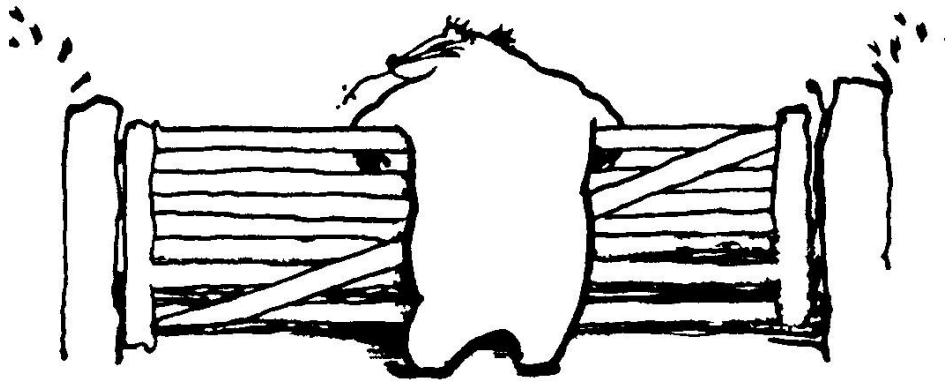
Recent advances in animal welfare science VIII



Scientific programme: Posters

UFAW Virtual Animal Welfare Conference

29th June -30th June 2021

#UFAW2021

UFAW
Established 1926

Science in the Service of Animal Welfare

Welcome to the Virtual UFAW Conference 2021

Welcome to UFAW's second online meeting. We are delighted that you can join us for what promises to be an exciting and engaging couple of days.

Switching to an online format has allowed us to reach a much larger and more global audience than we could at a face-to-face meeting, something we are incredibly excited about. We have attendees registered from at least 57 countries. The conference's scientific programme features our largest ever number of presentations exploring a huge range of animal welfare issues

The scientific poster programme comprises 119 posters. Links to access these can be found at the bottom of each abstract. Please use these to view the posters and leave comments for the authors to answer. You can also vote for the best poster - the winners and one lucky voter will win vouchers to spend on books from the UFAW/Wiley-Blackwell Animal Welfare book series.

We would like to thank all the participants for their contributions to the meeting.

Please help us keep these meetings free and open to all.

A special thank you goes to all those who, when registering, made a donation – thank you – your support is already making a difference. Spreading the message about animal welfare science as far and wide as possible is one of UFAW's key objectives. We make our meetings free to ensure access for those who could not otherwise attend. However, running our meetings is costly and involves an enormous effort from UFAW's staff. As a charity, supported entirely by donations, we can only keep meetings free and run our other activities with your support. If you are in a position to do so, please consider making a donation to make sure that we can continue to make our meetings free to attend for all.

Please join UFAW

UFAW is a membership society for all those who are interested in Animal Welfare Science. One of the best ways to support our work and stay up to date with our activities is to become a member of UFAW.

Membership currently costs just £30 or £10 for students .

ufaw.org.uk/membership

We would like to thank our publishing partner Wiley-Blackwell for their support. As part of your registration for this meeting Wiley-Blackwell are offering a discount of 20% on all the books in the UFAW/Wiley-Blackwell animal welfare book series (use the code VBT66 when you order from www.wiley.com).

We look forward to a thought-provoking couple of days and we hope that you all have an informative and enjoyable meeting.

Huw Golledge, Stephen Wickens, Birte Nielsen and Liz Carter
UFAW Organising Committee

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General Information

Organisers:
UFAW, the Universities Federation for Animal Welfare, is an UK based registered charity that works with the animal welfare science community worldwide to develop and promote improvements in the welfare of farm, companion, laboratory, captive wild animals and those with which we interact in the wild, through scientific and educational activity. To this end, UFAW:

- Promotes and supports developments in the science and technology that underpin advances in animal welfare, including the funding of research through its programme of grants, awards and scholarships.
- Promotes education in animal care and welfare.
- Provides information, organises symposia, conferences and meetings, publishes books, videos, technical reports and the international quarterly scientific journal *Animal Welfare*.
- Provides expert advice to governments and other organisations and helps to draft and amend laws and guidelines.
- Enlists the energies of animal keepers, scientists, veterinarians, lawyers and others who care about animals.

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 agreed, although it is not yet possible to prove absolutely, that many species are sentient - 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?

"Science informs, motivates and facilitates advances in animal welfare by providing a strong evidence base for changing attitudes and practices, and by creating practical and effective solutions to welfare problems."

UFAW promotes and supports a scientific approach aimed at finding ways to gain 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 legislation, professional 'best practice' or the actions of other organisations and individuals.

In promoting and supporting this scientific approach to improving welfare, UFAW's work is wide-ranging and undertaken with many other organisations and individuals - enlisting and informing the energies of animal keepers, scientists, veterinarians, lawyers and others who care about animals.

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

SCIENTIFIC PROGRAMME:

- List of posters
- List of posters (by area of study)
- Poster Abstracts

Recent advances in animal welfare science VIII
Virtual UFAW Animal Welfare Conference, 29th- 30th June 2021

List of posters:

1. **Alabi OM, FA Aderemi, MO Ayoola, BO Alabi, OS Iyasere and B Oyebanji** *(Bowen University, Federal University of Agriculture, Abeokuta and Obafemi Awolowo University, Nigeria)*
   Pecking among chickens: Is debeaking the best solution?
2. **Ali GL** *(Writtle University, UK)*
   The effects of Tayyib on the Halal meat industry. In UK consumer opinion do modern farming practises comply with the teachings of Quran and Hadith?
3. **Alonso WJ and C Schuck-Paim** *(The Welfare Metrics Project, Spain; Federal University of Santa Catarina, Brazil)*
   A novel framework for the quantification of pain and welfare assessment in animals
4. **Anderson KN, KJ Allen, A Baysinger, M Benjamin, J Berger, JR Claus, BJ Greco, B O'Brien, EA Pintens, A Ramirez, AA Reyes, PE Zhitnitskiy and KD Vogel** *(Universities of Wisconsin and Minnesota, Michigan State University, Merck Animal Health, Abbyland Pork Pack and Iowa State University, USA)*
   Relationship of tissue dimensions and three captive bolt application sites on cadaver heads from mature swine (*Sus scrofa domesticus*) > 200 kg body weight
5. **Arbel Y** *(Israeli Veterinary Services and Animal Health, Israel)*
   Import trends in 2011-2020 and its implication to the welfare of dogs during international air transport
6. **Azarpajouh S, L Boyle and JA Calderón Díaz** *(Independent researcher, USA; Teagasc, Ireland)*
   Cluster analysis of welfare indicators in group housed sows
7. **Baert S, DB Haley, R Bergeron, L Aubé, S Conte and N Devillers** *(University of Guelph and Agriculture and Agri-food Canada, Canada)*
   Thermoregulation strategies of sows housed outdoors in eastern Canada
8. **Baqueiro-Espinosa U, V McEvoy and G Arnott** *(Queen's University Belfast, UK)*
   Factors influencing ease of whelping and its relationship with maternal behaviour in commercial breeding dogs
9. **Barabas AJ, JR Lucas, MA Erasmus, HW Cheng and BN Gaskill** *(Purdue University, USA)*
   Validating measures of dominance in male laboratory mice to better understand home cage aggression
10. **Baumgartner K, F Delfour, T Hüttner, M Garcia Hartmann, D Garcia-Párraga, X Manteca, B Mercera, T Monreal-Pawlowsky, C Pilenga, K Ternes, O Tallo-Parra, L von Fersen and R Vaicekauskaite** *(Universitat Autònoma de Barcelona and Oceanográfic-Avanqua, Spain; Animaux et companies, MarLab, Parc Asterix and Fox Consulting, France; Zoo Nuremberg and Zoo Duisburg, Germany; IZVG, UK; Zoomarine Italia, Italy)*
    Dolphin-WET (Welfare Evaluation Tool): A protocol for the evaluation of bottlenose dolphins (*Tursiops truncatus*) welfare
11. **Bell L** *(University Centre Myerscough, UK)*
    Camera traps: Do they 'trap' data?
12. **Benneth EO, GO Adeyemo and OP Ajakaye** *(University of Ibadan, Nigeria)*
    The effect of varied dietary crude protein level with constant amino acid amount on egg quality characteristics of layers
13. **Bento TF, FC Resende and C Falcone** *(Brazilian Institute of Cancer – INCA, Instituto de Ciência e Tecnologia em Biomodelos – ICTB/FIOCRUZ and Instituto Israelita Albert Einstein – São Paulo, Brazil)*
    Strategies during the cage change to minimize stress
14. **Bertelsen T** *(Novo Nordisk AS, Denmark)*
    Culture of care in animal research
15. **Boddy ML, G Laws, D Moska, M Craven, T Boswell and TV Smulders** *(Newcastle University, UK)*
    Is chronic carbon tetrachloride treatment perceived as a chronic stressor by laboratory mice?
16. **Bolton OFD, GL Charlton and ECL Bleach** *(Harper Adams University, UK)*
    British farmers' perception of dairy cow-calf rearing in the UK
17. **Bouquet A, C Nicol, N Blackie, R Ferro De Godoy and M Díez-León** *(The Royal Veterinary College and Writtle University College, UK)*
    Maternal influences on foal behavioural stress indicators during artificial weaning
18. **Boys RM, EL Betty, NJ Beausoleil and KA Stockin** *(Massey University, New Zealand)*
    Ethology of stranded cetaceans in New Zealand: first insights for an a priori ethogram
19. **Britten NM and GP Pearce** *(University of Cambridge, UK)*
    Laterality is associated with different social strategies in dairy cattle
20. **Britten NM and GP Pearce** *(University of Cambridge, UK)*
    Left foot forward: left lateralised dairy cows are bolder and less neophobic
21. **Bystrova N and S Baskin** *(Russian Academy of Sciences, Russia; School of Applied Ethology, Haifa, Israel)*
    Pigs are kept as pets: Revealing problematic welfare areas
22. **Carnovale F and CJC Phillips** *(University of Queensland, Australia; Estonian University of Life Sciences, Estonia)*
    The effects of heat stress on sheep welfare during live export voyages from Australia to the Middle East

List of posters:

23. **Charalambous R and E Narayan** *(University of Queensland, Australia)*
Mapping baseline and elevated stress in captive and wild koala (*Phascolarctos cinereus*) populations through hormone analysis in an effort to improve welfare
24. **Chen M** *(University of British Columbia, Canada)*
Cattle welfare is basically human welfare: Workers' perceptions of animal welfare on two dairies in China
25. **Chen M, MAG von Keyserlingk, S Magliocco and DM Weary** *(University of British Columbia, Canada)*
Employee management and animal care: Ethnographies of two large-scale dairy farms in China
26. **Clark B and N Mahon** *(Newcastle University and University of Hull, UK)*
Creative engagement methods for exploring public perceptions of livestock health and welfare issues
27. **Clements N, RA Saunders and R Walters** *(Hartpury University and Rabbit Welfare Association and Fund, UK)*
Not like a rabbit in the headlights: Promoting positive welfare provision in rabbit veterinary practice
28. **Craven MJ, E De Haas, D Van Grembergen, T Boswell, JH Guy, FAM Tuyttens and TV Smulders** *(Newcastle University, UK; Flanders Research Institute for Agriculture, Fisheries and Food (ILVO), Belgium)*
Does footpad dermatitis induce a chronic negative welfare state in laying hens?
29. **Creagh K, JL Rault and S Hintze** *(University of Veterinary Medicine and University of Natural Resources and Life Sciences, Vienna, Austria)*
Tickled pink? The effect of long- and short-term positive human contact on pigs' judgement bias
30. **Crouch K, C Cabral, H Cramer, G Rees, D Sharp and D Barrett** *(University of Bristol and Aberystwyth University, UK)*
Exploring the use of complementary and alternative approaches on UK dairy farms
31. **Dancer AM, JK Bizley, M Díez-León and CC Burn** *(The Royal Veterinary College and University College London, UK)*
Are ferrets housed in conditions that help provide stimulation? Preliminary results from an international, cross sector questionnaire
32. **Duro S, C. Leeb and M. Mukaj** *(University of Tirana, Albania; University of Natural Resources and Life Sciences (BOKU), Austria)*
Preliminary on-farm welfare assessment of dairy goats in Albania
33. **Durosaro SO, OS Iyasere, TA Odubola, BM Ilori, VJ Oyeniran and MO Ozoje** *(Federal University of Agriculture, Abeokuta, Nigeria)*
Plumage colour genes and sexual dimorphism: Effects on welfare of Nigerian indigenous turkeys (*Meleagris gallopavo*)
34. **Eagan BH, Gordon E, Eagan B and Protopopova A** *(University of British Columbia, British Columbia Society for the Prevention of Cruelty to Animals and Independent Researcher, Canada)*
Validation of the use of computer vision technology for automatic cat behaviour monitoring in an animal shelter
35. **Eyraud C, M Valenchon, O Petit, M Prang, E Massol and O Adam** *(Université de Tours, Institut de recherche et coordination acoustique/musique and Sorbonne Université France; University of Bristol, UK)*
How to choose a music for horses?
36. **Eze, CA, KC Ogbanya, HN Okereke and CK Chukwu** *(University of Nigeria, Nsukka, Nigeria)*
Selected biochemical and electrolyte changes associated with selected food animals presented for slaughter
37. **Gábor A, N Kaszás, T Faragó, P Pérez Fraga, M Lovas and A Andics** *(Eötvös Loránd University, Hungary)*
How can your dog discriminate your voice from many others?
38. **Golightly HR, J Brown, R Bergeron, Z Poljak and TL O'Sullivan** *(University of Guelph and Prairie Swine Centre, Saskatoon, Canada)*
Comparison of injury, hydration, muscle strain and stress response in weaned piglets after long and short transport events
39. **Gorr SC, C Leeb, W Zollitsch, C Winckler and TD *Parsons*** *(University of Natural Resources and Life Sciences, Vienna, Austria; University of Pennsylvania, USA)*
Feeding systems for lactating sows: Effects on welfare and productivity of sows and piglets
40. **Grant C, T Boswell and TV Smulders** *(Newcastle University, UK)*
Adult hippocampal neurogenesis suppression, which is responsive to chronic stress in chickens, is associated with local inflammation
41. **Haddy E, J Brown, Z Raw, F Burden, J Kaminski and L Proops** *(University of Portsmouth and The Donkey Sanctuary, UK)*
Institutional analysis of attitudes to equid welfare initiatives
42. **Hancock A, E Narayan and C Driscoll** *(University of Queensland, Australia)*
Observations of horse welfare and horse emotional state during equine assisted interventions

List of posters:

43. **Ho J, S Hussain and O Sparagano** *(City University of Hong Kong, China; University of Veterinary and Animal Sciences, Lahore, Pakistan)*
Did the COVID-19 pandemic spark a wave of global interest in pet adoption?
44. **Hou AH and AP Protopopova** *(University of British Columbia, Canada)*
Predictors of surrender and adoption of pet rats in British Columbia, Canada
45. **Hussain S, A Hussain, J Ho, OAE Sparagano and UR Zia** *(University of Veterinary and Animal Sciences, Lahore, Pakistan; City University of Hong Kong, China)*
Economic and social impacts of COVID-19 on animal welfare and dairy husbandry in Central Punjab, Pakistan
46. **Iyasere OS, VJ Oyeniran, OD Ajayi, SO Durosaro, BC Majekodunmi, M Wheto, and JO Daramola** *(Federal University of Agriculture Abeokuta, Nigeria)*
Provision of artificial light at night for a short period affects the welfare of Nigerian indigenous chickens
47. **Johnson A, A Campbell, ME Persia, and L Jacobs** *(Virginia Polytechnic Institute and State University, USA)*
The impact of housing on fear and attention bias welfare indicators in laying hens
48. **Jones CT, A Pullin, R Blatchford, M Makagon and K Horback** *(University of California, Davis, USA)*
Effect of rearing environment on the development of spatial cognition in egg-laying hens
49. **Knight A and N Light** *(University of Winchester, UK; Griffith University, Australia)*
The nutritional soundness of meat- and plant-based pet foods
50. **Kogan LR and JA Oxley** *(Colorado State University, USA; University of Liverpool, UK)*
Laser play with cats and dogs – enrichment or endangerment?
51. **Konovalovaitė K, V Ribikauskas and J Kučinskienė** (Lithuanian University of Health Sciences Veterinary Academy, Lithuania)
Sound therapy for stress-relief during neutering procedure for female cats
52. **Ladejobi AK, M Wheto, OS Iyasere, SO Durosaro, VJ Oyeniran, DA Osinbowale, AK Osijo, AO Adebambo, OA Adebambo, AJ Shoyombo, OO Alabi, A Olayanju, A Yakuba, AO Olayinka, OH Osaiyumu, MA Popoola and CI Ukem** *(Federal University of Agriculture, Abeokuta, Landmark University, Omu Aran, University of Abuja, Nassarawa State University, University of Ibadan, National Biotechnology Development Agency, Abuja and Tertiary Education Trust Fund, Abuja, Nigeria)*
Role of age and plumage colour on the level of fear in guinea fowl keet
53. **LaFollette MR, S Cloutier, C Brady, ME O'Haire and BN Gaskill** *(Purdue University and The North American 3Rs Collaborative, USA; Independent Researcher, Ottawa, Canada)*
Training people to improve animal welfare: a longitudinal trial of laboratory animal personnel and rat tickling
54. **Lamb F, A Andrukonis and A Protopopova** *(University of British Columbia, Canada; Texas Tech University, USA)*
The role of online photo backgrounds of shelter/foster dogs on the perception of sociability in dogs
55. **Langbein J, K Rosenberger, N Keil and C Nawroth** *(Leibniz Institute for Farm Animal Biology, Germany; Centre for Proper Housing of Ruminants and Pigs, Agroscope Tänikon, Switzerland)*
Goat breeds with different breeding objectives differ in their behavioural flexibility
56. **Lanning S and LR Kogan** *(Colorado State University, USA)*
Teaching virtually from home – Let Alfie play
57. **Lauderdale LK, KA Shorter, D Zhang, J Gabaldon, JD Mellen, MT Walsh, DA Granger and LJ Miller** *(Chicago Zoological Society – Brookfield Zoo, Universities of Michigan, Florida and California and Portland State University, USA)*
Animal management factors and habitat characteristics associated with activity and habitat use by bottlenose dolphins in accredited zoological environments
58. **Lerch N, F Cirulli, C Rochais, C Lesimple, E Guilbaud, L Contalbrigo, M Borgi, M Grandgeorge and M Hausberger** *(University of Rennes, France; Istituto Superiore di Sanità, Rome and Istituto Zooprofilattico Sperimentale delle Venezie, Padua, Italy)*
Interest in humans: comparisons between riding school lesson equids and assisted-intervention equids
59. **Lindner EE, KN Gingerich and EK Miller-Cushon** *(University of Florida, USA)*
Effects of early social contact on dairy calf responses to initial grouping and subsequent regrouping
60. **Luke KL, A Rawluk and T McAdie** *(Central Queensland University and University of Melbourne, Australia)*
Equine welfare and human safety - time for a new conceptualisation and approach?
61. **Ly LH, E Gordon and A Protopopova** *(University of British Columbia and British Columbia Society for the Prevention of Cruelty to Animals, Canada)*
Exploring the relationship between human social deprivation and animal surrender to shelters in British Columbia, Canada
62. **Malkani R, E Tipton, V Betton, L James and S Wensley** *(PDSA, UK)*
The PDSA animal wellbeing (PAW) report: Use of animal welfare surveillance data to promote and monitor improvements in UK pet wellbeing

List of posters:

63. **Malkani R, S Wolfensohn and S Paramasivam** *(University of Surrey, UK)*
Development of the animal welfare assessment grid for dogs
64. **Manet MWE, S Kliphuis, RE Nordquist, V Goerlich-Jansson, FAM Tuyttens and TB Rodenburg** *(Utrecht and Wageningen University, The Netherlands Flanders Research Institute for agriculture, fisheries and food (ILVO) and Ghent University, Belgium)*
Brave breeds and brains under the spotlight: How do genetics and light during incubation impact young laying hens stress responsivity?
65. **Marcone G, P Piirsalu, T Kaart and D Arney** *(Estonian University of Life Sciences, Estonia)*
Panting score index to assess heat stress in sheep in Estonia
66. **Matrai E, ST Kwok, HYA Chan, FM Leung, Á Pogány and M Boos** *(Ocean Park, Hong Kong; Eötvös Loránd University, Hungary)*
Cognitive enrichments – a bridge between animal welfare, scientific advancement, conservation and education
67. **Mee G, E Tipton, JA Oxley and C Westgarth** *(University of Liverpool and PDSA, UK)*
Owner demographic factors are associated with adequate pet rabbit housing provision in the United Kingdom
68. **Mellor EL, M Mendl, G Mason, C Davison, Y van Zeeland and IC Cuthill** *(University of Bristol, UK; University of Guelph, Canada; Utrecht University, The Netherlands)*
Validating owner-reporting of feather condition of pet psittaciformes using photographs
69. **Mesarec N, M Prevolnik Povše, D Škorjanc and J Skok** *(University of Maribor, Slovenia)*
Social networks in a spontaneously mixed group of newly weaned piglets – a preliminary results
70. **Michaels CJ, BF Gini and L Clifforde** *(Zoological Society of London, UK)*
A persistent abnormal repetitive behaviour in a false water cobra (*Hydrodynastes gigas*)
71. ***Withdrawn***
72. **Montrose VT, LR Kogan and JA Oxley** *(Independent Researchers, UK; Colorado State University, USA)*
The role of social media in promoting organised dog fighting
73. **Nawroth C, K Rosenberger, N Keil and J Langbein** *(Leibniz Institute for Farm Animal Biology, Germany Agroscope Tänikon, Switzerland)*
Goats in a cognitive test battery – selection for production does not affect the interpretation of physical and social cues in goats
74. **Neave HW, CL Sumner, RJT Henwood, G Zobel, T Watson, H Thoday, K Saunders and J Webster** *(AgResearch Ltd, Ruakura and Lincoln Research Centres, RNZPCA and DairyNZ Ltd, New Zealand)*
Dairy farmers views on providing cow-calf contact in New Zealand
75. **Nogueira LB; R Palme and O Mendonça-Furtado** *(Universidade de São Paulo, Brazil; Institute of Physiology, Pathophysiology and Biophysics, Austria)*
Access to a toy or to lawn area for police dogs: effects on behaviour and stress physiology
76. **O'Brien C and J Pegg** *(University of Portsmouth and University Centre Sparsholt, UK)*
Ridden water submersion training a safer form of condition training in elite event horses?
77. **Obiasogu VO, PL Akinyemi and OJ Babayemi** *(University of Ibadan, Nigeria)*
Welfare and ethical issues on offloading of cattle in Akinyele market, Ibadan
78. **Odintsov Vaintrub M, L Cannito, C Ristori, L Lanzoni, M Chinacarini, I Fusaro, M Giammarco and G Vignola** *(University of Teramo and University G. D'Annunzio of Chieti-Pescara, Italy)*
Personality traits and experience, how it may influence equestrian s ability to assess pain in horses
79. **Ojelade OC, OS Iyasere, SO Durosaro, FF Oyebanji, I Abdulraheem and AO Akinde** *(Federal University of Agriculture, Abeokuta, Nigeria)*
Implication of being in isolation or not on the welfare of African catfish (*Clarias gariepinus*)
80. **Oyeniran VJ, OS Iyasere, SO Durosaro, DO Ajayi and JO Daramola** (Federal University of Agriculture, Abeokuta, Nigeria)
Responses of two age groups of Nigeria indigenous chicks to playback calls
81. **Pahuja H and E Narayan** *(University of Queensland, Australia)*
Categorizing stressors in rescued and rehabilitated Australian small reptiles in urban environment
82. **Papadaki K, GP Laliotis, P Koutsouli and I Bizelis** *(University of Athens, Greece)*
Differences in sheep vocal characteristics at weaning
83. **Paterson EA and PV Turner** *(University of Guelph, Canada; Charles River Laboratories, USA)*
Attitudes of veterinarians towards managing pain in research primates
84. **Paterson EA and PV Turner** *(University of Guelph, Canada; Charles River Laboratories, USA)*
Development of a primate welfare assessment tool for enhancing research animal care
85. **Ozkan G and M Petek** *(University of Bursa Uludag, Turkey)*
Live body weight, breast condition and welfare outcomes of a white laying hen housed in conventional cages
86. **Petró E, B Nagy and J Topál** *(Institute of Cognitive Neuroscience and Psychology, Hungary)*
Differential effects of social and non-social distractors on the touchscreen-based task performance of dogs with normal and low social skills

List of posters:

87. **Polla EJ** *(Perth Zoo, Australia)*
The importance of empirically assessing zoo animal enrichment programs to benefit animal welfare
88. **Prasad S, R van Vliet and E Vasseur** *(McGill University, Canada)*
Enrichment practices for nonhuman primates (NHPS) in laboratory settings: a systematic review
89. **Ramos CP, YM Seddon, B Sullivan, L Maignel, F Fortin and J Brown** *(University of Saskatchewan, Prairie Swine Centre, Saskatoon, Canadian Centre for Swine Improvement Inc, Ottawa and Centre de Développement du Porc du Québec, Québec, Canada)*
Survey of Canadian producers on factors related to sow mortality and culling
90. **Ricci-Bonot C, D Mills, C Nicol and T Romero** *(Lincoln University and The Royal Veterinary College, UK)*
Impact of substituted companion horse during stressful situations
91. **Rodrigues MS and N Hanley** *(University of Glasgow, UK)*
Disentangling farm animal health from farm animal welfare: A study on UK consumer preferences
92. **Russell AL, LV Randall, N Bollard, J Kaler, J Gibbons and M Green** *(University of Nottingham and Agriculture and Horticulture Development Board, Kenilworth, UK)*
A behavioural study to evaluate positive welfare in dairy cows
93. **Sans ECO, MM Vale, FMC Vieira, ES Vismara and CFM Molento** *(Federal University of Paraná and Federal University of Technology (UTFPR), Paraná Brazil)*
In-barn heterogeneity of broiler chicken welfare in two industrial house designs and two seasons in southern Brazilian subtropical climate
94. **Santiago Gonzalez K, T Boswell and TV Smulders** *(Newcastle University, UK)*
Hippocampal immediate–early gene induction and HPA-axis activation in response to acute stress in chickens
95. **Schneidewind SJ, V Heizmann, A Lange and I Windschnurer** *(University of Veterinary Medicine Vienna, Austria)*
Pet rat behaviour towards caretakers relates to housing conditions and human-animal interactions
96. **Schuck-Paim C and WJ Alonso** *(The Welfare Metrics Project, Spain; Federal University of Santa Catarina, Brazil)*
Quantifying the welfare of commercial layers in different indoor housing systems and the impact of the transition to cage-free housing
97. **Seganfreddo S, M De Santis, M Galardi, S Normando and L Contalbrigo** *(Istituto Zooprofilattico Sperimentale delle Venezie and University of Padova, Italy)*
Donkeys in the classroom: Investigation of donkeys' learning capabilities through an operant conditioning
98. **Smith A** *(Norecopa, Norway)*
PREPARING, CARING, SHARING and FLAGGING: The scientific and welfare benefits of increased collaboration and transparency
99. **Stamm FO, F Napolitano, CFM Molento, G De Rosa, AM Riviezzi, M Carvalhal and M Zopollatto** *(Federal University of Paraná and Faculdade de Ensino Superior da Amazônia Reunida, Redenção, Brazil; Università degli Studi dela Basilicata, Potenza and Università degli Studi di Napoli Federico II, Portici, Italy)*
Opinion on the relevance of dairy buffalo welfare indicators according to experts, Brazilians and Italians respondents
100. **Stamm FO, GOPA Pinto, GC Santos, VS Soriano, CFM Molento, JL Martinez, JFG Warth and M Zopollatto** *(Federal University of Paraná, Pontifical Catholic University of Paraná (PUCPR) and Paraná Rural Development Institute, Brazil)*
Correlation between dairy buffalo neutrophil:lymphocyte ratio and selected welfare indicators
101. **Tarakdjian J, K Capello, D Pasqualin, A Santini, G Cunial, A Scollo, A Mannelli, P Tomao, N Vonesch and G Di Martino** *(Istituto Zooprofilattico Sperimentale delle Venezie, Swivet Research, Reggio Emilia, University of Torino and Italian Workers' Compensation Authority (INAIL), Rome, Italy)*
Can welfare-friendly practices reduce antimicrobial need in pig farming?
102. **Tedds HL, S Sneddon, R Clubb, J Ollerton, E Iskhakov and WD McCormick** *(University of Northampton, RSPCA, Independent Researcher and Hartpury University, UK)*
Classified information: What's lacking from online herpetofauna sales?
103. **Thys M, M Valckx, S Vanden Berghe, L Vandaele, B Ampe and F Tuyttens** *(Flanders Research Institute for Agriculture, Fisheries and Food, Belgium)*
Effects of low stress stockmanship training on behaviour of stockpersons and dairy cows
104. **Tivey E, J Martin, V Poon, S Brown, V Bishop, V Bombail, B Nielsen, A Lawrence and S Meddle** *(University of Edinburgh and SRUC, UK; INRA, Jouy-en-Josas, France)*
Using the rat tickling model to investigate the neural correlates of positive affective states in female and male juvenile Wistar rats
105. **Ugwu N, E Love, J Murrell, HR Whay, TG Knowles and J Hockenhull** *(University of Bristol, UK; National University of Ireland, Ireland)*
Assessment of eye blink rate changes associated with disbudding in dairy calves

List of posters:

106. **Ugwu N, E Love, J Murrell, HR Whay, TG Knowles and J Hockenhull** *(University of Bristol, UK; National University of Ireland, Ireland)*
Assessment of eye blink rate changes following calf restraint in a crush
107. **Ursinus WW, JH Bongers, AM Voogt and DTHM Sijm** *(Netherlands Food and Consumer Product Safety Authority, The Netherlands)*
A mobile slaughter unit can reduce cow welfare risks
108. **van Staaveren N, J Pessoa, L Boyle and JA Calderón Díaz** *(University of Guelph, Canada; Teagasc Animal and Grassland Research and Innovation Centre, Cork and University College Dublin, Ireland)*
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Associations between damaging behaviours and their respective lesions during the weaner-finisher period in a farrow-to-finish pig farm
110. **Vandresen B and MJ Hötzel** *(Universidade Federal de Santa Catarina, Brazil)*
Brazilian dog owners attitudes towards dog euthanasia
111. **Veloso M, CS Lima, P Duarte-Coelho, C Sousa Santos and P Rachinas-Lopes** *(ISPA – Instituto Universitário and Marine and Environmental Sciences Centre, Lisbon, Portugal)*
On the impact of fin clipping in swimming patterns; a preliminary study using a model fish species
112. **Von Rentzell K, K Van Haaften, A Morris and A Protopopova** *(University of British Columbia, British Columbia SPCA and Vancouver Humane Society, Vancouver, Canada)*
Investigation into owner-reported differences between dogs born versus imported into Canada
113. **Voit M, R Merle, K Baumgartner, LV Fersen, L Reese, Me Ladwig-Wiegard, H Will, O Tallo-Parra, A Carbajal, M Lopez-Bejar and C Thöne-Reineke** *(Freie Universität Berlin and Tiergarten Nürnberg, Germany; Universitat Autònoma de Barcelona, Spain; Western University of Health Sciences, USA)*
Validation of an alternative feather sampling method to measure corticosterone
114. **Webb LE, F Marcato, EAM Bokkers, C Verwer, M Wolthuis-Fillerup, F Hoorweg, H van den Brand and CG van Reenen** *(Wageningen University & Research, The Netherlands)*
Impact of dam rearing on veal calves
115. **Whalin L, JR Webster, MAG von Keyserlingk, DM Weary and G Zobel** *(University of British Columbia, Canada; AgResearch Ltd., Ruakura Research Centre, New Zealand)*
Effects of pasture access on pre-weaned dairy calves in New Zealand
116. **Winans MM, K Cole, M Flint, and KA George** *(The Ohio State University, USA)*
Measuring the effect of transport on marine mammal welfare through salivary cortisol concentrations
117. **Woodward JL, EL Buckland, JK Murray, REP Da Costa and RA** Casey *(Dogs Trust, UK)*
Back to school: Exploring the reasons why adopters do not plan to take their recently adopted dog to training classes
118. **Woody SM, RM Santymire and KA Cronin** *(Lincoln Park Zoo, Chicago, USA)*
Exploring the use of novel tools for assessing welfare in American toads (*Anaxyrus americanus*)
119. **Yamanashi Y, K Hitoosa, N Yoshida, H Masuda, Y Sato, F Kano, Y Ikkatai and H Sakamoto** *(Kyoto City Zoo, Kyoto University, Kyoto City University of Arts, Advanced Science, Technology & Management Research Institute of Kyoto, Ryukoku University and The University of Tokyo, Japan)*
Do chimpanzees enjoy interactive arts? The potential use of interactive technologies as a form of environmental enrichment for zoo-housed chimpanzees (*Pan troglodytes*)
120. **Zinina O and S Baskin** *(Russian Academy of Sciences, Moscow, Russia; School of Applied Ethology, Haifa, Israel)*
Invading habitats of female bears with cubs: how to decrease the risk of conflict

