, UFAW



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General Information

Organisers:

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

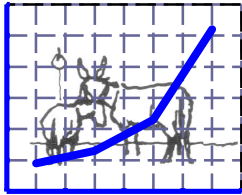
- Promoting and supporting developments in the science and technology that underpin advances in animal welfare.
- Promoting and supporting education in animal care and welfare.
- Providing information, organising symposia, conferences and meetings, and publishing books, videos, technical reports and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

UFAW is an independent organisation, and throughout its history its work has primarily been funded by donations, subscriptions and legacies.

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

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

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



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Information about the Symposium venue:

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

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

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

Catering:

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

Access to the wireless network:

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

Username: yorkcompany_guest_2

Password: pegasus1357

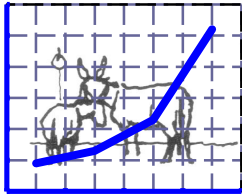
Safety:

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

Great Hall (2): 1. Main entrance and 2. Exit adjacent to the high dais.

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

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



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Information on Presentations

Speakers:

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

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

Posters:

Posters will be displayed in the Undercroft, on the ground floor of the Hall. Access to set up a poster is from 8.30 am and all posters should be in place before the start of the conference at 9.20 am. All must be taken down before the end of the conference at 5.30 pm and preferably by the end of the afternoon refreshment break

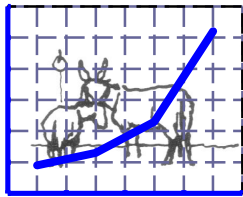
The poster boards that will be used for the UFAW conference in York will accommodate A0 portrait size posters (ie 1189mm high x 841mm wide) and will be mounted on these using velcro fastenings. Spare velcro will be provided for those who need it on the day

During the poster session, which is scheduled to begin at 1.15pm, authors have been asked to make themselves available to answer questions about their work. Accordingly delegates contributing posters are asked to ensure that at least one of the contributing authors is standing nearby their poster during this session.

Badges:

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

Blue	Organisers and helpers
Yellow	Speaker
Pink	Poster presenter



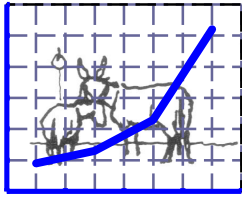
Recent advances in animal welfare science IV

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Timetable

8.30 – 9.20 Registration and poster set up		
9.20 – 9.30 Introduction to meeting		
9.20	Hubrecht R UFAW	Welcome and Introduction
9.30 – 10.25 Session 1		
9.30	Henry S, M Hausberger, C Fureix and M Bateson Université de Rennes1	Do horses with poor welfare show “pessimistic” cognitive biases?
9.50	Heath CAE, WJ Browne, S Mullan and DCJ Main University of Bristol	Iceberg indicators: Fact or fiction?
10.10	Jacobs L, E Delezie, L Duchateau, X Gellynck, K Goethals, E Lambrecht, J Viaene and FAM Tuytens The Institute for Agricultural and Fisheries Research	The welfare of broiler chickens during transport to slaughter plants
10.25- 11.10 Break: Refreshments		
11.10 – 12.30 Session 2		
11.10	de Haas EN, JE Bolhuis, B Kemp and TB Rodenburg Wageningen University	Consistent differences in behaviour and stress sensitivity in brown and white type laying hens requests a custom-made approach to improve bird welfare
11.30	O'Neill DG, DB Church, PD McGreevy, PC Thomson and DC Brodbelt The Royal Veterinary College	Post-Bateson: have pedigree dogs become exposed?
12.00	Paranhos da Costa MJR, LC Magalhães Silva, LP Silva and MFM Guimarães Universidade Estadual Paulista, Brazil	Effects of good practices of handling on the welfare of dairy calves
12.15	UFAW Award Presentations	UFAW Medal for ‘Outstanding Contribution to Animal Welfare Science’ UFAW ‘Young Animal Welfare Scientist of the Year’
12.30 – 14.00 Lunch – poster session from 13.15		
14.00 – 15.15 Session 3		
14.00	Ortolani A, J Gonggrijp, R Putman and F Ohl Utrecht University	Assessing dog welfare: A new perspective
14.20	Di Martino G, W McCormick, F Buniolo, G Berto, F Agnoletti and L Bonfanti Istituto Zooprofilattico Sperimentale delle Venezie	The effect of stocking density and feed formulation on the behaviour, health and growth of meat rabbits
14.40	Burn CC The Royal Veterinary College	Why are some animal welfare problems dismissed as ‘normal’?
15.00	McLennan KM, J Littlemore and W McCormick University of Cambridge	The effects of a dynamic group system on the social bonds of dairy cattle
15.15– 15.50 Break: Refreshments		
15.50 – 17.10 Session 4		
15.50	Hall LE, S Robinson and HM Buchanan-Smith University of Stirling	Refining oral gavage: Assessing and improving welfare in the laboratory-housed dog
16.10	Friend TH, WR Binion and JA Haberman Texas A&M University	The use of reflective films to improve the comfort of dairy calves during hot and cold weather
16.25	Tribe A, A Bouchon-Small and M Torregrosa Rocabado University of Queensland	Wildlife rehabilitation in Queensland
16.45	Dixon LM, I Dunn, S Brocklehurst, V Sandilands, M Bateson, T Boswell, B Tolkamp, P Wilson and RB D'Eath Scotland's Rural College Auchincruive	New measures of hunger in broiler breeder chickens
17.10 End		



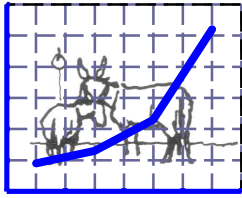
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SCIENTIFIC PROGRAMME:

Speaker Abstracts



Recent advances in animal welfare science IV

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DO HORSES WITH POOR WELFARE SHOW “PESSIMISTIC” COGNITIVE BIASES?

S Henry¹, M Hausberger^{1,2}, C Fureix³ and M Bateson⁴

¹ UMR-CNRS 6552 EthoS, Station Biologique de Paimpont, Université Rennes 1, France.

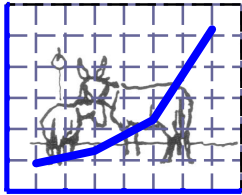
² UMR-CNRS 6552 Ethos, Campus de Beaulieu, Université Rennes 1, France.

³ Animal & Poultry Science, University of Guelph, Canada

⁴ Centre for Behaviour and Evolution, Institute of Neuroscience, Newcastle University, UK.

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Negative affect is known to cause individuals to interpret ambiguous stimuli ‘pessimistically’, exhibiting an increased expectation of punishment. Here, we hypothesised that horses suffering from poor welfare conditions would show more pessimistic judgement biases compared to horses with a better welfare state. This study involves 34 horses from 3 sites differing in management conditions. On one hand, we had 2 groups ($n_1=11$; $n_2=14$) of riding school horses living in individual boxes, with restricted feeding and used in daily riding lessons with constraining techniques. On the other hand, we had one group ($n_3=9$) of leisure horses living in more naturalistic conditions and used for occasional relaxed riding. We assumed that the riding school horses would have poorer welfare and hence more negative affective state than the leisure horses. The welfare of the horses was assessed by recording health-related (*e.g.* chronic pathologies, vertebral problems), behavioural (*e.g.* stereotypy, aggressive behavior) and postural (*e.g.* ears position) measures that have been proven to be good indicators of a chronic bad welfare state in domestic horses. All horses were also trained on a spatial judgment task during which they learnt to expect edible food in one location and unpalatable food in another. Judgement bias was tested using three ambiguous locations intermediate between the trained locations. A strong site effect was found: the horses living in the site characterized by the highest levels of behavioural and health-related problems exhibited a clear pessimistic bias when judging ambiguous stimuli, whereas the horses living in more natural conditions, associated with a good welfare state, showed an optimistic bias. This study is the first to reveal a link between poor welfare and pessimistic judgement biases in domestic horses, and reinforces existing data suggesting that horses in some riding schools may suffer from poor welfare.



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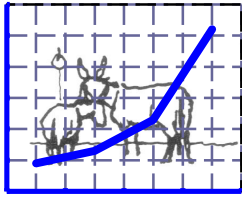
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ICEBERG INDICATORS: FACT OR FICTION?

CAE Heath, WJ Browne, S Mullan and DCJ Main

School of Veterinary Sciences, University of Bristol, UK
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Welfare science has progressed in recent years from resource-based welfare assessments to a focus on animal-based measures that provide a more direct account of welfare. However, when the aim is to present a holistic account of welfare the number of animal-based measures can be extensive. This can result in welfare assessment protocols that are both time consuming to carry out, and which can potentially suffer from the challenges associated with integrating the results of individual measures into a single overall welfare classification. The theoretical concept of iceberg indicators has the potential to address these challenges. The idea is that by measuring a subset of animal-based measures it may be possible to predict the overall welfare state. The Welfare Quality protocols provide a mostly animal-based, multidimensional assessment of welfare, where an overall classification can be calculated from the system via measure aggregation. To test the concept of iceberg indicators, a Welfare Quality assessment was carried out on 92 UK dairy farms which were found to have an overall Welfare Quality classification of either 'Enhanced' or 'Acceptable'. Inspection of the correlations between the animal-based measures showed no evidence in support of iceberg indicators. Next, logistic regression models were fitted using subsets of the measures, and cross-validation was used to examine how well such models predicted the overall classification. The proportion of times that the method correctly predicted the Welfare Quality classification increased when the aggregated score for 'Absence of prolonged thirst' was included in the model. As a single variable, 'Absence of prolonged thirst' correctly predicted the overall classification 88% of the time. A single, resource-based measure driving the classification system is, however, at odds with the conceptual underpinnings of the protocol which, instead, espouses a multidimensional, animal-based account of welfare. It is therefore suggested that the prominence of 'Absence of prolonged thirst' in this role may be better understood as an unintended consequence of the published measure aggregation system rather than as reflecting a realistic iceberg indicator. As a holistic measure, the Qualitative Behaviour Assessment was previously thought to have had potential as an iceberg indicator, however, the reasons why it was not shown to be a good predictor of overall classification in our data are not clear. Improved discriminatory ability for this measure might be achieved where the scope of welfare assessment is expanded and there is a focus on positive welfare and not just the absence of negative welfare.



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THE WELFARE OF BROILER CHICKENS DURING TRANSPORT TO SLAUGHTER PLANTS

L Jacobs^{1,2}, E Delezie¹, L Duchateau², X Gellynck³, K Goethals², E Lambrecht³, J Viaene³ and FAM Tuytens^{1,2}

¹ Animal Sciences Unit, The Institute for Agricultural and Fisheries Research (ILVO), Melle-Gontrode, Belgium

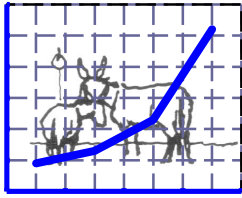
² Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium

³ Faculty of Bioscience Engineering, Ghent University, Belgium

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The broiler industry is substantial: 200 million broilers are transported and slaughtered annually in Belgium alone. Transport to the slaughter plant is a critical phase of the production process. Heat stress, metabolic disorders and injuries could be intensified by transport, with economic implications. The aims of this on-going study are to develop a protocol for welfare assessment of broilers during transport, and to use this protocol to assess the current transport practices in Belgium. Also, the protocol will be simplified for commercial use.

The developed full protocol contains animal-based measures from the Welfare Quality® (2009) protocol, the EFSA (2011) report on transport and other literature. Measures are recorded just before and after catching and just before and during slaughter. Preliminary results (n=20 summer transports) show a decrease in body weight after transport compared to before catching (mean \pm SEM: 2.48 \pm 0.01 vs. 2.63 \pm 0.01kg; p<0.001). Catching led to an increase in the percentage of birds with broken wings (0% before catching vs. 1.27% after catching, p<0.001). Transport led to a further increase in wing breaks (1.27% before transport vs. 3.5% after transport, p<0.001). Percentage of birds with skin lesions was higher after transport (16.1%) compared to before (6.6%; p<0.001) and after catching (8.3%; p<0.001). Plumage was more soiled after transport (p<0.001) and rectal temperature (p<0.001) decreased after transport, compared to before and after catching. Dead on arrivals and broken wings were positively associated with mean ambient temperature (resp. p=0.031 and p=0.003), but not with transport duration or lairage time (p>0.05). These preliminary results show an effect of transport on broiler welfare. Risk factors for and economic implications of welfare problems are yet to be determined.



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CONSISTENT DIFFERENCES IN BEHAVIOUR AND STRESS SENSITIVITY IN BROWN AND WHITE TYPE LAYING HENS REQUESTS A CUSTOM-MADE APPROACH TO IMPROVE BIRD WELFARE

EN de Haas^{1,2}, JE Bolhuis¹, B Kemp¹ and TB Rodenburg²

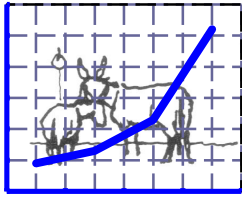
¹ Adaptation Physiology Group, Wageningen University, The Netherlands

² Institute National de Recherche, UMR85, Physiologie de la Reproduction et des Comportements, Nouzilly, France

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Recent studies have shown differences in production and behaviour between white and brown type laying hens. Although most laying hen farmers are aware of such differences, adjustment in management practices are not adapted to the specific type of laying hen.

In our longitudinal study on the laying hen chain (consisting of the parent stock (PS), rearing flocks (RF) and laying flocks (LF)), we assessed differences in fearfulness, stress-sensitivity, feather pecking and production in flocks of a White Leghorn (WL) origin and flocks of a Red Island Red (RIR) origin. We related these to management of the farmer. Our aim was to detect why white and brown flocks differ in behaviour, production and stress-sensitivity. WL birds were consistently more fearful of humans by keeping a greater distance of a stationary person, while RIR birds were consistently more fearful of a novel object, as indicated by a longer latency to approach it. Whole-blood serotonin levels, but not plasma corticosterone levels, were always lower in WL birds than in RIR birds. For RIR birds, group size affected feed intake, feed conversion and mortality in the PS, while aspects related to system management and litter availability affected fearfulness, feather pecking, whole-blood serotonin in RF and LF. For the WL birds, especially fearfulness was associated with reduced body weight, egg-weight and feed intake in the PS and showed associations with feather pecking in the RF. For both crosses, high basal levels of corticosterone related to low egg-weight in the PS. These outcomes indicate differences in management factors which cause stress between birds of a WL and RIR origin. RIR birds are strongly affected by group size, system and litter aspects, while WL birds are consistently more fearful which may be aggravated by negative human-bird interaction. Management practices, if not optimally applied and adapted to genetic line may inflict serious welfare problems (i.e. mortality, feather pecking, fearfulness) and thus requests a custom-made approach.



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POST-BATESON: HAVE PEDIGREE DOGS BECOME EXPOSED?

DG O'Neill¹, DB Church², PD McGreevy³, PC Thomson³ and DC Brodbelt¹

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² Small Animal Medicine and Surgery Group, The Royal Veterinary College, Hatfield, UK

³ Faculty of Veterinary Science, The University of Sydney, NSW, Australia

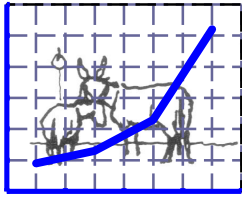
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The Independent Inquiry into Dog Breeding in 2010 led by Professor Sir Patrick Bateson concluded that serious welfare issues existed in dog-breeding but also identified that prevalence data gaps on common disorder in dogs constrained effective reforms. The report recommended electronic collection of anonymised diagnoses from veterinary surgeries, and specifically cited development of the VetCompass Animal Surveillance project, to provide reliable prevalence data. VetCompass now includes over 200 participating practices sharing clinical data on 270,000 dogs. This extensive clinical database has been analysed to extract longevity and disorder prevalence information on dogs in England.

Canine longevity was explored using clinical data on 5,095 confirmed deaths from a population of 102,609 dogs. The overall median longevity for dogs was 12.0 years (IQR 8.9-14.2). The longest-lived breeds were the Miniature poodle, Bearded collie, Border collie and Miniature dachshund. The shortest-lived were the Dogue de Bordeaux and Great Dane. The most frequent causes of mortality were neoplastic, musculoskeletal and neurological disorders. Longevity in crossbred dogs significantly exceeded purebred dogs by 1.2 years (95% confidence interval 0.9-1.4; $P < 0.001$) and increasing bodyweight was negatively correlated with longevity. These findings highlight major breed differences for longevity and support the concept of hybrid vigour for longevity in dogs.

Disorder prevalence in dogs was investigated by detailed analysis of coded and free-text clinical notes in a sample of 3,884 dogs from an overall population of 148,741 dogs. The most prevalent disorders recorded were otitis externa (10.2%, 95% CI: 9.1-11.3), periodontal disease (9.3%, 95% CI: 8.3-10.3) and anal sac impaction (7.1%, 95% CI: 6.1-8.1). Purebred dogs showed significantly higher prevalence than crossbreds for three of the twenty most prevalent disorders: otitis externa ($P = 0.001$), obesity ($P = 0.006$) and skin mass lesion ($P = 0.033$). The seven most popular breeds showed significant prevalence variation for five disorders: periodontal disease ($P = 0.002$), overgrown nails ($P = 0.004$), degenerative joint disease ($P = 0.005$), obesity ($P = 0.001$) and lipoma ($P = 0.003$). The results provide evidence for higher disorder prevalence in purebred dogs and substantial breed variation.

These studies follow the Bateson recommendations and provide disorder prioritisation evidence to support strategic welfare reforms. For maximal impact, breeding reforms should target commonly-diagnosed complex disorders that are amenable to genetic improvement and should place a special focus on at-risk breeds. Future studies on disorder severity and duration will further augment welfare prioritization



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EFFECTS OF GOOD PRACTICES OF HANDLING ON THE WELFARE OF DAIRY CALVES

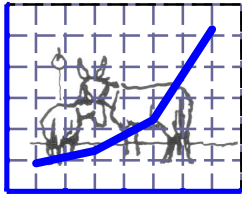
MJR Paranhos da Costa, LC Magalhães Silva, LP Silva and MFM Guimarães

Department of Animal Science, Faculty of Agricultural and Veterinary Sciences, UNESP, Jaboticabal-SP,
Brazil

mpcosta@fcav.unesp.br

There are several systems for rearing dairy calves, however in most of them the animals' welfare is not a priority. This study evaluated the effect of good practices of handling on the welfare of dairy calves. We evaluated 36 Girolando heifer calves, which were separated from their mothers 12 hours after birth, receiving 6.0 l/day of feed fresh cow milk (until the 35th day of life) and 3.0 l/day of calf milk replacer (from the 36st day of age to weaning, around 70 days of age). The calves were divided into three treatments, as follow: T1, the calves received colostrum within 12 hours after birth, and then they were feed in open buckets; T2, the colostrum ingestion was performed within three hours after birth, and then they received the milk in bucket teat feeders, allowing the calves to suck; and T3, alike T2, but adding brushing the heifers since the first day of life, for 5 minutes during feeding. As animal welfare indicators we considered: the occurrences of animals with diarrhea and pneumonia (%), flight distance (FD, m) and the average daily weight gain during the suckling period (ADG, kg/day). The one-way ANOVA method was used to test the effects of treatments on ADG and FD, and the means were compared using the Tukey test. Chi-square test was used to evaluate if the percentage of animals with diarrhea and pneumonia vary among treatments. There were no significant differences in the percentages of animals with diarrhea ($\chi^2 = 4.27$, $P = 0.11$) and pneumonia ($\chi^2 = 2.48$, $P = 0.29$) among treatments. Treatments affected significantly FD ($F = 4.02$, $P = 0.03$), with the calves of T3 showing lower average (1.07 ± 1.00 m) than T1 (2.40 ± 1.09 m), which did not differ significantly from T2 (1.37 ± 1.28 m) and, as well as for ADG ($F = 4.02$, $P = 0.03$), with higher mean for T2 (0.820 ± 0.180 kg/day) that differed significantly from T1 (0.645 ± 0.170 kg/day), and an intermediate value for T3 (0.765 ± 0.080 kg/day), which did not differ significantly from T1 and T2. In conclusion, the adoption of good practices of handling, involving the ingestion of colostrum within 3 hours of life, the use of teat feder buckets and calves brushing benefits the human-animal relationship and the performance of heifer calves.