General

3. Alonso WJ and C Schuck-Paim *(The Welfare Metrics Project, Spain; Federal University of Santa Catarina, Brazil)*
A novel framework for the quantification of pain and welfare assessment in animals
98. Smith A *(Norecopa, Norway)*
PREPARING, CARING, SHARING and FLAGGING: The scientific and welfare benefits of increased collaboration and transparency

Farm

1. A Alabi OM, FA Aderemi, MO Ayoola, BO Alabi, OS Iyasere and B Oyebanji *(Bowen University, Federal University of Agriculture, Abeokuta and Obafemi Awolowo University, Nigeria)*
Pecking among chickens: Is debeaking the best solution?
2. Ali GL *(Writtle University, UK)*
The effects of Tayyib on the Halal meat industry. In UK consumer opinion do modern farming practises comply with the teachings of Quran and Hadith?
4. Anderson KN, KJ Allen, A Baysinger, M Benjamin, J Berger, JR Claus, BJ Greco, B O'Brien, EA Pintens, A Ramirez, AA Reyes, PE Zhitnitskiy and KD Vogel *(Universities of Wisconsin and Minnesota, Michigan State University, Merck Animal Health, Abbyland Pork Pack and Iowa State University, USA)*
Relationship of tissue dimensions and three captive bolt application sites on cadaver heads from mature swine (*Sus scrofa domesticus*) > 200 kg body weight
6. Azarpajouh S, L Boyle and JA Calderón Díaz *(Independent researcher, USA; Teagasc, Ireland)*
Cluster analysis of welfare indicators in group housed sows
7. Baert S, DB Haley, R Bergeron, L Aubé, S Conte and N Devillers *(University of Guelph and Agriculture and Agri-food Canada, Canada)*
Thermoregulation strategies of sows housed outdoors in eastern Canada
12. Benneth EO, GO Adeyemo and OP Ajakaye *(University of Ibadan, Nigeria)*
The effect of varied dietary crude protein level with constant amino acid amount on egg quality characteristics of layers
16. Bolton OFD, GL Charlton and ECL Bleach *(Harper Adams University, UK)*
British farmers' perception of dairy cow-calf rearing in the UK
19. Britten NM and GP Pearce *(University of Cambridge, UK)*
Laterality is associated with different social strategies in dairy cattle
20. Britten NM and GP Pearce *(University of Cambridge, UK)*
Left foot forward: left lateralised dairy cows are bolder and less neophobic
28. Craven MJ, E De Haas, D Van Grembergen, T Boswell, JH Guy, FAM Tuyttens and TV Smulders *(Newcastle University, UK; Flanders Research Institute for Agriculture, Fisheries and Food (ILVO), Belgium)*
Does footpad dermatitis induce a chronic negative welfare state in laying hens?
29. Creagh K, JL Rault and S Hintze *(University of Veterinary Medicine and University of Natural Resources and Life Sciences, Vienna, Austria)*
Tickled pink? The effect of long- and short-term positive human contact on pigs' judgement bias
30. Crouch K, C Cabral, H Cramer, G Rees, D Sharp and D Barrett *(University of Bristol and Aberystwyth University, UK)*
Exploring the use of complementary and alternative approaches on UK dairy farms
32. Duro S, C. Leeb and M. Mukaj *(University of Tirana, Albania; University of Natural Resources and Life Sciences (BOKU), Austria)*
Preliminary on-farm welfare assessment of dairy goats in Albania
33. Durosaro SO, OS Iyasere, TA Odubola, BM Ilori, VJ Oyeniran and MO Ozoje *(Federal University of Agriculture, Abeokuta, Nigeria)*
Plumage colour genes and sexual dimorphism: Effects on welfare of Nigerian indigenous turkeys (*Meleagris gallopavo*)
36. Eze, CA, KC Ogbanya, HN Okereke and CK Chukwu *(University of Nigeria, Nsukka, Nigeria)*
Selected biochemical and electrolyte changes associated with selected food animals presented for slaughter
38. Golightly HR, J Brown, R Bergeron, Z Poljak and TL O'Sullivan *(University of Guelph and Prairie Swine Centre, Saskatoon, Canada)*
Comparison of injury, hydration, muscle strain and stress response in weaned piglets after long and short transport events
39. Gorr SC, C Leeb, W Zollitsch, C Winckler and TD *Parsons* *(University of Natural Resources and Life Sciences, Vienna, Austria; University of Pennsylvania, USA)*
Feeding systems for lactating sows: Effects on welfare and productivity of sows and piglets
40. Grant C, T Boswell and TV Smulders *(Newcastle University, UK)*
Adult hippocampal neurogenesis suppression, which is responsive to chronic stress in chickens, is associated with local inflammation

45. Hussain S, A Hussain, J Ho, OAE Sparagano and UR Zia *(University of Veterinary and Animal Sciences, Lahore, Pakistan; City University of Hong Kong, China)*
Economic and social impacts of COVID-19 on animal welfare and dairy husbandry in Central Punjab, Pakistan
46. Iyasere OS, VJ Oyeniran, OD Ajayi, SO Durosaro, BC Majekodunmi, M Wheto, and JO Daramola *(Federal University of Agriculture Abeokuta, Nigeria)*
Provision of artificial light at night for a short period affects the welfare of Nigerian indigenous chickens
47. Johnson A, A Campbell, ME Persia, and L Jacobs *(Virginia Polytechnic Institute and State University, USA)*
The impact of housing on fear and attention bias welfare indicators in laying hens
48. Jones CT, A Pullin, R Blatchford, M Makagon and K Horback *(University of California, Davis, USA)*
Effect of rearing environment on the development of spatial cognition in egg-laying hens
52. Ladejobi AK, MO Wheto, OS Iyasere, SO Durosaro, V Oyeniran, DA Osinbowale, AK Osijo, AO Adebambo, OA Adebambo, SA John, OA Olafadehan, A Olayanju, Y Abdulmojeed, AO Olayinka, OO Henry, M Popoola and CI Ukem *(Federal University of Agriculture, Abeokuta, Landmark University, Omu Aran, University of Abuja, Nassarawa State University, University of Ibadan, National Biotechnology Development Agency, Abuja and Tetiary Education Trust Fund, Abuja, Nigeria)*
Role of age and plumage colour on the level of fear in guinea fowl keet
55. Langbein J, K Rosenberger, N Keil and C Nawroth *(Leibniz Institute for Farm Animal Biology, Germany; Centre for Proper Housing of Ruminants and Pigs, Agroscope Tänikon, Switzerland)*
Goat breeds with different breeding objectives differ in their behavioural flexibility
59. Lindner EE, KN Gingerich and EK Miller-Cushon *(University of Florida, USA)*
Effects of early social contact on dairy calf responses to initial grouping and subsequent regrouping
64. Manet MWE, S Kliphuis, RE Nordquist, V Goerlich-Jansson, FAM Tuyttens and TB Rodenburg *(Utrecht and Wageningen University, The Netherlands Flanders Research Institute for agriculture, fisheries and food (ILVO) and Ghent University, Belgium)*
Brave breeds and brains under the spotlight: How do genetics and light during incubation impact young laying hens stress responsivity?
65. Marcone G, P Piirsalu, T Kaart and D Arney *(Estonian University of Life Sciences, Estonia)*
Panting score index to assess heat stress in sheep in Estonia
73. Nawroth C, K Rosenberger, N Keil and J Langbein *(Leibniz Institute for Farm Animal Biology, Germany Agroscope Tänikon, Switzerland)*
Goats in a cognitive test battery – selection for production does not affect the interpretation of physical and social cues in goats
74. Neave HW, CL Sumner, RJT Henwood, G Zobel, T Watson, H Thoday, K Saunders and J Webster *(AgResearch Ltd, Ruakura and Lincoln Research Centres, RNZPCA and DairyNZ Ltd, New Zealand)*
Dairy farmers views on providing cow-calf contact in New Zealand
77. Obiasogu VO, PL Akinyemi and OJ Babayemi *(University of Ibadan, Nigeria)*
Welfare and ethical issues on offloading of cattle in Akinyele market, Ibadan
79. Ojelade OC, OS Iyasere, SO Durosaro, FF Oyebanji, I Abdulraheem and AO Akinde *(Federal University of Agriculture, Abeokuta, Nigeria)*
Implication of being in isolation or not on the welfare of African catfish (*Clarias gariepinus*)
80. Oyeniran VJ, OS Iyasere, SO Durosaro, DO Ajayi and JO Daramola (Federal University of Agriculture, Abeokuta, Nigeria)
Responses of two age groups of Nigeria indigenous chicks to playback calls
82. Papadaki K, GP Laliotis, P Koutsouli and I Bizelis *(University of Athens, Greece)*
Differences in sheep vocal characteristics at weaning
85. Ozkan G and M Petek *(University of Bursa Uludag, Turkey)*
Live body weight, breast condition and welfare outcomes of a white laying hen housed in conventional cages system
89. Ramos CP, YM Seddon, B Sullivan, L Maignel, F Fortin and J Brown *(University of Saskatchewan, Prairie Swine Centre, Saskatoon, Canadian Centre for Swine Improvement Inc, Ottawa and Centre de Développement du Porc du Québec, Québec, Canada)*
Survey of Canadian producers on factors related to sow mortality and culling
91. Rodrigues MS and N Hanley *(University of Glasgow, UK)*
Disentangling farm animal health from farm animal welfare: A study on UK consumer preferences
92. Russell AL, LV Randall, N Bollard, J Kaler, J Gibbons and M Green *(University of Nottingham and Agriculture and Horticulture Development Board, Kenilworth, UK)*
A behavioural study to evaluate positive welfare in dairy cows
93. Sans ECO, MM Vale, FMC Vieira, ES Vismara and CFM Molento *(Federal University of Paraná and Federal University of Technology (UTFPR), Paraná Brazil)*
In-barn heterogeneity of broiler chicken welfare in two industrial house designs and two seasons in southern Brazilian subtropical climate
94. Santiago Gonzalez K, T Boswell and TV Smulders *(Newcastle University, UK)*
Hippocampal immediate–early gene induction and HPA-axis activation in response to acute stress in chickens

96. Schuck-Paim C and WJ Alonso *(The Welfare Metrics Project, Spain; Federal University of Santa Catarina, Brazil)*
Quantifying the welfare of commercial layers in different indoor housing systems and the impact of the transition to cage-free housing
99. Stamm FO, F Napolitano, CFM Molento, G De Rosa, AM Riviezzi, M Carvalhal and M Zopollatto *(Federal University of Paraná and Faculdade de Ensino Superior da Amazônia Reunida, Redenção, Brazil; Università degli Studi dela Basilicata, Potenza and Università degli Studi di Napoli Federico II, Portici, Italy)*
Opinion on the relevance of dairy buffalo welfare indicators according to experts, Brazilians and Italians respondents
100. Stamm FO, GOPA Pinto, GC Santos, VS Soriano, CFM Molento, JL Martinez, JFG Warth and M Zopollatto *(Federal University of Paraná, Pontifical Catholic University of Paraná (PUCPR) and Paraná Rural Development Institute, Brazil)*
Correlation between dairy buffalo neutrophil:lymphocyte ratio and selected welfare indicators
101. Tarakdjian J, K Capello, D Pasqualin, A Santini, G Cunial, A Scollo, A Mannelli, P Tomao, N Vonesch and G Di Martino *(Istituto Zooprofilattico Sperimentale delle Venezie, Swivet Research, Reggio Emilia, University of Torino and Italian Workers' Compensation Authority (INAIL), Rome, Italy)*
Can welfare-friendly practices reduce antimicrobial need in pig farming?
103. Thys M, M Valckx, S Vanden Berghe, L Vandaele, B Ampe and F Tuyttens *(Flanders Research Institute for Agriculture, Fisheries and Food, Belgium)*
Effects of low stress stockmanship training on behaviour of stockpersons and dairy cows
105. Ugwu N, E Love, J Murrell, HR Whay, TG Knowles and J Hockenhull *(University of Bristol, UK; National University of Ireland, Ireland)*
Assessment of eye blink rate changes associated with disbudding in dairy calves
106. Ugwu N, E Love, J Murrell, HR Whay, TG Knowles and J Hockenhull *(University of Bristol, UK; National University of Ireland, Ireland)*
Assessment of eye blink rate changes following calf restraint in a crush
107. Ursinus WW, JH Bongers, AM Voogt and DTHM Sijm *(Netherlands Food and Consumer Product Safety Authority, The Netherlands)*
A mobile slaughter unit can reduce cow welfare risks
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113. Voit M, R Merle, K Baumgartner, LV Fersen, L Reese, Me Ladwig-Wiegard, H Will, O Tallo-Parra, A Carbajal, M Lopez-Bejar and C Thöne-Reineke *(Freie Universität Berlin and Tiergarten Nürnberg, Germany; Universitat Autònoma de Barcelona, Spain; Western University of Health Sciences, USA)*
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Effects of pasture access on pre-weaned dairy calves in New Zealand

Equine

17. Bouquet A, C Nicol, N Blackie, R Ferro De Godoy and M Díez-León *(The Royal Veterinary College and Writtle University College, UK)*
Maternal influences on foal behavioural stress indicators during artificial weaning
35. Eyraud C, M Valenchon, O Petit, M Prang, E Massol and O Adam *(Université de Tours, Institut de recherche et coordination acoustique/musique and Sorbonne Université France; University of Bristol, UK)*
How to choose a music for horses?
41. Haddy E, J Brown, Z Raw, F Burden, J Kaminski and L Proops *(University of Portsmouth and The Donkey Sanctuary, UK)*
Institutional analysis of attitudes to equid welfare initiatives
42. Hancock A, E Narayan and C Driscoll *(University of Queensland, Australia)*
Observations of horse welfare and horse emotional state during equine assisted interventions
58. Lerch N, F Cirulli, C Rochais, C Lesimple, E Guilbaud, L Contalbrigo, M Borgi, M Grandgeorge and M Hausberger *(University of Rennes, France; Istituto Superiore di Sanità, Rome and Istituto Zooprofilattico Sperimentale delle Venezie, Padua, Italy)*
Interest in humans: comparisons between riding school lesson equids and assisted-intervention equids
60. Luke KL, A Rawluk and T McAdie *(Central Queensland University and University of Melbourne, Australia)*
Equine welfare and human safety - time for a new conceptualisation and approach?

76. O'Brien C and J Pegg *(University of Portsmouth and University Centre Sparsholt, UK)*
Ridden water submersion training a safer form of condition training in elite event horses?
78. Odintsov Vaintrub M, L Cannito, C Ristori, L Lanzoni, M Chinacarini, I Fusaro, M Giammarco and G Vignola *(University of Teramo and University G. D'Annunzio of Chieti-Pescara, Italy)*
Personality traits and experience, how it may influence equestrian s ability to assess pain in horses
90. Ricci-Bonot C, D Mills, C Nicol and T Romero *(Lincoln University and The Royal Veterinary College, UK)*
Impact of substituted companion horse during stressful situations
97. Seganfreddo S, M De Santis, M Galardi, S Normando and L Contalbrigo *(Istituto Zooprofilattico Sperimentale delle Venezie and University of Padova, Italy)*
Donkeys in the classroom: Investigation of donkeys' learning capabilities through an operant conditioning

Companion

5. Arbel Y *(Israeli Veterinary Services and Animal Health, Israel)*
Import trends in 2011-2020 and its implication to the welfare of dogs during international air transport
8. Baqueiro-Espinosa U, V McEvoy and G Arnott *(Queen's University Belfast, UK)*
Factors influencing ease of whelping and its relationship with maternal behaviour in commercial breeding dogs
21. Bystrova N and S Baskin *(Russian Academy of Sciences, Russia; School of Applied Ethology, Haifa, Israel)*
Pigs are kept as pets: Revealing problematic welfare areas
27. Clements N, RA Saunders and R Walters *(Hartpury University and Rabbit Welfare Association and Fund, UK)*
Not like a rabbit in the headlights: Promoting positive welfare provision in rabbit veterinary practice
31. Dancer AM, JK Bizley, M Díez-León and CC Burn *(The Royal Veterinary College and University College London, UK)*
Are ferrets housed in conditions that help provide stimulation? Preliminary results from an international, cross sector questionnaire
34. Eagan BH, Gordon E, Eagan B and Protopopova A *(University of British Columbia, British Columbia Society for the Prevention of Cruelty to Animals and Independent Researcher, Canada)*
Validation of the use of computer vision technology for automatic cat behaviour monitoring in an animal shelter
37. Gábor A, N Kaszás, T Faragó, P Pérez Fraga, M Lovas and A Andics *(Eötvös Loránd University, Hungary)*
How can your dog discriminate your voice from many others?
43. Ho J, S Hussain and O Sparagano *(City University of Hong Kong, China; University of Veterinary and Animal Sciences, Lahore, Pakistan)*
Did the COVID-19 pandemic spark a wave of global interest in pet adoption?
44. Hou AH and AP Protopopova *(University of British Columbia, Canada)*
Predictors of surrender and adoption of pet rats in British Columbia, Canada
49. Knight A and N Light *(University of Winchester, UK; Griffith University, Australia)*
The nutritional soundness of meat- and plant-based pet foods
50. Kogan LR and JA Oxley *(Colorado State University, USA; University of Liverpool, UK)*
Laser play with cats and dogs – enrichment or endangerment?
51. Konovalovaitė K, V Ribikauskas and J Kučinskienė (Lithuanian University of Health Sciences Veterinary Academy, Lithuania)
Sound therapy for stress-relief during neutering procedure for female cats
54. Lamb F, A Andrukonis and A Protopopova *(University of British Columbia, Canada; Texas Tech University, USA)*
The role of online photo backgrounds of shelter/foster dogs on the perception of sociability in dogs
56. Lanning S and LR Kogan *(Colorado State University, USA)*
Teaching virtually from home – Let Alfie play
61. Ly LH, E Gordon and A Protopopova *(University of British Columbia and British Columbia Society for the Prevention of Cruelty to Animals, Canada)*
Exploring the relationship between human social deprivation and animal surrender to shelters in British Columbia, Canada
62. Malkani R, E Tipton, V Betton, L James and S Wensley *(PDSA, UK)*
The PDSA animal wellbeing (PAW) report: Use of animal welfare surveillance data to promote and monitor improvements in UK pet wellbeing
63. Malkani R, S Wolfensohn and S Paramasivam *(University of Surrey, UK)*
Development of the animal welfare assessment grid for dogs
67. Mee G, E Tipton, JA Oxley and C Westgarth *(University of Liverpool and PDSA, UK)*
Owner demographic factors are associated with adequate pet rabbit housing provision in the United Kingdom

72. Montrose VT, LR Kogan and JA Oxley *(Independent Researchers, UK; Colorado State University, USA)*
The role of social media in promoting organised dog fighting
75. Nogueira LB; R Palme and O Mendonça-Furtado *(Universidade de São Paulo, Brazil; Institute of Physiology, Pathophysiology and Biophysics, Austria)*
Access to a toy or to lawn area for police dogs: effects on behaviour and stress physiology
86. Petró E, B Nagy and J Topál *(Institute of Cognitive Neuroscience and Psychology, Hungary)*
Differential effects of social and non-social distractors on the touchscreen-based task performance of dogs with normal and low social skills
95. Schneidewind SJ, V Heizmann, A Lange and I Windschnurer *(University of Veterinary Medicine Vienna, Austria)*
Pet rat behaviour towards caretakers relates to housing conditions and human-animal interactions
110. Vandresen B and MJ Hötzel *(Universidade Federal de Santa Catarina, Brazil)*
Brazilian dog owners attitudes towards dog euthanasia
112. Von Rentzell K, K Van Haaften, A Morris and A Protopopova *(University of British Columbia, British Columbia SPCA and Vancouver Humane Society, Vancouver, Canada)*
Investigation into owner-reported differences between dogs born versus imported into Canada
117. Woodward JL, EL Buckland, JK Murray, REP Da Costa and RA Casey *(Dogs Trust, UK)*
Back to school: Exploring the reasons why adopters do not plan to take their recently adopted dog to training classes

Laboratory

9. Barabas AJ, JR Lucas, MA Erasmus, HW Cheng and BN Gaskill *(Purdue University, USA)*
Validating measures of dominance in male laboratory mice to better understand home cage aggression
13. Bento TF, FC Resende and C Falcone *(Brazilian Institute of Cancer – INCA, Instituto de Ciência e Tecnologia em Biomodelos – ICTB/FIOCRUZ and Instituto Israelita Albert Einstein – São Paulo, Brazil)*
Strategies during the cage change to minimize stress
14. Bertelsen T *(Novo Nordisk AS, Denmark)*
Culture of care in animal research
15. Boddy ML, G Laws, D Moska, M Craven, T Boswell and TV Smulders *(Newcastle University, UK)*
Is chronic carbon tetrachloride treatment perceived as a chronic stressor by laboratory mice?
53. LaFollette MR, S Cloutier, C Brady, ME O'Haire and BN Gaskill *(Purdue University and The North American 3Rs Collaborative, USA; Independent Researcher, Ottawa, Canada)*
Training people to improve animal welfare: a longitudinal trial of laboratory animal personnel and rat tickling
83. Paterson EA and PV Turner *(University of Guelph, Canada; Charles River Laboratories, USA)*
Attitudes of veterinarians towards managing pain in research primates
84. Paterson EA and PV Turner *(University of Guelph, Canada; Charles River Laboratories, USA)*
Development of a primate welfare assessment tool for enhancing research animal care
88. Prasad S, R van Vliet and E Vasseur *(McGill University, Canada)*
Enrichment practices for nonhuman primates (NHPS) in laboratory settings: a systematic review
104. Tivey E, J Martin, V Poon, S Brown, V Bishop, V Bombail, B Nielsen, A Lawrence and S Meddle *(University of Edinburgh and SRUC, UK; INRA, Jouy-en-Josas, France)*
Using the rat tickling model to investigate the neural correlates of positive affective states in female and male juvenile Wistar rats
111. Veloso M, CS Lima, P Duarte-Coelho, C Sousa Santos and P Rachinas-Lopes *(ISPA – Instituto Universitário and Marine and Environmental Sciences Centre, Lisbon, Portugal)*
On the impact of fin clipping in swimming patterns; a preliminary study using a model fish species

Wild and captive wild animals

10. Baumgartner K, F Delfour, T Hüttner, M Garcia Hartmann, D Garcia-Párraga, X Manteca, B Mercera, T Monreal-Pawlowsky, C Pilenga, K Ternes, O Tallo-Parra, L von Fersen and R Vaicekauskaite *(Universitat Autònoma de Barcelona and Oceanográfic-Avanqua, Spain; Animaux et companies, MarLab, Parc Asterix and Fox Consulting, France; Zoo Nuremberg and Zoo Duisburg, Germany; IZVG, UK; Zoomarine Italia, Italy)*
Dolphin-WET (Welfare Evaluation Tool): A protocol for the evaluation of bottlenose dolphins (*Tursiops truncatus*) welfare
11. Bell L *(University Centre Myerscough, UK)*
Camera traps: Do they 'trap' data?
18. Boys RM, EL Betty, NJ Beausoleil and KA Stockin *(Massey University, New Zealand)*
Ethology of stranded cetaceans in New Zealand: first insights for an a priori ethogram
23. Charalambous R and E Narayan *(University of Queensland, Australia)*
Mapping baseline and elevated stress in captive and wild koala (*Phascolarctos cinereus*) populations through hormone analysis in an effort to improve welfare

57. Lauderdale LK, KA Shorter, D Zhang, J Gabaldon, JD Mellen, MT Walsh, DA Granger and LJ Miller *(Chicago Zoological Society – Brookfield Zoo, Universities of Michigan, Florida and California and Portland State University, USA)*
Animal management factors and habitat characteristics associated with activity and habitat use by bottlenose dolphins in accredited zoological environments

66. Matrai E, ST Kwok, HYA Chan, FM Leung, Á Pogány and M Boos *(Ocean Park, Hong Kong; Eötvös Loránd University, Hungary)*
Cognitive enrichments – a bridge between animal welfare, scientific advancement, conservation and education

68. Mellor EL, M Mendl, G Mason, C Davison, Y van Zeeland and IC Cuthill *(University of Bristol, UK; University of Guelph, Canada; Utrecht University, The Netherlands)*
Validating owner-reporting of feather condition of pet psittaciformes using photographs

69. Mesarec N, M Prevolnik Povše, D Škorjanc and J Skok *(University of Maribor, Slovenia)*
Social networks in a spontaneously mixed group of newly weaned piglets – a preliminary results

70. Michaels CJ, BF Gini and L Clifforde *(Zoological Society of London, UK)*
A persistent abnormal repetitive behaviour in a false water cobra (*Hydrodynastes gigas*)

81. Pahuja H and E Narayan *(University of Queensland, Australia)*
Categorizing stressors in rescued and rehabilitated Australian small reptiles in urban environment

87. Polla EJ *(Perth Zoo, Australia)*
The importance of empirically assessing zoo animal enrichment programs to benefit animal welfare

102. Tedds HL, S Sneddon, R Clubb, J Ollerton, E Iskhakov and WD McCormick *(University of Northampton, RSPCA, Independent Researcher and Hartpury University, UK)*
Classified information: What's lacking from online herpetofauna sales?

116. Winans MM, K Cole, M Flint, and KA George *(The Ohio State University, USA)*
Measuring the effect of transport on marine mammal welfare through salivary cortisol concentrations

118. Woody SM, RM Santymire and KA Cronin *(Lincoln Park Zoo, Chicago, USA)*
Exploring the use of novel tools for assessing welfare in American toads (*Anaxyrus americanus*)

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Do chimpanzees enjoy interactive arts? The potential use of interactive technologies as a form of environmental enrichment for zoo-housed chimpanzees (*Pan troglodytes*)

120. Zinina O and S Baskin *(Russian Academy of Sciences, Moscow, Russia; School of Applied Ethology, Haifa, Israel)*
Invading habitats of female bears with cubs: how to decrease the risk of conflict

PECKING AMONG CHICKENS; IS DEBEAKING THE BEST SOLUTION?

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Pecking is one of the social vices among chickens and it is an unpleasant behavior in response to bad welfare conditions. Many factors have been reported to be likely causes such as high stocking density, rearing of chickens of different ages together, uneven growth among the chickens of the same flock (poor uniformity), nutrient deficiencies, bad environmental condition and poor housing systems. Pecking is not limited to chickens on deep litter housing system alone but has been reported among those housed inside conventional cages also. Pecking usually lead to wound inflictions, death of chickens and or eventual cases of cannibalism. Beak trimming otherwise known as debeaking is the traditional method of controlling pecking and it is the reduction of the length of the upper and lower beak of the chickens. It is usually done with the use of scissors, clippers, hot knives and use of debeaking machine. Beak trimming is not only painful, it is a stressful act on the chicken; leads to severe blood loss, inflicts permanent injury on the birds and can lead to high mortality regardless of the age done. Alternative methods of controlling pecking are proper stocking density, good nutrition, proper housing. Meanwhile, beak trimming is still a “must do” operation in pullets rearing in developing countries specifically in Nigeria hence this review that it contributes to bad welfare condition of the chickens and therefore not the best method to solve pecking problems in poultry production.

Go to poster: .pdf or comment

Back / *F*

THE EFFECTS OF TAYYIB ON THE HALAL MEAT INDUSTRY. IN UK CONSUMER OPINION DO MODERN FARMING PRACTISES COMPLY WITH THE TEACHINGS OF QURAN AND HADITH

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Accelerated growth of the Halal industry along with increased knowledge of Halal* slaughter requirements and the concept of Tayyib** has invited industry professionals and government departments to pay close attention to the development of Halal standards and guidance under UK Government WATOK guidelines and Animal welfare legislation. UK Halal standards are no longer determined exclusively by Islamic dietary laws and the slaughter process, but also animal rearing, welfare and honest labelling to give consumers full transparency.

Broader analysis of religious guidance within Islam directs us to the plausibility that a Tayyib standard has a quality more intricate than the current Halal requirements. Current modern farming practices and halal standards not only compromise the teachings of Tayyib within the holy text, but UK Halal monitoring does not take into consideration animal rearing only from the slaughter process. Recent research and discussion from a religious perspective have brought to light that Tayyib should be integrated into Halal for Halal certification to even take place, This is where Halal certification bodies face their biggest modern challenge.

The application of this monitoring change would depend on understanding of Quran, knowledge of modern sciences and quality assurance systems, as well as a social change within the Muslim community when it comes to animal welfare in Islam and meat purchasing. Offering more ethically farmed Halal meat will operate as a tool for economic development but also serve as a safeguard to address food security and consumer transparency issues within the UK as well as provide spiritual and religious contentment within the Muslim community.

Recommendations include having 'Halal' defined within UK Law, with clear standards including animal welfare under WATOK guidelines.

Conferences inclusive of religious clerics, Halal monitoring organisations, Farmers, Animal scientists and government departments to present research, participation in discussion or agreement to determine which farming practices are considered a Tayyib process into order to comply with being Halal if all religious guidance, scientific knowledge and industry logistics are considered and should a Tayyib standard outside of the Organic realm be set to overcome restrictions due to Non- stun slaughter and Organic labelling currently under EU law.

*Halal, Lawful, Permissible, slaughtered as per Shari'a Law
** Tayyib, Clean, Wholesome, Nutritious

Go to poster: .pdf or comment

Back/ F

A NOVEL FRAMEWORK FOR THE QUANTIFICATION OF PAIN AND WELFARE ASSESSMENT IN ANIMALS

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To effectively improve the lives of the animals under human custody, a clear understanding of the impact of different living conditions and risk factors on animal welfare is essential to establish which policies and interventions should be ascribed priority, without burden shifting. But how to determine how much welfare loss is embedded in aversive conditions of different nature, so that they can be compared? For example, what is more unpleasant for a pig, chicken, or cow: enduring one hour of acute pain following a bone fracture or several hours in a state of hunger? What about conditions that do not involve obvious tissue damage or unmet physiological needs, such as the deprivation of behaviors animals are strongly motivated to perform? The assessment of pain and suffering in animals is notoriously complex, not only for being the outcome of multiple factors that vary across species, breeds and individuals, but also for being inherently constrained by the difficulties associated with assessing the private subjective experiences of nonverbal subjects. Here we present an analytical framework designed for the description and quantification of pain in animals. The framework translates evidence on the duration and intensity of the pain associated with different welfare harms to which animals are exposed to time spent in painful states of different intensities. It strives to describe pain (physical and psychological) in a way that is as truthful as possible to the individual's experience, grounded on observations of its manifestations and evolutionary reasoning. Discrete categories of pain intensity are defined based on the importance of the pain signal to promote adaptive behaviors and on the disruptive character of the pain experience. Information is recorded in a graphical interface, the Pain-Track, a time-series approach that dissects each aversive experience into its basic components (time segments) and attributes (intensities). For each harm, the time spent in each category of intensity can then be weighted by its estimated prevalence, providing an empirically sound measure of the magnitude of welfare loss endured by the average individual in the context of interest. The process is open to scrutiny at all stages, highlights existing knowledge gaps, and enables incorporating uncertainty about model parameters and their expected variability. The use of a common metric with real-world meaning (time in pain) enables determining the cumulative load of negative experiences over a period (or lifetime) and can help inform decision-making into those practices capable of improving welfare the most.

Go to poster: .pdf or comment

Back / *G*

RELATIONSHIP OF TISSUE DIMENSIONS AND THREE CAPTIVE BOLT APPLICATION SITES ON CADAVER HEADS FROM MATURE SWINE (*SUS SCROFA DOMESTICUS*) > 200 KG BODY WEIGHT

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The objective of this study was to contrast the soft tissue thickness, cranial thickness, total tissue thickness, and cross-sectional brain area from the common frontal captive bolt placement with the alternative temporal and behind ear placements for the captive bolt euthanasia of mature swine. Cadaver heads were obtained from 111 sows and 46 boars with estimated body weights greater than 200 kg from a regional slaughter establishment following electrical stunning. Heads were then assigned to the FRONTAL, TEMPORAL, or BEHIND EAR captive bolt placement treatments after cooling at 2-4° C for approximately 64 h. In sows, soft tissue thickness was less ($P < 0.05$) in the FRONTAL placement than the TEMPORAL and BEHIND EAR placements, (FRONTAL: 5.6 ± 0.2 mm, TEMPORAL: 52.2 ± 2.1 mm, BEHIND EAR: 59.1 ± 2.0 mm), cranial thickness was different ($P < 0.05$) between the three placements (FRONTAL: 47.1 ± 1.0 mm, TEMPORAL: 17.6 ± 1.7 mm, BEHIND EAR: 30.2 ± 1.6 mm), total tissue thickness was different ($P < 0.05$) between the three placements (FRONTAL: 52.7 ± 1.0 mm, TEMPORAL: 69.8 ± 1.4 mm, BEHND EAR: 89.3 ± 1.5 mm), and cross-sectional brain area was different ($P < 0.05$) between the three placements (FRONTAL: 4330.5 ± 86.9 mm^2, TEMPORAL: 1612.0 ± 130.1 mm^2, BEHIND EAR: 2769.8 ± 78.5 mm^2). In boars, soft tissue thickness was different ($P < 0.05$) between the three placements (FRONTAL: 6.4 ± 0.4 mm, TEMPORAL: 51.1 ± 3.1 mm, BEHIND EAR: 59.3 ± 2.3 mm), cranial thickness was different ($P < 0.05$) between the FRONTAL and TEMPORAL placements (FRONTAL: 34.8 ± 2.1 mm, TEMPORAL: 22.1 ±3.1 mm, BEHIND EAR: 31.6 ± 4.4 mm), total tissue thickness was different ($P < 0.05$) between the three placements (FRONTAL: 41.2 ± 2.1 mm, TEMPORAL: 73.2 ± 1.5 mm, BEHIND EAR: 90.9 ± 3.5 mm), and cross-sectional brain area was different ($P < 0.05$) between the three placements (FRONTAL: 4058.4 ± 144.6 mm^2, TEMPORAL: 1216.0 ± 109.3 mm^2, BEHIND EAR: 2467.5 ± 140.5 mm^2). Overall, the data suggest that the FRONTAL placement may have the greatest likelihood for successful euthanasia, due to the least total tissue thickness and greatest brain area, and as such may present less risk than the alternative TEMPORAL or BEHIND EAR placements.

Go to poster: .pdf or comment

Back / *F*

IMPORT TRENDS IN 2011-2020 AND ITS IMPLICATION TO THE WELFARE OF DOGS DURING INTERNATIONAL AIR TRANSPORT

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International transport of pet animals increased globally in recent years. However, in many countries, legislation regarding dogs' importation relates to health criteria only. IATA (International Air Transport Association) guidelines aimed to assure animal welfare obligated by many airlines and constitute the minimum standard for animals' air transport as part of the COUNCIL REGULATION (EC) No 1/2005 of the European Union concerning the protection of animals during transport.

In 2015, the legislation regarding animals' importation to Israel was changed and for the first time, welfare considerations were added to the legislation, beyond the health criteria. Hence enabling consideration such as cages size, length of the planned flight, and duration of stopovers and their location. These proved especially important during 2020 in light of the COVID-19 pandemic effects on the availability of flights. Therefore, puppies that were destined to arrive to Israel were sometimes forced to go through several countries before transport to Israel, and wait several weeks until finding a suitable flight option.

Over the last decade, there has been an increase in the import of dogs to Israel from 439 dogs imported during 2011 to 1793 dogs in 2020 – an increase of more than 400%. Most of which are of puppies for commercial purposes. In comparison, over the years 2011 to 2019, the increase in the number of registered dogs in Israel, which represents the natural increase in canine population, was 29% only. At the same time, an increase in the number of seizures of illegals dogs' importation to Israel can be seen: from 11 events with total of 12 dogs caught during 2019 to 16 events with total of 37 dogs in 2020, despite the limitation of international transport during the COVID-19 pandemic.

This increase in the number of imported dogs creates pressure on importers and pose a risk to the welfare of transported dogs. The most common violation to animal welfare documented was the density of pets imported in a single cage, co-transport of dogs that are incompatible to be transported together, and non-hygienic transport conditions.

Adding animal welfare requirements to the importation legislation, in addition to animal health requirements, and the inspection of these conditions in the borders as added to the Israeli legislation is significant in the face of increased number of dogs' importation.

Go to poster: .pdf or comment

Back / *C*

CLUSTER ANALYSIS OF WELFARE INDICATORS IN GROUP HOUSED SOWS

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The aim of this study was to characterise group housed sows on the basis skin and limbs lesions, and lameness scores at mixing. First parity sows (n = 160) were mixed into stable groups of eight unfamiliar individuals approximately 4 days after artificial insemination, housed on fully slatted concrete (n = 80) floor uncovered or covered with rubber slat mats (n = 80). Body condition score (BCS; 0 = emaciated to 5 = grossly fat) and leg conformation (1 = poor to 5 = normal) were scored at service. Lameness (0 = normal to 5 = severe), limb (i.e. wounds, bursitis, swellings and severe wounds/swellings; 0=normal to 6=severe) and skin (0=normal to 5=severe) lesions were recorded 24 to 72 h post-mixing. Hierarchical clustering on principal component analysis was done using the *FactoMineR* package in *R v3.6.3* to group sows according to their similarities for the different lesions scored. Lesion scores for each cluster were then compared using linear models. Multiple comparisons were performed using a Tukey adjustment. Three clusters were identified with skin lesions, bursitis and lameness score being the main variables contributing to the clustering of the sows. Leg conformation, BCS or floor type did not contribute to the clustering of sows. Sows in cluster 1 had similar skin lesion (mean ± SD) and lameness (8.2 ± 4.06 and 1.1 ± 0.55, respectively) scores compared with sows in cluster 2 (9.5 ± 4.20 and 1.3 ± 0.55, respectively) and these were lower than in sows in cluster 3 (16.8 ± 5.39 and 2.2 ± 0.56, respectively; $P < 0.05$). Similarly, bursitis scores were lower in sows in cluster 1 (2.9 ± 3.73) and cluster 3 (5.3 ± 0.56) when compared with sows in cluster 2 (12.0 ± 5.25; $P < 0.05$). Wounds, swelling and severe wounds and/or swelling scores differed between the three clusters ($P < 0.05$) with sows in cluster 1 having lower mean scores and sows in cluster 2 having the highest scores. In conclusion, sows with lower scores for skin lesions, a proxy for the aggression intensity at mixing also had lower lameness scores while sows with higher skin lesion scores will generally present higher scores for limb lesions. This is in line with aggression at mixing being a major risk factor for lameness and limb lesions such as wounds and swellings in-group housed sows.

Go to poster: .pdf or comment

Back / *F*

THERMOREGULATION STRATEGIES OF SOWS HOUSED OUTDOORS IN EASTERN CANADA

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Housing sows in a pasture-based system has many potential benefits. Compared to a typical indoor facility, outdoor systems require less capital investment, provide a more complex and spacious environment, and allow for a broader range of behaviour. However, pasture-based systems expose sows to variable weather and, in eastern Canada, summer conditions can lead to heat stress and negatively impact production parameters. The objective of this study was to describe the physiological response of gestating and lactating sows, living outdoors in Quebec, Canada during the summer, to different environmental conditions, and to determine which behaviours may be important to their thermoregulation. We housed six groups of 4 Yorkshire-Landrace sows from July to September in outdoor pens equipped with a wallow, shade structure, waterer, feed troughs, farrowing huts and access to a pasture. From week 15 of gestation to week 3 of lactation (inclusive), we recorded the location of each sow during 5 daily observation periods, each consisting of 15 consecutive scan samples, and additionally measured the sow's respiratory rate and mud cover at the end of each observation period. Simultaneously, we collected sow body temperature data with vaginal temperature loggers and monitored environmental conditions with temperature and humidity loggers to calculate the temperature humidity index (THI). During gestation, neither respiratory rate nor body temperature were influenced by THI (P= 0.1539 and 0.7898 respectively) or mud cover (P=0.2855 and 0.9354). However, in lactation, THI and mud cover interacted to influence respiratory rate (P=0.0061), while body temperature was impacted individually by THI (P=0.0161), and by mud cover (P=0.0061). In lactation, the percent of observations in the farrowing hut also had a positive relationship with respiratory rate (P=0.0090). Our findings suggest that lactating sows were more likely to show increases in respiratory rate and body temperature in warmer conditions than gestating sows, and that time in the farrowing hut may also be a risk factor for heat stress. However, mud cover may limit these physiological consequences when sows have access to a wallow.

Go to poster: .pdf or comment

Back / *F*

FACTORS INFLUENCING EASE OF WHELPING AND ITS RELATIONSHIP WITH MATERNAL BEHAVIOUR IN COMMERCIAL BREEDING DOGS

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Parturition is one of the most important stages in the reproductive cycle of the dam and a critical moment for the viability of the newborn puppy. Evidence in other mammals suggests that a difficult labour might influence maternal behaviour and the viability of the offspring during the first hours postpartum. To our knowledge, no previous studies have investigated how the difficulty of the whelping process may affect the onset of maternal behaviour in domestic dogs. The aims of this study were: a) to develop a behavioural index to measure ease of whelping (EoW) in dams maintained within a Commercial Breeding Establishment (CBE) environment, b) to investigate which environmental factors might influence the EoW process and c) to determine the relationship between environmental factors, EoW and maternal behaviour during the first 24 hours postpartum. Thirty dams from different breeds and crossbreeds were included in the study. Behaviour of dogs was observed starting 24 hours before delivery of the first pup and throughout the entire parturition process until birth of the last pup. Parturition duration, birth interval, and variables indicative of distress, restlessness, nesting behaviour and general activity were scored and included in a Principal Component Analysis to construct an Ease of Whelping Index. Following parturition, mother-pup interactions (nursing, licking and grooming pups, lying in contact with pups) were recorded during the first 24 hours postpartum. Generalized linear models showed that EoW was significantly affected by whelping season, litter size and dog origin (whether the dams were born within the CBE or bought in). Regarding maternal behaviour, average time spent by the mothers lying in contact with their pups was significantly affected by breed group and EoW. Mothers that experienced a more difficult parturition spent more time lying in contact with their pups during the first 24 hours after giving birth. Furthermore, there was a significant effect of breed group and origin of the dam on average nursing duration. This study is the first to investigate the relationship between EoW, environmental factors and maternal behavior. Results are especially relevant for the welfare of breeding dams maintained in large scale CBEs, where the staff-to-dog ratio might be insufficient to adequately manage multiple simultaneous parturitions.

Go to poster: .pdf or comment

Back / *C*

VALIDATING MEASURES OF DOMINANCE IN MALE LABOROATORY MICE TO BETTER UNDERSTAND HOME CAGE AGGRESSION

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Aggression among group housed male mice continues to challenge laboratory husbandry personnel because mitigation strategies are generally applied at the cage level without a good understanding of how these strategies affect the dominance hierarchy. Aggression is typically displayed by the dominant mouse targeting lower ranking subordinates; thus, strategies may be more successful if applied specifically to the dominant mouse. Unfortunately, social rank is infrequently assessed because observations or tests are time intensive. Several correlates of social status have been identified, but none have been directly compared to home cage behavior in standard housing. This study assessed the convergent validity of three dominance correlates (urinary darcin, tube test score, preputial gland to body length ratio) with wound severity and social ranking in the home cage using factor analysis and general linear models. Welfare checks for severe wounding were conducted daily to identify the mice that exceeded our humane endpoint criteria (wound >1 cm^2) for euthanasia. Static cages, containing aspen bedding and nesting material, were equally split between SJL (high aggression) and B6N-*Tyr$^{c\text{-}Brd}$ (moderate aggression)* strains and group sizes of 3 or 5 (N=24). However, data from five cages had to be excluded, four of which met the humane endpoint criteria. Home cage behavior was observed during the first study week and used to assign individual social rank. All occurrences of aggression were recorded per individual for one minute every five minutes across two 24 hour periods. Of the included cages, SJL displayed more aggression ($F_{1,14}$ = 6.22, P=0.026), but those that met the humane endpoint criteria were all B6N-*Tyr$^{c\text{-}Brd}$* cages. Group size did not impact aggression (P>0.05). During the second study week, urine was collected and darcin quantified; mice completed three rounds of tube tests; and preputial gland to body length ratio and postmortem wound severity were recorded. After controlling for strain and group size, darcin and preputial gland ratio had strong loadings on the same factor as home cage ranking (loadings greater than 0.64) and were significant predictors of home cage ranking (darcin: $F_{1,34}$ = 6.80, P=0.013; preputial ratio: $F_{1,36}$ = 26.74, P<0.001) showing strong convergent validity. Data from this study show that darcin and preputial gland ratio are representative of home cage social rank and can be practically applied when accounting for social status with aggression mitigation strategies. Identifying dominant males will improve mouse welfare by facilitating approaches to reduce inter-male aggression that specifically incorporate dominance status.

Go to poster: .pdf or comment

Back/ *L*

DOLPHIN-WET (WELFARE EVALUATION TOOL): A PROTOCOL FOR THE EVALUATION OF BOTTLENOSE DOLPHINS (*TURSIOPS TRUNCATUS*) WELFARE

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Guaranteeing best standards of animal welfare is not only an ethical duty for zoos and aquaria, but it is also crucial for the success of their conservation, education and research objectives.

In the past welfare assessment and management improvement mainly focused on how to decrease and/or to eliminate animals' negative experiences and to increase positive behaviours (i.e., affiliative, play and exploratory behaviours). Nowadays, the tendency in animal welfare protection and management is to ensure individuals' positive welfare balance making sure they exert agency in daily life, engage with their environment, solve problems, show a large behavioural repertoire and experience positive affective states. Therefore, the need for research on how to assess and how to improve the welfare of animals under professional care has become a central issue for zoos and aquaria.

In response to this demand the welfare committee of the European Association for Aquatic Mammals (EAAM) has united a group of experts on welfare science, cetacean biology and/or zoo medicine across Europe, with the aim to develop a protocol for the evaluation of bottlenose dolphin (*Tursiops truncatus*) welfare named Dolphin-WET (i.e. Dolphin Welfare Evaluation Tool). The integration of the multidimensional aspects of welfare is inspired by Mellor's Five Domains model (Mellor, 2016) and the protocol's hierarchical structure by the Welfare Quality®, following: overall welfare assessment > Principles > Criteria > Sub-criteria > Welfare indicators. Importantly, the present protocol prioritises animal-based indicators and it does not allow compensations between Principles or between Criteria or Sub-Criteria from the same Principle. Where one section (Sub-Criteria or Criteria) is missing or failing, the upper-related level cannot be considered optimal or fulfilled and will need to be addressed. Moreover, the protocol is intended to assess the welfare status of the dolphins not for a single point in time but covering a three-month period, by combining animal-based and resource-based indicators as well as information provided by records, questionnaires and surveys. The aim of the protocol is to provide a science-based tool for an objective welfare evaluation of dolphins under professional care. It can mainly be used for internal purposes as a regular welfare monitoring, including identification of welfare concerns, and daily welfare management. The protocol is currently under development and will be progressively scientifically validated within EAAM accredited facilities.

Go to poster: .pdf or comment

Back / W

CAMERA TRAPS: DO THEY 'TRAP' DATA?

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Elusive species can be difficult to observe in captivity due to their secretive nature and somewhat decreased activity level during diurnal observations. Furthermore, cathemeral, crepuscular or nocturnal species with irregular activity or high peaks of inactive behaviour during diurnal periods, provide are challenging. Remote-sensing cameras, or camera traps as they are more commonly known, provide a means for maximising observation and although routinely used in wildlife conservation they are used sparingly within zoos due to the practical challenges they face. This study aims to assess the pros and cons of using camera traps within the zoo setting whilst considering influential environmental factors which support or refute its application.

Observational data were collected using camera traps at Blackpool Zoo, UK for three aardvark (*Orycteropus afer*) to determine their practicality and usefulness as an observational tool. A standard Ltl Acorn 5210A wildlife camera was used in 42 observation sessions to record behaviour at five-minute intervals within; Trail A between 18:00-06:00 (GMT) for 24 sessions and Trail B between 20:00-00:00 for 18 observation sessions. For Trial A a maximum number of 144 images was planned and 48 for Trail B totalling 12,960 possible images for all aardvark. Aardvark activity was recorded when the camera was triggered and the specific behaviour noted with them deemed 'out of sight' if not triggered or individual aardvarks were not visible. Aardvark observed resting when triggered by a different aardvark were recorded as 'resting' and all other behaviour was recorded as per the study ethogram.

For all observations within both trials, the camera was triggered 56% of the time with a higher triggering rate during Trial B at 64% than Trail A at 54% respectively. A higher rate of 'active' behaviour was observed in Trial B at 61% of total triggered images and 37% in Trial A. Although study observation times differ the effectiveness of this type of sampling needs further consideration to ensure it is a fair representative of actual activity and behaviour. Beyond the control of the researcher, study flaws included technical problems such as trigger angle, positioning, storage and battery power failures and animal problems including aardvark disturbance. Despite unexpected novel behaviour observed, the success of this form of non-invasive monitoring therefore, is highly dependent upon many practical factors including observer access and animal disturbance which may deem this method unsuitable within a real-life zoo environment thus, further research is needed.

Go to poster: .pdf or comment

Back / W

THE EFFECT OF VARIED DIETARY CRUDE PROTEIN LEVEL WITH CONSTANT AMINO ACID AMOUNT ON EGG QUALITY CHARACTERISTICS OF LAYERS

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Some studies have shown that the nutrient density in commercial layers diet has no effect on their welfare or the external qualities of eggs produced, while others have reported that nutrient density to some extent has effect on the internal qualities of eggs. This study was done to determine an acceptable inclusion level of crude protein in the diet of commercial layers that will not be deleterious to the welfare of the birds, nor affect egg production or quality when the required amount of amino acids for the diet is unaltered. An eight weeks feeding trial was conducted on 240 Black Hacko birds at 25 weeks of age to examine the effect of feeding varied levels of dietary crude protein with constant amino acid amount on the egg quality characteristics of the birds. For the internal egg qualities, yolk depth, yolk width, albumen depth, and albumen width were monitored while for the external qualities, shell thickness at three sections of the eggs were monitored. The birds were randomly divided into five dietary treatments of eight birds per replicate and six replicates per treatment. Each dietary treatment had an inclusion level of crude protein at 15.96%, 15.02%, 14.04%, 13.05% and 12.05% representing treatments 1, 2, 3, 4 and 5 respectively with the amino acid amount (methionine – 0.10% and Lysine – 0.15%) kept constant across the treatments. Birds were weighed the evening prior to the start of the experiment and at the end of the eight weeks. There was no significant difference ($p>0.05$) between the treatments for yolk depth and width, albumen depth and width, shell thickness, average weight of eggs and total weight of eggs. In conclusion, low CP of 12.05% in the diet of commercial layers did not trigger any abnormalities in the behaviour of the birds nor impair the internal and external egg qualities which implies that CP inclusion level can be as low as 12.05% provided the required amino acid amount for their diet remains unaltered. Therefore, varying CP inclusion level between 15.96% – 12.05% in the diet of commercial layers will not negatively affect the welfare of the birds in terms of behaviour and production (egg quality parameters).

Go to poster: .pdf or comment

Back / *F*

STRATEGIES DURING THE CAGE CHANGE TO MINIMIZE STRESS

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Laboratory mice are constantly exposed to stress factors. Multiple studies have indicated that there is a correlation between cage change and physiologic and behavioural stress responses. The literature shows that mice mark their territories with pheromones eliminated in the urine and use the smell for communication. Cage changing, conducted every week or two, is constantly disturbing hierarchy and the areas where they determined to build their nests and waste disposal. It is commonly observed that after general husbandry procedures as cage changing, the animals express an increase of active and agonistic behaviors. The aim was to improve the cage change procedure, minimizing stress and promoting animal welfare. A maximum of five mice are keep in each cage and the cage change is performed weekly by the same technician, always starting at 07:00 a.m. with the immunodeficient strains, like NUDE or NSG. The material such as cages, water bottles and feed are organized following the unidirectional flow from clean to dirty. The animals are transferred from the dirty to the clean cages using with the cupped hand; a technique that has shown to minimize anxiety levels. The mice that are not yet adjusted to the cupped hand technique tend to escape and so they are keep quietly by the technician with hands closed for 15 seconds. Afterwards, the technician slowly opens her/his hands and the animals voluntarily move from the technician's hands to the clean cage containing nesting material by three pieces of paper towel offered in different ways (folded, rolled or crumpled) and one environmental enrichment by cardboard tunnels, igloo, among others. After the animals are placed in the clean cages, with the aid of an anatomical forceps, a sample of bedding is transferred from the dirty to the clean cage to six specific points: four corners and two sides. Thus, the odor of the animals remained in the same areas of the cage, reducing the disturbance of the microenvironment, and facilitating its recognition by the animals. After each cage change, the forceps is immersed in a disinfectant solution and air-dried in the exchange cabin until the next use. As results, it is expected to reduce the episodes of the hierarchical dispute between the males after cage changing and therefore, to decrease the stress and ameliorate the quality of life of the laboratory mice.

Go to poster: .pdf or comment

Back / *L*

CULTURE OF CARE IN ANIMAL RESEARCH

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EU Directive 2010/63 on the protection of animals used for scientific purposes encourages the promotion of a culture of care at research animal institutions. Guidance from the EU Commission points out that this will promote improved animal welfare, and therefore enhanced scientific outcomes. Such a culture gives all those involved in the establishment confidence that delivering high quality animal care and use practices is an important priority.

Culture of care is all about promoting a mind-set and behaviour that continuously and proactively works to progress and promote laboratory animal welfare and the Three Rs (Replacement, Reduction and Refinement of animal experiments). It should go to a level above and beyond a culture of compliance, and should also include a culture of challenge, so that all staff members have the confidence to raise difficult issues without fear of reprisals. Support at all levels, not least from management, is critical for its success.

Practical advice is needed on how to improve the culture of care. In 2016, an initiative was taken to establish an International Culture of Care Network. The aim of the Network is to produce, collate and disseminate such advice, and to give examples of approaches which have proved to be successful.

The Network has produced a website[1], with sections that explain the concept of a culture of care and its endorsement by the EU Directive 2010/63, and which include a Quick Start Guide for those who wish to improve the culture at their institution. The website also includes links to a range of resources produced by the Network and others.

The Network includes representatives from several personnel categories involved in animal research. Currently there are approximately 20 members from 14 countries; mostly in Europe but also overseas.

Go to poster: .pdf or comment

Back / *L*

[1] https://norecopa.no/coc

IS CHRONIC CARBON TETRACHLORIDE TREATMENT PERCEIVED AS A CHRONIC STRESSOR BY LABORATORY MICE?

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The Carbon Tetrachloride (CCl4) model in mice is used to aid the understanding of liver fibrosis in humans. As of yet, no severe long-term consequences have been associated with CCl4-induced liver fibrosis. However, research suggests there is evidence of some discomfort, such as oxidative stress and inflammatory responses. Repeated discomfort may lead to chronic stress and thus, it is important to research the effect of CCl4 to measure the welfare of mice in these studies. To test the extent to which CCl4 is having an effect, we used Adult Hippocampal Neurogenesis (AHN) as a proxy measure of chronic stress. Research suggests that chronic stress affects AHN in the subgranular zone (SGZ) of the dentate gyrus (of the hippocampus), specifically in the ventral hippocampal pole (vHp), which is involved in emotion (including stress) processing. We hypothesise CCl4-induced liver fibrosis is a source of chronic stress in mice and we predict CCl4-injections should reduce neurogenesis in the hippocampus, especially in the vHp. To provide context to our predictions, we compared 12 CCl4 mice (part of a liver fibrosis study) to 13 mice undergoing an unpredictable chronic mild stress (UCMS) protocol, known to reduce neurogenesis in the hippocampus, and to 15 control mice, which were kept in their home cages without only regular husbandry. If CCl4 induction aligns with the effects of chronic stress protocols, then such CCl4 liver fibrotic studies may be of detriment to the welfare of mice. We tested mice in the Open Field to test for anxiety and used immunohistochemistry to detect the proteins Doublecortin (DCX) and Brain-derived neurotrophic factor (BDNF), both markers of adult neurogenesis. Open field experiments showed that mice in the UCMS group spent significantly less time in the centre of the open field (i.e. they were more anxious) compared to the CCl4 group and controls ($p < .001$) with no difference in activity levels ($p = .082$). UCMS mice also entered the centre of the open field less frequently ($p < .001$). Body mass was also lower for UCMS mice ($p = .012$). Unexpectedly, however, the frequency of faecal pellets was higher for controls ($p = .016$). UCMS mice have lower DCX in the ventral hippocampus compared to controls ($p = .001$) and DCX was not lower in the CCl4 group ($p = .335$). A main effect of treatment was found in BDNF staining ($p = .036$). UCMS mice have darker BDNF staining than the other two groups in both dorsal and ventral hippocampus, and CCl4 mice did not differ from Controls. Our preliminary data suggest that liver fibrosis induction using CCl4 is much less stressful than UCMS, and therefore potentially not an important welfare problem.

Go to poster: .pdf or comment

Back / *L*

BRITISH FARMERS' PERCEPTION OF DAIRY COW-CALF REARING IN THE UK

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Assessing the British dairy farmers' perception towards cow-calf rearing is important in order to understand farmer uptake of alternative rearing strategies, and obstacles to doing so. Since the success of a rearing system depends on many factors, including stakeholder perception of the system, collaboration between scientific research and farmers is imperative to better understand the limitations of different cow-calf rearing systems, and the potential for their implementation on farm. It is common practice on British dairy farms to separate the cow and calf after birth to better facilitate the collection of saleable milk, however, the practice is increasingly criticised from the public and producers alike for potential negative impacts on animal welfare. Cow-calf rearing systems, whereby calves are reared either entirely or partly by the dam or foster cow, are gaining increasing interest however uptake of these systems in the UK is currently minimal and there is no clear consensus around the potential benefits or challenges of cow-calf rearing strategies. Researchers wanted to understand the reasons why farmers may use cow-calf rearing systems and why others do not, what they perceived were the main benefits or challenges of these, and whether they thought cow-calf rearing was a feasible option in modern dairy production. From interviewing 11 British dairy farmers using different calf rearing strategies, it became apparent that there was common themes and key disparities amongst producers. Depending on how farmers defined "animal welfare"; either from a production-based view of welfare, or a definition of welfare relating to "naturalness"– influenced how farmers perceived their calf rearing system and this influenced their perception of best practice. Farmers rearing calves on cows stated that calves had better growth, health, and welfare, and that "the calf reared by its mother is twice the calf reared by even the best calf rearer". Furthermore, many stated that they adopted this strategy to provide their animals a more natural life and that producing calves in what they perceived was a more "ethical" way was a priority for them. Conventional farmers expressed concerns around the potential financial impacts of cow-calf rearing, perceived lack of control during the milk feeding period, particularly surrounding colostrum management and impacts on calf health, and the potential to increase separation stress, which they felt negatively impacted welfare in cow-calf rearing systems. Nevertheless, conventional farmers stated that foster cow rearing was a preferred option for rearing calf with cow providing uptake was incentivised.

Go to poster: .pdf or comment

Back / *F*

MATERNAL INFLUENCES ON FOAL BEHAVIOURAL STRESS INDICATORS DURING ARTIFICIAL WEANING

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In the equine industry, artificial weaning often occurs when the foal's age is between four to six months and is recognised to be one of the most stressful events in a horse's life with potential deleterious effects compromising both short- and long-term welfare. In other species, maternal behaviour during early life influences offspring stress reactivity, yet little is known of the effects that mare behaviour might have on foal welfare at weaning. We therefore tested the hypothesis that foals from mares who exhibited higher levels of maternal behaviour post-partum spend less time locomoting and fewer vocalisations at weaning. Maternal behaviour (foal-directed licking) within the first hour post-partum of 11 mares was recorded via CCTV footage across three studs. The study population comprised eight multiparous and three primiparous mares of which six were Thoroughbreds and five were Warmbloods. The responses (vocalisations, locomotion) of their foals (n = 11) to artificial weaning (at 4-6 months of age) were also live-recorded from point of dam-offspring separation and continued for four hours. Locomotion and resting behaviour of foals was assessed by instantaneous sampling at 10min intervals, while maternal licking and foal vocalisations were assessed by *ad hoc* focal sampling and continuous recording. Preliminary results indicate that foals who spent more time at locomotion following weaning also had higher vocalisation frequencies ($r_S(9) = 0.945$, $p < 0.001$). There was considerable variation in the amount of maternal licking experienced by foals in the first hour post-partum (M=73.45±12.37 SEM). There was also high variation in the amount of vocalising (108.73±38.75), time spent locomoting (37.27±9.35) and resting (15.91±4.46) performed by foals at weaning. Preliminary data analyses, as assessed by GLM, revealed that maternal foal-directed licking has a significant effect on foal vocalisation frequency at weaning ($F(1,5) = 24.377$, $p = 0.004$), while there was no effect of studs ($F(1,5) = 5.917$) or foal age at weaning ($F(1,5) = 5.600$) on vocalisation frequency at weaning. There was no interaction between stud and maternal foal-directed licking ($F(1,5) = 2.171$). Additional on-going analyses will identify if maternal welfare at weaning (vocalisation frequency and time spent locomoting) is modulated by maternal behaviour post-partum as well as if maternal vocalisation is correlated with their offspring vocalisations at weaning. The statistically significant correlation between foal locomotion and vocalisations confirms either variable is a reliable behavioural indicator to assess artificial weaning stress. To conclude, these results provide baseline information on maternal influences on foal stress responses at weaning, while continuing work will replicate the study with a larger sample size in order to test our hypothesis with more statistical power.