Financial support: FAPESP, process numbers: 2011/ 00388-3 and 2011/00813-6.



Recent advances in animal welfare science IV

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ASSESSING DOG WELFARE: A NEW PERSPECTIVE

A Ortolani, J Gonggrijp, R Putman and F Ohl

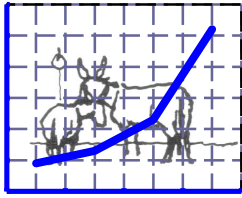
Department of Animals in Science and Society, Faculty of Veterinary Medicine, Utrecht University,
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Recent perspectives on animal welfare suggest that welfare should not be considered a static concept, but as a more dynamic, interactive construct which embraces the animal's own capacity to adapt. According to this approach, assessments of welfare should focus upon an individual's ability to respond appropriately to, and fulfil the demands of, any challenge it may be facing.

We developed a standard protocol to assess dogs' adaptive capacities when faced with a potentially challenging situation, such as a visit to the veterinarian. A simple, non-invasive procedure (i.e. attaching a heart rate monitor) was performed by the vet, in the presence of the owner, in 105 dogs visiting 11 different Dutch vet practices. Adaptive capacities were assessed by measuring behavioural and physiological responses (heart rate variability, body temperature and salivary cortisol) for 5 minutes, while dogs remained on the exam table next to their owners. Dogs exhibiting more *panting* and *licking lips*, showed less *sniffing* and had significantly lower heart rate variability, higher body temperature and higher mean salivary cortisol values. These parameters are known 'stress indicators' in dogs and the stress experienced by an individual is typically used as an indicator of its welfare state.

However, if welfare status is determined more by the ability to adapt, the magnitude of the stress response displayed may not in itself be indicative of poor welfare; more informative may be the pattern of change in those responses through time, as suggesting the extent to which an individual dog can adapt to the prevailing circumstances. We therefore analysed the time course of the individual responses. We found four distinct patterns of *panting* response: 1) constant high; 2) steeply increasing; 3) a rising and falling response; and 4) a low response rising at the end. Significant differences were found in physiological parameters associated with these coping responses, suggesting that dogs showing response 1) may have diminished adaptive capacities in this situation.

We believe that our approach could provide a first indication for identifying which individuals might face a greater welfare risk when confronted with potentially challenging circumstances.



Recent advances in animal welfare science IV

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York Merchant Adventurers' Hall UK, 26th June 2014

THE EFFECT OF STOCKING DENSITY AND FEED FORMULATION ON THE BEHAVIOUR, HEALTH AND GROWTH OF MEAT RABBITS

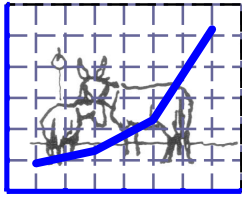
G Di Martino¹, W McCormick², F Buniolo¹, G Berto, F Agnoletti¹ and L Bonfanti¹

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This study is part of the project CIQUAS, funded by the Italian Ministry of Agricultural, Food and Forestry Policies to promote an innovative way to rear meat rabbits, in accordance with the guidelines of the European Commission regarding the reduction of antimicrobials and the improvement of welfare in livestock production. In Europe, this sector accounts for around 340 millions animals slaughtered each year and is characterized by a high antimicrobial consumption, mostly for prevention/control of enteric diseases. This study investigated the effect of stocking density (12 vs. 16 rabbits/m²) and feed formulation (pellet vs. pellet/fibre vs. unifeed) on the behaviour, mortality and growth performances of fattening rabbits reared in an intensive indoor farm in Italy. A factorial design (2 × 3) was applied on 612 commercial crossbred rabbits weaned at 40 days and allotted to mixed-sex group cages according to stocking densities and feed formulations. The experimental diets (pellet/fibre and unifeed) were characterized by a higher amount of fibre in comparison to conventional pellet and no prophylactic supplementation (oxytetracycline at 40 mg/kg/d was added to conventional pellet). Behaviour was monitored at eight and 13 weeks of age over 24 h by means of 240 scans in one quarter of the six experimental groups. Animals were slaughtered at 92 days of age; mortality and growth performances were recorded. The lower stocking density seemed to produce no significant improvements to rabbit behaviour repertoire. Conversely, it was associated with a significantly higher mortality and tendency to huddle. Therefore, this study confirmed the suitability of a stocking density of 16 rabbits/m². The absence of prophylactic supplementation combined with both pellet/fibre and unifeed gave lower growth performances, but did not significantly affect the mortality rate. The experimental diets tended to decrease active behaviours and increase huddling. Unifeed increased eating behaviour and had the lowest level of stereotypies. Therefore, this study suggested that the experimental diets should be reformulated to gain better growth performances, while the feasibility to avoid prophylactic treatments should be confirmed by further studies. Whether confirmed, these preliminary results will have an important impact on human health, because of the need for reducing the antimicrobial consumption in livestock in order to avoid the selection of antimicrobial resistant bacteria.



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WHY ARE SOME ANIMAL WELFARE PROBLEMS DISMISSED AS 'NORMAL'?

CC Burn

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Some animal welfare problems are easily recognised and are taken seriously. However, others may be dismissed as 'normal', even if signs are salient and the problems are highly detrimental to animals. Unfortunately, normality is often confused with 'acceptability'. Here I present food for thought regarding several possible contributing factors to this phenomenon, including that the problem may be (1) highly prevalent, (2) chronic, (3) superficially similar to a harmless condition, or (4) perceived anthropocentrically.

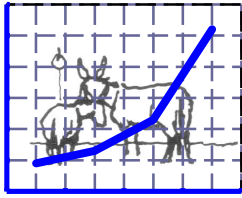
Highly prevalent problems may paradoxically, but almost by definition, appear normal. When >80% of horses in developing countries are thin, most owners have never seen a healthy horse, remaining innocent of the animal's potential. Another example is the high level (>20%) of calf mortality before first lactation in UK dairy farms. This occurs mainly due to easily preventable diseases, but some farmers simply seem to expect many calves to die and accept it as inevitable.

Indicators of chronic problems that are not obviously fatal can be even more easily overlooked. The obstructed breathing seen in many short-muzzled dogs exemplifies this well. That problem is both highly prevalent in some breeds, and it is chronic: life-long and of gradual disease progression. Some dog owners may see it as a characteristic that their dog has always had, and in a recent study, over half the owners of dogs with this condition did not believe that the respiratory difficulties constituted 'a problem'.

An example of a problem resembling harmless behaviour is persistent tail-chasing in dogs. Veterinary literature demonstrates that tail-chasing can signify neurological and other clinical conditions, but cultural references portray it as normal, playful canine behaviour. A third of dogs shown tail-chasing on YouTube tail-chased at clinically significant levels, but across 400 videos, users showed negligible awareness of its clinical implications. Indeed dogs showing very persistent tail chasing were described as 'stupid' or 'funny' six times more often than infrequent tail-chasers were.

Finally, anthropocentric attitudes mean that animal welfare problems may be ignored if they do not affect humans; indeed, sick animals can seem better behaved than healthy ones. Conversely animals may be regarded as 'misbehaving' if their attempts to cope do harm or inconvenience humans, e.g. canine aggression or so-called equine 'vices'.

Questioning accepted wisdom about what is 'normal' or 'harmless' can be achieved using controlled studies incorporating a range of validated welfare indicators. Sociological research will also help remove human barriers to improving animal welfare.



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THE EFFECTS OF A DYNAMIC GROUP SYSTEM ON THE SOCIAL BONDS OF DAIRY CATTLE

KM McLennan¹, J Littlemore² and W McCormick³

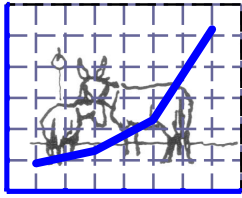
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² Agriculture subject area, Moulton College, Northampton, UK

³ Animal Welfare and Management, Moulton College, Northampton, UK

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With the welfare of cattle having not improved significantly since the FAWC's report in 1997, there is warranted concern by both the public and industry alike for the welfare of cattle housed in large, dynamic group systems. One of the main welfare and behavioural aspects that often lacks consideration is that of the cattle's social behaviour. Cattle will naturally form strong, long lasting relationships. Dynamic group systems remove stability in the herd and change its membership on a regular basis. The aim of this long term project was to assess the effects that a large dynamic group system had on the social bonds of dairy cattle. A herd of 400 Holstein-Friesian cattle were observed between 2007 and 2011. Cattle were housed in cubicles and managed under normal commercial conditions on a cascade system; cattle moved through three groups (high, mid/low and dry) according to their lactation. Using an association index, preferential relationships between cattle were identified, being stronger in the younger compared to older cattle. These relationships were tested under both short (30 minutes) and long (two weeks) term separation. In the short term separation trial cattle supported by their preferred partner whilst separated from the remainder of the herd, had significantly lower heart rates ($p < 0.01$) and significantly lower levels of behaviour suggestive of agitation ($p < 0.05$) compared to when cattle were supported by a familiar but non-preferred partner. During long term separation from their bonded partners (commercial practice and experimenter controlled) cattle showed significant behavioural, physiological and milk production changes. When animals were reunited, no changes in behaviour, physiology or milk production occurred. These results suggest that cattle are able to form preferential relationships with other cattle and these relationships are disturbed by separation. As reunion of cattle would have involved elements of regrouping, these results would suggest that the act of regrouping may be stressful to the separation of preferred partnerships. Social bonds in dairy cattle need to be carefully considered when designing and managing cattle herds. Reducing the regrouping of cattle will improve their behaviour, production and welfare.



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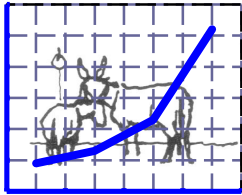
REFINING ORAL GAVAGE: ASSESSING AND IMPROVING WELFARE IN THE LABORATORY-HOUSED DOG

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The dog is a frequently-used, non-rodent species in the safety assessment of new medicines and we have a scientific and ethical obligation to ensure the best quality of data is achieved from their use. Oral gavage is a technique frequently used to deliver a compound directly into the stomach and in the dog. Oral gavage can be aversive and the frequency of its use is a cause for welfare concern where the technique is not Refined. Little research has been published on the gavage technique in dogs or on the Refinement of other regulated procedures. A Welfare Assessment Framework (Hall et al, in prep) was previously developed for use with the laboratory-housed dog and a contrasting pattern of behaviour, cardiovascular, nociceptive and affective measures was found in dogs with poor and good welfare. Using the Framework, we compared welfare measures across three conditions: Sham Dosing (SD), a Refined Training Protocol (RTP) that included sham dosing, and a Control group that had neither training nor sham dosing, to determine the benefit to welfare and scientific output of each technique. The pattern of findings in this study show that SD is ineffective as a habituation technique and 'primes' rather than desensitises dogs for dosing. Dogs in the Control group showed few changes in parameters across the duration of the study with some undesirable changes during dosing, while dogs in the RTP condition showed improvements in many parameters across the study. This presentation will describe the identification of welfare states in the laboratory-housed dog, along with the impact of welfare on data output and a protocol to mitigate the adverse effects of oral gavage.



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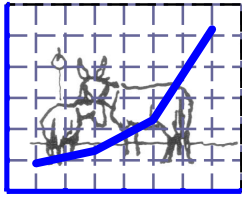
York Merchant Adventurers' Hall UK, 26th June 2014

THE USE OF REFLECTIVE FILMS TO IMPROVE THE COMFORT OF DAIRY CALVES DURING HOT AND COLD WEATHER

TH Friend, WR Binion and JA Haberman

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Many dairy calves in the U.S. and other regions of the world are housed in hutches made of thermoformed opaque polyethylene (e.g., Calf-Tel, Hampel Corp., Germantown, WI is a major brand). Some of the larger farms in the U.S. may have up to 5,000 or more of these or similar hutches that are in full sun. Prior research in this lab has found that temperatures in these hutches may get much higher than ambient temperatures because of radiant heating, e.g. 45 – 46.7°C. There were reports of over 7,000 calves dying in hutches during the heat wave the central region of the U.S. experienced during 2012. Reflective covers for these hutches appear to be a useful method for moderating temperatures and improving the comfort of the calves during hot as well as cold conditions. For example, the mean daily interior peak temperatures during 10 relatively hot days was significantly less ($P < 0.001$) in hutches with reflective covers ($40.15^{\circ}\text{C} \pm 0.16$) than in the uncovered hutches ($44.93^{\circ}\text{C} \pm 0.47$). Similarly, mean interior ceiling temperatures were lower ($P < 0.001$) in the hutches with reflective covers ($37.82^{\circ}\text{C} \pm 0.36$) than in uncovered hutches ($46.89^{\circ}\text{C} \pm 0.47$). Recent data also indicates that the covers increase growth rates in calves who are receiving free choice starter during the summer. The summer model we developed covers the top and sides of the hutch, leaving the front, back, and pen exposed, and is mounted with the reflective side out. The winter model also has a back panel and is mounted with the reflective side toward the interior. Our search for the optimum material that is inexpensive, reflective, rugged and UV resistant enough to last for the duration that a typical calf is housed in a hutch (commonly from birth to up to 12 weeks of age) is ongoing. This presentation will be a summary of the results of several hot and cold weather experiments, some of which are presently ongoing, and the results of our quest to find the optimum reflective film for farm use.



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WILDLIFE REHABILITATION IN QUEENSLAND

A Tribe, A Bouchon-Small and M Torregrosa Rocabado

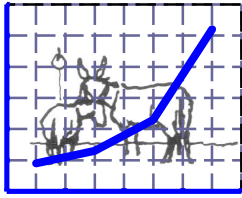
School of Agriculture and Food Science, University of Queensland, Gatton, Australia
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The rescue, rehabilitation and relocation of wildlife represents probably the most intimate, intensive and expensive interaction that the majority of people can have with wild animals. The motivation behind it undoubtedly stems from good intentions, but the practice has also become the focus of much controversy and discussion. However, despite the substantial resources invested little research has been conducted to examine the outcomes, success and welfare implications of these activities, particularly for birds.

This study evaluated the rehabilitation and release of wildlife in south-east Queensland. Data was collected from the three largest wildlife hospitals in the region: the Australia Zoo Wildlife Hospital (AZWH), Currumbin Wildlife Sanctuary Hospital (CWS) and the Royal Society for the Prevention of Cruelty to Animals Queensland (RSPCA) Wildlife Hospital for the years from 1st July 2009 to 30th June 2013. The results indicated that more than 50,000 animals were taken into care over this four year period, with 57% being birds, and most species admitted being abundant and widespread. Causes of admission were identified together with length of stay in rehabilitation and the outcomes for the animals. For instance vehicle accident and orphaned/nestling were the most significant causes of bird admission, with almost 60% being euthanized. Less than 20% of all birds were released, although this did vary with species. Strong seasonal trends were identified, with a marked increase in orphaned/nestling birds being admitted during spring and summer coinciding with the breeding season of most species.

The results also indicated that while the rehabilitation period should be as short as possible, many rescued animals remain in captivity for significant periods of time (more than 21 days), and that many of these succumbed to an unassisted death during their time in rehabilitation. It could be suggested that many of these should have been euthanased on first examination. The decision to euthanase is seldom easy, but if the prognosis is poor or the animal unsuitable for release a decision to euthanase must be made quickly in the interests of the patient's welfare.

The results highlight how little is known about current rehabilitation procedures and the need for comprehensive and consistent wildlife admission records to identify further areas of research and improvement.



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NEW MEASURES OF HUNGER IN BROILER BREEDER CHICKENS

LM Dixon¹, I Dunn², S Brocklehurst³, V Sandilands¹, M Bateson⁴, T Boswell⁴, B Tolkamp¹, P Wilson² and RB D'Eath¹

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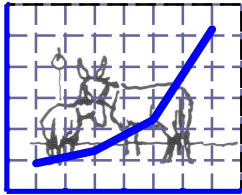
² Roslin Institute, University of Edinburgh, Edinburgh, UK

³ Biomathematics and Statistics Scotland, UK

⁴ Institute of Neuroscience, Newcastle University, Newcastle, UK

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Broiler breeder chickens are the parents of broiler chickens which produce meat. Their genetic potential for rapid growth is similar to that of their offspring (which are slaughtered at 6 weeks), but they must live until reproductive maturity (20 weeks) and beyond (to 60 weeks of age). To restrict their growth and ensure they remain healthy and productive, broiler breeders' food is rationed, resulting in signs of hunger such as rapid eating and increased foraging behaviour. Hunger in these birds is usually measured by asking the bird to pay an artificial cost (e.g. peck a key) for access to a reward (food) and determining the highest cost paid (e.g. how many key pecks). However, these methods have been criticised, as providing food as the reward during testing can change motivational state during the test. We developed a 'foraging motivation test' where birds overcame a natural cost of walking through water to be able to forage (peck and scratch to search for food) even though *no food reward* was provided. The water increased in length and depth over 8 tests. In a separate study we also measured neuropeptides which are known to be important in the control of feeding behaviour (AGRP and NPY), in birds experiencing different levels of restriction. For the foraging motivation test, as the water runway got deeper and longer, broiler breeder chickens fed restricted to commercial levels (R) were more willing to cross the water and took less time from the start of the test to reach an area of sawdust (without food) where they could peck and scratch, compared to chickens fed twice (2R) or three times (3R) as much. Similarly, agouti-related peptide (AGRP) (thought to be important in initiating feeding behaviour) measured in the basal hypothalamus was found to be much higher in restricted (R) than unrestricted chickens (*ad lib*), with 2R birds intermediate. When birds with the same end weight but with different growth trajectories were compared, AGRP levels were affected by both the long-term situation (they were higher in lighter birds) *and* the recent feeding experience (they were lower in recently-fed birds), suggesting they are an integrated measure of both aspects of hunger. Taken together, these results indicate chronic hunger in restricted broiler breeder chickens. The development of these new measures of hunger provide new tools to tackle this important animal welfare problem and will enable possible strategies to reduce hunger (such as new diets) to be objectively tested.