Go to poster: .pdf or comment

Back / *E*

ETHOLOGY OF STRANDED CETACEANS IN NEW ZEALAND: FIRST INSIGHTS FOR AN *A PRIORI* ETHOGRAM

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New Zealand has an international reputation for its high incidence of cetacean strandings and human intervention at these events. However, matters of animal welfare, including effects of human manipulation remain unknown. In order to address this, fine-scale empirical data on the ethology of stranded cetaceans is reported here. We describe and quantify the behavioural and physiological events displayed at a recent cetacean stranding and examine for effects of human intervention. Two individuals were filmed (x̄=150mins, SD=60mins) using two GoPro Hero 7 cameras mounted cranio-laterally and angled caudally. Effects of human intervention were investigated by assessing event duration with human presence/absence and manipulations (watering, rolling, touching, noise, digging, reflex tests). A total of 6,634 animal events were recorded in program BORIS, involving 19 different behavioural/physiological indicators. Animal 1 and 2 displayed 18 and 12 of these classified events, respectively, with 11 of the events displayed by both individuals. The frequency and duration of events varied significantly between individuals and over time. When examining differences in events displayed by the animals during human intervention, no significant differences were found. However, during particular manipulations (noise, rolling and digging) certain events showed a higher probability of occurrence for both individuals. For example, head side to side had an average probability of occurrence of 0.96 vs 0.33 during and in absence of human noise. These data provide the first insights into the ethology of stranded cetacea and can be used to build an *a priori* ethogram for the assessment of future stranding events.

Go to poster: .pdf or comment

Back / W

LATERALITY IS ASSOCIATED WITH DIFFERENT SOCIAL STRATEGIES IN DAIRY CATTLE

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Laterality refers to a consistent bias towards using one side of the body due to stimuli processing and control from within the contralateral brain hemisphere (lateralisation). The right hemisphere (left side of body) processes novel and stressful stimuli and the left hemisphere (right side of body) processes non-stressful stimuli. Cattle have been reported to show more right eye-use in aggressive interactions and more left eye-use in affiliative interactions and the degree to which this is shown varies between individuals. Identifying consistent laterality of behaviours in individuals could therefore be used as a means of reducing negative social behaviours (aggression) and promoting positive social behaviours (affiliation) to maximise group social stability.

595 social interactions (displacement, pushing, butting, threats and allogrooming) between 130 lactating Holstein cows were recorded over 2 hours following feed delivery on 31 days over 10 weeks. Social interaction networks were constructed for each type and direction of interaction as well as identity of adjacent animals at feeding. Network centrality was quantified using eigenvectors. Laterality of eye use, direction of movement and limb use in initiating movement during runway, crush, flight speed, novel arena, startle, novel object and human approach tests were recorded. Laterality index was quantified by assigning right lateralised behaviour a score of 1, left lateralised behaviour a score of -1 and taking the mean. Absolute laterality index was quantified as the number of times a lateralised behaviour was observed as a proportion of all observations.

Laterality index was positively correlated with network centrality in both allogrooming (P=0.04, Fig.1) and adjacent animals at feeding (P=0.01) networks. Absolute laterality index was positively correlated with network centrality in both displacement (P=0.05, Fig.2) and adjacent animals at feeding (P<0.001) networks and absolute laterality index in eye use was negatively correlated with centrality in the allogrooming network (P=0.05, Fig.3).

These results indicate that laterality is a strong predictor of the degree of social interactions occurring in dairy cattle. Cows showing right sided (left brain hemisphere) laterality engaged in more affiliative behaviours and cows showing greater lateralised behaviour (higher absolute laterality indices) engaged in more aggressive behaviour whereas cows with low degrees of lateralised behaviour engaged in more allogrooming behaviour. This suggests that quantifying the degree of lateralised behaviour could be used as a practical on-farm method to predict aggressive and affiliative social behaviour in order to manage group dynamics to promote positive and minimise negative social interactions in dairy cattle.

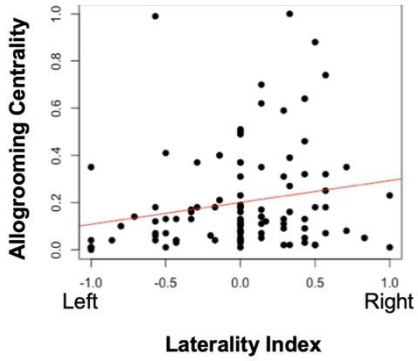

Figure 1: Laterality and Allogrooming

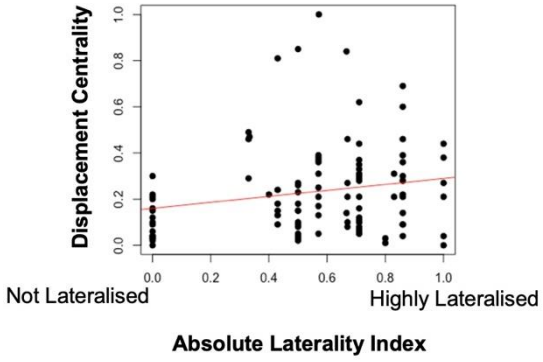

Figure 2: Absolute Laterality and Displacement

Go to poster: .pdf or comment

Back / F

LEFT FOOT FORWARD: LEFT LATERALISED DAIRY COWS ARE BOLDER AND LESS NEOPHOBIC

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Consistent variation in behaviour between individuals can be quantified as a series of temperament traits using standardised behavioural tests. Animals of different temperaments have different neuroendocrine and behavioural responses to stimuli which can impact on individual health and welfare. Consistent variation in behaviour can also be seen in animals that show a bias towards using one side of the body due to stimuli processing and control from within the contralateral brain hemisphere - a situation known as lateralisation. Identifying the relationship between lateralised behaviour and temperament in cattle could provide a practical means of identifying different temperament traits.

Temperament was quantified in 130 lactating Holstein cows using runway, crush, flight speed, novel arena, startle, novel object and human approach tests. The lateralisation of social interactions in these animals during feeding (displacement, pushing, butting, threats and allogrooming) was recorded over 2 hours following feed delivery at 8:30am. Principal component analysis (PCA) was used to categorise test responses into temperament traits. Laterality index was quantified by assigning right lateralised behaviour a score of +1, left lateralised behaviour a score of -1 and taking the mean. Absolute laterality index was quantified as the number of times that a lateralised behavioural response was observed as a proportion of all observations. Laterality in social interactions was quantified using a χ^2 test as predominately left, right or neutral.

PCA produced 6 traits representing the temperament characteristics of activity, sociability, neophobia, exploration, shyness/boldness and vocalisation. Laterality index for behaviours shown in all tests had a significant positive correlation with neophobia (P=0.03, Fig.1) as did laterality index of eye use (P=0.009, Fig.2). Absolute laterality index across all tests had a significant negative correlation with boldness (P=0.04, Fig.3) and individuals showing right-sided laterality during social interactions demonstrated significantly lower boldness in temperament tests (P=0.03, Fig.4).

The results of this study indicate that the presence and degree of lateralised behaviour in individual cattle are significant predictors of the temperament traits neophobia (right body side / left hemisphere lateralisation) and boldness (left body side / right hemisphere lateralisation and degree of absolute lateralisation). This suggests that quantifying the occurrence of lateralisation in dairy cattle may be a simple way to differentiate different temperament types in on-farm situations.

Go to poster: .pdf or comment *Back* / *F*

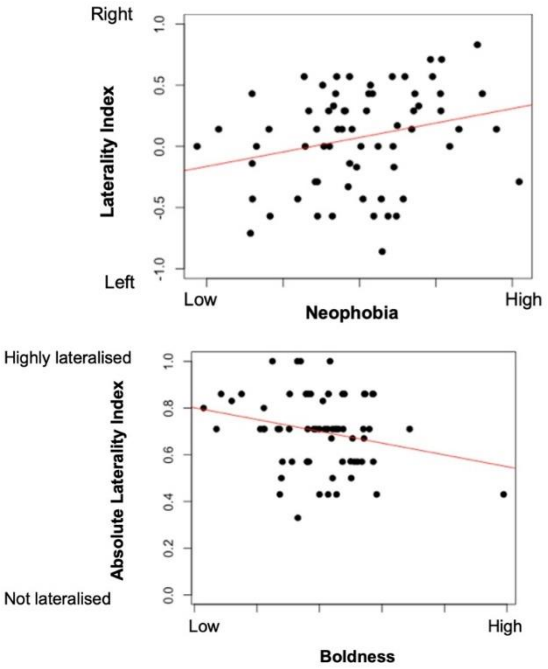

Figure 3: Absolute Laterality Index and Boldness

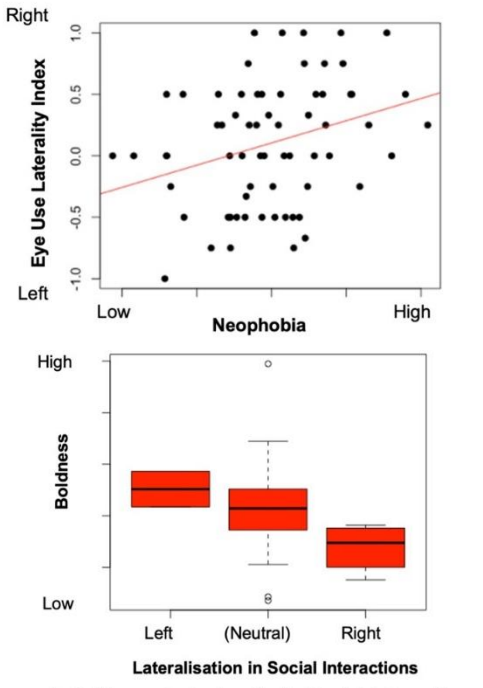

Figure 4: Boldness by Laterality in Social Interactions

PIGS ARE KEPT AS PETS: REVEALING PROBLEMATIC WELFARE AREAS

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In order to identify the risks to the well-being of minipigs in families, we conducted 15 interviews. The physical condition of the minipig was assessed during the interview. The questionnaire was compiled based on the Pig Welfare Quality Assessment Protocol (by European Welfare Quality Network). There were 10 male pigs and 5 females, all males were castrated, all females were not. Minipigs' ages ranged from 3 months to 10.5 years, weight ranged from 1.4 kg to 90 kg. Four families keep a minipig in the house, 11 - in an apartment. The questionnaires had covered 5 main welfare principles and 12 welfare criteria related to them. Freedom from hunger and thirst: all criteria were met. Freedom from injury and disease: pigs were generally healthy, but most of the owners were concerned about the availability of qualified veterinarian help. The issue of pain relief during castration and immobilization measures during canine teeth and hoof trimming remains unregulated. None of the pigs had their tails cut off, ears hurt or any wounds on their bodies. Freedom from discomfort: all pigs were kept inside, they were given a special place and heaters. Eleven animals were allowed to sleep on the owners' beds. None of the pigs showed any bursitis, shoulder lesions or bedsores. Freedom to express normal behaviour: no pig had the opportunity to communicate with conspecifics. Seven pigs never left the apartment during the winter season or walked less often than once a week. The owners expressed a desire to walk more, but the stairs and fear of cold were the main obstacles to walking. Only 4 pigs were trained to go down stairs. This problem has also limited access to veterinarian assistance. Freedom from fear and distress: 9 minipigs played with toys or were trick-trained, 3 interacted with other animals in the house. Most often minipigs were afraid of loud noises. The owners did not try to overcome this fear, but passively avoided situations in which the animal encountered a trigger. Thus, welfare concerns are different from farm pigs, and also from pet animals like dogs and cats. The global spread of information on preventing and correction of minipig behavioral problems among owners, as well as communicating the code of practices to veterinary clinics can contribute to overcoming the welfare issues of minipigs.

Go to poster: .pdf or comment

Back / *C*

THE EFFECTS OF HEAT STRESS ON SHEEP WELFARE DURING LIVE EXPORT VOYAGES FROM AUSTRALIA TO THE MIDDLE EAST

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One of the world's longest sea journeys with sheep transport is from Australia to the Middle East. There is a particular risk to animal welfare in voyages departing Australia in the Southern Hemisphere winter and arriving in the Persian Gulf in the Middle East after about 15 days, into the Northern Hemisphere summer, because of the rapid transition from cold to hot temperatures. The threshold temperature when welfare problems occur is not well understood. The indicators used to predict and analyse the stress during the voyagers were collected on 14 shipments, including temperature and the number of sheep that died travelling from Australia to the Middle East in the May to December period, between 2016 and in 2018. Data modelling suggested heat stress of sheep was detected in 50% of voyages especially between July and September offloading sheep at two of four Persian Gulf ports. In Doha, the hottest port presented the highest mortality of the sheep. Heat stress is a major cause of mortality in shipments of sheep, particularly in sheep leaving Australia in the Southern Hemisphere winter to arrive in the Middle Eastern summer. Moreover, the restriction of sailing with a cargo of sheep from Australia to the Middle East in the Southern Hemisphere winter confirmed positive effects on sheep welfare and suggest that shipments offloading at multiple ports should not offload at the hottest port, Doha, first.

Go to poster: .pdf or comment

Back / *F*

MAPPING BASELINE AND ELEVATED STRESS IN CAPTIVE AND WILD KOALA (*PHASCOLARCTOS CINEREUS*) POPULATIONS THROUGH HORMONE ANALYSIS IN AN EFFORT TO IMPROVE WELFARE

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Koalas were listed as “vulnerable to extinction” by the IUCN Red List of Threatened Species in 2014, as well as the Australian Governments Threatened Species Scientific Community in 2012. This folivores, tree dwelling marsupial occupies south-east Australia in a range of temperate, sub-tropical, and tropical forests, as well as woodlands and semi-arid communities dominated by eucalypt species. As south-east Australia continues to be dominated by an increase in human population, pristine koala habitat is either fragmented or removed entirely to make room for agriculture and urbanization. Research has shown that there is significant evidence to point to pressures associated with human population growth producing threats responsible for koala morbidity and mortality. In particular, recent research has linked exposure to long term stress, otherwise known as chronic stress, to an increase in death and disease for this species.

Each veterinary clinic around Australia has their own processes when triaging koalas into care. Most veterinary clinics do an extraordinary job, however a misunderstanding of the effects of stress on koalas is thought to be detrimental to this species’ successful rehabilitation. It is believed that there should instead be a single streamlined method of non-invasive veterinary procedures to assess stress and streamline rehabilitation of koalas admitted into care. Currently, there are no set baseline cortisol parameters for apparently healthy, stress free koalas in Australia. I will establish these baseline parameters by assessing faecal cortisol and hair cortisol (note: cortisol is a hormone indicative of chronic stress). Once established, I will use these pre-determined baseline parameters to compare with sick and injured wild koalas upon admission into veterinary care. This is expected to create effective triage processes by evaluating the relationship between stress and disease in koalas.

The overarching aim of this research is to identify and investigate the impact that known stressors associated with human population growth have on the longevity of the koala species. By establishing a set of base-line parameters for apparently healthy, stress free koalas, veterinary clinics will be able to direct appropriate rehabilitation methods to understand each individual koala patient’s level of stress, and this is expected to assist in the overall recovery of this vulnerable species.

Go to poster: .pdf or comment

Back / W

CATTLE WELFARE IS BASICALLY HUMAN WELFARE: WORKERS' PERCEPTIONS OF ANIMAL WELFARE ON TWO DAIRIES IN CHINA

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'Animal welfare' (动物福利) is a foreign term introduced to China, and stakeholders' interpretation of this concept can affect their receptiveness to improving animal welfare. My aim was to explore workers' perceptions of 'animal welfare' on two dairies in China. I used a mini-ethnographic case study design, living for 38 days on one farm and 23 days on a second. I conducted interviews and participant observations with farm workers ranging from farm management to animal care staff. I used template analysis to generate key themes from the ethnographic data. Overall, responses reveal a deep connection between human and animal welfare. Workers saw human welfare as a prerequisite to animal welfare, and cattle welfare as potentially mutually beneficial to the workers. Some workers also saw an ethical obligation towards providing good welfare. Though some workers were unfamiliar with the term 'animal welfare', in daily practice, caring for cattle inevitably leads all farm workers to ponder, prioritize, and make decisions relevant to specific aspects of 'animal welfare' such as lameness, morbidity, reproduction, nutrition. Many workers were pragmatic and workers, especially those in management positions, appeared to embrace evidence-based animal care improvements which were perceived to benefit them and the cattle. Based on my findings, I suggest future animal welfare initiatives should 1. Consider worker welfare, 2. Involve clear communication, 3. Identify mutual benefits, and 4. Provide pragmatic, evidence-based strategies to improve animal welfare in an economically sustainable way.

Go to poster: .pdf or comment

Back / *F*

EMPLOYEE MANAGEMENT AND ANIMAL CARE: ETHNOGRAPHIES OF TWO LARGE-SCALE DAIRY FARMS IN CHINA

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China has become the world's largest producer of livestock, and the world's third largest dairy producer with an estimated 10.3 million cattle in 2018. As farm structure shifts from smaller to larger operations, employee management can play a more important role in shaping animal care. Our aim was to explore how employee management impacts animal care on two large dairy farms in China (anonymized as Farm A and Farm B). The first author (MC) used a mini-ethnographic case study design, living for 38 days on Farm A and 23 days on Farm B. Using ethnographic interviews and participant observations, MC shadowed job positions within 5 departments in Farm A (e.g. calf department, veterinary department), and 6 departments in Farm B, and conducted 13 semi-structured interviews while living on the farms. We used template analysis to generate key themes from the data. On both farms, workers believed that animal care practices had improved over time, attributing this to 3 key employee management factors: 1) fostering a healthy and positive organizational culture, 2) competency of worker and management, and 3) setting up an effective incentive system. Our results suggest that aligning animal care outcomes with farm specific goals can result in improved animal care. This session is relevant for those interested in understanding strategies for improving animal care in large-scale farms, or farm animal care in a Chinese context.

Go to poster: .pdf or comment

Back / *F*

CREATIVE ENGAGEMENT METHODS FOR EXPLORING PUBLIC PERCEPTIONS OF LIVESTOCK HEALTH AND WELFARE ISSUES

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Recent changes to the way UK agriculture is governed has refocused attention and debate on the use of public money to subsidise public goods, e.g., livestock health and welfare. If this is the case, surely the public should have a say in how their money is used? This is especially pertinent given that livestock production can be a polarising issue. Research has demonstrated growing public concern over certain aspects of food and farming, and concurrently a disconnect from the realities of modern agricultural practices. Public engagement in science and policymaking is acknowledged to be a valuable tool, providing greater accountability, institutional trust, relevance and responsiveness. Therefore, as part of the Wellcome Trust funded project 'Farm-level Interdisciplinary approaches to Endemic Livestock Disease' ('FIELD') a series of engagement events were held to investigate these concerns and disconnects. Specifically: 1) Memories of livestock, food and farming, 2) Awareness of current livestock farming practices, 3) Understandings of animal welfare, health and disease.

We present examples, with select findings, to evidence the power of creative public engagement. Each event took a different approach to engagement through the use of: audio excerpts from oral history archives to cue memories of livestock; historic and contemporary images of farming to prompt discussion of the past, present and future of livestock agriculture, and; a choice-based decision-making game that put participants in the shoes of a farmer, accompanied with sticky note questions, and structured interviews used to capture the decision-making rationale. Data were analysed through several means including descriptive statistics, thematic analysis and reflective writing of the members of the research team involved.

The activities highlighted a public willingness to enter in-depth and meaningful conversations surrounding livestock health and welfare, and that the public have a strong interest in, and memories of, livestock farming. These creative and interactive methods allowed members of FIELD to engage with different groups of publics at each event, providing a range of insights instead of just one type of response from one section of the public. The range of events and locations facilitated engagement with audiences typically unlikely or unwilling to interact with traditional forms of science and science communication/engagement. The events engendered an environment of non-judgemental communication between science, agriculture and the public, providing a space for group reflection and recollection. Such activities could be used to make policy and research more inclusive and democratic.

For details of future events visit https://field-wt.co.uk/blog-news/.

Go to poster: .pdf or comment

Back / F

NOT LIKE A RABBIT IN THE HEADLIGHTS: PROMOTING POSITIVE WELFARE PROVISION IN RABBIT VETERINARY PRACTICE

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The knowledge that stress affects veterinary patient outcomes is not new, but interest in how to improve those patient outcomes by reducing stress is. There have been increasing numbers of papers published on stress-free handling and stress reduction in a clinic setting which demonstrates this growing awareness of a historically neglected aspect of veterinary practice.

Rabbits are the UK's 3rd most common mammalian pet, and one whose welfare – and patient outcomes in veterinary settings – often suffer as a result of a lack of awareness of their complex needs. Being a prey species, they are particularly prone to the effects of stress. For over a decade, the Rabbit Welfare Association and Fund has held a list of "Rabbit Friendly" veterinary practices which have been assessed by questionnaire, photos and video/in-person visits as meeting their Bronze or Silver criteria. This award system covers such aspects as separation of prey and predator species, appropriate equipment, and relevant training. An extra tier of the scheme (Gold) is now available for specialist rabbit/exotic practices. The RWAF have consistently emphasised the need for awareness of the special requirements of this easily stressed species.

Over recent years, industry awareness of lower stress leading to better outcomes generally has spread. More rigorous standards of stress reduction in practice for all species has evolved, for example through the Cat Friendly Clinic awards from the International Society of Feline Medicine, and "Fear Free®" cats, dogs, avian and equine, which offers training for veterinary professionals worldwide and practice certification in the US and Canada. The industry seems to be beginning to change its world view from a neutral welfare approach, mitigating negative welfare, to a commitment to positive welfare provision. This can only be a good thing for animals, owners, and veterinary staff alike.

The RWAF has always been ahead of the curve in its promotion of welfare. What can we learn from the approaches used for other animals and the direction in which research is heading, and how can this multi-species knowledge be applied to rabbits?

This talk summarises the standards historically and currently advised for "Rabbit Friendly Practices", compares and contrasts this with other certification schemes, and examines what the literature now recommends as best practice.

Go to poster: .pdf or comment

Back / *C*

DOES FOOTPAD DERMATITIS INDUCE A CHRONIC NEGATIVE WELFARE STATE IN LAYING HENS?

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Footpad dermatitis (FPD) is a common health condition in commercially housed hens. Birds with severe FPD have necrotic lesions on the feet, which are caused by prolonged contact with wet bedding or faeces in the housing environment. FPD is believed to have a negative impact on the welfare of laying hens, and may therefore affect the efficiency and sustainability of egg production. We hypothesise that birds with severe FPD experience chronic stress, and this study aimed to investigate this by comparing neurogenesis between birds which had severe FPD with those in which FPD was absent.

Hens managed under semi-commercial conditions were scored on three occasions (May, July, and September) for FPD severity, on a scale of 0-2 (0 = no FPD, 1 = necrosis only, and 2 = necrosis and swelling that was dorsally visible). Only individuals which had a FPD score of 0 on at least two occasions (including September) were selected as control birds (n=9). Birds with the most severe FPD were those which had a score of 2 on all three occasions, or a score of 1 in May and 2 in July and September (n=12). In each of these groups, some birds were reared with a dark brooder while others were not. Selected individuals were culled at 70 weeks of age, and their brains were collected and dissected. One hemisphere of each brain was fixed and then cut to 50µm coronal sections. The sections were immunohistochemically stained against doublecortin (DCX) in order to quantify the density of DCX^+ neurons in the rostral and caudal hippocampus, which has previously been validated as a marker of chronic stress.

FPD birds reared without a dark brooder had a significantly lower density of bipolar ($p<0.001$) and multipolar ($p=0.049$) DCX^+ cells than controls. However, in those reared with a dark brooder, FPD had no effect on bipolar cell density ($p=0.133$) and increased multipolar cell density ($p=0.042$). A cumulative FPD score was calculated for each bird by adding together their scores from May, July, and September. There was a significant interaction of cumulative FPD score and dark brooder on both bipolar ($p<0.001$) and multipolar ($p=0.015$) DCX^+ cell densities. These results suggest that the chronic stress experienced by laying hens could be reduced by providing housing conditions and adopting management practices which mitigate the risk of birds developing FPD, and rearing birds with a dark brooder could increase resilience to stress from FPD.

Go to poster: .pdf or comment

Back / *F*

TICKLED PINK? THE EFFECT OF LONG- AND SHORT-TERM POSITIVE HUMAN CONTACT ON PIGS' JUDGEMENT BIAS

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The study of affective states is a growing field in animal welfare science; however, it remains complicated to disentangle the assessment of longer-term mood and shorter-term emotion. Previous research shows that positive human-animal interactions can improve animals' affective states, assessed for instance by using judgement bias tasks, but the mechanisms underlying this change in affective states remain poorly understood. This study aimed to disentangle the effect of mood- and emotion-inducing treatments on pigs' responses in a judgement bias task. We studied 21 fattening pigs by administering the same five-minute human contact treatment, either over the course of 3 weeks (long-term positive contact: LTPC; intended to influence mood, n=11) or immediately before a judgement bias test (short-term positive contact: STPC; intended to influence emotion, n=10). Additionally, a control group (n=9) received minimal handling only. Moreover, in addition to their daily positive contact sessions, LTPC pigs received STPC or control sessions before the judgement bias test sessions to elucidate any interaction between emotion and mood. Pigs were trained to perform on a spatial Go/No-go judgement bias test (JBT) with active trial initiation and the percentage of go responses to ambiguous cues in the JBT was compared across treatments. STPC contact sessions were recorded and coded for contact latency and duration and saliva was collected pre- and post-testing to measure cortisol concentration in order to assess arousal. Data were analysed with (generalised) linear mixed-effect models. In the JBT, pigs went to the ambiguous positive and middle cues on average in over 90% of the trials and to the ambiguous negative cue in over 60% of the trials. Thus, the expected monotonically graded curve in response to the three ambiguous cues, suggested to be a criterion of internal task validity, was not present. This is surprising since other studies using a comparable task design with active trial initiation have found such graduated response patterns. We did not find any statistically significant differences between the treatment groups with respect to the pigs' behaviour during STPC, pigs' performance in the JBT, or differences in cortisol concentrations pre- and post-testing. The regular handling for training and testing might have overwritten effects of the human contact treatments, rendering their effects undetectable. Further research is warranted to disentangle the effect of potential interactions between the training procedure and treatments including human-animal interactions.

Go to poster: .pdf or comment

Back / *F*

EXPLORING THE USE OF COMPLEMENTARY AND ALTERNATIVE APPROACHES ON UK DAIRY FARMS

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Evidence suggests that farmers use complementary and alternative medicine (CAM) approaches to manage a range of conditions in dairy cows. However, there is little research to explore the current use of CAM within farms and as a method of achieving less antibiotic use. This is something which warrants further consideration for two main reasons; (1) to determine if this approach has potential to reduce unnecessary antibiotic use and support the global efforts against antimicrobial resistance, (2) to ensure that antimicrobials and other conventional approaches are used where appropriate. This is not only important to avoid unnecessary suffering under the Animal Welfare Act (2006), but also to ensure that responsible use of antibiotics is still present whereby farmers use 'as little as possible, as much as necessary". Better understanding of how CAM is viewed, used, and understood by dairy farmers could provide valuable insights. This project is designed to address that knowledge gap using a qualitative research approach, with ethnographic techniques to expand on our existing understanding of CAM use on dairy farms.

Qualitative research is becoming more widely used in veterinary research. This has provided important insights and rich detail regarding medicine related behaviours and human-animal interactions incorporating the opinions of both vets and farmers. This research employs semi-structured interviews and participant observation to explore a complex and novel research area among a heterogenous sample of dairy farmers in the UK. The sample includes farms with both large and small dairy herds, organic and conventional systems, mixed enterprise, and solely dairy farms. Early findings suggest that farmers are influenced in their use of CAM by a range of individuals within the agriculture community, including veterinary surgeons some of whom use homeopathic practices, mainstream farming press and pro-CAM organisations and advisors. To investigate this influence, we will conduct a documentary analysis to explore the ways in which CAM and conventional medicine are represented in a range of farming, veterinary and pro-CAM sources. Early findings indicate several drivers for UK dairy farmers to use CAM approaches, including their own personal [or friends and relations] experiences, the views of influential people and advisors, networks within the farming community and the fact that CAM use allows a greater sense of autonomy in health based decision making. It is evident that farmers often refer to milk buyers and organic guidelines as factors which influence their use of CAM. They further refer to a desire to 'do something' for the animal and to minimise animal welfare related concerns. Furthermore, we aim to describe a range of CAM information sources consulted by farmers including, holistic health management organisations/courses, online materials, and pharmacies. Participating farmers associate the use of CAM approaches with other holistic health management practices, human-animal interactions, the actual character and physical characteristics of an animal and animal welfare. This indicated that CAM use is seen by farmers as part of a wider ethos and belief about farming practices and land use. Additionally, data implies that some farmers value their personal experiences of CAM use over scientific evidence. In contrast, barriers to CAM use were also identified including: the perception that CAM approaches are reserved specifically for organic systems, little access to CAM and related resources and some existing tensions between farmers and other stakeholders' views.

Central themes that warrant further exploration include the persistent use of CAM on dairy farms despite some CAM e.g. homeopathy being at variance with the Royal College of Veterinary Surgeons, who state that, "we expect that treatments offered by veterinary surgeons are underpinned by a recognised evidence base or sound scientific principles" and "we expect treatments like homeopathy, which are not underpinned by a recognised evidence base or sound scientific principles, to be offered alongside, or complementary to, those treatments that are." Exploration regarding the subjective realities of what CAM is and is not will be helpful as the conceptualisation of CAM is not fixed among farmers and some extend this term to include supplements, oral rehydration therapies and certain conventional medicines.

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Go to poster: .pdf or comment

Back / F

ARE FERRETS HOUSED IN CONDITIONS THAT HELP PROVIDE STIMULATION? PRELIMINARY RESULTS FROM AN INTERNATIONAL, CROSS SECTOR QUESTIONNAIRE

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Ferrets are kept as companion, zoo, laboratory, and working animals, and have been shown to display boredom-like signs when kept with little environmental enrichment (EE). Yet little is known about ferret husbandry across sectors, caretakers' awareness of animal boredom, or how these in turn affect ferret welfare. We aimed to understand variation in housing types and within EE provided to ferrets in captivity, and the degree to which this was influenced by caretakers' beliefs about ferrets' capacity to experience boredom. We therefore conducted a cross-sector online survey of ferret caretakers, hosted by SurveyGizmo from 13th February to 21st March 2020. A total of 754 caretakers from eight sectors and 17 countries completed the survey, including pet owners (n=621), and respondents from zoos (n=46), rescue organisations (n=38), working animal (n=28), laboratory (n=11), and 'other' (n=10) sectors. Most (93.0%) pet owners reported believing ferrets 'definitely' or 'very probably' experience boredom, with the remainder indicating a greater level of doubt. Pet owners who expressed doubt in ferrets' capacity to experience boredom provided significantly fewer types of EE (GLM: $T_{1,588}$=2.651; P=0.00826). No relationship was apparent between pet owner belief in boredom and housing type or provision of out-of-house opportunities. Housing types, time outside of housing, and number of EE types varied strongly within and between sectors. Pet owners (62.5%) and laboratories (90.9%) most commonly housed ferrets in cages. The working animal sector reported highest usage of hutches (85.7%), while keeping ferrets free-ranging within an enclosure was most common for rescue organisations (73.7%) and zoos (71.7%). Out-of-house exploration opportunities also varied strongly. Pet owners, rescue organisations and zoos most commonly reported allowing ferrets daily opportunities (75.2%, 71.1% and 41.3%, respectively), while the laboratory and working animal sectors most commonly reported providing out-of-house time two-six times per week (45.5% and 42.9%, respectively). Laboratories (9.1%) and pet owners (1.1%) reported never providing out-of-house opportunities. Zoos provided the highest average number of EE types, followed by the rescue organisation, pet owner, laboratory, and working animal sectors. Social housing play with humans, and exploration ranked most important for preventing boredom. Reports of smaller housing and few EE types across all sectors may highlight a necessity for greater communication of ferrets' welfare needs. Furthermore, the relationship between pet owners' belief in boredom and number of EE types provided suggests the risks associated with, and mitigations for, boredom in ferrets need to be more widely disseminated.

Go to poster: .pdf or comment

Back / *C*

PRELIMINARY ON-FARM WELFARE ASSESSMENT OF DAIRY GOATS IN ALBANIA

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Albanian dairy goat farming breeding sector in Albania has been growing over the last decade. This includes small family herds, as well medium and large-scale dairy goat farms, concentrated in the coastal plain areas and surrounding hills. Even when farmers try to fulfil the needs of their animals, little information is available, if the conditions are in accordance with the EU directives standards of animal welfare. Until now, in Albania there are no welfare assessments carried out in small ruminates and especially in dairy goats. Therefore, the aim of this study was to assess for the first-time animal-based parameters, focusing on clinical parameters in dairy goat farms in Albania.

This study was carried out from May to September 2020. Five dairy goats' farms including in total 1230 goats (about 250 goats/farm), placed in 46 pens (about 26 goats/pen) were visited and, 24 pens and 102 from 757 lactating goats (four to five goats/pen) were individually observed randomly. Assessment of the health and welfare of dairy goats was carried out by two trained observers using an adapted AWIN assessment protocol for dairy goats, focusing on animal-based parameters such as: body condition score, coat condition, queuing or kneeling at the feeding rack, lameness, body lesions, overgrown claws, udder asymmetry etc. Also, some resource-based parameters were assessed. Statistical analysis was performed using SPSS 22. Descriptive statistic (mean prevalence's, standard deviation, min. and max. values) was carried out.

The farms fulfilled to almost 100% requirements regarding food and water provision, and there were no animals queuing for access to feed or water.

54,6% (33,3%-72,7%) of goats showed normal body condition. For clinical parameters, several areas to improve were found: abnormal coat condition 38,6%, lameness 29,4%, udder asymmetry 23,3%, overgrown claws 23,1% and body lesions 22,9%.

To conclude, this first on-farm study on dairy goat welfare obtained important data, which highlight some welfare problems, but also positive aspects, such as nutrition.

Further on-farm investigation in Albania should include more goat farms and work together with farmers to work towards improvement of the situation.

Go to poster: .pdf or comment

Back / *F*

PLUMAGE COLOUR GENES AND SEXUAL DIMORPHISM: EFFECTS ON WELFARE OF NIGERIAN INDIGENOUS TURKEYS (*MELEAGRIS GALLOPAVO*)

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Animal welfare problems in turkeys include foot pad dermatitis, breast injuries, skin alterations, impaired leg health, feather damage and head injuries. Extensive head injuries, large feather loss and skin injuries can lead to death of turkeys. Studies evaluating the effects of plumage colour and sex on welfare status of Nigerian indigenous turkeys are very few. The aim of this study was therefore to determine the effect of plumage colour and sexual dimorphism on welfare of Nigerian indigenous turkeys. One hundred and twelve (112) birds (36 white, 38 black, 38 lavender; 39 males and 73 females) were used for the study. Welfare indices such as feather condition (FC), hock burn (HB), foot pad dermatitis (FPD), feather spots (FS), breast blister (BB) and head spots (HS) were evaluated at 9th week of age. The HB, FPD and BB were scored based on the procedure of Welfare Quality Consortium (2009). The feather condition was scored as either intact or not intact while the number of spots on the head and feather were counted. Only score 0 was observed for HB and BB in all the birds, so they were not analysed. All the data obtained for FC, FPD, FS and HS were subjected to a Generalized Linear Mixed model and descriptive statistics. All the welfare indices measured were not significantly ($p>0.05$) by sex of the birds. Only FC and FPD were significantly ($p<0.001$) affected by plumage colour. 75% of the white birds have non intact feather condition, 94.74% of lavender turkeys have intact feather condition while all the black turkeys have intact feather condition. 68.42% of both black and lavender turkeys have FPD score of 2 while 30.56% of white turkeys have FPD score of 2. The FPD score of 3 was not observed in white and black turkeys. Generally less ($p<0.05$) incidence of FPD was observed in white turkeys. It can be concluded that plumage colour differences existed in feather condition and foot pad dermatitis incidence in Nigerian indigenous turkeys. White Nigerian indigenous turkeys should be raised separately from other colour variants as black and lavender turkeys peck the white turkeys after feeding to clean their beaks.

Go to poster: .pdf or comment

Back / *F*

VALIDATION OF THE USE OF COMPUTER VISION TECHNOLOGY FOR AUTOMATIC CAT BEHAVIOUR MONITORING IN AN ANIMAL SHELTER

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Monitoring cat behaviour in an animal shelter is critical for ensuring cat health and welfare in care. Additionally, collecting behavioural data is an essential component of most shelter-based research. Both shelter staff and researchers typically collect data in-person or through video monitoring to record maintenance behaviours such as food and water intake and litter box use, as well as exploratory and hiding behaviour. These approaches can be time-consuming and involve trained observers, which may prove a barrier to needed data collection. An alternative approach may be to utilize computer vision technology to monitor cat behaviour in shelters automatically. Cats (n=4), housed at the BC SPCA in pair housing, were enrolled in the study. We used the OpenCV fiducial tag library ArUco to generate and recognize 16-bit 2d unique identifiers optimized for automatic detection in video data. These were printed on a customized lightweight cotton sleeve attached to a standard breakaway cat collar. Two cameras were placed around the room, including next to litter boxes and food bowls and recorded continuously for 48 hours. The video streams were analyzed by computer vision software to identify the unique markers' existence and location in each frame, providing the unique ID value and timestamp. Two trained observers also coded the videos. This automated method's validity will be presented, as evidenced by high accuracy with human-coded behavioural data from the video output. Computer vision technology may be an accessible and low-cost behavioural data collection method for research and animal care applications within animal shelters.

Go to poster: .pdf or comment

Back / *C*

HOW TO CHOOSE MUSIC FOR HORSES?

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Domestic horses are exposed daily to various stressful situations that are inherent to their human-controlled environment and represent a major welfare challenge. An increasing body of evidence suggests that music can alleviate stress in horses during such episodes. However, we know nothing about why and how western music produces such effect. This study aims to determine which musical or acoustic features (*e.g.* melody, harmony or rhythm) are responsible for the relaxing effect of music during an acute stress situation.

To do so, we altered 4 fundamental features of the track "Free to run" by Janet Marlow, which we previously proved to be relaxing for horses, and compared its effect to the original track. Therefore, we obtained 6 variations: 1) tempo 3 times slower, 2) tempo 3 times faster, 3) up-shifted frequency spectrum, 4) down-shifted frequency spectrum, 5) loss of harmonicity by up-shifted frequency spectrum, and finally 6) repetitions of the 8 sec introduction structure. They have also been compared with the original track and a *no music* control condition. Each audio track was broadcasted at 35dB through headphones placed in an ear net.

We observed the behaviour of 31 horses exposed to a 15-min basic grooming session in each experimental condition. Indeed, grooming sessions are known to be a source of discomfort. Therefore, if the chosen musical features modulate the impact of the music, we expect to find the music impact to differ between audio tracks.

The results suggest that music improves a grooming session impact. Indeed, in the *no music* condition, we observe more behaviours with a negative valence than with a positive one. On the opposite, there were less negative behaviours than positive ones with the *original music* and its variations in harmony and tempo. Changes in the frequency spectrum do not induce such improvement. In addition, concerning the sole positive behaviours, we observe significative differences for some conditions (permutation tests, P=0,05). Individuals expressed more positive behaviours when exposed to the audio track with *disrupted harmonicity* (P =0,05) and the *lower frequency spectrum* track (tendency, P=0,06) than *without music.* To conclude, music seems to be adapted to alleviate the negative impact of grooming and its effect appears to depend, at least, on tempo, frequency spectrum, harmony and structure. Those musical characteristics have been defined by humans based on their own perception, so their effect on horses also questions animal perception from an evolutive perspective.

Go to poster: .pdf or comment

Back / E

SELECTED BIOCHEMICAL AND ELECTROLYTE CHANGES ASSOCIATED WITH SELECTED FOOD ANIMALS PRESENTED FOR SLAUGHTER

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Food animals meant for slaughter undergo different levels of stress which runs counter to animal welfare and handling. This study was designed to evaluate biochemical and electrolyte changes associated with selected food animals presented for slaughter in Ikpa abattoir, Nsukka Local Government Area, Enugu State. Seven adult cattle, goats and pigs each were used for the study. Each of the cattle, goat and pigs were divided into 4 males and 3 females. Forty eight (48) hours and at the point of slaughter, cortisol, total protein (TP), aspartate aminotransferase (AST), alkaline phosphatase (ALP), creatinine, albumin, blood urea nitrogen (BUN) and potassium were evaluated. The findings of this study revealed that slaughter processes significantly ($p>0.05$) increased serum cortisol and glucose in the slaughtered cattle and pigs. Also, the slaughtered female animals (cattle and pigs) recorded significantly ($p>0.05$) higher cortisol levels (in cattle and pigs) with increased glucose levels (in pigs) than their male counterparts. In conclusion, humane treatment of slaughter animals reduces unnecessary suffering and stress which will in turn enhances the quality and value of meat produced.

Go to poster: .pdf or comment

Back / *F*

HOW CAN YOUR DOG DISCRIMINATE YOUR VOICE FROM MANY OTHERS?

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Voices are prominent stimuli in the auditory environment due to the wide variety of ecologically relevant information they code in their acoustic structure, including vocalizer identity cues. Acoustics of voice-based individual recognition is well-described in intraspecific-, but unknown in interspecific contexts. Dogs, for whom the identification of humans became crucial during domestication, are suitable subjects of such investigations.

In this test, dogs had to find their hiding owner based on vocal cues in two-way choice tasks. Stimuli were pre-recorded neutral speech sentences from the owner and a set of control persons played through loudspeakers (placed near the hiding persons) from behind two opaque screens. The effect of speakers' acoustic distance along a set of dimensions on choosing success, choosing latency and looking time was investigated.

Dogs chose their owner's voice significantly more often than control persons' voices (82%) and acoustic distance of speakers did not affect their choosing success, which suggests that dogs can confidently identify their owner's voice. Fundamental frequency-related (F0 mean, gender difference of speakers) and noisiness parameters (entropy, jitter, df) affected either choosing latency or looking time which, however, indicate that the shorter the acoustic distance between speakers, the harder the decision.

According to these results, interspecific voice discrimination in dogs is based on similar acoustic parameters as intraspecific voice recognition in both humans and in various canine species. This novel experimental design is applicable to further explore the nature of dog-human vocal communication. Our results are beneficial for either working or family dog keepers who can apply them in practise to improve the cooperation with their dogs. Learning about human-animal interspecific communication during social interactions, moreover, contributes to a better understanding of animals' needs and thus it serves their welfare.

Go to poster: .pdf or comment

Back / *C*

COMPARISON OF INJURY, HYDRATION, MUSCLE STRAIN AND STRESS RESPONSE IN WEANED PIGLETS AFTER LONG AND SHORT TRANSPORT EVENTS

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Commercial piglets are often transported between farm sites after weaning to mitigate the risk of disease transmission in this vulnerable age group. Canadian transport regulations state that the maximum duration that piglets may undergo restriction from feed, water, and rest is 28 hours. These regulations are informed from data derived from market hog transportation. Few studies have investigated the effects of transport >24 hours on weaned piglets in a North American commercial context. Increased transport duration length influences piglets' exposure to the trailer environment, vibrational forces, and the duration of time without access to feed and water. The objective of this research was to compare physiological changes in piglets undergoing commercial transport after weaning for long (LD: >30h) and short (SD: <3h) durations. Changes in weight, injury, and hematological and/or biochemical indicators of hydration, stress and muscle strain incurred during and after transport were observed. Body weights, lesion and gait scores and blood samples were collected on weaned piglets from two production systems (LD: n=240, SD: n=200) over eight transport events during the summer of 2019. Piglets were sampled at timepoints including the day before (T0), immediately after (T1), and approximately 3 days after (T2) transport. Average body weights of sampled piglets at T0 were LD: 6.0kg (2.8-8.9) and SD: 6.2kg (4.1-8.6). Neither group demonstrated extreme adverse physiological responses to their respective transport duration. Piglets in the LD group lost more weight than SD piglets between T0 and T1 (P<0.01). This was accompanied by markedly increased beta-hydroxybutyric acid levels indicating a negative energy balance. Additionally, hematocrit levels were mildly elevated in LD piglets, although average values of blood indicators of hydration were within normal reference intervals. Piglets in the SD group had increased levels of muscle strain (aspartate aminotransferase and creatine kinase) compared to LD piglets (P<0.01), but were within normal physiologic reference ranges. Increased serum cortisol levels and neutrophil:lymphocyte ratios after transport was noted in SD piglets compared to LD piglets (P<0.05), suggesting an increased physiological stress response. The prevalence of moderate/severe lesions and lameness observed at all timepoints was low (<5% of piglets) for both groups, with the exception of ear lesions. These results indicate that piglets underwent different physiological challenges in each duration group. It is therefore not possible to conclude whether short or long transport duration is more optimal for piglet wellbeing, though areas for mitigations that may further increase piglet welfare during transport were identified.

Go to poster: .pdf or comment

Back / *F*

FEEDING SYSTEMS FOR LACTATING SOWS: EFFECTS ON WELFARE AND PRODUCTIVITY OF SOWS AND PIGLETS

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Feeding lactating sows is difficult due to their changing nutrient demands from gestation to and during lactation. This study evaluated the effect of four different feeding systems on productivity and welfare of 62 sows and their piglets allocated by treatment and parity. An automated ad libitum feeding system without (T1) and with attraction portion four times a day (T2) and a manual ad libitum feeding system (T3) were compared with a non-ad libitum system (T4). Daily feed disappearance, piglet growth, piglet growth per feed disappearance as well as other productivity data were recorded. Furthermore, health indicators (e.g. lesions and lameness) of sows and piglets were scored and behavior (e.g. stereotypies) was analyzed using 96 hours of video recording per sow (n=35 sows). Sows from the ad libitum systems (T1 to T3) showed a lower feed disappearance than T4 ($p < 0.001$). There was a tendency, that average daily piglet growth was higher in T1 to T3 than T4 ($p = 0.054$) and in T1 and T2 a higher piglet growth per feed disappearance ($p < 0.001$) in was found. Furthermore, more piglets without head lesions were found in T1 and T2 ($p = 0.006$). No treatment effect was seen for piglet mortality, sow weight loss and conception rates. Sows in ad libitum systems (T1 to T3) spent more time with their head in the trough than in the non-ad libitum system T4 ($p < 0.001$) but no effect regarding the (low) occurrence of stereotypies was seen. Our data suggest, that sows fed ad libitum eat what they need and can convert this better into the piglets' growth without any additional weight loss. The good nutritional status of sows in the ad libitum systems could be an explanation for less head lesions of their piglets due to sufficient milk production and therefore little fighting among the piglets. Furthermore, the increased time sows spent in ad libitum systems with their head in the trough points towards longer feeding times, which could be positive for sows' welfare, but needs further, more detailed observations. In conclusion, automated ad libitum feeding systems improve the productivity, especially the piglet growth per feed intake. Further research in the area of feeding behavior and piglet growth per feed disappearance is needed to contribute to the development of feeding systems, which improve the welfare of sows and piglets as well as economic costs.

Go to poster: .pdf or comment

Back / *F*

ADULT HIPPOCAMPAL NEUROGENESIS SUPPRESSION, WHICH IS RESPONSIVE TO CHRONIC STRESS IN CHICKENS, IS ASSOCIATED WITH LOCAL INFLAMMATION

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Following increasing demand, the egg industry has widely adopted free-range and multi-tier housing systems. However these systems may impose welfare challenges to the industry and reduce productivity. For example, hens may experience pain and discomfort including keel bone fractures (KBF) commonly caused by collision with perches in the free-range multi-tier housing, causing pain and reduced mobility. These welfare challenges may induce chronic stress in hens which has recently been shown to be associated with reduced adult hippocampal neurogenesis (AHN), the formation of new neurons in the hippocampus. Work from our laboratory has shown that hens with KBF have reduced numbers of cells in the hippocampus expressing the neurogenesis marker doublecortin. A similar observation was also made in hens considered in poor condition in a study that compared birds housed in a free-range multi-tier system with those in a colony cage housing system. It is currently unclear what physiologically drives the reduction of AHN in chronically stressed hens. However, mammalian research suggests the immune system may be a mediator of AHN reduction. This includes stress sensitive neuroimmune cells, microglia, which secrete inflammatory cytokines. We hypothesise that birds with poorer welfare and decreased AHN will show a greater level of inflammation.

We analysed hippocampus and spleen tissue from birds where we have previously demonstrated reduced AHN. Real-time-PCR was used to determine gene expression of colony stimulating factor receptor-1 (CSFR-1), a marker of microglia, and several inflammatory cytokines. We measured significantly higher CSFR-1 gene expression ($p=0.03$) in the hippocampus of birds with severe KBF compared to those with minimal KBF. Comparing free-range multi-tier and colony housing systems, we measured peripheral markers of inflammation in the spleen. We found significantly increased expression of the pro-inflammatory cytokines interleukin-18 ($p=0.01$) in the colony system birds, and transforming growth factor-beta-1 (TGFb-1) ($p=0.002$) in multi-tier birds. However, we found no difference in AHN between these two groups, suggesting these inflammation markers are not involved in regulating AHN.

We conclude that local inflammation in the brain, rather than peripheral expression in the spleen is most important in regulating neurogenesis. We show evidence of increased microglia in the hippocampus in birds with KBF who had reduced doublecortin expressing cells.

Go to poster: .pdf or comment

Back / *F*

INSTITUTIONAL ANALYSIS OF ATTITUDES TO EQUID WELFARE INITIATIVES

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For many of the poorest people in the world, over 100 million working equids play a vital role in sustaining livelihoods. They reduce human physical burden, increase social standing, provide access to healthcare, education and basic necessities. Despite their value, working equids are found primarily in the poorest communities of low/middle-income countries and standards of welfare are low. In response to these concerns, a range of animal welfare focussed non-governmental organisations (NGOs) strive to improve standards of working equid welfare. Over the years, these NGOs have employed a wide range of initiatives, including community-led programmes, educational workshops, free veterinary clinics and advocacy at national and international levels. The type of initiative adopted can vary depending upon the size of the organisation, the areas of the world in which they work, their funding sources, and the current ethos of the organisation. The employees of these NGOs hold a wealth of knowledge regarding different methods; however constraints often mean that the long-term efficacy of these initiatives are not documented, or are not directly compared with other welfare improvement models.

Here we provide a cross-institutional analysis of the attitudes and expert opinions of professionals experienced in planning and running interventions to improve working equid welfare across a range of countries and contexts. Participants have been recruited from a variety of roles within NGOs, from those who plan and design interventions to those charged with implementing programmes on the ground. Organisations range from large international organisations to smaller national charities. In a series of ongoing semi-structured interviews, experts discuss their experience and opinions of different welfare intervention models, identifying the contexts in which certain models of intervention have been most successful (or have resulted in failure) and the barriers to success they may have encountered. In the presentation we will provide a framework for conducting cross-institutional analyses and discuss our findings, detailing common opinions regarding the strengths and weaknesses of the different welfare initiatives employed.

More broadly, the collaborative pooling of experience across different NGOs could aid future programme planning and help make welfare initiatives more effective. Similarly, understanding the different opinions within an organisation with regards to potential welfare programmes could facilitate their implementation. This process of institutional analysis could be expanded outside of the current context of working equids to provide a framework for NGOs to learn from each other's knowledge and experiences, which often remain undocumented.

Go to poster: .pdf or comment

Back / E

OBSERVATIONS OF HORSE WELFARE AND HORSE EMOTIONAL STATE DURING EQUINE ASSISTED INTERVENTIONS

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Equine Assisted Interventions have unequivocal benefits to human mental and physical health, with this form of intervention rapidly growing worldwide with particular focus on equine assisted psychotherapy (EAP) and equine assisted learning (EAL) programs. EAP/EAL programs involve humans with a range of emotional states interacting with horses for outcomes such as, counselling, behaviour management and leadership. The horses' natural behaviours and emotional contagion will trigger a flight or fight response that is adaptive in the moment to both the human and the environment. The horse's behavioural responses act as a mirror or signal of an emotional aspect the human recognises in themselves or their lives. These interventions can involve several different people interacting with the same horse or horses repetitively within a day and/or over several week sessions, which raise concerns for the welfare and potential stress of program horses. Published research to date has concentrated on the human emotional state (positive and negative) responses during human-horse interactions. Research addressing the emotional state of horses and their welfare has had minimal consideration. Previous studies that have included assessment of stress in program horses had limitations in regards to sample size of humans and horses; the methods used for physiological responses of horses; and the variability of interpretation of the behavioural and physiological biomarkers of stress in horses. The University of Queensland veterinary advice stated the most accurate physiological biomarkers for emotional state, of stress (e.g. cortisol) and wellbeing (e.g. oxytocin) was from blood sampling versus saliva sampling. Due to clinical sensitivities, the need for non-invasive methodologies and ease of sampling by practitioners, our study focus is on equine behavioural responses and welfare as indicators of emotional state in the horses. An equine ethogram model will be refined and provided to practitioners with key behavioural indicators of the horses' emotional state (positive, neutral and negative). The ethogram results will be correlated with video/photography of the horses; the horse and client case studies; and practitioner equine welfare questionnaires. Our research aims to provide practical and clear equine behavioural and welfare indicators to better consider the horses' emotional state of mind and improve equine psychological welfare needs as equally as other welfare needs, while they are involved in assisting the humans' emotional state of mind. This will ultimately provide improved human-horse intervention outcomes.

Go to poster: .pdf or comment

Back / *E*

DID THE COVID-19 PANDEMIC SPARK A WAVE OF GLOBAL INTEREST IN PET ADOPTION?

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Following the global spread of the COVID-19 pneumonia, social distancing measures such as working from home policy has been reinforced worldwide. Along with an increased unemployment rate, the average hours per day spent at home for the general population has considerably increased after the pandemic as compared to similar seasons in 2019. Sporadic news reports have indicated an increase of dog and cat adoption from animal shelters. Some of which in the United Kingdom have even witnessed an emptied shelter because of an ever-high adoption rate. In this study, we aimed to determine if there has been an increase of global interest on pet adoption following the pandemic. We conducted a Google Trends search to determine the global internet searches for “pet adopt*”, “dog adopt*”, and “cat adopt*” between 1st December 2015 to 1st December 2020. An asterisk wildcard was added to represent truncated words. Search interest (SI) was scored between 0 and 100 for the lowest and the highest, respectively. Data from Google Trend was exported into a .csv file which was then imported into SPSS for statistical analyses. Normality of data was determined by Kolmogorov-Smirnov test. Five-year average SI was computed and compared with the worldwide SI in late April 2020. From 2015 through 2020, the worldwide SI for pet adopt* (SI=59), dog adopt* (SI=97) and cat adopt* (SI=33) peaked at 19th-25th April 2020, the early epidemic phase of the COVID-19 pandemic. These were significantly higher than the five-year worldwide SI average for pet (40), dog (58) and cat (21) (Mann-Whitney U test, P=0.001). Comparing the worldwide SI between 2020 and 2019 on the same period, the SI ratio (2020/2019) for both dog (1.91, range= 1.18-1.42) and cat adoption (2.54, 1.90-1.55) has been increased by up to 250%. In descending order, the research volume in Australia was the highest (SI range=100), followed by the United States, Canada, New Zealand, and the United Kingdom (SI range=42-90). In Asia, search for pet adoption was the highest in Singapore (SI=38), followed by the Philippines, and Malaysia (SI range=20-36). In conclusion, we observed a global interest in pet adoption, in particular for dogs, following the COVID-19 pandemic. These newly adopted companion animals may experience a sudden absence of their owners when their owners return to work as normal in the near future once vaccination is made available. Special training to these fluffy companions may be required during the transition period.

Go to poster: .pdf or comment

Back / *C*

PREDICTORS OF SURRENDER AND ADOPTION OF PET RATS IN BRITISH COLUMBIA, CANADA

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Our data show that the fancy rat (*Rattus norvergicus*) has surpassed rabbits and is now the third most common companion animal admitted to the British Columbia Society for the Prevention of Cruelty to Animals (BC SPCA), but little is known about determinants of surrender and adoption of pet rats. The aim of this study was (1) to describe the characteristics of rats entering shelters and reasons for relinquishment, and (2) to identify determinants of adoption and length of stay (LOS) at an animal shelter.

The intake records of rats (N = 3,298) previously collected by the shelter personnel between June 1st, 2015 and June 1st, 2020 were imported to the R software for collation, data management, and generating descriptive statistics. A logistic regression model was built to analyze how the LOS of rats was affected by their sources of acquisition, sex, age, colour, and health conditions.

A plurality of rats that entered the BC SPCA animal shelter system originally came from an unplanned litter (31%) or breeder or pet store (30%), were white (35%), sexually intact (89%), and between 1 to 3 years old (32%). They were mostly relinquished by their guardians (47%), and the two most common surrendered reasons were due to owner-related (62%) and housing (18%) issues. A logistic regression model showed that rats that were older (increase in 8 days compared to young), albino (increase in 14 days compared to grey), Treatable/ Rehabilitable (Assilomar Accords category; increase in 7 days compared to Healthy), and were seized by humane officers stayed longer in the BC SPCA animal shelter system (increase in 12 days compared to stray). Sex did not predict LOS.

Our findings may be used for programs aiming to reduce LOS of rats in animal shelters, to create community initiatives to reduce intake, and to generally encourage more research on this understudied but growing in popularity companion animal species.

Go to poster: .pdf or comment

Back / *C*

ECONOMIC AND SOCIAL IMPACTS OF COVID-19 ON ANIMAL WELFARE AND DAIRY HUSBANDRY IN CENTRAL PUNJAB, PAKISTAN

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Studies on the impact of the COVID-19 pandemic on animal welfare and dairy husbandry in low-income countries are limited. We conducted a survey between February and June 2020 to evaluate the economic impact and animal health problems upon the pandemic. Participants were lead veterinarians from 14 dairy farms with herd size between 100 and 500 in Lahore. These farms were major suppliers of milk and dairy products to central Punjab, Pakistan. During the pandemic, 10 of the 14 dairy farms relied on feedmill concentrates to provide feeds to their herds. Half of the farms reported feed shortage due to lockdowns. Six (43%) dairy farms have witnessed a 7.5% shortage of dry feed intake. In seven (50%) farms, the body condition score decreased by 0.24 point. The body score reduction was significantly associated with depleted feed intake (P = 0.005). The veterinarians of 10 (71%) farms failed to gain access to essential veterinary medications, hampering the treatment of sick animals. Due to feed shortage and drug unavailability, daily milk production reduced by two litters per cow in the herd of five (35%) farms. The reduced feed intake was significantly associated with the decrease in milk production (P = 0.003), while numerous downstream milk-processing facilities were out of service during the pandemic, significantly reducing the profit of six (43%) dairy farms. There was a significant negative impact of COVID-19 on the surveyed farms on animal health, milk production, and animal welfare. Such issues were due to the closing of feedmills and transport hurdles, which created barriers in the milk supply chain. Dairy farmers also faced economic losses due to a decrease in milk production and limitations in selling milk. As milk production is the basic source of income for these dairy farmers, such pandemic greatly affected their livelihood as for those involved in hospitality industry, food and feed transportation, and the food chain. If the government does not provide proper support to the dairy sector at this time, then not only the dairy sector but other connected businesses will go down, and long-lasting consequences will remain beyond this pandemic. Our study showed that the dairy farming industry and animal welfare were critically affected by three aspects: feed shortage, inaccessibility to essential veterinary drugs, and a reduced consumer demand for dairy products.

Go to poster: .pdf or comment

Back / *F*

PROVISION OF ARTIFICIAL LIGHT AT NIGHT FOR A SHORT PERIOD AFFECTS THE WELFARE OF NIGERIAN INDIGENOUS CHICKENS

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Nigerian indigenous chickens (NICs) are mainly scavenging birds whose welfare have been neglected for long especially in terms of poor feeding, lack of housing, inadequate medications and harsh environmental conditions such as rain and high temperature. Naturally, as dusk approaches, NIC seek appropriate roosting sites on trees or other elevated platforms in preparation for sleep. Most NICs roost close to the house of their owners where the security lights could be on at night. It is unknown how these birds react under artificial light conditions. Sixty four sexually matured NICs (24 cocks and 40 hens) were randomly housed in eight pens with each pen having three cocks and five hens. From each pen, two birds (one cock and one hen) were randomly selected and roosting behaviour was monitored for 12 days consecutively under natural light (NL) and another 12 days under artificial light, AL (light was put on from 6-8pm) using CCTV cameras. At the end of 12 days each of NL and AL period, 2ml of blood was collected for blood analysis (heterophil/lymphocyte ratio (H:L), triiodothyronine (T_3), Packed Cell Volume (PCV) and blood glucose level). The roosting behaviours monitored were roosting location (lower and upper tier of a perch), neck position (neck stretched, normal neck and head tucked under wings) and sleeping posture (standing or crouching). Behavioural data were analysed using paired sample T-test/Wilcoxon signed rank test while blood parameters were analysed using paired sample T-test all in SPSS 23. A higher ($t_{(7)}$=2.398, p=0.048) percentage of NICs roosted on the upper tier of the perch under NL than AL but there was no difference (p>0.05) in the percentage of NICs in the lower tier under both conditions. There was no difference in the percentage of NICs that roosted with the neck stretched out or tucked under wing in both conditions. However, a higher percentage of NICs adopted the normal neck position in the AL than NL ($t_{(7)}$ = -2.608, p=0.035). Roosting in a standing position was greater ($t_{(7)}$ = -3.971, p=0.005) under AL than NL but roosting in a crouching position was greater ($t_{(7)}$ = 3.971, p=0.005) under NL than AL. Blood glucose, PCV and H:L did not differ (p>0.05) in the two conditions (NL and AL) but T_3 was greater ($t_{(15)}$ = 2.640,p=0.019) in NL than AL. Provision of light at night for 2 h altered the roosting behaviour and body metabolic rate.

Go to poster: .pdf or comment

Back / *F*

THE IMPACT OF HOUSING ON FEAR AND ATTENTION BIAS WELFARE INDICATORS IN LAYING HENS

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Most U.S. laying hens are housed in conventional cages that restrict motivated behaviours and can impact affective states. The objective was to determine the impact of housing conditions on laying hen fearfulness and anxiety. In total, 184 Bovan Brown laying hens were housed in 28 conventional cages with 3 birds/cage (675 cm^2/bird) or 4 enriched pens with 25 birds/pen (3168 cm^2/bird). Cages contained nipple drinkers and ad libitum feed. Pens contained a bell drinker, ad libitum feed, nest boxes, litter, a hay bale, perches, and biweekly cabbage as nutritional enrichment. The study was approved by the Virginia Tech ethical committee. At 22 weeks old, a tonic immobility (TI) test was performed using a v-shaped cradle to assess fearfulness (n=24 birds/treatment), recording latency to righting (s) and induction attempts (maximum 3). An attention bias test (ABT) aims to quantify birds' responses to a perceived threat and can indicate their level of anxiety. At 29 weeks old, a novel ABT was performed in familiar groups of 3 (n=36 birds/treatment). Hens were placed in a 7950cm^2 testing arena with a feeder containing mealworms along the back wall. The test started with a playback of a conspecific ground predator alarm call (8s), which was repeated after all 3 hens were observed feeding (≥5s). Frequencies and latencies (s) to begin and resume feeding were recorded. Data were analysed with Wilcoxon rank-sum test and mixed models (housing as fixed, test group and pen as random factors).