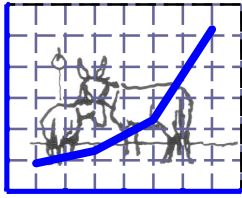
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SCIENTIFIC PROGRAMME:

Poster Abstracts



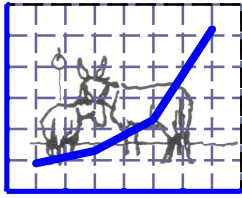
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Posters:

- **Abiola SS, MO Ayeni and EM Bello** (Federal University of Agriculture, Nigeria)
'Effect of litter management on growth and haematological traits of broilers'
- **Aguayo-Ulloa LA, M Pascual-Alonso, M Villarroel, R Triggs, S Turner, GC Miranda de la Lama, J Escós and GA María** (University of Zaragoza and Polytechnic University of Madrid, Spain; Metropolitan Autonomous University, México and University of Reading UK)
'Effect of using double bunks and straw in home-pen on behaviour, use of the space and stress physiology of finishing lambs'
- **Alabi OM, FA Aderemi, OR Adeniyi and OS Alabi** (Bowen University and Ministry of Education and Technology, Nigeria)
'Animal welfare in Nigeria; need for mass education and legislation'
- **Allard SM, LL Torgerson-White and AM Murray** (Detroit Zoological Society, USA)
'The use of infrared thermography as a tool to assess emotion in captive gorillas'
- **Barrett J, AC Rayner, R Gill, TH Willings and A Bright** (University of Oxford, FAI Farms Ltd, The Lakes Free Range Company Ltd and Noble Foods Ltd, UK)
'Smothering in UK free-range flocks Part 1: Incidence, location, timing and management'
- **Bellamy F and JM Lane** (Animal Health and Veterinary Laboratories Agency, UK)
'Marking techniques: Do they pose a risk to animal welfare?'
- **Belshaw Z, R Dean and L Asher** (University of Nottingham, UK)
'Peer reviewed canine quality of life tools: Are they of good quality?'
- **Bennett LA** (Nottingham Trent University, UK)
'Comparative longitudinal study looking at the relationship between intrinsic and extrinsic factors on overall faecal egg counts in a group of horses'
- **Bolt SL, NK Boyland, JM Gibbons and DP Croft** (AHDB, DairyCo Division and University of Exeter, UK)
'The effect of social contact on weaning distress in dairy calves'
- **Boyd J and A Pullen** (Nottingham Trent University, UK)
'Canine sports: Fun, fitness and frolics?'
- **Carder G and H Proctor** (WSPA International, UK)
'Animal sentience – Be part of the movement'
- **Clarke N, ES Paul and DCJ Main** (WSPA International and University of Bristol, UK)
'Belief in animal sentience during veterinary education'



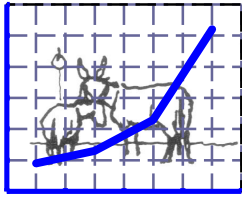
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Posters (continued):

- **Coombs EJ** (University of Oxford, UK)
'The effects of environmental enrichment on behavioural deficits in C57/BL mice'
- **Dewhurst DG and R Ward** (University of Edinburgh, UK)
'Virtual pharmacology lab – an online repository of 'alternatives' teaching and learning resources'
- **Draper C, M Glover and S Harris** (Born Free Foundation, Respect for Animals Educational Trust and University of Bristol, UK)
'A review of recent research into the welfare of animals kept in fur farms'
- **Edgar JL, S Penturn, S Held, ES Paul and CJ Nicol** (Universities of Bristol and Edinburgh, UK)
'Associations between socially-mediated arousal and social buffering in chickens'
- **Edge SJA, EC Phelps and AV Willett** (ADAS UK Ltd, UK)
'Promoting good health and welfare in European organic laying hens'
- **George I, M Coulon, L Henry, A Perret, H Cousillas and M Hausberger** (University of Rennes 1, France)
'Assessing video presentations as environmental enrichment for laboratory birds'
- **Gibson B, J Boyd and S Croxford** (Moulton College, Nottingham Trent University and PACE Agility, UK)
'Jump kinematics of elite agility dogs'
- **Hausberger M, C Lesimple, C Lunel, and C Fureix** (Université de Rennes 1, France)
'May work alter horse's welfare?'
- **Hemmam K, H Lohi, S Ahonen, M Raekallio, J Juga and O Vainio** (University of Helsinki, Finland)
'Is there genetic susceptibility for crib-biting behaviour in horses?'
- **Herborn KA, DJ McCafferty, RG Nager and DEF McKeegan** (University of Glasgow, UK)
'Infrared thermography as a tool for assessment of acute stress in hens'
- **Hiestand K and FM Langford** (Cats Protection, University of Edinburgh and Scotland's Rural College, UK)
'Computer-based learning in animal pain for UK veterinary students: Effect on learning and attitude towards animal pain'
- **Holmes A, CA Hosie, TE Smith, R Coleman and C Emmans** (University of Chester, UK)
'Non-invasive stress assessment in the laboratory African Clawed frog, *Xenopus laevis*'



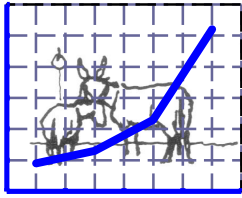
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Posters (continued):

- **Hothersall B, L Whistance, H Zedlacher, B Algers, E Andersson, M Bracke, V Courboulay, P Ferrari, C Leeb, S Mullan, J Nowicki, MC Meunier-Salaün, T Schwartz, L Stadig and DCJ Main** (University of Bristol, UK; University of Natural Resources and Life Sciences (BOKU), Austria; Swedish University of Agricultural Sciences (SLU), Sweden; Wageningen, The Netherlands; IFIP Institut du Porc and Institut National de la Recherche Agronomique (INRA), France; Centro Ricerche Produzioni Animali, Italy; University of Agriculture in Krakow, Poland; Institute for Agricultural and Fisheries Research (ILVO), Belgium)
'An e-learning package improves the consistency of professional judgments in relation to EU welfare legislation for finisher pigs'
- **Ijichi C, LM Collins and R Elwood** (Queen's University Belfast, and University of Lincoln, UK)
'Personality is a lame excuse in horses'
- **Keating SC, AA Thomas, PA Flecknell and MC Leach** (University of Guelph, Canada and Newcastle University, UK)
'Ouch that hurts – Using the rabbit grimace scale to assess the pain associated with ear tattooing and the efficacy of a topical local anaesthetic'
- **Lesimple C, C Fureix, MA Richard-Yris and M Hausberger** (Université Rennes 1, France)
'Relations between management, emotionality and cognitive abilities in riding school horses'
- **Magalhães Silva LC, LP Silva, MFM Guimarães, F Baldi and MJR e Paranhos da Costa** (Unesp, Brazil)
'Good practices of handling and their influence on the dairy calves welfare'
- **Mahrán HA, AM Reyad and HM Atta** (Beni-Suef and Al-Azhar Universities, Egypt)
'Toward a new trend in aquaculture welfare; Effect of probiotic marine actinomycetes on *T. maritimum* isolated from diseased fish and their environment'
- **Mata F and R Bhuller** (Newcastle University and Imperial College London, UK)
'Chemotherapy vs. holistic treatments: The welfare of limb amputee dogs after appendicular cancer'
- **Mazas-Gil B, R Fernández-Manzanal, FJ Zarza-Alzugaray and GA María** (University of Zaragoza, Spain)
'Attitudes of students towards animal welfare'
- **Mazlan NH, CC Burn and DJ Wells** (The Royal Veterinary College, UK)
'The impact of ear biopsy on laboratory mouse welfare'
- **Milne CE and J Liu** (Scotland's Rural College and Bioss, UK)
'Farm management choices – preferences for high welfare options'



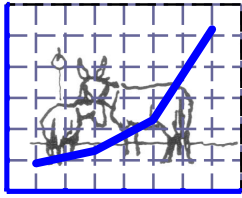
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Posters (continued):

- **Morton DB, M Sant'Ana, F Ohl, V Ilieski, L Keeling, AC Wöhr, B Zemljic, D Neuhaus, N de Briyne and S Pesie** (Federation of Veterinarians of Europe (FVE), Belgium; University of Birmingham, UK; University of Porto, Portugal; Universities of Utrecht and Wageningen, The Netherlands; University of Skopje, Republic of Macedonia; Swedish University of Agricultural Sciences (SLU), Sweden; Ludwig-Maximilians University and Unna, Germany and University of Ljubljana, Slovenia)
'The European veterinary animal welfare curriculum'
- **Murray Rand CV Brigden** (Myerscough College, UK)
'A proposed holistic risk assessment aimed to prevent maternal and neonatal mortality within the equine breeding industry based upon analysis of data from a 43 year period'
- **Padilla de la Torre M, EF Briefer, T Reader and AG McElligott** (University of Nottingham and Queen Mary, University of London, UK)
'What information can be gained from a cutting-edge analysis of cattle (*Bos taurus*) calls?'
- **Pascual-Alonso M, L Aguayo-Ulloa, R Triggs, S Turner, GC Miranda de la Lama, M Villarroel and GA Maria** (Universities of Zaragoza and Madrid, Spain; University of Reading, UK and Metropolitan Autonomous University, México)
'Effect of temperament on transport stress response in cull ewes'
- **Pollo S and A Vitale** (Sapienza Università di Roma and Istituto Superiore di Sanità, Italy)
'Choosing animal models: it is not just about science'
- **Proctor HS and G Carder** (World Society for the Protection of Animals, UK)
'Do ear postures indicate positive emotional state in dairy cows?'
- **Rao MA** (Euro Quality Lambs Ltd, UK)
'Measures to improve the welfare of animals slaughtered in accordance with religious requirements and EC Reg 1099/2009'
- **Reid J, EM Scott, ML Wiseman-Orr, AM Nolan, J Morris and S Fontaine** (University of Glasgow, UK)
'Responsiveness of a 46 item health-related quality of life (HRQL) measurement instrument in dogs with lymphoma'
- **Robertson BA, L Rathbone, G Cirillo, RB D'Eath, M Bateson, T Boswell, PW Wilson, IC Dunn and TV Smulders** (Universities of Newcastle, Durham and Edinburgh and Scotland's Rural College, UK)
'Hippocampal markers of depression and chronic stress in feed-restricted broiler breeder hens'
- **Rogers F and M Farrell** (UWEHartpury, UK)
'Enclosure use and social associations of Common squirrel monkeys (*Saimiri sciureus*) at Bristol zoo gardens'



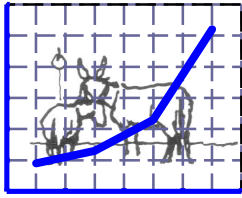
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Posters (continued):

- **Ross A, J Paddison and D Nash** (Aberystwyth University, UK)
'Validation of a novel culture protocol for equine endometrial cells as a model to investigate uterine inflammation'
- **Scrase A, SL Lambton and CA Weeks** (University of Bristol, UK)
'Factors associated with variation in laying hen mortality and methods of improving on-farm recording'
- **Tribe A, G Clark, TK Galloway, K Hansen and CJC Phillips** (University of Queensland and Australia Zoo, Australia)
'Emotional states and enrichment in captive big cats'
- **Verhoeven MTW, J Peuscher and MA Gerritzen** (Wageningen University and Twente Medical Systems International, The Netherlands)
'Measuring physiological parameters using non-invasive techniques in sheep'
- **Zaldívar JE, V Iniesta, R Muñoz-Madrid, M Ibáñez, R Sáez, R Luna, AI Marín, E Vicente and M Gallego** (Veterinary Association for the Abolition of Bullfighting and Animal Abuse -AVATMA and Universities of Extremadura and Madrid, Spain)
'Irregularities in the first part and agonizing death of animals during the bullfight'
- **Zarb AM, M Connor and A Lawrence** (Scotland's Rural College, UK)
'Barriers to horse owners adopting management practices to improve horse welfare'



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EFFECT OF LITTER MANAGEMENT ON GROWTH AND HAEMATOLOGICAL TRAITS OF BROILERS

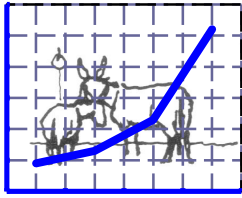
SS Abiola, MO Ayeni and EM Bello

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A study was conducted for 8 weeks to determine the effect of litter management on growth and haematological traits of broilers. A total of 126 broilers were used for the study. There were 3 treatment groups and 3 replicates of 42 birds per treatment and 14 birds per replicate. In treatment 1 (control), the litter which was made of wood shaving was not changed. In treatment 2, litter was changed 2 times (4th and 8th week) while in treatment 3, litter was changed 4 times (2nd, 4th, 6th and 8th week). Body weight gain tended to decrease with increase in the frequency of change of litter. Highest average body weight gain of 20.67g/bird was recorded in treatment 1 while lowest value of 16.57g/bird was obtained in treatment 2. Values obtained for haematological traits (PCV, Hb, WBC and RBC) were not statistically significant ($P>0.05$). However, results of PCV and Hb increased with frequency of change of litter. Highest PCV (26.67%) and highest Hb (9.03g/dl) values were recorded in treatment 3. Results obtained for WBC and RBC did not follow any particular trend.

Frequent change of litter imposed undue stress to the birds and had negative effect on growth rate. However, there were no adverse effects on haematological parameters. Effective management of litter in broiler production will enhance better performance and improved welfare.



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EFFECT OF USING DOUBLE BUNKS AND STRAW IN HOME-PEN ON BEHAVIOUR, USE OF THE SPACE AND STRESS PHYSIOLOGY OF FINISHING LAMBS

LA Aguayo-Ulloa¹, M Pascual-Alonso¹, M Villarroel², R Triggs⁴, S Turner⁴, GC Miranda-de la Lama³, J Escós¹ and GA María¹

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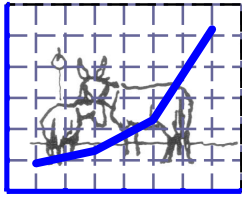
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Sixty *Rasa Aragonesa* lambs (male, 65 day old, liveweight 17.2±0.2 kg), were housed indoors for five weeks in six pens (2.9m x 3.3m, density 0.95m²/lamb, 10 lambs/each) and divided into two treatments (3 replicates/treatment). The control housing system (CO) was designed to model feed lot intensive conditions without any items or straw. The enriched environment (EE) contained straw, as forage and bedding, and a double bunk with two ramps (DB) (lambs could either hide under the bunk or climb the ramp to rest on top). Lambs were fed *ad libitum* with concentrate. Behaviour and occupancy rate of different areas were recorded daily during week 4 using video (8:00 to 20:00) by scan sampling (1' every 10'). During week 5, lambs were sent through a T maze on two consecutive days. Blood samples and infra-red temperatures (IRT) were taken before slaughter to assess differences in stress response. Lambs spent most time resting (76.85%), with no differences between treatments, resting less in the morning (59.8%) than in the afternoon and evening. The CO walked more in the morning than EE (13.71% and 11.53%, respectively) and ate more concentrate (11.57% and 9.7%, respectively) and spent more time standing than EE (6.5% and 4.7%, respectively). In general, the active behaviours decreased in the afternoon and evening. Stereotypes were significantly higher in CO lambs (P<0.05), especially in the morning. The use of space was different between treatments, for all the moments of the day (P<0.05). The EE lambs spent most of their time around the DB (mean 70.7%), 41.8% of time under the DB in the morning, increasing to 64% in the afternoon and evening. There were no significant differences between treatment in the ability to solve the T-maze test. However, both treatments decrease significantly the time to solve the maze by the second trial (P<0.05). The EE lambs had higher cortisol (+142%) and IRT (+0.57°C) values (P<0.05), and significantly higher lactate (+74.4%), NEFA (+182%) and CK (40%) levels. Lambs were very attracted to the double bunks and preferred to lie underneath them than on top. The higher stress levels of EE lambs were probably associated with using DB as a shelter, avoiding visual contact with the handlers. However, the higher level of N/L ratio (P<0.05) in CO suggest signs of chronic stress.



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ANIMAL WELFARE IN NIGERIA; NEED FOR MASS EDUCATION AND LEGISLATION

OM Alabi¹, FA Aderemi¹, OR Adeniyi² and OS Alabi³

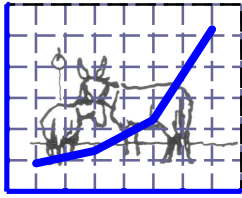
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The need to cater for the general well being of our animals is undisputable. Vital management practices such as housing, feeding, vaccination, weighing, milking, transportation and slaughter must be done without inflicting pains on the animals. There are scientific facts and research findings to confirm that animals with bad welfare are usually stressed with poor performance. Many developed countries have enacted laws to ensure animal welfare while many international organizations have also been helpful in awareness creation. Specifications for animal housing, transportation and humane slaughter are being strictly observed in some parts of the world most especially United Kingdom and Europe. Being of global concern, animal welfare science is getting wider acceptance in many countries but in direct proportion to their level of economic development. Nigeria is a developing country in West Africa where animal welfare is unpopular and ethics none exist. Sequel to this, a survey was conducted to identify means through which objectives of animal welfare can be delivered to the farmers and ways to ensure compliance. Seventy (70) livestock farmers from each of the three regions of the country (north, south-west and south-east) were randomly sampled for the purpose of this survey. Structured questionnaires and verbal interview were the tools used for data generation which were later subjected to descriptive analysis statistically. Meanwhile, 6.50% of the poultry farmers in Nigeria were partially concerned with the welfare of their chickens in areas of transportation and humane slaughter while 83.25% of them are still using conventional battery cages for egg-type chickens. Respondents suggested the need for awareness creation on animal welfare through mass education in the media (50.50%), academic fora (18.45%), corporate bodies and international organizations (20.15%) and government agencies (10.90%). For implementation, persuasion (31.70%), demonstration (25.50%) and legislation (42.80%) were the suggested tools. The results of this research suggest that mass education is widely preferred for awareness creation on animal welfare issues while legislation will likely be the best tool to ensure compliance.



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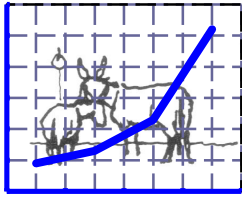
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THE USE OF INFRARED THERMOGRAPHY AS A TOOL TO ASSESS EMOTION IN CAPTIVE GORILLAS

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Knowledge of the affective states, or emotions, of animals plays a central role in our understanding of their welfare. Emotions cannot be measured directly, thus the development of accurate measures must rely on behavioral and physiological indicators, including skin surface temperature. Recent research has demonstrated that nasal skin temperature decreases in macaque monkeys during negative emotional states and shows no change during neutral emotional states. On the contrary, it has been demonstrated that nasal temperatures decreased in human infants who were laughing. These studies strongly suggest that this may be a good non-invasive means of assessing the emotional states of primates, and also that broader examination across different primate taxa are needed to validate this methodology for different species. Infrared thermography (IRT) shows promise as an excellent non-invasive investigative strategy because it allows the measurement of surface temperatures without the need to place a thermometer in contact with the animal. We are using IRT to determine if nasal skin temperature is an indicator of emotion in gorillas. The Detroit Zoo currently houses three silverback Western lowland gorillas (*Gorilla g. gorilla*) in a bachelor social group which routinely participate in cognitive testing as part of a different research study. It is presumed that the gorillas perceive the activities of the cognitive testing as positive, but development of a non-invasive method by which we can assess their emotional states during the cognitive testing trials will allow us to understand the impact of this activity, as well as other activities and experiences, on the gorillas. Validating innovative and non-invasive means of assessing emotions in gorillas has the potential to broadly impact the ways in which we provide their care and ensure their well-being in zoos.