TI latencies to righting (mean±SEM) tended to differ, with 134±23s for caged birds and 82±17s for penned birds (P=0.097). Induction attempts were unaffected (2.0±0.1; P=0.709). In the ABT, caged birds tended to begin (P=0.059), and resumed feeding (P=0.022) more often compared to penned birds, with 45.8% vs. 37.5% feeding within 300s, and 53.8% vs. 46.1% resumed feeding after the 2nd call respectively. ABT latencies were unaffected (P≥0.12), with start and resume latencies of 96.6±24.6s and 27.3±12.9s for caged birds and 153.7±24.6s and 36.2±14.6 for penned birds respectively. This study suggests that housing layers in cages resulted in somewhat more fearful but less anxious birds compared to enriched pens. These results support the theory that anxiety and fear are not necessarily correlated, with anxiety being an affective state, and fear associated to a specific object or being. Housing conditions could impact fear and attention bias in laying hens, although more work is needed to clarify the relationship.

Go to poster: .pdf or comment

Back / F

EFFECT OF REARING ENVIRONMENT ON THE DEVELOPMENT OF SPATIAL COGNITION IN EGG-LAYING HENS

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Multi-tiered aviary systems provide laying hens with opportunities for species-specific behaviors, including vertical and horizontal movement. However, collisions and failed landings that occur during vertical movement are associated with injuries, such as keel bone fractures. Previous studies have suggested that floor rearing of pullets with minimal access to elevated structures may negatively impact adult laying hens' ability to navigate vertical space. Unfortunately, it is not clear whether this is due to deficits in physical ability or if differences in rearing environment influence the development of adequate spatial cognition. The effect of rearing environment on the development of spatial cognition was investigated in egg-laying hens using a novel Y-maze task and a visual cliff task at 7-8, 15-16, and 29-30 weeks of age. Dekalb White pullets (n = 450) were reared in three different environments until 16 weeks of age: floor, single-tier aviary, and multi-tier aviary. At 16 weeks, all birds received a multi-tier aviary for the laying period. Distance perception was evaluated via a Y-maze task with a ratio of 1:3 or 1:1 difference in escape arm length and exit choice was recorded. To evaluate depth perception, hens were placed on a perch in the center of the visual cliff table, facing the perceptual cliff. Each bird was tested with three trials with random assignment of cliff depth at 15, 30, and 90 cm below the perch. Birds were given the option of escaping by jumping to a platform suspended over the visual cliff. Behaviors recorded included crossing the visual cliff and number of downward head orientations over the cliff edge. It was found that birds, regardless of age and rearing treatment, exited the Y-maze through the shorter (0.70, $P < .001$) arm more than chance. An interaction effect of age and rearing treatment on crossing the visual cliff (Wald $x^2 = 12.734$, df = 4, $p = 0.013$) was found, with hens reared on the floor being less likely to cross the visual cliff at 8 and 16 weeks of age than 30 week old floor reared birds or multi and single treatment birds at 8 and 30 weeks old. These results suggest that floor reared birds do not have impaired depth perception, but do respond differently when faced with a vertical structure prior to being transitioned to adult housing. This has implications for pullet rearing and the importance of early access to vertical structures.

Go to poster: .pdf or comment

Back / *F*

THE NUTRITIONAL SOUNDNESS OF MEAT- AND PLANT-BASED PET FOODS

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Global trends such as population growth, increasing competition for protein sources, environmental degradation, and farmed animal welfare concerns, are all driving plant-based pet food development. However, lack of evidence of nutritional sufficiency is inhibiting their uptake. This interferes with the ability of some consumers to adopt pet foods more aligned with their values, and the ability of the pet food sector to fully realise the potential of this emerging market, whilst concurrently reducing its environmental footprint. Yet, no systematic study has been published examining the prevalence of steps taken to ensure the nutritional soundness and quality of pet foods, and whether plant-based diets have lower standards in these respects. Accordingly, we surveyed pet food manufacturers producing 19 meat-based and 10 vegan, almost vegan or vegetarian pet foods. Although there were there were limited areas in which practices could be improved, most manufacturers had acceptable or superior standards at nearly all stages examined, throughout the design, manufacturing, transportation and storage phases, with plant-based diets slightly superior to meat-based diets overall. A range of best practice steps should be implemented by companies and regulators, and a comprehensive range of communication modalities implemented, to reassure consumers about the nutritional soundness of products.

Go to poster: .pdf or comment

Back / *C*

LASER PLAY WITH CATS AND DOGS – ENRICHMENT OR ENDANGERMENT?

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Laser pointers are often used as toys by cat and dog guardians. The fast movement of a laser activates animals' prey drive and stimulates chasing behaviour. Despite their popularity, the benefits and potential risks associated with laser pointers are uncertain. Inexpensive laser pointers are readily available for purchase from numerous outlets in the US and UK (e.g. Chewy.com, PetSmart, Pets at Home, Amazon, etc). These laser pointers are marketed as a fun, safe way to prevent pets' boredom and give them an easy way to obtain more exercise. A minority of lasers come with a warning to avoid direct eye exposure, yet most indicate the light is safe for animals and humans. No other warnings are included in the online product descriptions or container/box. Yet, it has been suggested that while laser pointers trigger an animal's natural drive to hunt and chase, they do not allow the animal to successfully complete the hunting process, therefore potentially leading to frustration, compulsive tendencies (e.g., fixation on lights/shadows/reflections) and behaviour problems. To examine relationships between the use of laser toys and compulsive behaviours, 618 current cat owners were asked how often they play with their cat using a laser, and how often their cat displayed potentially compulsive behaviors (shadow/tail chasing, stare obsessively at reflections, overgrooming, etc.). Nearly half (45.5%) reported using laser pointers to play with their cats. All compulsive behaviors except overgrooming were associated with frequency of laser play. A multiple linear regression predicting compulsive behavior using laser play, guardian, cat, and household factors was significant, with the largest predictor being laser play. Overall, the more frequently laser pointers were used, the more likely owners were to report compulsive behaviors. Although correlational, these results support concerns that laser toys may be associated with the development of compulsive behaviors in cats, warranting further research into their risks.

Go to poster: .pdf or comment

Back / *C*

SOUND THERAPY FOR STRESS-RELIEF DURING NEUTERING PROCEDURE FOR FEMALE CATS

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There is evidence that musical sounds can reduce pain, anxiety and stress of animals during neutering procedure. As consequence this can lead to a decrease in anaesthetic and analgesic requirements. The stimulation of a sound is based on vibration which positively affects blood circulation and central nervous system. However, the choice of the right sound for different species of animals is very important. Cats are carnivores with a great sense of hearing that helps them to catch prey. This ability makes sound therapy possible for them as it is similar to cats ability to purr and that may be the way to deal with stress and pain.

The present study has been done by measuring the diameter of the cat‘s eye pupil, respiratory rate and heart rate in chosen two points of a female feline neutering surgery – T1 (abdominal wall near linea alba) and T2 (ovarian lig. suspensorium). This has been done while three different types of music (classical music, special cat sounds and sound of kitten) were playing using the earphones which were inserted in the ears of a cat. Before each of these measuring points, two minutes of control has been made.

12 cats were examined during the research, half of them were 12 to 60 months of age. Results of the research show that the heart rate at point T2 was faster (21, 34 bpm) than at point T1 while breathing rate almost did not change during the whole surgery. Most measured physiological factors were the biggest when the sounds of kittens were playing (KK), average when classical music was playing (KM) and lowest when a special cat music (SKM) was playing. Comparing KT and SKM using a T-test these results were significant: the diameter of the eye pupil (T1, P = 0.032; T2, P = 0.001), heart rate at (T2, P = 0.010) Also, while comparing KT and KM the results were significant when measuring the diameter of the eye pupil at T2 (P = 0.002).

Using of SKM showed very promising results in relieving of stress and pain caused by neutering procedure for female cats.

Go to poster: .pdf or comment

Back / *C*

ROLE OF AGE AND PLUMAGE COLOUR ON THE LEVEL OF FEAR IN GUINEA FOWL KEET

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Guinea fowl is second to the domestic fowl in terms of numbers and supply of poultry protein in Nigeria with three common plumage colours namely: Pearl, lavender and white. They are highly social birds and tend to languish when alone. High level of fear can have a harmful effect on the welfare of poultry thereby leading to a decrease in performance. A number of studies have investigated the adaptive behaviour of fear in broilers, but very little work has been carried on guinea fowls. From an established flock of sexually matured guinea fowl flock, eggs were collected and taken to the PEARL hatchery. Keets which hatched on weekly basis were housed and reared appropriately. Thirty guinea fowl keets per age group (one, two and three weeks old) of three plumage colours (lavender, pearl and blonde) were subjected to tonic immobility and emergence tests. The number of attempts to induce tonic immobility and the duration of tonic immobility was recorded. The time taken for each keet to exit the emergence box was also recorded. Data was subjected to Kruskal-Wallis test of SPSS. There was a significant effect of age on the number of attempts to induce tonic immobility and the duration of tonic immobility. Three weeks old guinea fowl keets were easily (χ^2 =12.194, df=2, p=0.002) induced and remained immobile for a longer period (χ^2 =8.434, df=2, p=0.015) compared to the two and one-week old keets. Age had no effect on the duration of emergence from the emergence box. Within each age category, the number of attempts to induce tonic immobility, duration of tonic immobility and time taken to emerge was similar for the three plumage colours of the guinea fowl keets. This study shows a close association between age and level of fear in guinea fowl keets. Interestingly, plumage colour of guinea fowl keets was not related to the level of fear. The increase in level of fear as the keets increase in age could affect their welfare in terms increased smothering which could cause mortality. Further studies on how to reduce the level of fear in keets using environmental enrichments and other management strategies need to be investigated.

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Go to poster: .pdf or comment

Back / *F*

TRAINING PEOPLE TO IMPROVE ANIMAL WELFARE: A LONGITUDINAL TRIAL OF LABORATORY ANIMAL PERSONNEL AND RAT TICKLING

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Despite strong evidence supporting the welfare benefits of rat tickling, the technique is not often implemented. A recent survey showed that 55% of personnel working with rats never use rat tickling. One barrier to use was lack of training. Therefore, our object was to determine the efficacy of training programs to increase important outcomes related to rat tickling implementation. We hypothesized that laboratory personnel who undergo training will report higher self-efficacy, knowledge, familiarity, and implementation of rat tickling.

Laboratory animal personnel currently working with rats in the USA were recruited from widespread online promotion. After completing a baseline survey, participants were semi-randomized to either online-only training (n = 30), online + hands-on training (n = 34), or waitlist control (n = 32). At baseline, treatment groups were not significantly different in demographics or outcome measures (ANOVAs, $p > 0.05$). Both training groups received a 30-minute interactive, visual training course in rat tickling. In addition, the hands-on training group received a 30-minute training session specifically reviewing the hands-on components of rat tickling. Participants received a survey immediately after their assigned training and a follow-up survey two months later. In each survey, participants answered questions related to their self-efficacy, knowledge, familiarity, and implementation of rat tickling. Data were analyzed using general linear mixed models.

Compared to baseline, participants in both training groups reported increased implementation, self-efficacy, knowledge, and familiarity of rat tickling at 2-months follow up (respectively $F_{4,154} = 3.5$, $p = 0.009$, $F_{4,177} = 7.4$, $p < 0.0001$, $F_{4,179} = 32.0$, $p < 0.0001$, $F_{4,178} = 4.5$, $p = 0.002$, post-hoc Tukey's, p's<0.05), whereas those in the waitlist group did not experience any changes. At the follow-up survey, hands-on training participants also had higher self-efficacy and familiarity as compared to the waitlist ones (Tukey, p's<0.05). Compared to baseline, online + hands-on training participants also showed increased in their perceived control beliefs at 2-months ($F_{4,178} = 3.5$, $p = 0.009$, Tukey, p's<0.05).

Our findings show that both online and hands-on training improves laboratory animal personnel's self-efficacy, knowledge, and implementation of rat tickling. Adding a hands-on component to the training improved perceived control beliefs and had greater benefits for self-efficacy and familiarity. However, our results suggest targeted, interactive training courses (whether online or in-person) are effective means of promoting implementation of animal welfare-enhancing techniques.

Go to poster: .pdf or comment

Back / *L*

THE ROLE OF ONLINE PHOTO BACKGROUNDS OF SHELTER/FOSTER DOGS ON THE PERCEPTION OF SOCIABILITY IN DOGS

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With the increasing prevalence of technology, the internet is often the first step for potential pet owners searching for an adoptable dog. However, best practices for the online portrayal of shelter and foster dogs remain unclear. Different online photo backgrounds appearing on adoption websites for shelter dogs may impact adoption speed by influencing viewer interest. Online clicking behaviour on pet profiles and human-directed sociability, broadly defined, has been previously linked to increased adoption likelihood. Therefore, the objective of this study was to determine the relationship between photo backgrounds of shelter dogs and online clicking as well as perceived human-directed sociability. In a virtual experiment, 680 participants were asked to rank the sociability and friendliness of four different adoptable dogs on a scale from 0-10. The photo background of each dog was digitally altered and randomly assigned to four experimental background conditions: 1) outdoor, 2) home indoor, 3) in-kennel indoor, and 4) plain coloured. As a proxy for adoption interest, a link to the dog's adoption profile was presented on each slide and the clicking behaviour of participants on this link was recorded. Mixed logistic regression models revealed that background did not affect participants' link-clicking behaviour (*chisq = 3.55, df = 3, p = .314*) nor perceptions of sociability (*statistic = 6.19, df = 3, p = .103*). Across all backgrounds, only 4.74% of presented slides culminated in participant link-clicking. Sociability scores also did not predict link clicking. Assessment of participant-related factors and dog ID revealed that link clicking and sociability scores of photographs were influenced by differences between dogs themselves and unaffected by participants' awareness of study hypotheses; sociability scores were however affected by participants' location of residence. We conclude that artificial background types did not affect participant responses. The results demonstrate the importance of empirical data in making marketing decisions in animal shelters. Understanding which aspects of online marketing materials impact viewer interest will provide guidance for both animal shelter personnel and foster families to improve speed of adoption of the animals in their care.

Go to poster: .pdf or comment

Back / *C*

GOAT BREEDS WITH DIFFERENT BREEDING OBJECTIVES DIFFER IN THEIR BEHAVIOURAL FLEXIBILITY

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Breeding farm animals for high performance likely has an indirect impact on other physiological and behavioural traits due to re-location of resources to production traits (Resource Allocation Theory). These changes might also affect the flexibility of animals to adapt to new environments and could thus lead to welfare problems. We investigated how breeding for high performance affects goats' learning success in a discrimination task and a reversal task – with the latter being frequently used to assess behavioural flexibility. We tested a total of 33 female goats (18 dairy goats selected for high milk yield; 15 dwarf goats not selected for specific performance objectives; half of each housed and tested at a facility in Germany or Switzerland to increase robustness of findings). Goats were individually presented with an object-discrimination task in which they had to discriminate between two containers (black or white), only one of which was baited with a reward. Half of the subjects were rewarded for choosing the black container, while the rest was rewarded for choosing the white container. All subjects received a maximum of 20 sessions, each consisting of 12 trials. Learning criterion was set at 10 or more correct trials in two consecutive sessions. Subjects that reached the criterion proceeded to the reversal task in which the rewarded contingencies were reversed. In the initial discrimination learning task, there was no difference in learning success between dairy and dwarf goats ($P = 0.5$). In contrast, dwarf goats were faster to reach the learning criterion in the reversal task compared to dairy goats ($P = 0.03$). Our results indicate that selection for high performance might be associated with decreased behavioural flexibility in goats.

Go to poster: .pdf or comment

Back / *F*

TEACHING VIRTUALLY FROM HOME – LET ALFIE PLAY

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The psychological and physical benefits associated with companion animals has been documented in numerous studies, yet little research has been done exploring the impact of including companion animals within educational environments. Even before COVID, virtual college lectures were becoming increasingly common, but now, countless college instructors are being asked to record and present virtual lectures from their homes. Even though they are at home more, if teaching most of the day, these instructors may still be unable to spend as much time interacting with their companion animal as desired for maximum well-being of both guardian and companion animal. Being in the same house with companion animals does not necessarily translate into increased well-being. Yet, direct interaction throughout the workday might foster increased welfare for companion animals. One way to impact companion animal well-being, therefore, is to include them within virtual lectures. In this way, instructors could spend more time interacting with their companion animals, thereby strengthening the human-animal bond, improving the daily life of companion animals, while also potentially impacting students' perceptions of the lectures and performance in the class.

To test these potential effects, a pilot study exploring the feasibility and impact of including a dog within college lectures was conducted in a fully online, asynchronous undergraduate histology course during the Spring 2021 semester at one United States university. In a random selection of approximately half of the lectures, the instructor "asked" her dog a question related to material presented earlier in the lecture. She then answered the question while petting her dog and giving her dog a treat. In the control group, the instructor asked the quiz question (and supplied the answer) directly to the students (via the computer screen). At the end of each lecture, students were asked to completed a short online assessment that included the quiz question asked in the lecture and a question asking them to rate the lecture (on a 4-point Likert scale from 1 = excellent to 4 = poor). Chi-square tests were used to assess the difference between dog and control group on quiz question responses (coded as correct or incorrect) and ratings of the lecture. A significant difference was found in lecture rating; whereby students rated the lectures with the dog present higher than the lectures without the dog. No differences were found in quiz question scores. These results suggest that that the inclusion of a dog within virtual college lectures appears to positively impact students' perceptions of the lectures. Therefore, instructors are encouraged to include their companion animals in their at-home virtual lectures (live and taped) to not only to improve the student experience but also to simultaneously enhance their companion animals' well-being and welfare.

Go to poster: .pdf or comment

Back / C

ANIMAL MANAGEMENT FACTORS AND HABITAT CHARACTERISTICS ASSOCIATED WITH ACTIVITY AND HABITAT USE BY BOTTLENOSE DOLPHINS IN ACCREDITED ZOOLOGICAL ENVIRONMENTS

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Non-invasive cetacean tagging systems can be used to investigate the influence of habitat characteristics and management factors on behavior by quantifying activity levels, distance traveled, diving behavior, and habitat use by bottlenose dolphins. The way an animal uses its habitat can serve as an indicator of habitat appropriateness for the species or individual and may influence the social design chosen by the facility. Bottlenose dolphins (*Tursiops truncatus* and *T. aduncus*) under professional care experience a range of habitat types and management programs that provide opportunities for dolphins to engage in species-appropriate behaviors. The purpose of the present study was to explore if and how factors related to environmental enrichment programs, training programs, and habitat characteristics are related to the activity and habitat use of dolphins in accredited zoos and aquariums. The overall dynamic body acceleration (ODBA; a proxy for energy expenditure), average distance traveled, diving duration, and vertical habitat movements of 60 bottlenose dolphins at 31 accredited zoos and aquariums were recorded when dolphins were outside of formal training sessions using non-invasive bio-logging devices (MTags). Dolphins wore the MTags one day per week for two five-week data collection periods. The results show that demographic, environmental enrichment programs, training programs, and habitat characteristics were associated with kinematic data and vertical habitat use. Specifically, features of the environmental enrichment programs were related to ODBA, average distance traveled, dive duration, and habitat use. Features of the training programs were associated with average distance traveled and habitat use. Habitat characteristics were associated with ODBA and habitat use. Taken together, the results suggested that management practices were more strongly related to how dolphins use their environment relative to the physical characteristics of the habitat.

Go to poster: .pdf or comment

Back / W

INTEREST IN HUMANS: COMPARISONS BETWEEN RIDING SCHOOL LESSON EQUIDS AND ASSISTED-INTERVENTION EQUIDS

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Animal-assisted interventions, and especially equine interventions, are more and more widespread. Whereas it is generally admitted that these practices have positive effects on the human side, very little is known about how animals perceive these activities. In particular, how horses perceive humans and associate them with emotional valences may depend on associations built during interactions. Thus, studies have shown that different factors can influence the human-horse relationship such as horse's individual characteristics, the repeated interactions with the caretaker, the riding techniques and the conditions of life.

In this study, 172 horses (from 12 riding centers) were submitted to a standardized human-horse relationship test, the motionless person test. They had all been involved in the same working practices for at least one year. Seventeen horses worked in assisted activities (EAI), 95 in "classical" riding school activities (RS) and 60 in both activities (EAI-RS). During the test, the experimenter entered the stall and stood with her back against the closed door, without interacting with the horse, during five minutes. All behaviours directed toward the experimenter were recorded. For each horse, the age, the sex, the type (horse or pony), the housing conditions and feeding practices (hay quantity/number of concentrate meals per day) were collected.

Important individual variations were observed in the number of behaviours directed toward the experimenter (0 to 51; mean±SE=8.3±0.8). A negative binomial model was used to test which factors influence this number. Activity, quantity of hay per day, type of equids, age and sex all seem to have an impact. The type of activity appeared as a major factor of influence: RS horses performed more interactive behaviours than both EAI (p=0.039) and EAI-RS (p=1.98e-05) horses. The feeding practices seemed to be the second most important factor (equids with more than 3kg of hay per day interacted more than equids with less than 3kg per day, p=0.013). Some individual characteristics also influenced horses' behaviours: the type (horses proved more interactive than ponies p=0.009), sex (geldings were more interactive than mares p=0.032) and age (3-15 year-old horses performed more behaviours than over 15 year-old horses p=0.032).

Horses working in animal-assisted interventions clearly proved less interactive with an unknown person. Reasons for these results remain to be further investigated, hypotheses can be a selected temperament characteristic, a result of a training or apathy due to the type of work. In any case, these results open new questions on the equine assisted practices.

Go to poster: .pdf or comment

Back / E

EFFECTS OF EARLY SOCIAL CONTACT ON DAIRY CALF RESPONSES TO INITIAL GROUPING AND SUBSEQUENT REGROUPING

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Social contact affects social development and response to novelty in dairy calves, but the age of introduction to social housing varies on-farm and may have implications for behavioral development and response to social grouping. The objective of this experiment was to evaluate the effects of early social contact during the first 2 weeks of life on responses following initial social regrouping, followed by subsequent regrouping. We hypothesized that calves previously housed in pairs would engage in more social behavior, have increased rest, and interact more readily with a novel pen resource (rotating brush). At birth, calves were randomly assigned to individual (IH; n=16 calves) or pair housing (PH; n=8 pairs). Calves were mingled between treatments and initially grouped (4 calves/pen) at 13±2 days of age and then regrouped (8 calves/pen) at 20±5 days of age. Activity and social interactions were continuously recorded from video for the first 24 hours following grouping and regrouping (except for allogrooming and social play, which were observed for 12h due to nighttime visibility). Following initial grouping, previously pair-housed calves spent more time lying socially (within one body length of another calf) than previously individually-housed calves (9.8 vs. 5.7 h; PH vs. IH; SE = 0.82; *P* = 0.005). However, there was no effect of previous social contact (P > 0.45) on lying duration (17.7 h; SE = 0.35), brush use (24.2 min; SE = 0.42), allogrooming (4.3 min; SE = 0.15), or social play (0.18 min; SE = 0.2). Following regrouping, the duration of social lying remained greater for calves previously housed in pairs (11.9 vs. 9.0 h; PH vs. IH; SE = 1.0; *P* = 0.02). During regrouping, there remained no effect of previous social contact (P > 0.08) on lying duration (17.3 h; SE = 0.47), brush use (35.9 min; SE = 4.4), allogrooming (4.0 min; SE = 0.16), or social play (0.76 min; SE = 0.79). These results suggest that early social contact during the first 2 weeks of life did not greatly affect rest, active social interactions, and brush use upon initial introduction to a group pen or subsequent regrouping. However, persistent differences in duration of social lying time following initial grouping and regrouping suggest that early life social contact may influence the formation of social bonds. Overall, these results support evidence of welfare benefits of early life social contact for dairy calves.

Go to poster: .pdf or comment

Back / *F*

EQUINE WELFARE AND HUMAN SAFETY - TIME FOR A NEW CONCEPTUALISATION AND APPROACH?

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Describing the horse industry as an “anthropocentric hall of mirrors”, many influential researchers are calling for change. This study identifies opportunities to address this call by examining the intersection of horse welfare and human safety as a complex interdisciplinary challenge. Drawing on “undesirable horse behaviour” as a reflection of this intersection, the contemporary state of research is systematically reviewed and critically examined, and a reconceptualisation of the challenge using a systems thinking approach proposed. All full-text, peer reviewed studies published between 2010 and 2020 retrieved from the Science Direct, ProQuest and Wiley online databases using the key words “equine”, “horse”, “behaviour”, “conflict”, “abnormal”, “problem” and “stereotype” were included. Analysis of literature examined behaviours and factors studied in research, disciplines conducting research and underpinning assumptions in order to identify opportunities for approaching research differently. Results suggest that undesirable horse behaviour is commonly occurring across breeds, age, sport, “at rest”, during routine handling procedures and while being ridden. Most commonly studied are stereotypies, undesirable riding and handling behaviours, problem behaviour during transportation and head-shaking. Factors identified relating to these behaviours include horse management, pain, stress and feeding practices. Veterinarians, psychologists and agricultural scientists are conducting the majority of research, yet separately in their disciplines and utilising positivist scientific approaches to study horse behaviour. While researchers are recognising the complexity of these undesirable behaviour problems, and beginning to form cross-disciplinary teams, to date, these are yet to reframe their conceptualisation of or approach to the problem. Systems thinking is utilised to reconceptualise undesirable horse behaviour at the intersection of horse welfare and human safety. Emerging from the natural sciences, systems thinking is an interdisciplinary approach to observing complex challenges (such as undesirable behaviour) as dynamic, part of a highly interconnected network of components and feedback relationships that are embedded in socio-cultural contexts. The focus of undesirable horse behaviour in a horse-human system is conceptually mapped in terms of factors associated with the behaviour (eg. management, pain, stress, diet), and the relationships between them. The use of systems thinking demonstrates a way to integrate multiple disciplines and an opportunity to identify and navigate new solutions to addressing horse welfare and promoting safety in contemporary society and offers an opportunity for discussion and reflection.

Go to poster: .pdf or comment

Back/ *E*

EXPLORING THE RELATIONSHIP BETWEEN HUMAN SOCIAL DEPRIVATION AND ANIMAL SURRENDER TO SHELTERS IN BRITISH COLUMBIA, CANADA

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The close relationship of humans and companion animals means the two populations often share similar physical and social conditions. Previous studies identify owner-related issues, such as cost and housing, as common reasons for relinquishment of pets to animal shelters. It is likely that the burden of surrendering for owner-related reasons falls on those who are socially vulnerable (e.g. low income, unemployed); however, very few studies have assessed social determinants as a predictor of animal relinquishment. The present study used the Canadian Index of Multiple Deprivation (CIMD), which uses four factors of social vulnerability (Ethnocultural Composition, Economic Dependency, Residential Instability, and Situational Vulnerability) to predict risk of surrender for various reasons, of various species and breeds, and of various health statuses across British Columbia, Canada (n=29,236). Our study found that these factors predicted increased risk of surrender across many shelter variables. For further understanding of differences between areas in the province, the present study also analyzed the relationship between CIMD factors and animal surrender variables in two areas of interest: Metro Vancouver (n=3,445) and Kamloops (n=2,665), and plotted these relationships on a geospatial scale. Our study found that there were some similarities across areas, such as Situational Vulnerability predicting increased odds of surrendering pit bull-labelled dogs versus all other dog breeds. There were also differences in predictors of animal surrender variables, suggesting that animal servicing for vulnerable groups may be specific to location. For example, while Ethnocultural Composition predicted increased risk of owner surrender for multiple owner-related reasons in Metro Vancouver, these same surrender reasons were predicted by Residential Instability in Kamloops, indicating demographic differences that affect animal shelter service use. The results of this research justify the use of geospatial analysis to understand relationships between human vulnerability and animal welfare, but also argue the need for further interventions in marginalized populations to increase retention of animals.

Go to poster: .pdf or comment

Back / *C*

THE PDSA ANIMAL WELLBEING (PAW) REPORT: USE OF ANIMAL WELFARE SURVEILLANCE DATA TO PROMOTE AND MONITOR IMPROVEMENTS IN UK PET WELLBEING

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Introduction

The PDSA Animal Wellbeing (PAW) Report provides nationally representative companion animal welfare surveillance that identifies trends and priorities, and helps to drive and monitor change. The PAW Report was initiated by PDSA, the national UK veterinary charity, in response to the introduction of the UK's Animal Welfare Acts. It set out to understand and monitor the wellbeing of the UK's pet dogs, cats, and rabbits and is framed around the Five Welfare Needs.

The report has been conducted annually since 2011, providing longitudinal data over 10 years which explores if and how pet owners are meeting the Five Welfare Needs of their pets, pet acquisition, and animal and owner demographics. Veterinary professionals are also surveyed to ascertain their views related to the welfare of UK pets, and in 2018 alongside the PAW Report, we worked with the British Veterinary Association (BVA) and the British Veterinary Nursing Association (BVNA) to ask their members what their views are on two key pet wellbeing topics: pre-purchase and pet obesity. Following the first 2020 UK-wide lockdown, we additionally surveyed pet owners to examine the early impacts of COVID-19 restrictions on pet wellbeing.

Methods

Surveys are used to explore pet ownership, behaviour, health, environment, diet, and companionship. Questions have been refined over the 10 years, and additional questions have been included to encompass new areas where animal welfare data may be of value. Data collection and analysis is completed by the research organisation, YouGov, using their panel methodology to survey nationally representative samples of UK pet-owning adults. The findings are also used to estimate the size of the owned pet cat, dog and rabbit populations in the UK.

Impact

Over ten years of data collection, some key findings include:

- Fewer owners feel informed about their pet's need to express normal behaviour.
- The number of dogs, cats, and rabbits that have been microchipped has significantly increased.
- More cats are being kept indoors only.
- Fewer rabbits are fed muesli-type mix as their main food type.

The wealth of data that the PAW Report generates is used to stimulate collaborative working, inform government research, policy and legislation and to inspire innovative approaches in veterinary clinical practice. PDSA works alongside university researchers and students, and makes PAW data available for studies on selected relevant topics to bring additional benefit to animal welfare through further research.

Go to poster: .pdf or comment

Back / *C*

DEVELOPMENT OF THE ANIMAL WELFARE ASSESSMENT GRID FOR DOGS

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Introduction

Assessment of animal welfare is notoriously difficult due to its subjective nature. Veterinary surgeons have a duty to protect their patients' welfare and they are required to have sufficient awareness of the major components that affect welfare, and to be aware of the possible harm that veterinary treatment can cause and risks of treatment. Ethical treatment decisions should be based on the welfare of the animal, rather than meet the expectations of the client. Tools to aid the decision-making process are scarce, and rarely consider the holistic wellbeing, nor do they consider the temporal experience of the animal.