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SMOTHERING IN UK FREE-RANGE FLOCKS PART 1: INCIDENCE, LOCATION, TIMING AND MANAGEMENT

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² FAI Farms Ltd, The Field Station, Wytham, Oxfordshire, UK

³ The Lakes Free Range Company Ltd, Meg Bank, Stainton, Penrith, UK

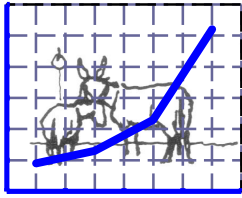
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Smothering in poultry is an economic and welfare-related concern. This study presents the first phase of analysis of a questionnaire addressing smothering sent to Noble and The Lakes free-range farm managers (representing 35.0 per cent of the UK free-range egg supply). In total, 206 questionnaires were returned; 162 from Noble and 44 from The Lakes, translating to a 50.0 and 100.0 per cent response rate respectively. This first study considers the incidence, location, timing and management of smothering.

The average reported flock mortality due to smothering in flocks that experienced smothering was 1.3 per cent, although there was high variability between farms (range = 0.003 - 9.6%). A mean frequency of 6.1 smothering incidences in the last flock was reported and an average of 26.4 birds were typically lost per incidence. Smothering was identified as a cause of mortality in 62.5% of farm managers' flocks. The location and timing of smothering (excluding smothering in nest boxes) tended to be unpredictable and also varied between farms, although some popular reduction measures were identified, for example walking birds more frequently.

A follow up study will investigate the correlations between smothering, mortality, disease challenges and other welfare problems and may shed further light on management solutions.



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MARKING TECHNIQUES: DO THEY POSE A RISK TO ANIMAL WELFARE?

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Recognition of individual animals plays an important part in many types of animal research. It may simply be needed as a husbandry technique to identify individuals which are housed in large numbers (e.g. fish) or be necessary to gain data on free-living animals such as population dynamics, social behaviour, and other aspects of an animal's ecology.

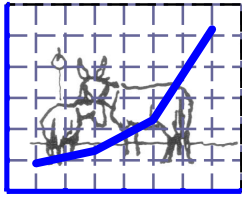
There are many different methods of marking animals which range in terms of invasiveness and effectiveness and which type used will depend on the species and type of study. When choosing a marking technique, primary consideration should be given to methodologies that are the least invasive, will remain detectable for the duration of the study and if possible, do not require physical handling for identification.

This presentation will consider differing marking and recognition techniques used on amphibians, reptiles, fish, mammals and birds, including:

- Telemetry, GPS, VHF and proximity transmitters.
- External ringing and tagging (bird and bat banding, mammal ear-tags).
- Physical marking (tattooing, fur-clipping, scale marking).
- Internal marking (microchips, fish wire-tags)
- Natural markings.

The potential of differing marking methods to significantly affect the health and overall welfare of an animal will be discussed along with techniques to mitigate these adverse effects including the pros and cons of using anaesthesia.

Refinement of marking techniques is necessary to ensure high welfare of research animals whilst maintaining the integrity of the science. No techniques should ever be used without due consideration of the potential effects on different species under varying situations and stressors. Hence, it is essential that all researchers using marking techniques are aware of 'best practice' in this area of science.



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PEER REVIEWED CANINE QUALITY OF LIFE TOOLS: ARE THEY OF GOOD QUALITY?

Z Belshaw, R Dean and L Asher

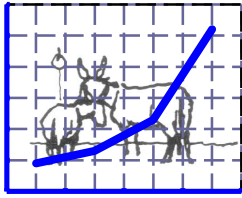
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Quality of life (QoL) is a term frequently used by small animal veterinarians in the UK, but it is poorly defined for use in this context. QoL measurement in non-verbal mammals is challenging but there is increasing recognition that these challenges must be overcome to improve the health and welfare of patients in small animal practice. Formal instruments for QoL assessment have been produced but have not been widely adopted by veterinarians working with small animals. This study aimed to review the use of QoL instruments in dogs published in peer-reviewed journals.

CAB Abstracts and PubMed were searched in July 2013 using terms relevant to dogs, well-being and quality of life, linked with Boolean terms. An operational definition of QoL was established. Inclusion and exclusion criteria were applied. Evidence of validation was sought for adequately reproduced instruments.

Of 1,145 unique publications found, fifty-two publications met the inclusion criteria; many publications were excluded as they did not adequately describe the instrument used. Only twelve instruments were found to have demonstrated reliability or validity in peer reviewed publications and only four defined the terms QoL or well-being. Forty-eight instruments were for a specific disease type. Novel, unvalidated instruments continued to be used to gather clinical data, even when an existing validated instrument for that disease type was available.

Whilst many QoL instruments are available for use by veterinarians working with dogs, the majority are unvalidated. Validated QoL instruments would allow veterinarians to assess and compare treatment options and could facilitate decision-making at individual and population level. Many instruments focused on the physical health implications of a single disease, which is likely to provide a barrier to their use in veterinary patients with comorbidities. This is unfortunate as it is likely to be these patients who would most benefit from a QoL assessment. Researchers should use validated measures where available and acknowledge the limitations of using unvalidated instruments. There is still a need for validated, replicable, generic canine QoL assessment instruments for use in general practice.



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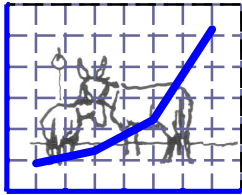
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COMPARATIVE LONGITUDINAL STUDY LOOKING AT THE RELATIONSHIP BETWEEN INTRINSIC AND EXTRINSIC FACTORS ON OVERALL FAECAL EGG COUNTS IN A GROUP OF HORSES

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Parasitic burdens are a major threat to the health and welfare of infected equines. Parasitic worms are ubiquitous in UK equine (*Equus caballus*) populations. Faecal egg counts (FECs) are the most common method for quantifying worm burdens in equine populations and anthelmintics are used prophylactically to treat parasitic worms. A longitudinal study was undertaken to assess worm burdens in a group of horses by FEC and compare this information against age, breed, pasture management routine and temperature on the day of the testing. A comparative case study was undertaken for a 10 month period to compare FECs of a population of 18 horses kept at a livery yard in Nottinghamshire. Fresh faeces were obtained from each equine and monthly FECs were conducted using a modified McMaster technique to quantify the number of eggs present in the sample. In addition to the FECs, information was recorded regarding the age, breed, colour, height, weight, stocking density, housing conditions (kept inside or outside), if there were mixed species grazing, anthelmintic treatments given, pasture management and field size. Data suggests that horses grazed on managed (faecal removal) pasture have a lower worm burden and younger horses (0-4 years) have a higher egg count than the older horses (5+ years). As a direct result of this study the yard is likely to amend its management and deworming strategies. The information gathered from this study can be used to improve the long term management of these horses which will result in an improvement in their health and welfare.



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THE EFFECT OF SOCIAL CONTACT ON WEANING DISTRESS IN DAIRY CALVES

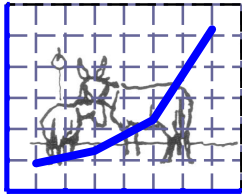
SL Bolt¹, NK Boyland², JM Gibbons¹ and DP Croft²

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In the UK dairy calves are separated from their dam almost immediately, however subsequent rearing practices vary. Around 60% of calves are individually reared, while others are housed in pairs or small groups. The use of individual pens is largely driven by attempts to reduce the risk of disease transmission. Calves work harder to gain full social contact over partial contact with conspecifics indicating that social contact is important to the calf. One of the potential benefits of social contact is that it can increase social support, thus promoting wellbeing. For example, previous work has shown that calves exhibit reduced distress when separated with a familiar calf and that social support can buffer the stress of weaning. We currently know little about the importance of the strength of the social bond for social buffering. This study compared the effects of rearing calves individually or in pairs with different contact durations on stress, health, production and behaviour at weaning. Forty female Holstein-Friesian calves were allocated to one of three treatments: individual housing (I) (n = 8), calves pair-housed from day 5 (P5) (n = 8 pairs), and calves pair-housed from day 28 (P28) (n = 8 pairs). From day 48 calves were weaned by gradual reduction of milk over three days. Vocalisations were recorded as a behavioural response to stress during the 3 days pre-weaning, during weaning and the first 3 days post-weaning. Additional data were collected on health, feed intake and body weight. Treatment did not have a significant effect on health (faecal score and respiratory score) or production (specific growth rate and feed intake). However, there was a significant effect of treatment on vocalisations during and post weaning. Individually reared calves vocalised four times more than P5 calves during the post-weaning period and over twice as much as P28 calves. Moreover, during this post-weaning period the P28 calves vocalised more than P5 calves. These results suggest that the duration of time calves have had to socialise is important for determining the degree of social buffering to stressors (weaning in this case). We discuss these results in the context of current calf rearing practices in the UK and the potential benefits of rearing calves in direct social contact.



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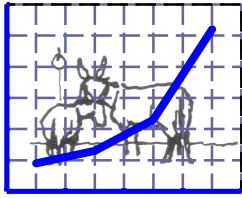
CANINE SPORTS: FUN, FITNESS AND FROLICS?

J Boyd and A Pullen

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Canine sports and activities are an increasingly popular leisure pursuit for many pet dog owners. Disciplines include the more traditional activities of obedience, working trials, field trials and the more recently developed activities of flyball, agility, heelwork to music and cani-cross. Involvement in such activities is widely reported to be of significant benefit to both canine and human participants in terms of enhancing levels of obedience and training, improving overall fitness and activity levels, modulating canine behavioural issues and enhancing the human-animal bond. However, there is a paucity of research relating to training strategies, performance requirements, clinical consequences and overall impact of the discipline on participating animals, including the long term consequences for the health and welfare of canine participants. Indeed, anecdotal and veterinary reports are starting to suggest that specific injuries and musculoskeletal conditions are being seen with increased frequency in “sporting” dogs. However, there is limited data to suggest the origin of these conditions and injuries as being a consequence of conformation, performance output, training regimes, breed specific characteristics or other factors. Recent interest has started to focus on specific aspects of certain disciplines, with concern being noted about the apparent discrepancy between rules, guidelines, discipline requirements and the perceived well-being of the canine participants.

At Nottingham Trent University, work is currently being undertaken relating to canine sports science and the kinematics of dogs participating in cani-cross and agility activities (notably the kinematics of canine jumping and exercise induced gait changes). Initial findings include an analysis of the conformational characteristics of elite versus non-elite agility dogs, where data suggests that there might be an optimum fore-limb assembly pattern in elite dogs. With regard to agility participation, preliminary data suggests that the level of achievement and training has an effect on canine jump kinematics and this information could be utilised to modify training programmes to ensure the competitive longevity of competing animals. In addition, cani-cross dogs show a significant change in stride length during a 5km race, suggesting potential indicators of canine fatigue. Further analysis will be used to distinguish between elite and non-elite partnerships with relation to stride length changes. We will present findings relating to our examination of the sporting dog and consider the wider implications of these findings for the long term health and welfare of these animals.



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ANIMAL SENTIENCE – BE PART OF THE MOVEMENT

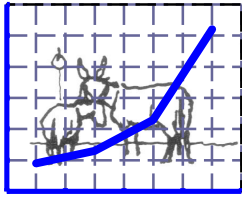
G Carder and H Proctor

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Animal sentience is a subject of growing international research interest. Understanding of animal sentience underpins the entire animal welfare movement; understanding of sentience in a range of species is crucial in consideration of how we as human beings should treat animals. The World Society for the Protection of Animals (WSPA) is committed to promoting animal sentience science as a mainstream and credible science in the field of animal welfare. As a result, WSPA has launched an interactive website called the Sentience Mosaic (www.sentiencomosaic.org) which acts as a resource for students, scientists, academics and anyone whose work may involve animals. The site promotes and shares scientific research on animal sentience and features interviews with leading scientists. The Sentience Mosaic also offers the opportunity for anyone to become actively involved through monthly online debates and a forum. The Sentience Mosaic is currently available in English and Spanish and will be launched in Portuguese soon.

WSPA aims to promote animal sentience science through the Sentience Mosaic and other avenues. In this way WSPA aims to reach out not just to individuals and organisations working in animal welfare, but also to others whose work may affect animals. This may include encouraging those involved in conservation, agriculture, and animal experimentation to consider animal sentience in their work.

Looking forwards we are optimistic that the future of animal sentience research is promising. There is still a great deal to learn about the capabilities of non-human animals. We hope that future research explores sentience not just in vertebrates, but also in invertebrates, in an ethical and humane way.



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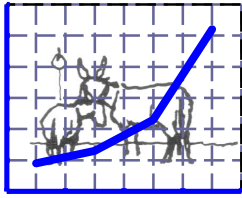
BELIEF IN ANIMAL SENTIENCE DURING VETERINARY EDUCATION

N Clarke¹, ES Paul² and DCJ Main²

¹ World Society for the Protection of Animals, London, UK

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The veterinary student population in the U.K. has become predominantly female in recent years but little is known about the relationship between feminization within the veterinary context and attitudes towards animals, or how such attitudes might evolve during veterinary education. Between 2001 and 2011, two studies were conducted at a British university assessing veterinary students' beliefs about the sentient capacities of non-human animals. In Study 1, a Belief in Animal Sentience (BiAS) questionnaire was used to sample eleven consecutive cohorts ($n = 1045$, veterinary students that enrolled between 2001 and 2011) of first-year veterinary students' beliefs about the sentience ("capacity for feeling") of ten species: Dogs, rats, bees, sheep, rabbits, lions, chickens, spiders, cats and pigs. In Study 2 the BiAS questionnaire was completed again by a subset of these students in their final years of study ($n = 218$; veterinary students who first participated in 2004, 2006, 2007). In both Studies 1 and 2, students' beliefs in animal sentience varied according to each species' position on the phylogenetic scale and their morphological similarity to humans. In Study 1, female first-year veterinary students, relative to their male counterparts, had significantly higher sentience beliefs for all animal species, though with small effect sizes. Year of enrolment was also found to have a significant effect on veterinary students' belief in animal sentience, highlighting the need for caution when interpreting the results of cross-sectional studies. In Study 2, longitudinal findings indicated that individual veterinary students' belief in animal sentience did not change significantly with progression through veterinary education for the majority of the species included. Further research assessing veterinary students' belief in animal sentience, and the relationship that this might have with welfare-relevant aspects of veterinary practice, is needed with larger and more representative populations of veterinary students from other universities within the U.K.



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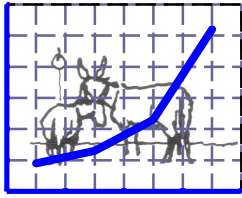
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THE EFFECTS OF ENVIRONMENTAL ENRICHMENT ON BEHAVIOURAL DEFICITS IN C57/BL MICE

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Mice are commonly used in the laboratory as models for human diseases, and this practice is likely to continue until reliable and effective alternatives can be found. In the meantime the 3Rs (reduce, refine and replace) are achievable steps towards improving laboratory animal welfare. This study considers refinement via enriching the environment that test subjects live in. C57BL mouse models are commonly used in clinical trials. The aim of this study was to assess whether improved environmental enrichment (EE) influences the behaviour and cognitive and motor functioning of test animals. C57BL/6s and C57BL/10s are seemingly identical in appearance but exhibit slightly different behaviours and are used in different clinical studies. The two strains were used because of the differences between them, thus potentially highlighting the varying effects that EE may have on different test strains. Observations on the differences in cognition, species-typical behaviours and motor-coordination have shown deficits in B10s. In the majority of these tests B6 mice consistently performed better. The study aimed to determine whether the B10 mouse housed in a standard (S), non-enriched environment would show further motor and cognitive deficits consequently asking whether EE can be influential on brain and behavioural functioning in the adult B10. Contrary to the previous studies, the C57BL/10 functioned to a higher level than the C57BL/B6 in a number of species typical, motor, anxiety and cognitive tests. B6s functioned at a lower level on a number of (but not all) species-typical and motor tests such as the static rods and Open field, with standard housed B6s generally functioning at the lowest level of all groups. Unlike in previous studies, B10 mice, particularly those that had been raised in an enriched environment, functioned to the highest level of all groups in the majority of tests. EE mice generally functioned to higher levels than those of their S counterparts, suggesting that EE may be the cause of raised functioning in EE mice and enhanced behaviour in both strains, particularly the B10 strain. This may suggest that environmental enrichment is not only beneficial to the animal's welfare, but can also influence raised natural functioning and natural behaviour.



Recent advances in animal welfare science IV

UFAW Animal Welfare Conference

York Merchant Adventurers' Hall UK, 26th June 2014

VIRTUAL PHARMACOLOGY LAB – AN ONLINE REPOSITORY OF ‘ALTERNATIVES’ TEACHING AND LEARNING RESOURCES

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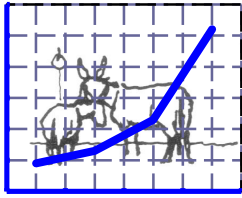
Typical UK BSc Pharmacology courses now deliver far fewer hours of practical teaching than 10-20 years ago. Many university departments have, in part, replaced those abandoned practical classes with computer simulations developed by third party organisations and thus have little control of their content and what is being delivered to their students. The most common feedback from teachers is that they would like to be able to edit the programs and tailor them to their specific learning outcomes and student groups.

The Virtual Pharmacology Lab (www.virtualpharmacologylab.com) is an open access repository of quality assured learning objects designed to support pharmacology practical teaching. The aim is to promote sharing and re-use of existing pharmacology resources to enhance teaching and learning and reduce animal use in education. Currently the repository contains >650 learning objects that are in fact the disaggregated components of eleven existing computer-based simulations of practical pharmacology classes developed by one of the authors (DD) - brief descriptions can be found at www.sheffbp.co.uk. Typically disaggregation of the computer programs yields 50-100 learning objects per individual program. Once disaggregated each learning object is stored in a database and tagged with descriptive metadata including author, title, and brief description.

The learning objects include: data traces - showing how a particular tissue preparation responds to a change in experimental parameters (e.g. administration of a drug/drug combination, electrical stimulation); textfiles e.g. a description of an experimental protocol, the experiment method; images, diagrams, illustrations; video – e.g. an illustration of how a preparation is dissected, set-up in an organ bath; interactive student tasks, activities and self-assessment questions.

It is hoped that making resources available in more granular formats may make it easier for teachers of pharmacology to tailor their teaching by embedding/incorporating the learning objects into their own teaching materials e.g. a website, PowerPoint presentation, e-book. While the repository content is currently limited to the author's materials it is hoped that other pharmacologists/physiologists will wish to contribute additional resources and make these freely available to colleagues for (non-profit) teaching purposes under the same Creative Commons license.

Users of the repository are requested to complete a short questionnaire and the feedback from that will inform future developments which will depend very much on the level of interest in using the repository from the user community.



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A REVIEW OF RECENT RESEARCH INTO THE WELFARE OF ANIMALS KEPT IN FUR FARMS

C Draper¹, M Glover² and S Harris³

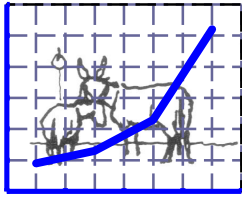
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The Report of the European Commission's Scientific Committee on Animal Health and Animal Welfare (2001) listed areas where future research on a wide range of aspects of fur farming was desirable, including housing, breeding selection and management. In particular, it stated: 'Since current husbandry systems cause serious problems for all species of animals reared for fur, efforts should be made for all species to design housing systems which fulfill the needs of the animals.' The Farm Animal Welfare Council's Five Freedoms include those to 'express normal behaviour' and 'Freedom from Fear and Distress – by ensuring conditions and treatment which avoids mental suffering'. We review the research that has been published since the SCAHAW report, in particular examining the causes and consequences of stereotyped locomotor behaviour, and the hypothesis that stereotyped behaviour may help to alleviate boredom. This is of significance since an estimated 80% of breeding female mink on mink farms perform stereotyped behaviour. The presence of stereotyped and other abnormal behaviours on such a scale raises fundamental questions when seen in the context of accepted standards and regulations for raising farm animals. A review of the research and changes in practices on the ground indicates that little substantial progress has been made and that the welfare of animals in fur farms remains poor and unacceptable. Specifically, the European Convention for the Protection of Animals Kept for Farming Purposes Recommendation Concerning Fur Animals (1999) states that, for mink, unless these issues can be resolved, 'production should be suspended.' We examine recent attempts to apply existing Welfare Quality® principles and criteria developed for farmed livestock to animals in fur farms. Fur farms have historically selected animals for fur colour and quality, not for behavioural traits, and they remain essentially wild animals. Domestication of silver foxes, for example, is associated with a range of undesirable coat traits. Animals farmed for fur are unlike other farmed animals and we question the applicability of Welfare Quality® to captive wild animals bred for their fur.



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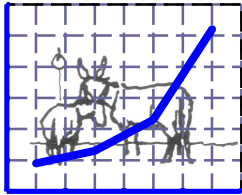
ASSOCIATIONS BETWEEN SOCIALLY-MEDIATED AROUSAL AND SOCIAL BUFFERING IN CHICKENS

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Socially-mediated arousal - the behavioural and/or physiological reactions of animals to the responses of conspecifics - is one of the component features of emotional empathy. The spread of arousal and distress within a social group will depend upon a number of social factors, including individual animals' capacities for emotional empathy and the extent to which social buffering occurs. The term "social buffering" refers to the process by which the presence of a conspecific can alleviate the distress of another animal. Despite the potential for interaction between the two social phenomena, previous research on empathy and socially-mediated arousal has been conducted almost entirely in isolation from work on social buffering. Having previously demonstrated that mother hens show behavioural and physiological arousal in response to chick distress, our current work examined whether, and to what extent, the hen's level of arousal in turn affected their chicks' response to a mild stressor. We will describe studies in which we used natural variation in mother hens' socially-mediated arousal to study its interaction with social buffering. Our results point towards a negative association between socially-mediated arousal and social buffering, suggesting that individual mothers that become more aroused in response to their chicks' distress act as poorer social buffers for those chicks. These findings will be considered in terms of the implications for the spread of distress, and consequences for animal welfare, within a social group.



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PROMOTING GOOD HEALTH AND WELFARE IN EUROPEAN ORGANIC LAYING HENS

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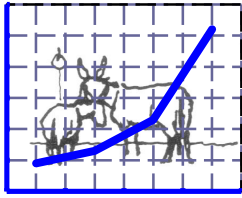
Whilst organic egg production still accounts for a small proportion of egg production in Europe, it has gained increasing importance in a number of Member States in recent years. There are a number of health and welfare risks associated with organic egg production which tend to be of greater significance than for colony cage production. These include increased risk of injurious feather pecking and increased mortality levels caused by cannibalism and greater exposure to infectious diseases. Because of the small size of the organic egg sector coupled with the industry still being in its infancy, there have been few studies to address these and other health, welfare and environmental problems.

The objective of this study was to identify management strategies that promote good animal health and welfare in European organic laying hens, whilst limiting environmental impacts. Attention was also paid to potential problems related to the proposed change to 100 % organic feed ingredients.

The study focused on five main areas including: quantifying the major risk factors for important endoparasites and ectoparasites; factors influencing the use of the range and the relationship with environmental impacts; factors affecting the occurrence of injurious pecking and other health problems including fracture/deviation of the keel bone, foot lesions and cloacal discharge. The study observed 107 flocks across eight European countries. All flocks were visited twice at similar age periods (at peak of lay and end of lay), including observations over spring/summer and autumn/winter periods. Information on housing, management, and animal based data was collected through interviews, direct measurements and from farm documentation.

Data collection was finalised by March 2014 and will be analysed using multivariate statistical analysis. This will be completed by July 2014.

The main outcomes of the study will be the identification of management strategies that promote good animal health and welfare in organic laying hens, whilst limiting environmental impacts. The epidemiological approach taken will identify important risk factors and concurrently identify efficient prevention and treatment strategies to secure good hen health and welfare and lower environmental impacts. Furthermore the study will establish a database detailing information on genetics, feeding, housing, management, and other risk factors impacting upon health, welfare, and performance of organic laying hens. Outcomes will be communicated to farmers and advisors in each study country, through the publication of papers and articles. Further data recorded within the study will be available for use in European benchmarking.



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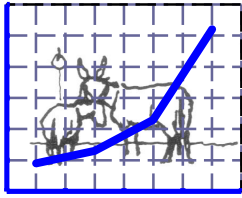
ASSESSING VIDEO PRESENTATIONS AS ENVIRONMENTAL ENRICHMENT FOR LABORATORY BIRDS

I George, M Coulon, L Henry, A Perret, H Cousillas and M Hausberger

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The aim of the present study was to investigate the effects of video presentations of natural landscapes on European starlings' (*Sturnus vulgaris*) stereotypic behaviours (SBs) and other abnormal repetitive behaviours (ARBs) and to evaluate the impact of past experience by comparing wild-caught and hand-reared starlings' reactions. Ten wild-caught and five hand-reared starlings were presented 1-hour videos of landscapes twice a day for five successive days, while a control group of eight wild-caught and four hand-reared starlings was presented a grey screen for the same amount of time. The analysis of the starlings' behaviour revealed that the video presentations of landscapes appeared to have a positive but limited and experience-dependent effect on starlings' SBs and other ARBs compared to the controls. Indeed, whereas video presentations seemed to remedy high rates of SBs and ARBs in highly stereotyped wild-caught starlings, they did not appear to be enriching enough to prevent the emergence or the development of SBs and ARBs in slightly stereotyped wild-caught starlings or hand-reared starlings. They even appeared to promote a particular type of SB (somersaulting) that is thought to be linked to escape motivation. The fact that this effect was observed in hand-reared starlings suggests that videos of landscapes could elicit motivation to escape even in birds that never experienced outdoor life. These results highlight the importance of investigating stereotypic behaviour both quantitatively and qualitatively in order to provide crucial clues on animal welfare.



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JUMP KINEMATICS OF ELITE AGILITY DOGS

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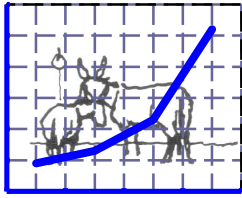
³ PACE Agility, Hinckley, Leicestershire, UK

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Since its creation as a main ring programme filler at Crufts in 1978, dog agility is becoming one of the fastest growing canine disciplines around the world. However, despite its popularity, scientific research is currently limited and remains a novel field of study.

Instead many of the theories used for canine agility performance are taken from basic canine locomotory studies and those of the equine sports world. Nevertheless, although these fields are both relevant to a degree, research with the emphasis on canine jumping motion is needed to better the training, performance and welfare of the canine participants. This observation, together with the current debate amongst agility enthusiasts, regarding the current hurdle heights in relation to the dog's height, means that research of this nature could be beneficial to the sport and will hopefully act as a foundation for further study in this area.

With this in mind, this project aimed to examine the 'typical' jumping motion of the elite agility dog. Data was collected on-invasively via digital video recordings during an agility Team GB training day held in May 2013. Three height classifications of dogs were recorded (Small, Medium, Large) and all dogs were considered to represent an "elite" standard of training and performance, having been previously selected for Agility Team GB. Downstream video analysis was undertaken utilising Dartfish software to permit measurement of specific jump kinematics, namely; take-off and landing distances, clearance height over the jump and also the angle of the dog's trajectory at take-off and landing. Findings suggest that elite dogs present a consistent, although sometimes individual style of jumping and that there are notable differences between height classifications of dogs. It is anticipated that these findings will continue to add to the paucity of knowledge currently relating to the understanding of performance output and training regimes in sporting dogs, with the hope of improving long term health and welfare.



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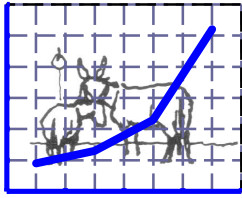
MAY WORK ALTER HORSE'S WELFARE?

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From early on in the domestication history of horses, their relation to humans has been largely centered around a working relation through harnessing and riding. Archeological data trying to estimate when riding first occurred are largely based on examination of teeth and spine, both showing traces of bit actions and rider's weight on the back respectively. Thus, work does affect the horse's body but the question remains of whether this is so that horses' welfare may be altered both during the working sessions and/or in a more chronic way, with consequences outside the working sessions. In this presentation, we will review the existing evidence of the potential effect of work on the overall welfare of horses and try and identify the behavioural indicators of discomfort at work as well as the indicators of work related problems outside the working situation. Studies converge to show that increased emotionality, behavioural disorders and aggressiveness outside work may in some cases result from the type of work the horses are used for or the way it is performed. Different approaches lead to a high prevalence of back disorders in sport horses that could explain for some part some of these welfare problems. We will try and disentangle the potential mechanisms relating welfare issues to work in horses and propose manageable solutions of improvement that would not only avoid altering horses' well being but also may lead horses to enjoy working, as seen in certain facilities.



Recent advances in animal welfare science IV

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IS THERE GENETIC SUSCEPTIBILITY FOR CRIB-BITING BEHAVIOUR IN HORSES?

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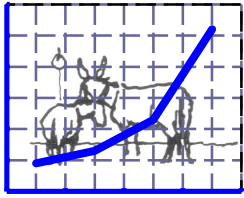
Crib-biting in horses is a stereotypical oral behaviour with a prevalence of 2.8–15%. Factors such as stress, gastric discomfort and frustration caused by stall restrictions has been suggested as a causal basis. Our hypothesis was that crib-biting is a quantitative trait with a moderate heritability (h^2), because there is some anecdotal evidence that the trait is expressed in certain families.

Our aim was to test the associations of known or suspected stereotypic genes with equine crib-biting and estimate the heritability of crib-biting behaviour in a Finnhorse population. Data on a cohort of crib-biting and non-crib-biting (control) privately-owned horses were collected during 2009–2013. Controls were at least 10 years of age and without a history of crib-biting.

A candidate gene study with a case-control design was performed, including 98 crib-biting and 135 control horses of two breeds, Finnhorses and half-breds. Eight selected candidate genes were: *Leptin*, *Ghrelin*, *Ghrelin receptor*; *Dopamine receptor*, *μ -opioid receptor*, *N-cadherin*, *Serotonin receptor* and *Semaphorin*. SNPs flanking the candidate genes were genotyped. Comparison of the allele and genotype frequencies between the cases and controls for each breed separately did not indicate an association with any of the studied genes in either of the breeds. The odds ratios were >1 for *OPRM1* in half-bred horses and for *SEMA6D*, *LEP* and *DRD1* in Finnhorses, but the p-values did not reach the significance. These results suggest that the studied genes are not major risk factors for crib-biting in horses.

The data for heritability estimation comprised 111 crib-biting and 285 non-crib-biting Finnhorses. All necessary pedigree data was available. The estimates of linear and threshold animal models did not converge within allowed parameter space why a more robust linear sire model was used in the final analysis. In the sire model 190 sires were included. The intra-class correlation estimated from the variance of sire effects was 0.17 with SE of 0.07, and hence the estimated heritability of crib-biting was 0.68.

To our knowledge, this is the first time that h^2 has been estimated for crib-biting behaviour in any horse population. Although a polygenetic component was found and the heritability was high in the studied population, caution is needed, since the size of study population was quite small, and the frequency of crib-biting in Finnhorses is not precisely known. Consequently, the estimate of h^2 is rather an indicative than a true value and this study represents a preliminary stage in genetic research of crib-biting. Higher than moderate heritability suggests further studies on larger sample cohorts together with new genome-wide approaches to identify risk loci.



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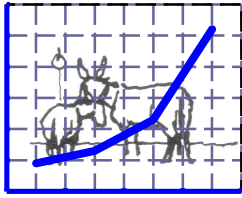
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INFRARED THERMOGRAPHY AS A TOOL FOR ASSESSMENT OF ACUTE STRESS IN HENS

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Reliable measurement of stress is extremely important for animal welfare assessment. While the well-established approaches of quantifying stress hormone levels and behaviour have been the basis of significant progress in welfare research, these are either time-consuming, invasive, or have serious limitations of data interpretation. We investigate infrared thermography (IRT) of body surface temperature as a novel alternative. Acute stressors induce rapid changes in the pattern of blood flow, with blood moving from the periphery to the core via sympathetically mediated cutaneous vasoconstriction. This leads to an increase in core body temperature, termed stress-induced hyperthermia (SIH), and a corresponding decrease in surface temperature. Measurement of SIH using core temperature requires deployment of invasive devices. By contrast, body surface temperature can be measured non-invasively, reliably and quickly using IRT. We tested whether the magnitude of surface temperature change was proportional to stressor magnitude: an essential characteristic for a welfare assessment tool. The acute stressor was handling: we compared three forms of handling that were shown to elicit different levels of hormonal stress response. Hens ($n = 98$) were assigned one handling type. Before the trial, they were then familiarised with a 1m x 1m test arena adjacent to their holding pen and gradually habituated to the experience of being physically (but not visually) isolated from the group after entering that pen via a side door. The trial consisted of two parts, conducted in a randomised order on one day: a baseline trial and a handling trial. In the baseline trial, hens entered the test arena voluntarily, via the side door. In the handling trial, hens were captured from the holding pen, handled in their allotted hold for 30 seconds and then released into the test arena. In both trials, hens were filmed in the test arena using a thermal imaging camera for 20 minutes. General Additive Models (GAMs) were used to describe changes in the temperature of the face, wattle, comb, eye and leg through time. We found a pulse-like pattern in the handling trial: there was an immediate temperature decrease followed by an increase above and then decline toward baseline levels. The rate of this change differed between body regions. Importantly, different handling types elicited different forms of this temperature response. As such, thermal profiles could provide a non-invasive and graded indication of the magnitude of acute stress.



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COMPUTER-BASED LEARNING IN ANIMAL PAIN FOR UK VETERINARY STUDENTS: EFFECT ON LEARNING AND ATTITUDE TOWARDS ANIMAL PAIN

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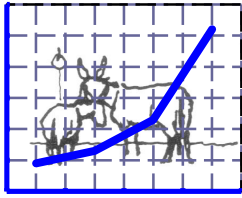
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Despite the importance of effective pain management for comprehensive care in both humans and other animals, inadequacies remain in pain recognition and treatment in medical and veterinary fields. Introducing and increasing education specifically about pain recognition, assessment and treatment into veterinary curricula has been recommended to redress these inadequacies. Computer-based learning (CBL) can circumvent constraints on teaching time, resource and expertise that continue to limit adequate pain education provision. CBL is increasingly used in veterinary education and the effectiveness of various online tools has been investigated with generally positive results.

As part of the larger 'Animal Welfare Indicators (AWIN)' project, this study provided UK veterinary students with CBL learning interventions on the topic of feline chronic pain. A randomized, single-blinded controlled trial was used to compare effectiveness of CBL against traditional presentation of comparable material. Six UK veterinary schools participated with a response rate of 22% (n=649). Students were recruited and participated entirely online. Participants first completed a pre-questionnaire consisting of demographic information, knowledge about feline pain, confidence and experience evaluating feline pain and attitudes to animal pain (multiple species). Students were then randomly supplied with either a CBL tool or a pdf document. Post-questionnaires were completed to assess knowledge transfer, potential attitude change, attitude towards learning intervention style and perception of learning.

As in previous work, CBL and traditional methods were found to result in comparable knowledge transfer. For example, respondents were 2.3 times more likely to correctly identify the most common cause of chronic pain after learning interventions (95% CI 2.06–2.56, $p < 0.001$) with no statistical difference between intervention type. Retention of material was assessed after two months and respondents remained twice as likely to answer this question correctly (95% CI 1.83–2.338, $p < 0.001$).

Students responded more favorably to interaction with CBL compared to conventional didactic presentation of materials, illustrated by the perception that they learnt more ($\chi^2=5.281$, $DF=1$, $p=0.02$) and that the way information was presented helped them to learn ($\chi^2=17.24$, $DF=1$, $p < 0.001$). Belief in various species ability to experience pain similarly to humans was shown to increase significantly after specific pain education, particularly in CBL respondents (Wald, $F_{(1,629)}=15.67$, $p=0.02$). This study further validates use of CBL for veterinary students and confirms its appropriateness for specific pain education.



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NON-INVASIVE STRESS ASSESSMENT IN THE LABORATORY AFRICAN CLAWED FROG, *XENOPUS LAEVIS*

A Holmes, CA Hosie, TE Smith, R Coleman and C Emmans

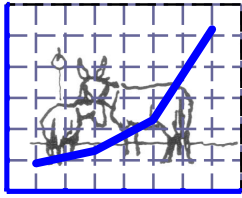
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The African Clawed frog, *Xenopus laevis*, is a widely used laboratory animal, being a useful model organism in biomedical research. Various husbandry guidelines have been developed towards appropriate care, but little consensus exists on the specificity of these, and virtually none are supported by adequate research data. Establishing optimal housing conditions for *X. laevis* is therefore crucial both for improving aquatic amphibian welfare and ensuring the quality and repeatability of scientific research involving this species.

The quantification of adrenal steroids in the tank water for aquatic amphibians presents a valuable way to assess welfare since it involves minimal disturbance and consequently results are not affected by sampling methods. We have immunologically validated an enzyme immunoassay to quantify corticosterone in the tank water for this species and are currently conducting biological validation. In combination with behavioural observations this assay will be used to assess a variety of housing parameters and enrichment effects.

Pilot endocrine data show that there are clear sex differences in corticosterone release with males releasing 2-3 times more than females (per g body mass). Preliminary behavioural observations show reduced locomotory behaviour when areas of cover are provided in the home environment, suggesting the importance of adequate enrichment for *X.laevis* husbandry.

Following these initial findings we are further developing both the behavioural and endocrine methodology to assess welfare in *X. laevis*. We will then investigate housing parameters with the principle aim of establishing optimal husbandry protocols for laboratory *X. laevis*.



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AN E-LEARNING PACKAGE IMPROVES THE CONSISTENCY OF PROFESSIONAL JUDGMENTS IN RELATION TO EU WELFARE LEGISLATION FOR FINISHER PIGS

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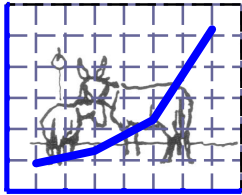
⁹ Animal Sciences Unit, Institute for Agricultural and Fisheries Research (ILVO), Belgium

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As reported by the Food and Veterinary Office, many EU member states have been inconsistent in their implementation of legislation on enrichment and tail docking requirements for finisher pigs. We produced an online training package in multiple languages that provided a concise synthesis of the scientific data underpinning the legislation, with the aim of improving the consistency of professional judgements. It defined four essential characteristics: 'edible, chewable, rootable and destructible' for assessing the suitability of different enrichments.