The Animal Welfare Assessment Grid (AWAG) for dogs has recently been developed into a user-friendly online tool for veterinary surgeons and welfare professionals to use. The AWAG is a tool that monitors the welfare of animals and is highly adaptable to any species. It assesses physical health, psychological wellbeing, environmental comfort, and veterinary and management procedural events, and draws attention to the temporal component of welfare. It has been validated in a number of other species and is currently in the process of being refined and validated for use in companion animal practice following pilot trials.

Methods

The AWAG site was developed alongside a web design company that incorporates the validated algorithm and welfare scoring. Small animal veterinary practices were recruited to trial the tool and provide feedback on its use and factor scores.

Results

The main themes from the feedback were that some factors were too difficult to score or that they did not feel they were as relevant to dog welfare. Clinicians also reported that some scores were not mutually exclusive. From this feedback, the AWAG site and factor scores been refined to make the tool more intuitive. Data are now being collected to validate the AWAG and to assess the welfare impact of chronic disease.

Impact

Development of the AWAG tool means dogs will have their welfare objectively assessed and this can be measured over time. It can help veterinary surgeons can make well-reasoned and ethical treatment decisions based on the welfare of the animal, rather than simply to meet the expectations of the client. By enhancing the quality of decision-making, decisional conflict will be reduced; thereby, improving mental health in veterinary surgeons as well as improving canine quality of life.

Go to poster: .pdf or comment

Back / C

BRAVE BREEDS AND BRAINS UNDER THE SPOTLIGHT: HOW DO GENETICS AND LIGHT DURING INCUBATION IMPACT YOUNG LAYING HENS STRESS RESPONSIVITY?

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A promising intervention to improve chicken welfare is the presence of light during incubation. More specifically, a cycle alternating a phase of green light and a phase of darkness has proved to help decreasing fearfulness in broilers. The impact on laying hens, however, is not known. We thus investigated the effects of light during incubation on the stress sensitivity of two common layer hybrids: ISA Brown and Dekalb White. The latter are known to be flightier than the former, especially with humans.

Although the developmental stage has a major impact on the ability to cope with stressors at adulthood, there is an even greater gap of knowledge on the impact of light during incubation on layer pullets. That led the rearing phase to be the main focus of our research.

Half of the eggs of each hybrid were incubated in standard dark conditions and the other half in a green light:dark cycle of 12:12 throughout the incubation, resulting in a 2*2 design. Different behaviour tests were performed to investigate pullets stress responsivity, including two novel object tests and two voluntary approach tests.

We expected the light-incubated chicks to show lower fear responses in both tests as compared to dark-incubated chicks. In addition, we expected brown chicks to show lower fear responses in the voluntary approach tests as compared to white chicks. Finally, stronger effects of the incubation treatment were expected in the white chicks – given their higher stress sensitivity and a better transmission of light through white eggshells compared to brown.

There was a tendency to have more light-incubated chicks close to the first novel object at the same time (N = 20, linear mixed-effects model, p = 0.088), which would indeed show that these chicks are less fearful than the dark-incubated ones. A second round of experiments is required to increase the sample size and confirm these results.

Brown pullets pecked at the bait significantly faster than the white ones during both the voluntary approach tests (N = 188, Cox model survival analysis, p < 1,84e-05), meeting our expectations to be less fearful. However, light during incubation only tended to make the pullets less fearful (p = 0.0981), and there was no interaction between the two factors. Human-chicken interactions being very relevant in practice, this shows the importance of adapting the farming conditions to the hybrid used, rather than looking for a universal solution to improve laying hen welfare.

Go to poster: .pdf or comment

Back / *F*

PANTING SCORE INDEX TO ASSESS HEAT STRESS IN SHEEP IN ESTONIA

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The threat to sheep welfare of heat stress when pastured outdoors in the summer, particularly without access to shade, has been under investigated. This may be of importance not only in hot climates, but also during the summer months in cooler climates. Panting score has been suggested as a measure of evaluating heat stress in sheep. This measure was used to investigate the incidence of heat stress in sheep in northern Europe during the summer with sheep at pasture either with no access to shade, the control group (NS) or with access to shade, the treatment group (SH). There were twelve sheep in each of the groups. Respiration rates and panting scores were recorded for each sheep in each group twice each day. Other behaviours were also recorded at the individual animal level. In the SH group, the numbers of sheep in the shaded areas were also noted. Climatic data on observation days was collected. Respiration rates were significantly higher at higher panting scores ($p < 0.001$). Higher panting scores were recorded for NS sheep than for SH sheep ($p < 0.001$), as were panting intensities ($p < 0.001$). The behaviour of open mouth with tongue extended was not observed in the SH group but was observed in the NS group. SH sheep ruminated more ($p < 0.001$) and stood more ($p=0.006$) than the NS sheep, while NS sheep stood panting more than the SH sheep ($p < 0.001$). Indicators of heat stress, respiration rates and panting scores, were more strongly correlated to air temperature and weather conditions in the NS group compared to the SH group, and these were significant. The number of animals observed to be in the shade in the SH group was positively correlated with air temperature. Panting score can therefore be used as a reliable measure for estimating respiration rate and heat stress in sheep. Sheep, even in northern Europe, can suffer from heat stress, particularly when given no access to shade, and shade from the sun should be provided for sheep at pasture.

Go to poster: .pdf or comment

Back / *F*

COGNITIVE ENRICHMENTS – A BRIDGE BETWEEN ANIMAL WELFARE, SCIENTIFIC ADVANCEMENT, CONSERVATION AND EDUCATION

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Cognitive enrichments represent a special category of environmental enrichments. They provide challenges to the subjects' natural problem solving skills, while enhancing well-being and reducing unwanted behaviours and boredom. Cognitive enrichment have been gaining increasing popularity in zoos and aquariums over the past decade. In this presentation we would like to share our first experiences with successful applications of the approach at Ocean Park Hong Kong.

Four cognitive enrichments have been designed and tested with three species, including Indo-Pacific bottlenose dolphins (*Tursiops aduncus*), Spotted seals (*Phoca largha*) and Arapaimas (*Arapaima gigas)*. The dolphins were provided with two cognitive enrichment devices designed to investigate their mutual and altruistic cooperative abilities. The seals were given floating ice plates that allowed them to practice their natural haul out behaviour. Finally, the Arapaimas were allowed to interact with a laser pointer in their habitat.

The welfare impact of the cognitive enrichment was measured by the presence/absence of positive and negative welfare indicators in dolphins. Cooperative play increased significantly on the days when the cognitive enrichment was presented vs the days with no cognitive enrichment (27% vs 16%; $t = 14.626$, $df = 5$, $P < 0.001$), while aggression and potential stereotypy decreased (10% vs 14%; $t = -3.515$, $df = 5$, $P = 0.009$ and 45% vs 48%; $t = -3.162$, $df = 5$, $P = 0.013$ respectively). Seals showed an increase in the rate of interactions with the ice plate from 25 to 204 events/session. On average they spent 50% (± 28%) of the session time investigating/interacting/hauling out in the ice. The Arapaimas spent significantly more time in the exhibit tank during the test than during baseline (63% vs 50%, $t = 2.221$, $df = 53$, $P = 0.015$). Moreover, the three fish were observed travelling more often (average frequency/session/fish 4 ± 2.418 vs 3.02 ± 2.507, $t = 2.274$, $df = 53$, $P = 0.014$), and also longer (average duration/session/fish 468.326s ± 279.631s vs 338.725s ± 288.414s, $t = 2.741$, $df = 53$, $P = 0.004$) during the use of the laser pointer.

The cognitive enrichments also provided opportunities for investigating the subjects' cognitive skills leading to novel peer-reviewed publications. These findings have been valuable addition to the scientific literature of marine mammal social organisation and welfare as well as fish behaviour and welfare, ultimately contributing to the conservation of these species. Moreover, the experimental sessions were partially conducted in the visitor areas. The guests were not only able to observe unique interactions but also to learn more about the threats these animals may face in the wild. For example, the floating ice plates provided a real-life demonstration on the impact of global warming.

Zoos and aquariums play a key role in environmental education, welfare, conservation and science. The use of cognitive enrichments provide a silver bullet for linking the four main pillars of contemporary animal management.

Go to poster: .pdf or comment

Back / W

OWNER DEMOGRAPHIC FACTORS ARE ASSOCIATED WITH ADEQUATE PET RABBIT HOUSING PROVISION IN THE UNITED KINGDOM

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Rabbits (*Oryctolagus cuniculus*) are one of the most popular pets with an estimated population of 1 million kept in the UK. Despite their popularity, there is limited research on the management practices (i.e., housing) used by owners and the impact these have on the welfare of pet rabbits. This study aimed to analyse the potential association(s) between the provision of suitable pet rabbit housing and owner demographics in the UK.

Data from the 2017, 2018 and 2019 PDSA Animal Wellbeing (PAW) surveys were collated resulting in a sample of 1,333 UK pet rabbit owners. Both adequate and inadequate housing were defined by using an assessment of hutch and run size or indoor environment type. Participants were asked to select images similar to their own rabbit housing; selecting a small hutch or indoor cage classed the housing as inadequate whereas medium or large hutch or run environments were classed as adequate. Owner demographic factors collected included gender, education, household income and area deprivation. Chi-square tests and binary logistic regression (univariable and multivariable) were used to analyse owner demographic factors associated with adequate/inadequate housing.

Over half of pet rabbits were housed outside (60.0%) and lived on their own (51.4%). Most owners (86.2%) used a hutch as part of their rabbit housing management with over half (60.3%) of these rabbits being kept in the hutch for 12 hours or more per day. Overall, 31.2% of pet rabbits were reported to live in inadequate housing. Male owners were more likely to report inadequate housing compared to females (OR=1.795, 95%CI 1.319-2.441, P<0.001). Owners between 25-34 years of age were most likely to house their rabbit(s) inadequately (OR=2.050, 95%CI 1.286-3.267, P=0.003) compared to those over 55 years of age. Owners with a household income below the UK average were more likely to provide inadequate housing compared to those with a household income above average (OR=1.406, 95%CI 1.025-1.928, P=0.035).

The findings of this study have highlighted the need for education and supply of adequate pet rabbit housing, especially to owners which are male, aged 25-34, or with a household income below average. The study also brings to light important considerations that may influence animal welfare policies. The establishment of a code of practice for the care of rabbits in England, which considers the design of pet rabbit housing, could encourage a ban on the sale and manufacture of inadequate rabbit housing.

Go to poster: .pdf or comment

Back / *C*

VALIDATING OWNER-REPORTING OF FEATHER CONDITION OF PET PSITTACIFORMES USING PHOTOGRAPHS

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Caregiver-reporting of outcome variables in scientific studies of captive animals is commonplace but requires validation. Here, we aim to validate owner-reporting of the plumage condition of pet parrots, including those with self-inflicted feather-damaging behaviour (FDB), by comparing owners' scores of feather condition with those of two non-expert independent raters, blind to the owners' ratings. We surveyed pet parrot owners to collect data on pets' basic demographics and feather condition, and requested four standardised photographs of each bird for assessment by raters. We received 259 responses, and for 78 of these images of appropriate quality for assessment by raters were provided. Mean percentage agreement between owners' and raters' scores was generally acceptable (average ± SE; rater 1: 77.6 ± 0.03%; rater 2: 79.1 ± 0.04%), and mostly fair to substantial using Cohen's kappa (κ = 0.31-0.74). However, raters scored a significantly greater proportion of feather damage than did owners (rater 1: V = 1257, $P < 0.001$; rater 2: V = 1205.50, $P < 0.001$). Across the subset of 31 parrots whose owners reported had FDB, overall agreement was slightly less (rater 1: 69.9 ± 0.05%; rater 2: 72 ± 0.04%), and rater 1 tended to report a greater proportion of damage than owners (V = 326, $P = 0.06$) and for rater 2 this was significant (V = 333.50, $P = 0.04$). Birds with owner-reported FDB were scored by owners (W = 1369.50, $P < 0.001$) and raters as having a significantly greater proportion of plumage damage than birds without FDB (rater 1: W = 1178, $P < 0.001$; rater 2: W = 1233, $P < 0.001$). Overall, our results indicate owner-reporting of feather condition, including FDB, to be generally reliable but perhaps underestimating damage. Photographs aid independent assessment of feather condition, but are limited by image quality and because images might not be representative of the long-term state of the parrot. Regarding welfare, evidence that owner-reports can be reliable may improve understanding of the extent of welfare-relevant problems. Finally, that photographs might be useful non-invasive diagnostic tools may also prove useful for future studies.

Go to poster: .pdf or comment

Back / W

SOCIAL NETWORKS IN A SPONTANEOUSLY MIXED GROUP OF NEWLY WEANED PIGLETS – A PRELIMINARY RESULTS

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The formation of social structure after weaning is usually studied using the standard weaning procedure and under high stocking density, where litters are suddenly mixed in a pen. Such immediate mixing implies the unspontaneous formation of a new social order with uncontrolled (predominantly agonistic) interactions that are also difficult to track. Here, we analysed post-weaning social networks by implementing a weaning approach that allows piglets to mix spontaneously and individually. Each repetition (6 repetitions in total) included two entire litters. On the day of weaning, litters were housed in two pens (one litter in each) separated by an intermediate pen that was left empty (buffer zone). The pens were connected by passageways that remained closed for the first 24 h after weaning to allow the animals to habituate to the new physical environment. Thereafter, the passageways were opened to the buffer zone to allow spontaneous mixing of the groups. All three pens were equipped with a video system, and the whole pen area was continuously filmed for 8 days after weaning. One hundred and seventeen piglets from 12 litters were involved in the study. In this preliminary study, social networks were constructed based on fighting and mounting activities, and relationships between basic social network parameters (closeness and betweenness centrality – CC and CB, degree of a vertex – deg (v), and closeness vitality – CCV) and individual piglet traits (body weight – BW, skull width – SW, and daily gain – DG) were further analysed. At this stage of the study, social networks were constructed for the entire observation period without considering temporal dynamics. The present preliminary results showed a moderate but significant correlation ($r = 0.21$ to 0.39, $p < 0.05$) between CC and all piglet traits, for both fighting and mounting, while CCV and CB were negatively correlated with BW ($r = -0.29$, $p < 0.05$) and SW, but only when fighting was considered. However, all other correlations showed a similar trend but were not statistically significant. Thus, it appeared that there was some relationship between the physical characteristics of piglets and their position within a social network, but not as distinct as might be expected. To elucidate the complex nature of social order formation in pigs, further analyses will be conducted for social networks, which we hope will provide a more comprehensive insight into post-weaning social structure formation, which is important for improving welfare at weaning.

Go to poster: .pdf or comment

Back / F

A PERSISTENT ABNORMAL REPETITIVE BEHAVIOUR IN A FALSE WATER COBRA (*HYDRODYNASTES GIGAS*)

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Stereotypies (a subset of Abnormal Repetitive Behaviour) are characterized by an unchanging pattern of behaviour and in captive animals can be associated with poor welfare. Although well known in some taxa, little is known about both welfare and ARBs in reptiles, especially snakes. We document an instance of an ARB in a captive snake species (*Hydrodynastes gigas*), set it in the context of husbandry in zoos, and assess efforts to reduce it.

The stereotypy consisted of a fixed pattern of movement against the enclosure's viewing window. Ethographic data were used to focally sample the animal's behaviour over several months in the context of different enrichment interventions. Modified Spread of Participation Indices (mSPIs) were also calculated to quantify the evenness of enclosure use. The snake spent considerable portions of time (47% of observations) performing a behaviour that fulfils the criteria for stereotypy. mSPI data suggested a possible welfare impact of the behaviour on the snake. Zoos holding this species globally were surveyed about observations of similar behaviour and one other institution reported similar behaviour. Standard husbandry practice (A) was used alternately in an ABAC format with prey scent trails (B) and modified feeding schedules (C), representing enrichment types based on species natural history. No enrichment intervention significantly affected stereotyping frequency or mSPI.

Our results, interpretation of which is limited by the paucity of data on snakes, uncover stereotypies in snakes and suggest that like in other taxa, ARBs may be resistant to strategies employed to reduce them.

Go to poster: .pdf or comment

Back / W

THE ROLE OF SOCIAL MEDIA IN PROMOTING ORGANISED DOG FIGHTING

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Organised dog fighting is a criminal activity in most developed counties, however, despite this, its occurrence continues. Unfortunately, there is a general lack of data available on the incidence of dog fighting, in part, because of its illegal and 'underground' nature making it difficult to quantify and study, but also because many suspected cases are not reported to authorities. As with many underground activities, social media is felt likely to play a critical role in promoting organised dog fighting. To explore social media's role in the promotion of dog fighting, a content review of three social media platforms (YouTube™, Facebook™, Instagram™) was conducted between September 1-18, 2020. The search terms used were "dog fight", "dog fights" and "dog fighting". Videos were excluded if they were documentaries, reports on dog fighting or if they appeared to be unintended dog fights. The videos suggestive of organised dog fighting were placed into four categories: i) fights involving physical contact; ii) intimidation; iii) promotion of dog fights and iv) hypothetical 'match-ups'. Information collected (where available) included video information (title, author, date posted, URL), content description (video description, breed description) and popularity of the video (number of likes, views and comments). Fifty-eight incidents indicative of organised dog fighting were identified across the three social media platforms (YouTube™: n=27, Instagram™: n=18, Facebook™: n=13). On YouTube™, 17 videos (63.0%) were of fights involving physical contact, 5 (18.5%) were hypothetical 'match-ups', 4 (14.8%) were a promotion of dog fights, and 1 (3.7%) was a video of a slide show of images of an organised dog fight. On Facebook™ and Instagram™, all videos were of fights involving physical contact. Where breed information was available, the dogs were largely described as pit bulls (YouTube™: 51.9%; Instagram™: 66.7%). These videos often garnered high numbers of views (mean no. of views: YouTube™: 682,856.0, Instagram™:773.6), comments (mean no. of comments: YouTube™:319.5, Facebook™: 10.3) and likes (mean no. of likes: YouTube™: 4,868.4, Facebook™: 434.8). Our findings suggest that more vigilance by these social media platforms and their users to monitor, remove and report such footage is essential, especially where videos breach animal welfare rules and regulations. Further research into other online platforms or different formats (e.g., live streaming) on which dog fighting and/or promotion may occur, and the education of social media users to recognise the subtle signs that videos may be promoting organised dog fighting would be of value.

Go to poster: .pdf or comment

Back / *C*

GOATS IN A COGNITIVE TEST BATTERY – SELECTION FOR PRODUCTION DOES NOT AFFECT THE INTERPRETATION OF PHYSICAL AND SOCIAL CUES IN GOATS

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General knowledge on how the selection for production traits has also affected behaviour and cognition within a species is key to improve animal welfare in the long-term. We investigated the cognitive capacities of dwarf goats (not selected for high production performance, 15 subjects) and dairy goats (selected for high milk yield, 18 subjects) in a cognitive test battery comprising different physical and social cues. To increase the heterogeneity of our test sample, data was collected by two experimenters at two research stations (Agroscope in Ettenhausen, Leibniz Institute for Farm Animal Biology in Dummerstorf). Goats were individually confronted with an object choice task in which they could choose between two containers of the same colour, while only one was baited with a reward. Each subject received five different physical cues (full visual information, partial visual information, full acoustic information, partial acoustic information, transpositions, plus a control condition) and five different social cues (sustained pointing, momentary pointing, pointing from incorrect location, body orientation, marker, plus a control condition) to locate the baited container. Each subject received 12 test sessions, totaling in 24 test trials for each of the test conditions. Remarkably, goats were able to proficiently use most of the physical and social cues to locate the reward, while they did not perform better compared to the control condition when confronted with partial acoustic information about the reward or the body orientation of the experimenter. Importantly, both selection lines did not differ in their test performance. This indicates that selection for production has not altered the interpretation of physical and social cues in goats.

Go to poster: .pdf or comment

Back / *F*

DAIRY FARMERS' VIEWS ON PROVIDING COW-CALF CONTACT IN NEW ZEALAND

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Separation of the cow and calf shortly after birth is a common practice on dairy farms around the world, but there are emerging concerns about this practice among citizens. Continuous improvement of management practices in collaboration with dairy sector stakeholders increases the likelihood that systems evolve in a way consistent with societal expectations. Few commercial dairy farms around the world provide extended cow-calf contact, and there is little understanding of how dairy farmers view this practice. This study examined the views of New Zealand dairy farmers towards providing cow-calf contact, particularly the barriers to adopting such a system in a seasonal calving pasture-based dairy system. Farmers that removed calves from cows within 48 h after birth (conventional farmers; n = 63) were phone interviewed following a semi-structured interview format and their responses to questions about providing cow-calf contact (defined as contact beyond 48 h) were analyzed using thematic analysis. Three major themes of concern were identified by conventional farmers about providing cow-calf contact: (1) reduced animal welfare, especially cow mastitis risk and inadequate colostrum for the calf, increased stress from delayed separation, and lack of shelter for calves while outdoors with the cow; (2) increased labor and stress on staff; and (3) required system-level changes, including infrastructure and herd management, and cows being mothers rather than milk producers. Many of these concerns stemmed from challenges related to the nature of a year-round rotational grazing and seasonal calving dairy system, where a large number of calves are born in a short period of time and are exposed to inclement weather in late winter. Several small-scale farmers that practiced cow-calf contact (did not remove calves from cows within 48 h; n = 4) were also interviewed; these farmers also felt that animal welfare and health are important, and that this was promoted in their cow-calf contact systems. Concerns about colostrum and mastitis, for example, were not raised by these farmers, but they did agree that additional infrastructure and shelter are important considerations for cow-calf contact systems. Current farmers providing cow-calf contact may be a useful resource for better understanding how practical and economical cow-calf contact systems could be adopted on commercial pastoral dairy farms.

Go to poster: .pdf or comment

Back / *F*

ACCESS TO A TOY OR TO LAWN AREA FOR POLICE DOGS: EFFECTS ON BEHAVIOUR AND STRESS PHYSIOLOGY

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Introduction: Kenneling can negatively affect the welfare of domestic dogs, associated to permanence in poor environments. Working dogs are not only often kept in kennels during the most part of their lives as they are usually housed without any kind of enrichment.

Objective: This work aimed to identify the effectiveness of two interventions to a group of kenneled police dogs.

Methodology: Interventions consisted of access to lawn area (350 m²) and "toy" (made of jute rag, hanged in the kennel ceiling), both applied for 15 minutes a day, for four days in a row. Animals were divided into two distinct groups, and the order they received the interventions was alternate, in a crossover experimental design. The impact of the interventions was assessed through measurement of fecal cortisol metabolites (FCM) and behavioral evaluation. Data collection was made before, during and after the interventions.

Results: FCM levels (ng/g feaces) were significantly reduced (Friedman, $X^2(5)=12.800$, p=.012) during the second round of intervention (averages; ± s.d.) (7.05; ± 3.15) regardless of the type of intervention, returning to their initial levels (15.94; ± 10.94) when ceased. We identified a large variety of behavioral profiles amongst the animals. A cluster analysis identified two groups of individuals regarding the frequencies of stereotyped behaviours. Stereotyped behaviours performed inside kennel (percentage of total observations) varied significantly between interventions in high-stereotyping individuals (Friedman, $X^2(3)=8.200$, p=.042) with tendency to be reduced in response to lawn area intervention (22.91; ± 21.94) compared to toy intervention (52.97; ± 24.37). No significant behavioral changes were found within the low-stereotyping animals.

Discussion/Conclusions: We concluded that 15 minutes of access to the lawn area was effective in reducing stress from kenneling to high-stereotyping individuals. The physiological data indicate that the cumulative effect of interventions may benefit both low-stereotyping and high-stereotyping animals. The variety of behavior and endocrine profiles detected highlights the need to account for the individual in behavior and welfare research.

Go to poster: .pdf or comment

Back / *C*

RIDDEN WATER SUBMERSION TRAINING – A SAFER FORM OF CONDITION TRAINING IN ELITE EVENT HORSES?

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Tendon injuries are one of the most common injuries reported in equestrian disciplines such as eventing, show jumping and National Hunt racing. The majority of injuries occur during the fittening process of training regimes, where tendons can be exposed to repetitive submaximal strains without sufficient recovery time between exercise sessions. Once the tendon ruptures, healing is often a long and arduous process. Rehabilitation protocols can involve prolonged confinement, surgical interventions and costly treatments. Conservative treatment, even when successful, has still resulted in 23-67% of horses re-injuring tendons within two years of injury, which raises concerns regarding the impacts on welfare for animals involved. As such, methods for preventing tendon injury are of more interest to stakeholders in the industry than researching treatments.

Ridden Water Submersion Training (RWST) is a form of training that involves submerging the horse in water up to sternum height and trotting for set intervals. The anecdotal basis behind this form of training is most likely derived from the use of cryotherapy treatments post-injury, although there have been no publications on the effects of RWST to date. Therefore, the aim of this observational study is to elucidate the effects of RWST on the cardiovascular and musculoskeletal systems of the horse.

15 international event horses participated in the study. Horses were warmed up on land before being submerged in the water (either 3x3 or 3x4min intervals - depending on their current fitness and competition level), with 1-minute rest breaks in between. Horses were then cooled down in the water in walk. Horses were fitted with Polar v800 heart rate monitors throughout training, and distal limb temperature was measured in between each phase of training (warm-up, RWST and cool-down) using a FLIR E800 infrared thermal imaging camera.

RWST produced a mean HR_{max} of 65.18 ± 3.76%, which is within the parameters for aerobic conditioning. In contrast to increasing heart rate between warm-up and RWST, distal limb temperature decreased across the three phases of training, suggesting that RWST can sufficiently challenge the cardiovascular system without the accompanying increase in tendon temperature commonly reported during equivalent training sessions on land. Therefore, RWST may be a useful adjunct to current condition training protocols, and further investigation on this form of training is warranted. Due to the destructive nature of tendon injuries, implementing evidence-based training practices may help to standardise protocols and decrease the risk of musculoskeletal injuries during training programmes.

Go to poster: .pdf or comment

Back / E

WELFARE AND ETHICAL ISSUES ON OFFLOADING OF CATTLE IN AKINYELE MARKET, IBADAN

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Transportation of animals is accompanied by many stressful events, which affect animal welfare and uncover ethical issues about animal transportation. The study was carried out at the International Cattle, Sheep and Goat market, Akinyele, Ibadan to uncover unethical issues of cattle offloading using a questionnaire. The average number of cattle carried by a canter, single and trailer are 17, 28 and 51 respectively. The average time taken for cattle offloading from a canter, single and trailer is 19, 28 and 49 minutes respectively. Sokoto state had the least amount of cattle and Kebbi state had the highest amount of cattle offloaded at The International Cattle, Sheep and Goat market, Akinyele, Ibadan at 0.2% and 65.8% respectively. The population of the breeds of cattle offloaded at the International Cattle, Sheep and Goat market, Akinyele, Ibadan stood at 1%, 31.8%, 32.1%, and 35.8% for Kuri, Bunaje, Red Bororo and Gudali breeds respectively. The total number of cattle offloaded at the International Cattle, Sheep and Goat market was proportioned at 39% bulls and 61% cows. 60.7% of the cattle offloaded were meaty or in good body condition while 39.3% of the cattle offloaded were rickety or debilitated. 60.7% of the cattle offloaded were without carcass bruises while 39.3% of the cattle offloaded were with carcass bruises. 1.7% of the cattle were dead at offloading, 4.4% of the cattle were slaughtered at offloading, 6.8% of the cattle were wheeled, 7.6% of the cattle were supported with therapy, 12.7% were supported with wood 29.1% of the cattle were standing, 37.7% of the cattle were supported with tail during offloading. 3% of the cattle offloaded had injured leg, 3.2% of the cattle offloaded had injured horn 7% of the cattle offloaded had bruised skin, 78.9% of the cattle offloaded was without defect. Single, Trailer and Canter vehicles were used for cattle transportation at 26.2%, 31.7% and 42.1% respectively. It was concluded that cattle is dragged, beaten and unethically handled during offloading.

Go to poster: .pdf or comment

Back / *F*

PERSONALITY TRAITS AND EXPERIENCE, HOW IT MAY INFLUENCE EQUESTRIAN'S ABILITY TO ASSESS PAIN IN HORSES

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Equestrians such as sport riders, riding instructors and trainers usually work in a strict contact with horses on a daily basis frequently having a significant impact on the welfare conditions of horses under their care. However, there is inherent level of subjectivity among individual equestrians regarding perception of good management practices, individual attention and pain assessment skills. A big part of the subjective variability can be attributed to individual personality and other character traits such as empathy and past experience. In the current work, personality assessment tests such as HEXACO (Personality Index for six major dimensions-100 item test) and IRI (Interpersonal Reactivity Index-22 item test) were conducted in a cross section survey of equestrians in Italy (n. 68). The assessments also included horse pain evaluation on a Simple Descriptive Scale (SDS) of 1-5 (8 photos) all taken from the same horse with known clinical condition. The assessments were distributed by e-mail and evaluated individually in order to create a personality profile for each participant. Further statistical analysis such as t-test and multi variable models were performed using the SPSS software. The sample group resulted to be true representative of overall equestrian population in Italy, with 3:1 of female: male ratio and average experience with horses of 12.6 years. Additionally, 46% of the participants held a professional certification from a riding association. Similar characteristics were reported by the national riding associations (FISAS & ENGEA) census. Among specific traits two were identified as having a key impact on pain assessment results: a) "Experience" (Exp), i.e. number of years passed in working with horses. Exp resulted to be correlated with under-scoring of pain levels "Prospective Taking" (PT)- i.e. the ability of a person to put oneself on the place of another being which resulted to be correlated with over-scoring. A two variable linear model analysis of conditional effect was performed (Y=mX+n;) with Y= Horse pain score, m= Exp, X= PT. It resulted with PT being the dominant trait at 0<Exp<12, consequently losing its relevance at Exp=12.6 and becoming completely irrelevant at Exp=24. It can be concluded that while high levels of Prospective Taking are dominant in early years, the impact is dulled with accumulated experience which in turn reduces the equestrian's sensitivity to perceive pain. Therefore, maintaining awareness of such trend, for example during professional courses may be an important factor in improving human-livestock interactions, and consequently horses' welfare.

Go to poster: .pdf or comment

Back / E

IMPLICATION OF BEING IN ISOLATION OR NOT ON THE WELFARE OF AFRICAN CATFISH (*CLARIAS GARIEPINUS*)

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Globally, the behaviour and growth rate of cultured fish species is gaining increasing interest and thus regarded as a major subject of welfare concern. However, little is known about the behavioural pattern of African catfish which represents over 80% of the cultured fish species. Hence, this study assessed how social interaction (isolatory (IS) and group (GR)) affects the behavioural pattern (escape attempt (EA), aggressive acts (AA), resting (RE) and active swimming (AS)), feeding behaviour (feeding intake (FI), duration of feeding (DF) and rate of habituation (response to feed, RH)), and growth performance (Specific Growth Rate (SGR), Feed Conversion Ratio (FCR) and Protein Efficiency Ratio (PER)) of *Clarias gariepinus*. Catfish species with an average weight of 34.05g were stocked in triplicates in a 20L-aquaria (1.7x1.2x1.0m), fed twice daily in IS (one-fish/tank) and GR (four-fish/tank) for the 35-days experimental period. Fish behavioural pattern was observed twice per week by direct observation for a maximum of 10mins. Weight gain, number of scars and bruises were recorded weekly. Wilcoxon two sample test and GLM were used to analyse the data using SAS software. IS group rested (Ws=610.00, z= 5.397; P<0.0001) more and were less active than the GR counterpart (30.50 vs 10.50; mean rank scores). GR fish species displayed more EA (Ws=210.00, z= -5.47; P<0.0001) and also had higher number of body scars and bruises. Social interaction significantly (P<0.001) affected all the observed behavioural pattern. The FI and DF was also affected significantly (P<0.001) by social interaction, however, the time of feeding (P>0.001) did not affect the FI or DF. Fish species cultured in GR conditions consumed higher number of pellets (42±2.36) compared to the solitary (31±.5.11) fish. However, DF was longer in IS (576s) in comparison with the GR (184s). RH increased significantly (P<0.001) from day-5 to day-2 of the experiment for the IS and GR respectively. Furthermore, GR had higher SGR and FCR than IS, while the PER of the IS was higher than the GR fish species. In conclusion, these findings are of relevance to African catfish welfare as social interaction enhanced the behavioural pattern, feeding behaviour and growth rate of this fish species. Social interaction resulted into higher number of scars and bruises which might affect the acceptability and market value of this fish species.