121 participants from over 10 countries (including official inspectors, certification scheme assessors and advisors) undertook the training. All participants completed a quiz twice: Control group participants completed the second iteration *before*, and Training group participants *after*, viewing the training. Data were analysed using nested models in MLwiN (Iteration within Person within Country). P values represent significant *Iteration* (1 vs 2) x *Group* (Control vs Training) interactions, indicating a divergence between groups following training.

In Section 1 of the quiz, participants were asked to rate the importance of modifying the enrichment defined in nine scenarios from 1 (not important) to 10 (very important). Training significantly increased participants' ratings in two scenarios: where wood was provided but not being manipulated ($p=0.0004$) and where a chain was present and being manipulated ($p=0.003$). Thus training helped participants identify enrichments that were less likely to achieve compliance. Section 2 listed nine risk factors for tail biting and participants rated the level of risk from 1 (no risk) to 10 (high risk). Participants' initial mean rating for barren environment was already above 9 but nonetheless increased significantly after training ($p=0.002$). Conversely, training led to moderate decreases in risk ratings for heat stress ($p=0.0003$) and high stocking density ($p=0.005$) which is accordance with the information provided during training. Section 3 described four scenarios relating to tail docking and management. Training significantly increased the proportion of respondents correctly identifying that a farm with no evidence of tail lesions should stop tail docking (McNemar's test; $p=0.001$). Section 4 asked participants to rate the importance of modifying enrichment in three further scenarios. Training increased the rating in the two scenarios where non-compliance was less obvious: a) tail lesions present; pig provided with but not manipulating straw that was wet and dirty ($p=0.01$), and b) no tail lesions; chains provided and partly used ($p=0.006$). Therefore the training was able to increase knowledge, and particularly recognition of enrichments that may be insufficient to achieve compliance.



Recent advances in animal welfare science IV

UFAW Animal Welfare Conference

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PERSONALITY IS A LAME EXCUSE IN HORSES

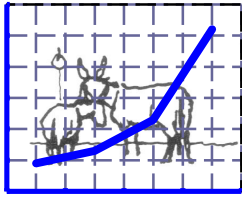
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Tissue damage may result in pain, inducing protective behaviour such as lameness. Because we cannot directly measure an animal's subjective experience, pain research and veterinary assessment rely on these behavioural indicators when quantifying pain. This assumes that the level of pain expression is proportional to the severity of damage but this has not been tested in animals and ignores the possible effects of personality and coping style. First, we assessed whether lameness accurately predicted the severity of tissue damage, or whether there is variance in how "stoical" individuals are. An experienced equine veterinarian scored horses for lameness and then the severity of tissue damage using either x-ray or ultrasound during the course of normal diagnostics in a clinical setting. Contrary to assumptions, we found no relation between scores for lameness and severity ($p=0.28$). Consequently, "Stoicism" was calculated as severity score minus lameness score. Subsequently, we tested hypotheses founded on previous work concerning how personality would be expected to link with Stoicism and pain behaviour. Personality was quantified using a validated questionnaire, completed by owners. Owners also gave their subjective opinion on how tolerant the horse was to pain using a 1-5 Likert scale. This is the first paper to assess the relationship between pain behaviour and personality in animals. We found that Neuroticism is negatively related to "Stoicism" ($p=0.04$) whereas Extroversion was positively related to levels of lameness ($p=0.03$), which may mean that pain is more easily identified in highly extrovert individuals. Future work to clarify these findings and their major implications for accurate assessment of damage and pain in animals are discussed.



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OUCH THAT HURTS – USING THE RABBIT GRIMACE SCALE TO ASSESS THE PAIN ASSOCIATED WITH EAR TATTOOING AND THE EFFICACY OF A TOPICAL LOCAL ANAESTHETIC

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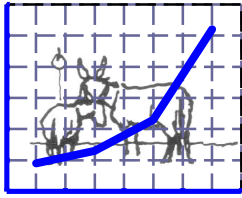
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Ear tattooing is a routine procedure performed on laboratory, commercial and companion rabbits for the purpose of identification. Although this procedure is potentially painful, it is often performed without the administration of pain relief so compromising animal welfare. Current methods of assessing the severity and duration of pain in rabbits are often poor and unreliable. The objectives of this study were to assess the potential pain associated with routine ear tattooing in rabbits, to evaluate the analgesic efficacy of topical local anaesthetic cream application prior to this procedure and to develop pain assessment scheme based on facial expression changes.

Using a crossover design, New Zealand White rabbits (n=8) underwent four different treatments of actual or sham ear tattooing, with and without prior application of a topical local anaesthetic (EMLA cream: lidocaine/prilocaine) Changes in immediate behaviour, heart rate, arterial blood pressure and serum corticosterone concentrations were recorded as the four treatments were carried out. Facial expressions and home pen behaviours were assessed immediately post treatment.

Tattooing without EMLA cream resulted in significantly greater struggling behaviour and vocalization ($P<0.001$), higher peak heart rate ($P<0.05$ for all comparisons) and higher systolic and mean arterial blood pressure ($P<0.05$ for all comparisons) compared to all other treatments during the procedure. Tattooing without EMLA cream resulted in significantly higher RbtGS score immediately post compared to pre procedure ($P<0.001$), with no further significant differences between pre and post procedure for the other treatments. Physiological and behavioural changes following tattooing with EMLA cream were similar to those in animals receiving sham tattoos with or without EMLA cream. Behavioural changes 1 hour post-treatment were minimal with no pain behaviours identifiable in any group. Serum corticosterone responses did not differ between sham and tattoo treatments.

Ear tattooing causes transient and potentially severe pain in rabbits, which is almost completely prevented by prior application of local anaesthetic cream. The Rabbit Grimace Scale developed appears to be a reliable and accurate way to assess acute pain in rabbits.



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RELATIONS BETWEEN MANAGEMENT, EMOTIONALITY AND COGNITIVE ABILITIES IN RIDING SCHOOL HORSES

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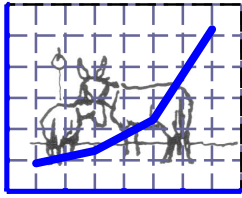
Objectives: Previous studies showed that housing conditions have a major impact on young horses' behaviour: horses kept in group in paddock are less prone to express undesirable behaviours at weaning and at work than stalled ones. A study highlighted that the time spent stabled was associated with an increase of aggressiveness in horses. In riding schools, horse behaviour is crucial regarding users' and professionals' safety. Our study aimed to investigate how human management could impact on riding school horses' behaviour.

Methods: 3 emotionality tests (Arena, Novel object & Bridge tests), and 1 learning test (Chest test) were performed on 184 horses from 22 riding schools involved in the same general activity (teaching, beginner to moderate level) and differing in terms of housing conditions.

Statistics: Factorial correspondence and multivariate analyses were used to assess the effect of each factor on horses' behaviour. Non parametric tests (Kruskall-Wallis, KW & Mann-Whitney, MW) were used to compare horses' responses between categories of schools.

Results: The results show that riding schools could be separated into 4 categories according to their horses' behaviour. The MANOVA revealed a strong impact of breed (Wilks' $\lambda=0.49$, $F(60, 646)=2.14$, $p<0.001$) and housing conditions (Wilks' $\lambda=0.33$, $F(4, 179)=7.56$, $p<0.001$) on horses' behaviour. In particular, horses from riding schools with box housing reacted more strongly in the novel object test (MW, $X_{\text{box}}=21.11\pm 2.37$, $X_{\text{padd}}=9.65\pm 1.51$, $U=9$, $p<0.005$) and showed more active locomotion (MW, $X_{\text{box}}=42.66\pm 5.98\%$ of horses/school, $X_{\text{padd}}=6.56\pm 3.99\%$ of horses/school, $U=5.5$, $p=0.0005$).

Conclusion: This study highlights the importance for riding school owners to take into account horses individual characteristics, as well as to have a more general reflection on how management (in particular housing) may impact on safety.



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GOOD PRACTICES OF HANDLING AND THEIR INFLUENCE ON THE DAIRY CALVES WELFARE

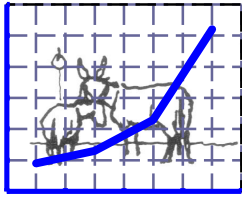
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The quality of handling procedures of young calves can influence their welfare and future behavioral responses to humans. Aiming to evaluate the role of positive handling in early life of dairy calves, we compared two treatments (with 24 bull calves per treatment), Conventional Handling (CH, where the animals were maintained in individual stall, received the milk direct in buckets and faced abrupt weaning) and Rational Handling (RH, where the animals were maintained in groups, receiving the milk in buckets with nipple for suckling, daily brushed and faced progressive weaning). The calves welfare were assessed by using two groups of indicators: health (mortality rates, percentage of animals presenting clinical signs of diarrhea and dehydration) and behavior (flight distance, FD and docility test (recording the following variables LM = latency to the calf present the first movement; TCont = time to contain it in a corner of the test area and TTA = total time being touched). The statistical analyzes were performed using the MIXED procedure of SAS , considering the fixed effects: week of birth, age and farm of origin, the means were compared by t - test , except for diarrhea and dehydration that were analyzed by procedure FREQ and interpreted by χ^2 test ($P < 0.05$) . The frequency of mortality was significantly ($P < 0.01$) lower for RH than for CH (4.5 and 18.2%, respectively), as well as for the percentage of animals presenting signs of diarrhea and dehydration ($P < 0.01$, for both). The rational handling (RH) also promoted higher frequencies of desirable behaviours, with shorter flight distance ($P < 0.01$), lower TCont ($P < 0.01$) and longer TTA ($P < 0.01$). In conclusion, the adoption of positive handling has potential to improve the welfare of dairy calves.

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TOWARD A NEW TREND IN AQUACULTURE WELFARE; EFFECT OF PROBIOTIC MARINE ACTINOMYCETES ON T.MARITIMUM ISOLATED FROM DISEASED FISH AND THEIR ENVIRONMENT

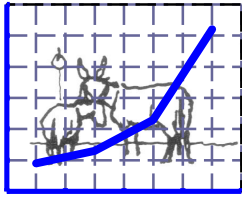
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To meet the ever-increasing demand for protein, aquaculture continuously requires new techniques to increase the production yield. With every step towards intensification of aquaculture practices, there is an increase in stress level on the animal as well as on the environment. Aquatic animal's welfare is greatly affected with the composition and changes in the surrounding environment. Also the aquatic environment provides many predisposing stress factors that reduce the fish immunity and support pathogens which can reach densities sufficient to cause stress and disease. Moreover there are many environmental pollutants which act as stressors which destruct the "host-pathogen-environment" equilibrium. And ultimately lead to disease outbreak. Using of chemotherapeutics in aquacultures associated with emerging of antibiotic-resistant bacteria also it hides the risk of transferring the antibiotic-resistance plasmid to human pathogenic bacteria. Considering these factors, as well as the dangerous effect of residual antibiotics of aquaculture products on human health, Instead, microbial interventions in sustainable aquaculture have been proposed, and among them, the most popular and practical approach is the use of Actinomycetes. Beside the ability for the production of bioactive compounds, antimicrobial, anti-viral and antitumors, Actinomycetes are popular for their powerful bioremediating properties. Actinomycetes, are effective consumers of antibiotics and chemical complexes. They can degrade high doses of pesticides and chemical complexes. Which reflected in minimizing the stress on the fish health and improving the aquaculture welfare also it reduce the adverse health and ecological consequences of the environmental pollutants. The aim of the present study was to isolate and identify marine actinomycetes may be used as probiotics microorganisms having antibacterial activities. The actinomycete isolate YSC12334 was isolated from Salwa beach in Jazan province, KSA. The isolate was then screened with regard to its potential to generate antimicrobial activity against marine fish pathogens *Tenacibaculum maritimum*, *Vibrio alginolyticus*, and other common pathogens. The actinomycetes isolate YSC12334 showed high antimicrobial activity against *T. maritimum* and no antimicrobial activity was observed against *V. alginolyticus*. Also, the isolate YSC12334 inhibited the growth of Gram-positive bacteria such *B. subtilis* and *S. aureus* and Gram-negative bacteria like *E. coli* and *P. aeruginosa*. The cultural and physiological characteristics tests identified the actinomycetes isolate YSC12334 as a member of the genus *Nocardiosis*. The nucleotide sequence of the 16S rRNA gene (1.272 kb) of the identified isolate evidenced a 94% similarity with *Nocardiosis dassonvillei* subsp. *dassonvillei* DSM 43111.



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CHEMOTHERAPY VS. HOLISTIC TREATMENTS: THE WELFARE OF LIMB AMPUTEE DOGS AFTER APPENDICULAR CANCER

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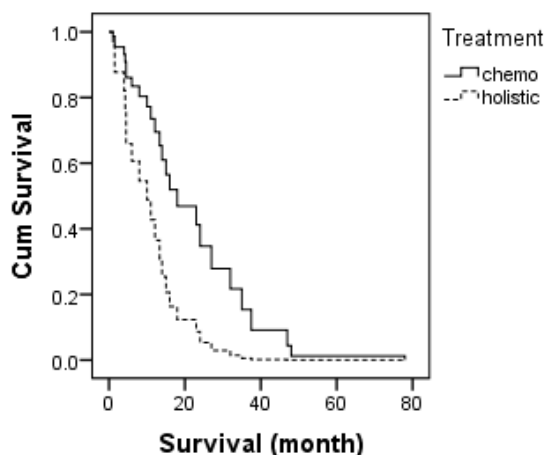
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Canine appendicular cancer has been reported as an increasingly important disease and osteosarcoma accounts for approximately 85% of canine bone tumours. The treatment of choice for these conditions has been described as surgical excision for limb amputation. These amputations are normally followed by chemotherapy with drugs, such as carboplatin and doxorubicin. However, these drugs have side effects like neutropenia, thrombocytopenia, anorexia and cardiomyopathy. Around 60% of the dogs diagnosed with osteosarcoma die in the first year after diagnosis with other 10 to 20% dying in the second year. In the attempt to save their loved pet from these side effects, owners impelled by compassion, evaluate alternative holistic methods of treatment. Holistic treatments include chiropractic treatments, homeopathy, herbal therapy, acupuncture, special diet and massage.

This study aims to contribute to the knowledge of welfare of limb amputee dogs, namely by relating survivability with treatment methods, and therefore allowing owners and practitioners to do an informed evaluation of their options.

Data was surveyed in 2010 from N=64 owners of cancer limb amputee dogs, in the blog Tripawds.com. Owners from all over the world but mainly USA answered. A Kaplan-Meier survival analysis procedure was performed, where the dependent variable “survival time after amputation” was considered and dogs still alive were censored. The independent variable considered was the treatment method (holistic treatment vs. chemotherapy). The IBM SPSS® Statistics 21 was the statistical package used in the analysis.

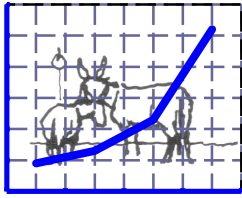


A survival model was successfully fit after the Log Rank (Mantel-Cox) test ($X^2_{(1)} = 5.126, p < 0.05$), showing a survival advantage of chemotherapy (median 16.0 ± 5.5 month) over holistic treatment (median 4.5 ± 4.2 month).

The figure on the left is a plot of the survival functions for the two treatment methods.

When tested against controls without treatment, chemotherapy, in single or two agent protocols, has shown to double the survivability in dogs after surgical removal of limb due to osteosarcoma. Carboplatin was the drug of choice in the sample used in this study, in single protocol or together with doxorubicin in double agent protocols. The results of the

study reveal that chemotherapy with these drugs is advantageous for the survivability of the dog as compared to the holistic treatment. It is up to the owner now to weight this advantage with the disadvantage of the chemotherapeutic side effects and decide the best option for his loved pet.



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ATTITUDES OF STUDENTS TOWARDS ANIMAL WELFARE

B Mazas-Gil¹, R Fernández-Manzanal¹, FJ Zarza-Alzugaray² and GA María³

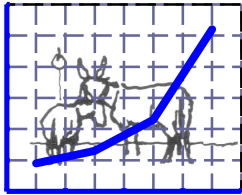
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This work presents a study that compares attitudes towards animal welfare among secondary and university studies in four different countries: Spain, Austria, USA and Colombia. The study was carried out with 1156 participants with an age range of 12 to 22 years. To comprehend people's different attitudes on the use of animals, certain studies have focussed their attention on analysing attitude according to personal characteristics such as gender, personality, experience with animals or age. We have developed a new and validated instrument for this purpose, which is a Likert type attitude scale questionnaire with four components: Component C1 (Animal abuse for pleasure or due to ignorance), Component C2 (Leisure with animals), Component C3 (Farm animals), Component 4 (Animal abandonment), known as Animal Welfare Attitude (AWA) Scale. The validation scale results were item-total correlation between 0.27-0.60 and its reliability is calculated with a Cronbach (0.89) corroborated with a pilot sample. The application of the scale shows us significant differences in age, gender, rural or urban origin and country in the different components of the scale. The worst scores were by 15 to 16 year old students in Component 2, about leisure with animals ($x=3.73$). The most favourable animal welfare scores were those of students over 18 in C1, expressing disagreement with animal abuse for pleasure or ignorance ($x=4.61$). The results according to the different countries, it is noteworthy that Spain and Colombia repeatedly appear in relation to favourable attitudes towards animal welfare and obtains favourable mean scores towards animal welfare in all of the scale components, except for C2 (Leisure with animals). The small sample of USA displays the lowest scores in Components C1, C2 and C3. Education must be the key to improve animal welfare attitudes in Secondary schools. The lack of scientific evaluations acts as an impediment to developing more effective educational activities or eliminating those that do not meet fulfil their mission. Evaluation using validated scales such as the AWA Scale is thus fundamental to be able to seriously develop animal welfare education programmes.



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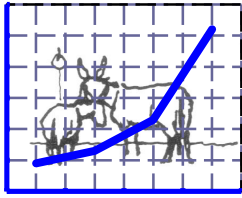
THE IMPACT OF EAR BIOPSY ON LABORATORY MOUSE WELFARE

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We have carried out an online survey on mouse identification covering 54 laboratory animal establishments in the UK and found that ear biopsy, namely ear punch and ear notch are the most commonly used method to identify or/and genotype mice (85% of establishments). Most of the survey respondents rated ear biopsy as the most preferred identification method (57%), very easy to carry out (52%), being mildly stressful or/and painful (70%), and the procedure is rated as the best identification method for standardisation (76%). However, there has been only limited scientific evidence of the welfare consequences of ear biopsy on mice. Regardless of being a routine husbandry procedure, it is likely to cause stress during restraint, acute pain at the time of marking and potentially a degree of chronic pain afterwards because it penetrates the sensitive tissues. Here we assess the welfare impact of ear biopsy on mice using a number of measures including acute and chronic behavioural responses, faecal corticosterone metabolites level, local histology and activation of nociceptors.



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FARM MANAGEMENT CHOICES – PREFERENCES FOR HIGH WELFARE OPTIONS

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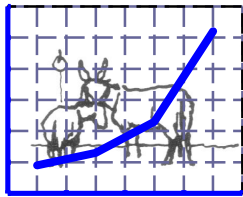
Higher welfare standards for farmed livestock are clearly a desirable goal. However, achieving them can be a challenge with farmers not always adopting the better practices identified in research. This can seem surprising in the light of studies that report financial benefits of improving welfare but is explainable when a holistic examination of the decision choices faced by farmers is undertaken. Such an analysis highlights barriers to changing practice that can otherwise be overlooked. For example, regulations establishing minimum standards for other goals, such as environmental protection, can dominate decision choices effectively downgrading welfare goals as illustrated by Milne et al (2008). Similarly a report by OECD (2009) highlights the essentialness of examining risks, such as animal welfare harms, within integrated systems.

This poster draws together some results of two studies. The first examines farmer preferences with respect to different types of risk – risks which often must be reconciled when choosing between alternative courses of action. Our results show that farmers have a higher aversion to ethical (including animal welfare) than many other types of risk, indicates that in the absence of other barriers farmers would prefer to adopt higher welfare options. The second study demonstrates how while science experts may be effectively providing farmers with good information on improving practices this may not be resulting in changed behaviours due to a failure to address uptake barriers. Together these studies demonstrate that greater improvements in animal welfare might be achieved if innovations developed were better fitted to the limits of commercial conditions and farmers were better informed.

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THE EUROPEAN VETERINARY ANIMAL WELFARE CURRICULUM

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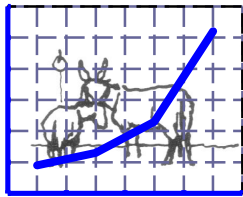
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The Federation of Veterinarians of Europe (FVE) established an *ad hoc* working group to firstly map animal welfare teaching in undergraduate veterinary education and secondly to develop a model animal welfare curriculum. The working group was composed of representatives of FVE, the European Association of Establishments for Veterinary Education (EAEVE), and the EU FP7 research project Animal Welfare Research in an Enlarged Europe (AWARE). The first task of mapping education was done via an online survey and by follow-up contacts, it was finalised end 2012. Secondly the group drafted an animal welfare science, ethics and law syllabus, allowing implementation in line with the faculty's preferences and existing learning culture. The aim is to reach a uniform high standard veterinary education by including basic animal welfare science into the accreditation process of all veterinary medicine faculties in Europe. The syllabus includes learning objectives and learning outcomes (e.g. Day 1 Competencies). Consultation with vet schools was carried to check the validity and feasibility on the proposed syllabus. For the actual content of the proposed learning program multiple existing resources are indicated. The syllabus aims to cover all basic competences related to animal welfare necessary for responsible, modern veterinary practice. Some of these competencies are very much related to practice e.g. on-farm animal welfare assessments, whereas others maybe more to do with professionalism e.g. effective communication, ethical deliberation and personal development.



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A PROPOSED HOLISTIC RISK ASSESSMENT AIMED TO PREVENT MATERNAL AND NEONATAL MORTALITY WITHIN THE EQUINE BREEDING INDUSTRY BASED UPON ANALYSIS OF DATA FROM A 43 YEAR PERIOD

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The loss of mares and foals poses an enormous threat to the equine industry. Attempts to reduce such losses are made through preventative measures, such as management schemes and health precautions; however there is a clear need for further improvements to prevent deaths. The aim of this study was to explore the most common causes of loss of mares and foals that can be classified as preventable. Analyses were conducted on 16,392 records of mare or neonate losses reported to the National Foaling Bank between 1965 and 2007. Data were categorised into 18 causes of foal losses and 14 causes of mare losses. Frequencies of the most common causes of loss were compared using Kruskal Wallis analysis, with Mann Whitney U-test used to carry out pair-wise comparison of causes. An online survey featuring 15 closed questions was used to capture the opinions and experiences of equine breeders in the UK in relation to mare and foal losses. Responses (n=118) were used to ascertain how representative the National Foaling Bank data were of the general breeding industry and explore potential factors relating to the causes. Differences were identified in frequencies of mare and losses by cause overall (Figs 1a and 2a, $P < 0.001$). The most common causes of mare loss could not be clearly differentiated from each other terms of incidence (Table 1b). Significantly more foal losses were attributed to "Unknown" causes and Smothering than other causes (Table 2b).

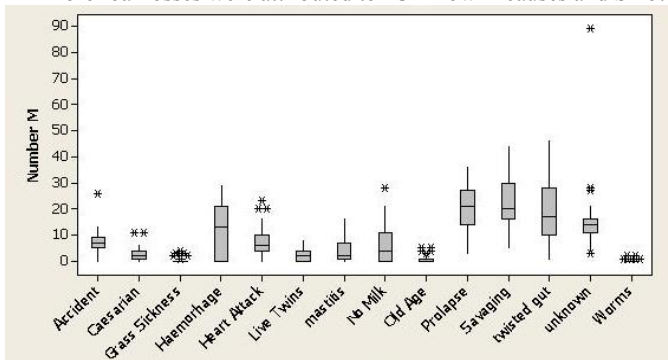


Table 1b: Four most common causes of mare loss (causes with distinct letters significantly different $P < 0.05$)

Cause of Mare Loss	Median Incidence / Annum
Prolapse	21 ^A
Savaging	20 ^{AB}
Twisted Gut	17 ^{AB}
Unknown	14 ^{AB}

Figure 1a: Causes of mare loss

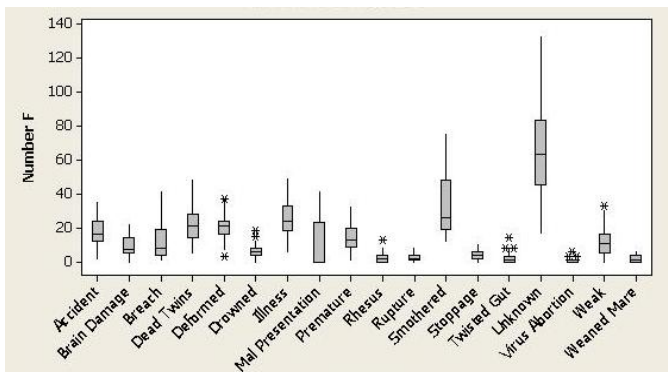
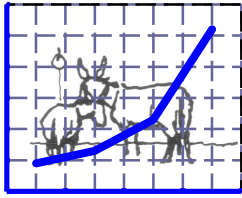


Table 2b: Five most common causes of foal loss (causes with distinct letters significantly different $P < 0.05$)

Cause of Foal Losses	Median Incidence / Annum
Unknown	63 ^A
Smothered	26 ^B
Illness	24 ^C
Dead Twins	21 ^C
Deformed	21 ^C

Figure 2b: Causes of foal loss

Questionnaire responses provided some supporting evidence of the types of losses experienced in industry; however, one important finding was that 69.5% reported that their staff were not trained foaling assistants. This detailed analysis of mare and foal losses has informed the development of a holistic risk assessment tool. The suggested system provides simple risk management tool prior to active breeding and offers an opportunity for the breeder to decrease the risk and increased potential benefits.



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WHAT INFORMATION CAN BE GAINED FROM A CUTTING-EDGE ANALYSIS OF CATTLE (*Bos Taurus*) CALLS?

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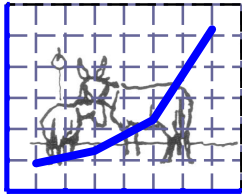
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Vocalisations play key roles in a wide range of communication contexts, both within and among species; for example, in mating contexts, to help coordinate social behaviours, and for individual recognition. In recent years, two factors have greatly assisted our progress in developing an understanding of animal vocal communication. Firstly, the adoption of the “source-filter theory” of speech production from linguistics, which links the acoustic structure of vocalisations to the morphology and physiology of calling animals. Secondly, new more rigorous call analysis techniques allow us to describe the variation present in the vocal parameters in unprecedented detail. Using these approaches, it is possible to quantify the potential for each acoustic component to carry information about individual identity, even in quite complex vocalisations. In this study, we examined the contact calls made between cows and their calves in a semi-natural setting. We were able to distinguish two different types of cow calls associated with different behavioural contexts, and with differing acoustic structures. Low Frequency Calls (LFCs) were made with the mouth closed or only partially open. They were produced by cows exclusively when they were in close proximity to their calves, in the first two weeks postpartum. They were very quiet, with a Fundamental Frequency (F0/pitch) average of 81.17 ± 0.98 Hz. By contrast, High Frequency Calls (HFCs) were much louder and produced by both cows and calves when they were separated (e.g. not in visual contact) and often preceded nursing/suckling. HFCs had an average F0 of 152.81 ± 3.10 Hz. The detailed analysis of cow HFCs and LFCs, and of calf LFCs, using many vocal parameters showed that both types allow individual animals to be distinguished. Although it has previously been suggested that cattle contact calls are individually distinctive, to our knowledge, ours is the first to use the most rigorous, modern methods. Several flawed attempts have been made in the past to characterise the acoustic structure of cattle calls. Our new analyses provide a solid foundation for future work on the information contained in cattle vocalisations, which has great potential for application in animal welfare research.



Recent advances in animal welfare science IV

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EFFECT OF TEMPERAMENT ON TRANSPORT STRESS RESPONSE IN CULL EWES

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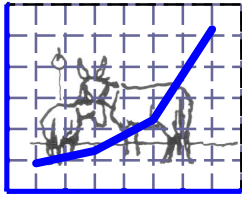
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The aim of this study was to determine the effect of dominance rank on the stress response, live weight shrinkage and behaviour of cull ewes subjected to 4 h of road transport. A total of 44 *Chamarita* native breed cull ewes were divided into four experimental groups with 11 ewes each, according to dominance status (high or low status based on 20 days direct observation). Two groups (one of high dominance and one of low dominance) were transported while the others (high dominance and low dominance) stayed on the experimental unit. The journey lasted 4 h (200 km) including loading and unloading times. Live body weight was noted the day before and immediately after transport and shrinkage was calculated. Blood samples were taken the day before and immediately after transport and 4 h and 24 h post-transport to evaluate the stress response. Internal body temperatures (IBT) were also recorded using ibuttons. Ewes were observed using a combination of scan and behaviour sampling to describe individual behaviour and the time it took the transported ewes to drink, eat and rest after unloading. Transported ewes lost approximately 1 kg live weight (2%) compared to controls. Cortisol, glucose, NEFA as well as the neutrophil:lymphocyte ratio were higher immediately after unloading in transported ewes but mostly returned to normal after 4 h, with complete recovery after 24 h. Physiological stress variables were not significantly different between ewes of high or low dominance rank. Internal body temperatures were lower in the low dominance in the control group but higher in the transported group. Post-transport behavioural analysis demonstrated that among transported ewes, high dominance ewes took significantly more time to eat and drink but no differences were found in time to lie down and rest. Low dominance ewes spent more time resting and drinking. Although there is evidence to suggest that stress responses may be more severe and prolonged in older animals, the range of physiological stress parameters fell within normal values for adult sheep. All ewes recovered by 24 hours after transport without influence of their dominant status. The shrinkage observed was within normal values for sheep.



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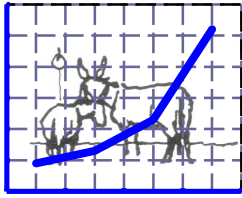
CHOOSING ANIMAL MODELS: IT IS NOT JUST ABOUT SCIENCE

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When choosing a particular animal model in laboratory animal experimentation, many factors play a role and considerations on animal welfare are just one of these factors. Traditionally, the choice should be driven mainly by scientific issues, that is, scientists should choose the animal that is likely to best answer the questions they raise. As a matter of fact, the need for a scientific and methodological link between the question asked and the chosen model is crucial for research, in term of validity and reproducibility. Is this scientific paradigm still the major factor? For example, a particular ethical perspective can influence and have an effect on the choice of a particular species to create research models. Obviously, financial aspects play a role too (primates are very expensive compared to rodents) Last, but not the least, is public opinion. The general public could be more sensitive about the use of dogs and non-human primates, than to mice or zebrafish, and influence science directions. Different countries with different traditions, scientific, ethical and cultural, could consider the interaction among these factors (financial, ethical, scientific, societal) in different ways with different specific weights. The aim of this paper is try to better understand how much weight animal welfare issues should have in the choice of a particular animal model, also in relation to other different kinds of consideration. We will also suggest that, in any case, a better awareness of animal welfare practical and theoretical issues and animal welfare demands of given species could help researchers to identify the “best” species for experiments not just from the ethical, but also from the scientific point of view.



Recent advances in animal welfare science IV

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DO EAR POSTURES INDICATE POSITIVE EMOTIONAL STATE IN DAIRY COWS?

HS Proctor and G Carder

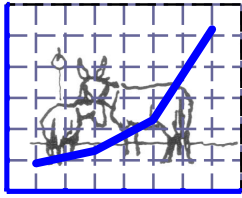
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If we are to ensure that animals have a good life, one which is rich with positive experiences, then we need to have reliable and practical animal-based measures for their emotional states. In our study, we aimed to determine the suitability of ear postures as indicators of a positive low arousal emotional state in dairy cows. Using a group of 13 cows we analysed their ear postures before, during and after experimental stroking, which is assumed to be a positive experience. Before starting, the cows were fully habituated to the researchers and to the procedure, and so any effects could be attributed to the stroking procedure.

We conducted 381 fifteen minute focals, comprised of three, five minutes conditions; pre-stroking, stroking and post-stroking. The duration of time each cow spent in the four identified ear postures was recorded along with the number of ear posture changes they performed during each condition. Two of the postures were alert with tense muscles, and two were relaxed with little to no muscular tension. We performed One-Way ANOVA repeated measures analyses and found that the two alert postures, EP1 and EP3, were performed for significantly longer during the pre-stroking and post-stroking conditions than they were during stroking (EP1; $F(1,2) = 241.22$, $p = 0.00$ & EP3; $F(1,2) = 39.09$, $p = 0.00$). The opposite was found for the relaxed ear postures EP2 and EP4, which were performed for significantly longer during stroking (EP2; $F(1,2) = 81.20$, $p = 0.01$ & EP4; $F(1,2) = 169.98$, $p = 0.00$). Furthermore, EP2 was performed for significantly longer during post-stroking than during pre-stroking, and EP1 was performed for significantly less time during post-stroking compared with pre-stroking, suggesting a lasting positive effect (EP1; $F(1,2) = 241.22$, $p = 0.01$ and (EP2; $F(1,2) = 81.20$, $p = 0.01$). We also found a significant drop in the frequency of ear posture changes during stroking compared with the pre-stroking and post-stroking conditions ($F(1,2) = 17.89$, $p = 0.00$).

We conclude that types of ear postures and the number of ear posture changes could be a useful indicator of positive emotional state in dairy cows. Ear postures could be used as a tangible and quick measure, which could be incorporated into on-farm welfare assessments alongside measures of negative emotional states.



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MEASURES TO IMPROVE THE WELFARE OF ANIMALS SLAUGHTERED IN ACCORDANCE WITH RELIGIOUS REQUIREMENTS AND EC REG 1099/2009

MA Rao

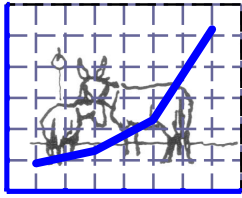
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This review covers the concerns for animal welfare that accompany the religious slaughter of livestock primarily (cattle & sheep) with a focus on Halal slaughter. The aim of this review is to provide a practical and equitable means for combining respect for religious beliefs with needs for improvement in animal welfare. In my view, speaking or writing disparagingly about religious communities and their traditional religious slaughter practices does not improve the welfare of animals but is destructive and damaging to constructive debate that would otherwise lead to improvements in animal welfare.

The welfare of animals at slaughter is protected by the EC Regulation 1099/2009 and permits religious slaughter of animals for the production of meat for the Muslim and Jewish communities. Slaughter without stunning will always be a difficult subject. However, open and honest discussions and consultation with the religious communities, Muslim & Jewish, are needed to improve the welfare of food animals slaughtered by this method. The religious communities are also very much concerned about bad practices during conventional as well as traditional slaughter resulting in unnecessary suffering. In principle the religious communities support the need for fair and accurate information since consumers have a right to make an informed choice based on the facts.

If all other animal welfare risks have been properly managed and made equal for all slaughter systems, there are three main animal welfare concerns when the animal is slaughtered traditionally. The first concern is how the animal is restrained and positioned at the time of slaughter. The second is the potential pain associated with the ventral neck cut. The third, and the most important, is the length and 'quality' of time that the animal is conscious after the cut.

Slaughter without stunning can be effective for traditionally slaughtered livestock providing the equipment, protocols and personnel are appropriate for the species of animals slaughtered. The actual rather than perceived welfare realities should be assessed and prioritised. It is critical to address welfare concerns in the species where they exist and the welfare concerns in sheep are considerably less than in cattle. Livestock should be treated with respect at all times and any procedures at the point of slaughter should be done with considerations for the animal's welfare, operator's safety, and the consumer's requirements. The potential application of post-cut stunning needs to be further communicated, discussed and debated within the religious communities.



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RESPONSIVENESS OF A 46 ITEM HEALTH-RELATED QUALITY OF LIFE (HRQL) MEASUREMENT INSTRUMENT IN DOGS WITH LYMPHOMA

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Introduction

Initial validation and reliability of the instrument, which generates a profile of scores in 4 domains of HRQL, vitality, pain, distress and anxiety, have been reported in dogs with a variety of clinical conditions. Responsiveness is that property that ensures that a clinical instrument is sensitive enough to detect differences in health status that are important to the clinician or patient as well as being statistically important. Accordingly, the responsiveness of an instrument is central to the determination of clinically important change. Lymphoma can cause depression, lethargy, weight loss and weakness and while chemotherapy increases life expectancy, owners often report side-effects that might affect HRQL. Data from a longitudinal study of dogs with lymphoma were used to investigate responsiveness of the instrument.

Methods

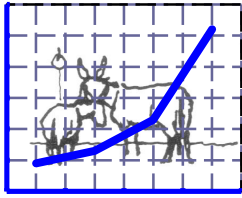
Thirty two owners of dogs with lymphoma attending Glasgow University Small Animal Hospital completed 3 or more questionnaires (median 7, range 3 – 19), each questionnaire coinciding with a hospital visit. Simultaneously owners reported whether they considered their dog's health status to be better, unchanged or worse since the last visit. Score difference between questionnaires was calculated for each dog and for each domain and these were related to owner reported change. Level of change was assessed using 95% confidence intervals for the population mean, indicated in bold below. If the interval does not include 0, this reflects that there is evidence of a statistically significant change in the mean domain score.

Results

Dogs were classed as better, unchanged or worse on 65, 149 and 41 occasions respectively. Mean and 95% confidence intervals for change in vitality, pain, distress and anxiety for dogs assessed as 'better' were 0.64 (**0.28,0.99**); -0.46 (**-0.78,-0.15**); -0.52 (**-0.83, -0.22**); -0.45 (**-0.70,-0.19**); for dogs assessed as 'unchanged' were 0.01 (**-0.12,0.14**); -0.05 (**-0.15,0.05**); -0.03 (**-0.17, 0.11**); 0.00 (**-0.11, 0.12**); and for dogs assessed as worse were -1.16 (**-1.61,-0.72**); 0.98 (**0.52,1.43**); 0.96 (**0.47,1.45**); 0.81 (**0.40,1.21**) respectively. For dogs identified as better, there was a statistically significant improvement in vitality, pain, distress and anxiety scores. For dogs identified as worse, there was a statistically significant deterioration in the domain scores.

Conclusions

The instrument was shown to be responsive to clinical change as determined by the owners of dogs suffering from lymphoma. This relatively small study will form the basis of further studies to determine clinically important change on a larger scale for dogs with cancer.



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HIPPOCAMPAL MARKERS OF DEPRESSION AND CHRONIC STRESS IN FEED-RESTRICTED BROILER BREEDER HENS

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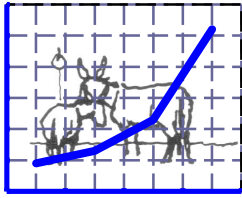
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Commercial broiler breeders are feed-restricted to avoid negative health outcomes including obesity and reproductive inviability. Beyond knowing these chickens are healthy but hungry, little is known about how this restriction impacts the animals' affective state. We investigated potential correlates of the subjective affective state of broiler chickens by quantifying neurochemical changes to the hippocampus and the HPA axis thought to be markers for depression and chronic stress. Alterations in hippocampal morphology are found in humans suffering prolonged and recurrent episodes of depression and chronic stress where decreases in both hippocampal volume and neurogenesis can occur. The purpose of this study was to determine if chronic hunger creates a state of chronic stress or depression leading to an overall negative subjective experience for the chicken. We looked for evidence of chronic stress using measures of hippocampal morphology (volume, neuron numbers, adult neurogenesis), as well as the expression of stress-related genes in the hippocampus (glucocorticoid receptors, BDNF), the hypothalamus (CRF), the pituitary gland (POMC), the adrenal gland (ARL10 and StAR) and the spleen (IL-6, shown to be higher in depressed patients), as well as corticosterone (CORT) blood titres.

Chronic hunger was induced by placing chickens on either a commercial feed-restricted diet, or feeding *ad libitum* from weeks 7-12 of life. Hypothalamic AgRP expression confirmed that feed-restricted chickens were hungry, and elevated CORT levels in blood plasma were observed during the treatment, as is typical in feed restriction, given CORT's metabolic function. IL-6 was also higher in restricted than *ad libitum* birds. The other potential molecular markers of stress did not differ between the treatments. We did find hippocampal markers of depression-like state: the density of both BrdU-positive cells and new neurons were significantly reduced in the feed-restricted condition, as compared to chickens fed *ad libitum*. This decrease in neurogenesis could be an indication of chronic stress, but could also be a direct consequence of the higher CORT levels. Feeding condition did not affect hippocampal volume or the total number of neurons.

In conclusion, while the majority of our putative markers did not suggest the restricted birds were suffering chronic stress, the changes in neurogenesis and IL-6 observed may be symptoms of chronic stress. This is worthy of further investigation.

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ENCLOSURE USE AND SOCIAL ASSOCIATIONS OF COMMON SQUIRREL MONKEYS (*SAIMIRI SCIUREUS*) AT BRISTOL ZOO GARDENS

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Common squirrel monkeys (*Saimiri sciureus*) are popular primates within zoos. Surveys in 2006 showed breeding of the genus in European zoos is often indigent, prompting an establishment of breeding programmes. Intra- and interspecific variance is high for the genus and group compositions vary. Bristol Zoo Gardens' 11-strong group live in a large semi-naturalistic enclosure. Welfare concerns have been raised due to deleterious aggressive attacks directed towards the adult male outside of the breeding season. Whilst not an abnormal socio-ecological event, attacks are not consistent throughout entire non-breeding time spans. Evaluation of potential triggers through examination of social dynamics may inform management interventions.

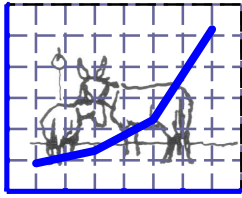
Index of Association was used to analyse the social interactions. Modified Spread of Participation Index (SPI) and Chi squared test were used to determine the enclosure usage. A luminary, if not entire exposition of the troop's social configuration was achieved through gathering information regarding associations using Indices of Association scores and enclosure use from scores obtained through the Modified Spread of Participation Index, collated outside of the breeding season.

Behavioural measurement detected no aggression. Zoological Reports indicate no aggression occurs during actual breeding season therefore it is reasonable to assume aggression occurs in the months directly preceding breeding due to premature advances by the adult male towards unreceptive females.

A Modified SPI calculated for both the whole group and individuals indicated the extent of enclosure use was relatively even yet there appears to be zone preferences amongst individuals. An increase in environmental enrichment is desirable but not imperative. Enrichment for the purpose of improving welfare of the adult male is recommended.

Association scores confirm the social structure of the group is influenced by relationships between individual females, maintained through subgroup formation. Association between the adult male and a top group female was stronger than expected. It is probable that this association is likely due to attempts of affiliation by the male.

It is suggested that behavioural measurement of the group should be repeated in the months of January to march, directly preceding breeding season using the Modified SPI and Indices of Association. The social behavioural category should be redefined to differentiate between affiliate behaviours such as huddling and open and closed genital displays.



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VALIDATION OF A NOVEL CULTURE PROTOCOL FOR EQUINE ENDOMETRIAL CELLS AS A MODEL TO INVESTIGATE UTERINE INFLAMMATION

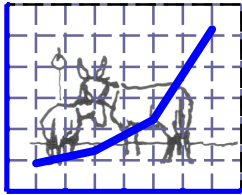
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Uterine inflammation (endometritis) is ubiquitous in the mare post-mating but subsequent persistent mating-induced endometritis (PMIE) has severe implications for fertility and affects approximately 15% of Thoroughbred broodmares. The current method used to investigate the immune pathways that underlie PMIE and potential therapeutic targets uses the whole (live) animal. Whole animal models provide data which accurately reflects the *in vivo* scenario, accounting for the interplay between internal organ and tissue systems. However, whole animal models require large numbers of animals and the application of invasive procedures such as repetitive artificially-induced endometritis and uterine biopsy. Therefore, alternative *in vitro* models are essential tools if they are synonymous of the whole animal. *In vitro* cell culture models are commensurate with the 3Rs of animal research; Reduction, Refinement and Replacement. Equine endometrial epithelial and stromal cells have been cultured twice previously; however, methodological challenges were apparent. This study aimed to adapt a bovine endometrial cell culture protocol and validate its use for equine endometrial epithelial and stromal cells.

Equine uteri were collected post-slaughter from a commercial abattoir (n=17). All uteri were in the luteal phase of the oestrous cycle. Endometrium was dissected from underlying tissue, chopped into 1mm³ sections, and plated in culture flasks. Tissue remained in each flask until a corona of mixed endometrial cells had formed. Cultures were purified via a process of differential trypsinisation. Williams complete media was used for cell culture and 0.1% and 0.25% trypsin to lift stromal and epithelial cells respectively. Once confluent; cells were challenged with control (media alone), oxytocin (OT; 1nM), or *E. coli*-derived lipopolysaccharide (LPS; 1µg/ml), to determine their response to physiological and immunological conditions. The response was assessed by measuring cellular prostaglandin F_{2α} and prostaglandin E₂ secretion by radioimmuno assay.

Stromal cells were cultured up to and including fifth passage. Epithelial cells were cultured up to and including fourth passage however there was a degree of inter mare variability with this. Stromal cells secreted significantly more (P<0.05) PGF_{2α} and PGE₂ when challenged with OT than control treatment. There was a significant effect of inter-mare variability with prostaglandin secretion (P<0.001). The protocol was established, optimised and validated for the culture of equine endometrial epithelial and stromal cells. The model may be used for future studies to investigate the response of equine endometrial cells to immunological challenge and the effect of potential anti-inflammatory compounds. The protocol negates the need for live, whole animals to be used in endometritis research, and will facilitate the understanding of PMIE and potential treatment strategies for improving mare health and welfare.



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FACTORS ASSOCIATED WITH VARIATION IN LAYING HEN MORTALITY AND METHODS OF IMPROVING ON-FARM RECORDING

A Scrase, SL Lambton and CA Weeks

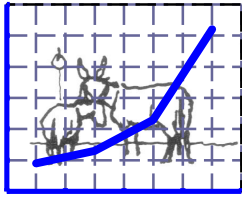
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Cumulative mortality data from over 2,000 farms and 3,564 flocks were used to determine the principal factors affecting the recorded levels of mortality. The ten data sources included both health and welfare monitoring bodies and previously published scientific studies mainly from UK farms with one from the Netherlands and Sweden. Average flock size was 11,742 hens with a range: 6-172,500.

The overall mean level of mortality from the dataset was 7.9% with a standard deviation of 7.1 reflecting high variability, as also indicated by the very wide range of losses between flocks of 0 to 69.3%. Data were collected between 16-208 weeks, with a mean age of 65 weeks; 75% of datapoints were from flocks 60 - 100 weeks of age. Apart from an expected significant increase with age, other factors significantly ($p < 0.001$) associated with cumulative mortality in statistical models of the data were higher levels in flocks of intact beaked birds and differences between housing system and breeds.

Mortality is a bird-based indicator of welfare that has the potential to be objective and accurate. As such it is increasingly included as part of assurance assessment as well as being used in scientific evaluations of welfare. However, we have found that farmers can find it difficult in practice to keep easily accessed records of mortality. We therefore conducted telephone interviews with farmers to determine their current methods of recording mortality and their 'wish-list' for improvements. We also developed an App to record mortality directly onto a mobile phone as 'found dead' or 'culled' with opportunities to ascribe the causes of death in broad categories such as disease, pecking injury, smothering and predation. The App was distributed to nine UK farms for a four month trial period. In post-trial interviews, 78% of participants reported recording more detail into the app than their current paperwork systems. Having access to graphical summaries of electronic data and more information on causes of mortality had several benefits for farmers, most notably in aiding flock health management decisions. This trial indicated the potential for app technology to be used on farm to collect more detailed mortality data, whilst also aiding farm management processes.

Reducing overall levels of mortality would benefit not only bird welfare but the profitability and sustainability of egg production.



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EMOTIONAL STATES AND ENRICHMENT IN CAPTIVE BIG CATS

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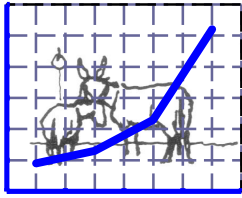
The welfare and behavior of captive wild animals can be heavily influenced by their zoo habitats and husbandry systems. As such the need to create, provide and optimize captive environments is essential. This is likely to be of particular importance for big cats kept under a 'free contact' system of management, where keepers have daily, personal contact with their animals; it is essential that this relationship become reliable and safe for the welfare of both the cats and their keepers. Keeper identification of emotional states in captive big cats is one way for them to optimize enrichment strategies and to reduce the risks from their interactions with the animals.

This paper discusses the results of two studies to assess the emotional states of big cats, and then to determine whether different enrichments given to them in their night pens will cause a change in their emotions and pacing behaviour during the night.

In Study 1, the emotional states of 4 cheetahs were rated daily by 5 keepers, from a list of 29 states. Three domains were identified, associated with nervousness, adventurousness and aggression, and keepers rated each cheetah for 18 days. Consistent differences between keepers in scores were identified. Aggression scores were least variable.

In Study 2, with 9 keepers and 9 tigers, four emotional state domains were identified from keeper ratings, which related to aggression, fear, vigilance and obedience. Keeper ratings of these domains before and after housing were used, together with videorecording of behaviour, to evaluate the impact of three enrichments offered overnight in their cages in a Latin Square design over 22 days. The enrichments were provision of coffee essence, fish smears and palm leaves. There were no overall differences in the emotions of the tigers between the three enrichments, although individual tigers were affected. However, videorecords of 90 minute duration at the start and end of housing indicated that most pacing occurred at the end of the housing period and that the tigers receiving fish smears paced less (37% of time \pm 3.1%) than those receiving coffee essence (48% of time, \pm 3.1%) or palm leaves (50 % of time, \pm 3.1%).

It is concluded that emotions can be reliably detected in big cats by experienced keepers, and that these can assist in the evaluation of appropriate enrichment strategies.



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MEASURING PHYSIOLOGICAL PARAMETERS USING NON-INVASIVE TECHNIQUES IN SHEEP

MTW Verhoeven^{1,2}, J Peuscher³ and MA Gerritzen¹

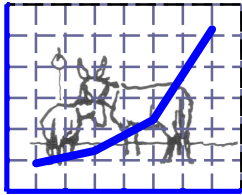
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Physiological parameters in sheep, such as heart- and brain activity, are measured in various research areas to assess the animal's physiological state. Brain activity in sheep is often recorded in an invasive way since surface electrodes will not attach well to the oily skin of these animals. One of the aims of this study was to record multiple physiological parameters simultaneously using non-invasive techniques in sheep that were anaesthetised with propofol. Each of ten healthy ewes (36.0 ± 3.4 kg) from a commercial flock was placed in a custom made hammock and anaesthetised with propofol twice, with one week apart. Parameters to be recorded continuously included brain activity (electroencephalography, EEG), heart activity (electrocardiogram, ECG) and respiratory rate. Responses to a threat, eye and pain reflex were assessed every one or two minutes to confirm (un)consciousness. Respiratory rate was measured by placing a respiratory band around the abdomen behind the animal's last rib, recording frequency and volume of each breathing. Three recently developed EEG water surface electrodes were placed left, right and on top of the midpoint between the caudal margin of the head and the line joining the caudal corners of the eye and ear in a triangle shape. ECG electrodes (Ag/Cl) were snapped on bands that were placed around the legs at ± 5 cm above the knee. After recording a baseline of five minutes, the sheep received a bolus injection of propofol (8 mg kg^{-1} , intravenously) followed by continuous infusion of propofol of $8 \text{ mg kg}^{-1} \text{ hr}^{-1}$ for 28 minutes. Heart rate increased from 85 to 126 bpm ($P < 0.05$) after induction with propofol and respiratory rate decreased ($P < 0.05$) simultaneously from 35 to 20 breathings per minute. After induction, EEG activity quickly changed from high frequency, low amplitude waves to low frequency, high amplitudes waves. Loss of consciousness was also confirmed by the loss of reflex responses. Sheep regained consciousness after on average 30 ± 5 minutes after which the EEG, ECG and respiratory rate also changed back to baseline values. From this study can be concluded that it is possible to measure good quality ECG, EEG and the respiratory rate simultaneously in a non-invasive way in sheep during anaesthesia. Future studies and developments should point out if these techniques could also be applied in non-restrained animals to extend their application.



Recent advances in animal welfare science IV

UFAW Animal Welfare Conference

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IRREGULARITIES IN THE FIRST PART AND AGONIZING DEATH OF ANIMALS DURING THE BULLFIGHT

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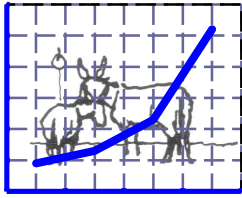
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Bullfights, which are legal in eight European and Latin American countries, are typically divided into three different phases: “*Tercio de Varas*” (lances third), “*Tercio de Banderillas*” (*banderillas* third), and “*Tercio de Muerte*” (death third). During the first third, the animal is approached by a rider on horseback (*picador*), who punctures his withers with a sharp metal lance, inflicting serious damage to several body structures. The “death third” is carried out using three different instruments: an 80-88 cm-long sword (*estoque*), inserted into the thoracic cavity of the animal, an optional pithing sword (*descabello*), used to sever the spinal cord, and a 10 cm blade knife called “*puntilla*,” employed to destroy the medulla oblongata and kill the bull.

The aim of this study was to analyze the presence of various irregularities—not permitted by the rules of bullfighting—committed by the *picador*, which increase the pain and lesions inflicted on the animal even more: “drilling” (moving the lance up and down once inserted), “corkscrewing” (turning the lance once it is inserted) and “*carioca*” (blocking the exit of the bull with the horse, not allowing him to escape the punishment), as well as the intentional beating of the stirrup (a 30kg iron structure) against the bull intended to inflict injuries such as ocular trauma, and fissures and fractures of the skull. The times that the three tools were employed during the “death third”, the behavioral signs of suffering following use of the *puntilla* and the time elapsed from when the first mortal wound was inflicted until the animal could be considered dead were also measured. For these purposes, 28 bullfighting videos (recorded in bullrings of Spain during 2010) were individually analyzed by different veterinarians.

The frequency of use of the illegal acts during the “lances third” were: 84% (drilling), 88% (corkscrew) and 76% (*carioca*). The beating by the *picador*'s stirrup was also commonly deployed (92%). In addition, the analysis of the “death third” exposed the terrible and prolonged agony that these animals suffer. The number of *estoques*, *descabellos* and *puntillas* employed was 1.89 ± 1.1 (max=5), 1.46 ± 1.9 (max=7) and 1.75 ± 1.1 (max=6), respectively. The average time between deployment of the first *estoque* and the death of the bull was determined as more than 2.4 minutes, with a maximum of 4.42 minutes. The *puntilla* did not result in immediate death; behavioral signs of distress (voluntary head shakings, asphyxia signs, wide eyes opening, etc.) were observed after its use in 85% of bulls, and 2.10 minutes of suffering was recorded in one case.

We would like to thank Humane Society International for allowing us the use of their video materials, namely the 28 videos analyzed for this report.



Recent advances in animal welfare science IV

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BARRIERS TO HORSE OWNERS ADOPTING MANAGEMENT PRACTICES TO IMPROVE HORSE WELFARE

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Horse management is variable and dependent on several factors. It has been shown that the welfare of domesticated horses can be affected by a number of management factors resulting in development of stereotypic behaviours. Horse owners may understand the effects of different management practices on stereotypies. However the barriers that prevent implementation of that understanding have not yet been studied. The aim of the present study was to investigate the factors influencing horse management practices in order to identify the barriers to adoption of welfare friendly management practices for horses. An online survey questionnaire was administered through the British Horse Society, online equine forums and social networking sites in summer 2013. A total of 406 (93% female) horse owners participated in the study. The questionnaire was based on different cognitive behavioural models and investigated occurrence of management practices, different types of knowledge, management motivations, attitudes towards equine welfare, and empathy towards horses (all measured on 6-point likert scales). A regression analysis where welfare-friendly horse management practices functioned as the dependent variable showed that management practices are predicted by motives ($\beta=-0.056$, $t=-4.05$, $p<0.001$), objective knowledge of equine welfare ($\beta=-0.161$, $t=-5.55$, $p<0.001$), social norms ($\beta=0.129$, $t=5.48$, $p<0.001$) and attitude towards equine welfare ($\beta=0.099$, $t=2.74$, $p<0.01$). All predictor variables explained 32.7% of the model's variance. The main motivational factor for management practices was concern about horse health ($M=5.87$, $SD = 0.48$) and welfare ($M=5.77$, $SD = 0.62$). Perceived social norm, including the influence of other people especially for yard stabling owners, clearly plays an important role in the management of horses. The greatest barrier to welfare friendly management practices seems to be the management of the yard and how much control horse owners have over yard management practices.