Go to poster: .pdf or comment

Back / *F*

RESPONSES OF TWO AGE GROUPS OF NIGERIA INDIGENOUS CHICKS TO PLAYBACK CALLS

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This study investigated the physiological responses (changes in eye and wing temperatures) and level of fear of 3 days and 2 weeks old (n= 7 chicks per age group) Nigeria indigenous chick (NIC) to 1 h playback of feed (FC), alarm (AC) and no calls (NC; control). The eye (ET) and wing (WT) temperatures of the bird were taken before and after 1 h playback to different calls. Chicks experienced one type of call per day and there was a day interval before the next call was played. Immediately after the playback calls, ET and WT were measured with an infrared thermometer, each chick was then subjected to tonic immobility test (TI). The number of attempts to induce TI and the duration of TI was recorded for each chick. Data was analyzed separately for each age group. The effect of call type on these parameters for each age group was analyzed using Kruskal Wallis or One Way ANOVA using IBM SPSS version 23. For the 2 weeks old chicks, there was a significant effect of call type on change in ET (χ^2= 6.090, df=2, p= 0.048) but not on change in WT, number of attempts to induce TI (χ^2= 0.006, df=2, p= 0.997) and duration of TI (χ^2=1.917, df=2, P=0.384). The ET dropped after 1 h playback of AC compared to FC and NC. For the 3 days old chicks, call type had a significant (χ^2=6.115, df=2 p=0.047) effect on duration of TI such that the duration of TI was shorter after NC than after FC and AC. There was a tendency (χ^2=4.962, df=2 p= 0.082) for the number of attempts to induce TI to be greater after AC than FC and NC. Call type had no significant effect on change in ET but had a significant effect on change in WT ($F_{2,20}$=7.060, p=0.005) the change in WT was lower after FC and AC than after NC. In conclusion, 3 day old and 2 weeks old NIC showed different body temperature responses and level of fear to playback calls. Playback to different calls for 1 h did not affect the level of fear of the 2 weeks old chicks but FC and AC playback for 1 h increased the level of fear in the 3 day old chicks. The use of playback calls as a means of simulating maternal care to improve the welfare of NIC chicks should put into consideration the age of the birds as 3 days old chicks showed similar (decrease in WT and increase in TI) response to FC and AC.

Go to poster: .pdf or comment

Back / *F*

CATEGORIZING STRESSORS IN RESCUED AND REHABILITATED AUSTRALIAN SMALL REPTILES IN URBAN ENVIRONMENT

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Urban landscapes create a dynamic environment for native small reptiles in Australia. A significant number of reptiles are injured, rescued and registered into wildlife hospitals annually however there remains unclear statistics on the levels of exposure to environmental trauma to native small reptiles such as skinks. In this research, we conducted a retrospective study to evaluate the exposure levels of various forms of environmental trauma (defined as any physical impact to the wildlife caused by humans) on sub-populations of reptiles (lizard and turtles) from urban areas within the vicinity of Adelaide, South Australia. The statistics in this study included a total of 220 rescued reptile individuals comprising of five species (3 lizard species and 2 turtle species) that were admitted to the Adelaide Koala and Wildlife Hospital over the past 5 years. The most interesting finding was that the 2020 period showed the most number of rescued cases in spite of the local COVID-19 restrictions. Of all the species, blue tongue were the most commonly rescued (73.6%) and the most common clinical outcome was released for all species (64%). We categorised the cases into 4 levels of stressor categories (preliminary, primary, second and tertiary) which depended on the clinical diagnosis of each admitted animal. In total, over 100 cases were admitted for preliminary stressors (e.g. pet attack, lawn mowing and vehicle collisions). Also, in an unusual case, a reported reptile had a duct-tape wrapped around its mouth. Although the number of secondary and tertiary cases were lower (over 50 cases each). Collectively, the findings indicate that most commonly apparently healthy lizards tend to be rescued due to exposure to preliminary stressors. As a drawback, this could increase added workload on the clinics which could reduce support for more severe cases, such as those related to health and infectious diseases. We hope that the assignment of stressor categories could be beneficial tool for registering and indexing stressors depending on the nature and severity of exposure. This data-set could support wildlife clinicians with the long-term care and recovery plan for individual cases hence bolstering the welfare monitoring program for small native reptiles in clinical settings.

Go to poster: .pdf or comment

Back / W

DIFFERENCES IN SHEEP VOCAL CHARACTERISTICS AT WEANING

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Individual recognition between parents and offspring is necessary for the development and survival of the young. In follower species like sheep many studies analyzing high- or low-pitched bleats reported high individual identity and vocal recognition in both mother and offspring, at the early post-partum period of the offspring's life. Vocalizations are, also, considered to be affected by emotions of different valence and arousal. Even though individuality appears to be stable in farming conditions with different emotional load, it has been reported that vocalizations appear to have different vocal characteristics under different levels of stress. The aim of the present study was to analyze high-pitched bleats produced by dairy sheep at weaning day (40±2 days post-partum). Ewes (n= 36) of two different Greek dairy breeds were isolated from their offspring and vocalizations were recorded. Statistical analysis showed that breed affected significantly ($p<0.05$) the duration of bleat as well as acoustic parameters related with intensity, fundamental frequency spectrum and formant frequencies. These parameters have been previously related to different underlying emotions of different arousal/valence. Interestingly, ewes having two lambs showed a higher mean value of the fourth formant derived from the vocal tract, indicating that they may experience separation in a more aroused state compared to ewes with one lamb. The study provides valuable novel information about sheep communication at weaning stage and may contribute to future development of *in-situ* livestock applications that allow early identification of stressful situations under farming conditions.

Go to poster: .pdf or comment

Back / *F*

ATTITUDES OF VETERINARIANS TOWARDS MANAGING PAIN IN RESEARCH PRIMATES

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Research primates may experience pain as a result of scientific manipulations or veterinary procedures. To provide effective pain treatment, it is necessary to objectively recognize and evaluate pain. However, there is a lack of evidence-based pain assessment tools, increasing the challenges in mitigating and managing pain in these animals. This study aimed to collect information on current pain management practices for primates in research settings. A survey was administered to members of the Association of Primate Veterinarians (APV) and European Primate Veterinarians (EPV) via organizational email listserves using SurveyMonkey software. All individual responses were anonymous and data was collected and evaluated in aggregate. Information regarding participant demographics, institutional pain assessment and treatment practices, pain management policies, and attitudes about current pain management practices were collected. The survey was administered in winter 2019 and a total of 93 responses were received. Responses were analyzed using descriptive statistics. The results demonstrated that only 29% (n=83) of respondents reported a formal pain assessment policy at their facility, and of these, 38% (n=26) had generic pain assessment policies that were not species-specific. Evaluation of analgesic treatment efficiency was reported to be conducted routinely (91%, n=86). Respondents were asked to evaluate their confidence levels in recognizing and managing pain in primates, and 44% (n=85) reported being only somewhat confident. Similarly, participants were only somewhat confident (52%, n=88) that research personnel at their facility could recognize and manage pain in research primates. Descriptive analyses of open-ended question responses were also in line with these results, demonstrating a general lack of formalized evidence-based assessment policies and tools specific to research primates. The lack of formal validated tools may negatively impact confidence in pain recognition and treatment of research primates. These results were used to support the development of the APV 2019 Guidelines on Acute Pain Assessment in Research Primates. Given the importance of pain management from an ethical, welfare and scientific perspective, future research should be directed towards developing evidence-based pain and welfare assessment tools specific to primates in research settings.

Go to poster: .pdf or comment

Back / *I*

DEVELOPMENT OF A PRIMATE WELFARE ASSESSMENT TOOL FOR ENHANCING RESEARCH ANIMAL CARE

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In recent years, various frameworks and assessment tools have been developed to assess the welfare of farm and zoo animals. Increasingly, there are regulatory and compliance expectations that periodic welfare assessments will be conducted on populations of research animals that are separate from the daily observations. This approach helps to support continuous program improvements and builds institutional awareness of areas requiring more attention, outside of external regulatory and compliance visits. There are currently no established formal welfare assessment tools for laboratory species, including primates. As part of an internal 3Rs initiative, we sought to develop a novel primate welfare assessment tool (PWAT) to be used by laboratory personnel for assessing the quality of the primate behavioral management program as well as overall institutional culture of care. Working collaboratively with multiple sites, our aim was to create a practical tool that could provide an objective measure of research primate care. Development of the PWAT involved: (i) formation of an internal working group of primate behavior experts; (ii) identification of welfare categories and descriptors based on a literature review; (iii) development of a preliminary tool; (iv) beta-testing the tool at different facilities (including 6 facilities located in CAN, USA, and the EU) to assess feasibility and areas requiring modification; and finally (v) development of a finalised tool on a user-friendly platform. Welfare assessment indicators were grouped into 6 categories: physical, behavioral, training, environmental, procedural, and institutional culture of care and allows for assessment of animal welfare at the individual, room, and facility level. Within each of the categories, descriptors (n=167) were classified as animal outcome-based measures or management input measures and weighted, depending on the expected impact of each measure on animals. The PWAT requires 5-8h to complete for large, complex facilities housing many animals and ~2h to complete for small facilities. The process used to develop the PAWT demonstrate how evidence-based welfare assessment tools can be developed for large groups of animals through collaborative efforts of those invested in their care and well-being.

Go to poster: .pdf or comment

Back / *L*

LIVE BODY WEIGHT, BREAST CONDITION AND WELFARE OUTCOMES OF A WHITE LAYING HEN HOUSED IN CONVENTIONAL CAGES

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Plumage and keel bone damages are very common and an important problems for commercial laying hens especially in non-cage housing system. Conventional cages for laying hens banned in EU and it is planning to ban after the end of 2022 in Turkey. This study was made to investigate the relationship between the live body weight, breast condition and animal-based welfare indicators of a white laying hens housed in a conventional cage system. A total of 450 birds assigned to 3 groups according to their live weight and then further divided into 2 sub-groups according to breast condition. The birds in each group were housed with 5 birds per cage and they were palpated and visually inspected twice at the age of 59 and 67 weeks to analyze the variation for the plumage quality and keel bone deformations of the birds in the groups. The keel bone deviation development was not significantly affcted by initial body weight but breast condition appears to be significantly affected the development of keel bone deviation. The plumage condition was not affected by neither initial body weight nor breast condition. The obtained preliminary results indicated that controlling breast condition and body weight within the layer (breed) standard may help to reduce the susceptibility to keel bone changes.

Go to poster: .pdf or comment

Back / *F*

DIFFERENTIAL EFFECTS OF SOCIAL AND NON-SOCIAL DISTRACTORS ON THE TOUCHSCREEN-BASED TASK PERFORMANCE OF DOGS WITH NORMAL AND LOW SOCIAL SKILLS

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Dogs have been increasingly proposed as a model of many human psychiatric diseases, including autism spectrum disorder (ASD). A recent account of the mechanisms underlying autistic behaviour in humans suggests that many of autism's traits are associated with *impaired social motivation* (ISM). The finding that the distracting effect of task-irrelevant social stimuli is weaker in children with ASD than in neurotypical patients fits well with the expectations of ISM theory. Here, we aimed to investigate the predictions of the ISM theory in dogs.

Based on the diagnostic criteria of ASD we have developed and validated a questionnaire to assess those aspects of social skills in dogs that may relate to the ASD-like behaviours. Adult pet dogs were assigned to Low Functioning (LF; N=10) or Normal Functioning (NF; N=10) groups using this questionnaire. During the pre-training phase, subjects were trained to use a touchscreen in a visual cue-choice association task until the criterion is reached. Pre-training was followed by 10 baseline trials (without distractor stimuli) and then by 2x10 test trials during which dogs had to perform the same nose-poke task while exposing them to non-social and social distracting stimuli in a semi-random order (image of a book cover and image of a human face).

Subjects of both LF and NF groups showed comparable performance during the baseline period. In the test trials, however, dogs in both groups made slower pokes than they did under the baseline condition ($p=0.003$). This demonstrates a clear effect of the distractor stimuli on dogs' task performance. We also found a significant interaction effect between the groups and the type of the distractor stimulus on dogs' visual attention: the duration of looking at the touchscreen increased for the face distractor picture only in the Normal Functioning group ($p=0.027$).

These results seem to indicate that the social nature of task-irrelevant distractor stimuli differently affect the task-performance of dogs with low- and normal social competence. Recognizing the spectrum of sociality in dogs is important from animal welfare perspective. Training dogs with an autistic character is important to take into account our findings.

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Go to poster: .pdf or comment

Back / *C*

THE IMPORTANCE OF EMPIRICALLY ASSESSING ZOO ANIMAL ENRICHMENT PROGRAMS TO BENEFIT ANIMAL WELFARE

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Many zoo animals have specialised enrichment programs where certain elements of a zoo animal's environment are intentionally altered to provide physical and/or mental stimulation. The assumption is often made that these modifications are beneficial for animal welfare but changing environments may also result in negative welfare outcomes, such as increased stress. It is important to record empirical data indicative of welfare state, such as behavioural observations, to understand the effect of specific zoo enrichment programs on animal welfare. However, not all enrichment programs are empirically tested in order to understand the impact that these programs have on animal welfare. This presentation discusses the value of assessing enrichment programs using behavioural observations with the specific example of exhibit-swapping enrichment resulting in frequency change of abnormal behaviour in Sumatran tigers (*Panthera tigris*). The frequency of exhibit-swapping was altered and tiger behaviour was observed over three distinct exhibit swapping routines. The results differed for individual animals, highlighting the importance of empirically assessing enrichment programs and tailoring enrichment programs on an individual level to optimise zoo animal welfare. Catering to animal welfare on an individual level by changing an individual animal's exposure to specific enrichment types that have previously been empirically demonstrated to alter the individual's welfare is a recommended outcome.

Go to poster: .pdf or comment

Back / W

ENRICHMENT PRACTICES FOR NONHUMAN PRIMATES (NHPS) IN LABORATORY SETTINGS: A SYSTEMATIC REVIEW

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In 2019, over 4000 nonhuman primates were used for research purposes and this number is expected to increase in future years. Considering the stressful environment that research protocols and laboratory settings may create for animals, various enrichment practices are applied and studied to enhance their well-being. This review aimed to understand 1) the types of enrichment that are being applied to rhesus and cynomolgus macaques and common marmosets in laboratory settings, 2) what the enrichment plans are designed to achieve and 3) to assess their effectiveness. This systemic review was carried out following the PRISMA guidelines. The review included studies regarding enrichment practices applied to rhesus and cynomolgus macaques and common marmosets found in laboratory settings and tested their effectiveness. Data extraction and eligibility of the articles was assessed by one reviewer. The databases used for literature searches were Web of Science Clarivate and Scopus. The search yielded 794 results out of which 116 articles were included in the review. These studies mainly focussed on the effect of the different types of enrichment on animal behavioural and/or physiological responses. The enrichment programs' objective was to benefit the subjects and generate positive effects in order to improve the monkeys' welfare. Generally, nonhuman primates (NHPs) that received enrichment, as opposed to control group subjects that were not provided with enhancements, displayed more favourable behavioural profiles. The most effective types of enrichment were environmental, social and food enrichment as they typically promoted natural behaviours. Technological and occupational enrichment were mostly used and effective in stimulating the primates' cognition. Overall, enrichment practices generated positive species-typical behaviours, thus favouring their addition to management routines. The review includes a thorough analysis of the effectiveness of enrichment programs that involve NHPs, model animals that are growing in popularity for research projects. Although several studies that assessed the outcome of the various forms of enrichment were only conducted for certain durations (short, medium and/or long-term), which limited the understanding of the effects of some forms of enrichment, the studies presented in this review shed light on the effectiveness as well as the importance of enrichment for NHPs placed in laboratory settings. Most of these enrichment practices generated positive behavioural profiles in their subjects and did not interfere with research protocols, therefore allowed a more favourable environment to carry out research-related tasks and improved the primates' well-being.

Go to poster: .pdf or comment

Back / *L*

SURVEY OF CANADIAN PRODUCERS ON FACTORS RELATED TO SOW MORTALITY AND CULLING

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Understanding risk factors for sow mortality in Canadian herds will provide a scientific basis for management recommendations to optimize animal welfare, increasing sow longevity, and benefiting producers by reducing costs. The goals of this study are to understand the most significant problems encountered in sow longevity, identify causes of death related factors in sow herds, and to provide management recommendations to producers to increase sow retention and longevity. A survey was sent to Canadian pork producers in February 2020 through Provincial Pork Organizations in Quebec, Ontario, Manitoba, Saskatchewan, Alberta, BC, and the Maritime provinces. One hundred and 4 producers provided complete responses to 49 questions about sow management and factors related to culling and mortality. Forty eight percent of respondents had herds under 500 sows, with 33% percent representing herds between 500 and 2000 sows, and 19% had herds over 2,000 sows. Related to housing system, the highest number of farms in the survey used stalls (43%), followed by groups (40%) and mixed housing systems (17%). Necropsy is an important procedure as it can increase information accuracy by identifying unexpected health events, in our study, 64% of respondents never perform necropsy on dead sows. Survey results are under analysis with initial results indicating higher mortality levels in larger herds. Higher mortality was also found in group housing systems compared to stalls or mixed systems. Average reported mortality was 5.45% (ranging from 0.02% to 20%) which corresponds to what is described in the literature. Increasing herd size also negatively influenced the parity of the herd. Herds of up to 500 animals had an average parity of 3.7 while herds with 3,000 animals or more had an average parity of 2.9. Another significant topic related to sow longevity is early removal causes. According to our survey results, the two major causes of early sow removal in 2019 were poor reproductive performance (31%) and lameness (14%). Old age (37%) was ranked as the first cause of removal in general however, does not qualify as early removal. Further analysis will examine the relationships between mortality, culling levels, and farm level factors affecting the early removal of sows.

Go to poster: .pdf or comment

Back / *F*

IMPACT OF SUBSTITUTED COMPANION HORSE DURING STRESSFUL SITUATIONS

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Social buffering describes the situation whereby the presence of one animal attenuates another's stress response during a stressful event and/or helps the subject to recover more quickly after a stressful event. The horse, as a highly social species that is often kept in isolation, is a good model for researching social buffering effects in animals. The aim of this study was to determine if a horse companion could be partially replaced by a visual substitute during two separate unusual events: a novel stationary stimulus test (a Ball presented gradually) and a novel sudden stimulus test (Umbrella that opened suddenly). This visual substitute was an indirect social stimulus presented as a poster of a relaxed horse face. In order to evaluate the impact of a horse face poster on the subject's stress responses, behavioural (reactivity score) and physiological (heart rate) measurements were taken. 28 horses representing 18 males (geldings) and 10 females, aged 4 to 16 (average age = 8.5 years, standard deviation = 3), of 5 different breeds were used for this experiment. These horses were all kept at the same location. Each subject completed 4 tests in a counter-balanced order: Ball test – with a pixelated poster and with relaxed horse face poster; Umbrella test - with a pixelated poster and with relaxed horse face poster. To avoid order effects, the 28 subjects were randomized into 4 groups; with each group performing the tests in a different order. Our results showed that the presence of a horse face poster reduced the behavioural response (reactivity) of subject horses in the Ball test (Cumulative Link Mixed Models (CLMM): estimate ± s.e.: 2.15 ± 0.73, $P < 0.004$) but did not help the heart rate to recover more quickly (Linear Mixed Model (LMM): t-value, df: 0.164, 21, $P = 0.871$). The horse face poster did not have an impact on the reaction (CLMM: estimate ± s.e.: 1.70 ± 0.87, $P = 0.051$) and the heart rate recovery (LMM: t-value, df: 0.161, 26, $P = 0.873$) in the Umbrella test. In conclusion, the efficiency of the horse face poster to act as social buffer depends on the nature of the stressful event.

Go to poster: .pdf or comment

Back / *E*

DISENTANGLING FARM ANIMAL HEALTH FROM FARM ANIMAL WELFARE: A STUDY ON UK CONSUMER PREFERENCES

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Do consumers care about the health of farm animals? We assess the relationship between consumer preferences (N=515) and farm animal health and welfare (FAHW) by analysing UK consumers purchasing decisions, using two endemic livestock conditions Bovine Viral Diarrhoea (BVD) in cattle and lameness in sheep. The unique characteristics of these diseases make them apt objects for study. They are a source of numerous health complications throughout the life of the animals, leading to early death in the case of BVD. However, consuming animal products from sheep and cattle affected by these conditions induces no adverse effects in consumers. This led us to ask the question whether consumers care about the sickness level of farm animals independently of the overall animal welfare grading assigned to the farm. Do people care about sickness levels in farm animals when such sickness has no direct implications for food safety?

The analysis uses discrete choice experiments on four products: beef, milk, lamb and wool. Our study provides robust evidence that UK consumers care about farm animal health and welfare independent of the sickness level in the herd/flock, when sickness levels do not compromise the safety of the products consumed. This is interesting, as respondents were given strong reassurance that the products were completely safe to consume regardless of the infection level. Thus, consumers seem to care about sickness levels in farm animals even when this has no consequences for food or product safety. This finding is particularly relevant given recent statements by DEFRA on the direction of public funding for farming post-Brexit, where farm animal health is seen as something which taxpayers should contribute to. Price, opt out and high infection rates showed negative preferences whilst products from within the UK and more specifically locally produced products were found to have a positive preference. Additionally, we have also found that the value placed on high animal welfare and low infection rates varies with the participants' age and income. Younger consumers value high animal welfare and low infection rates more than older consumers and higher income consumers showed a greater preference for high animal welfare. There was, however, significant un-observed preference heterogeneity in the findings despite the inclusion of possible observed sources of such variation like age, income, and education. This is in line with literature where several studies find that preferences tend to vary more than can be explained by observed respondent characteristics.

Go to poster: .pdf or comment

Back / *F*

A BEHAVIOURAL STUDY TO EVALUATE POSITIVE WELFARE IN DAIRY COWS

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Both within the UK and globally, there has been an increasing shift to year-round housing of dairy cattle. Over the past decade, the evaluation of animal welfare has extended beyond solely alleviation of negative states, there is now increased emphasis that opportunities for positive experiences should be considered. Evaluation of animals' subjective states is not directly possible, therefore identifying when animals are experiencing something they perceive as positive and identifying how to offer opportunities for this are problematic. Current housing of dairy cattle paired with the increased societal concern for dairy cattle welfare poses opportunity for investigation and development of how current housing may offer positive experiences.

Opportunities for interest and exploration have been highlighted as possible avenues of positive welfare provision. Exploration has been suggested as a valued behaviour, offering some agency and diversity within the environment, conversely with the lack of, being shown to be aversive with possible links to boredom. Novel object tests have been widely used to evaluate predominantly fear, but also explorative behaviour, however these tests tend to be conducted for a short period, on isolated individuals in different contexts to their commercial management. This study evaluated the behavioural response of a group of commercially housed dairy cattle through a five week long novel object test.

A group of 37 adult dairy cows of mixed age and stage of lactation, were recruited. Exploration within an extended loafing area containing the novel object (inflated sailing buoy), evaluation of physical interaction with the object, self-grooming and use of an established automatic brush were conducted using video recordings. A detailed ethogram of cow behaviour was used to evaluate cows' initial behavioural response to the novel object. Positive and negative social behavioural interactions surrounding access to the novel object and brush were evaluated. Herd level activity was monitored including behaviours such as lying and inactive standing, a behaviour linked to boredom.

Preliminary analysis shows that all individuals interacted with the object within 27.11 hours of object presentation, (mean (± standard deviation): (220.02 minutes (± 319.04)). The group physically interacted with the object for 655.97 minutes (week 1), 327.22 minutes (week 2) and 301.64 minutes (week 3). Percentage of cows which performed self-grooming during at least one of their interactions with the object was 84.38% (week 1), 70% (week 2) and 86.21% (week 3). The two most frequently occurring behaviours in response to the object were tail wagging (rate per minute, 1.49±0.96) and head and nose contact with the object (rate per minute, 1.99±2.51). Both self-grooming and tail wagging have previously been considered to be associated with positive experiences.

Go to poster: .pdf or comment

Back / *F*

IN-BARN HETEROGENEITY OF BROILER CHICKEN WELFARE IN TWO INDUSTRIAL HOUSE DESIGNS AND TWO SEASONS IN SOUTHERN BRAZILIAN SUBTROPICAL CLIMATE

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The science of animal welfare is key to improving the life quality of billions of chickens, by supporting decisions through the assessment of environmental and animal-based indicators in different conditions. We compared four closed-sided (CS) and 13 open-sided (OS) industrial poultry houses regarding broiler chicken welfare, during summer/autumn and winter seasons, concerning bird location inside the house. The measures were divided into two categories: 1) environmental indicators: relative humidity, temperature, air velocity, ammonia (NH_3), and carbon dioxide (CO_2) concentrations, and illuminance; 2) health indicators: contact dermatitis on the breast and abdominal areas, bird soiling, footpad dermatitis, hock burn, and lameness. Assessments in 30 equidistant locations, covering the whole inside area of each barn, were organized into kriging maps. Linear regression and generalized models were adjusted, considering predictor variables and the interaction effect between variables; the Tukey test was used for the multiple comparisons of means. We used geostatistical modelling for continuous and discrete data for environmental measurements and bird health, respectively. In-barn spatial distribution heterogeneity was observed for the prevalence of both environmental and health indicators. In addition, there was a pattern for the spatial distribution heading from the house centre to the West end of both house types, with worse results for three environmental indicators (temperature, NH_3 and CO_2 concentrations) and three health indicators (hock burn, bird soiling, and footpad dermatitis). Illuminance was very restrictive in CS (4.4 to 6.7 lx) when compared to OS houses (119.8 to 145.3 lx) and the prevalence of lameness was high (50.9 to 78.0%), even though both indicators were evenly distributed inside the two house types studied. The kriging maps allowed for the identification of worse welfare problems in the West direction, which in CS houses means near exhaust fans and in OS houses the direction of positive-pressure mechanical ventilation by fans. These results may contribute to the adoption of strategies for animal welfare improvement, taking corrective actions in both house designs, with the goal of spreading best welfare conditions throughout the internal barn area.

Go to poster: .pdf or comment

Back / *F*

HIPPOCAMPAL IMMEDIATE–EARLY GENE INDUCTION AND HPA-AXIS ACTIVATION IN RESPONSE TO ACUTE STRESS IN CHICKENS

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The increasing concern of the consumer's responsibility over animals raised for food has turned public attention to the demand of higher rearing and production standards. The improvement of animal welfare conditions has important economic and ethical implications. The properties of the stress response and its consequences have become a central aspect of animal welfare studies.

Stress has a behavioural as well as a physiological manifestation. Since the perception of stress depends on the individual's subjective experience, researchers' attention has focused on the detailed understanding of the neural components and the molecular events that underlie the response to stress in order to enhance its assessment and predictability. The mammalian stress response and the regulation of the HPA axis by the brain is generally well studied, however less is known about the neural mechanisms and characteristics of the stress response in birds.

A number of physiological and pharmacological studies in mammals support the hippocampus as being an important brain region for the feedback regulation of HPA axis function. The mammalian and avian hippocampal formation (HF) share numerous morphological similarities. Interestingly, reduction in adult hippocampal neurogenesis has been associated with chronic stress in birds. However, few investigations have focused on whether changes in neurogenesis and the regulation of the stress response are associated with regional specialization of the hippocampus in birds.

This study aims to extend the understanding of the avian HPA axis functioning and to shed light on the role of the hippocampus in the regulation of stress in birds. In addition, it aims to identify which subdivisions of the HF play an active role in stress regulation. We therefore evaluate the effect of an acute stressor on the activity patterns of the c-Fos immediate-early gene (IEG) expression in the chicken hippocampus. A significant increase in hippocampal activation was found in chickens exposed to acute stress. Findings suggest that hippocampal participation in stress regulation is functionally restricted to intermediate areas along the rostro-caudal axis with significant differences at a subregional level.

Go to poster: .pdf or comment

Back / *F*

PET RAT BEHAVIOUR TOWARDS CARETAKERS RELATES TO HOUSING CONDITIONS AND HUMAN-ANIMAL INTERACTIONS

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Various studies have explored the relationship between husbandry conditions and behaviour for laboratory rats. However, little is known about this relationship for pet rats. This study aimed to look for associations between housing conditions (e.g. roaming frequency, group size, enrichment items, inadequate toys/supplies such as running wheels), human-animal interactions and rat behaviour towards their caretaker. An online survey was available for two months to reach as many pet rat owners in German-speaking countries as possible. In case of multiple rats per household, respondents were asked to report on the rat whose name comes first alphabetically compared to the other pet rats. Principle Component Analysis was used to reduce variables to factors. Linear regression models for the dependent variables *frequency of approaching the caretaker* (including e.g. approaching the caretaker (for food), eating food from the caretaker's hand and approaching the caretaker after encouragement)*, frequency of positive reactions towards the caretaker* (e.g. resting next to the caretaker, grooming the caretaker, allowing to be picked up by the caretaker) and *frequency of aggressive behaviour towards the caretaker* (including pinching, scratching and biting) explained 20.9 %, 28.2 % and 2.9 % of the variance ($p \leq 0.001$, n=454). A higher *frequency of approaching the caretaker* was related to more 'positive human-animal interactions' (stroking the rat, carrying the rat around, feeding the rat out of the hand and talking to the rat; estimate ± SE; *Beta*: 0.32 ± 0.03; 0.41; $p<0.001$), constant access to hiding places (0.13 ± 0.05; 0.11; p=0.012), more frequent roaming opportunities per month/week (0.04 ± 0.02; 0.11; p=0.014), and a lower frequency of offering running wheels/plates (-0.05 ± 0.02; -0.09; p=0.042). A higher *frequency of positive reactions towards the caretaker* was associated with more frequent 'positive human-animal interactions' (1.01 ± 0.09; 0.48; p<0,001), a higher frequency of 'outdoor-activities with the caretaker' (walks with/without leash and roaming freely on green spaces; 0.27 ± 0.11; 0.10; p=0.014) and caretakers spending more time on daily interactions with the rat (0.11 ± 0.05; 0.10; p=0.017). A higher *frequency of aggressive behaviour towards caretakers* was associated with fewer 'positive human-animal interactions' (-0.09 ± 0.04; -0.12; p=0.010), less frequent roaming opportunities/month/week (-0.002 ± 0.001; -0.10; p=0.027) and a lower number of rats kept in the same enclosure (-0.02 ± 0.01; -0.10; p=0.033). Both adequate housing conditions and positive human-animal interactions are important to promote a good animal-human relationship in pet rats, which is reflected in their behaviour towards humans.

Go to poster: .pdf or comment

Back / *C*

QUANTIFYING THE WELFARE OF COMMERCIAL LAYERS IN DIFFERENT INDOOR HOUSING SYSTEMS AND THE IMPACT OF THE TRANSITION TO CAGE-FREE HOUSING

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We have recently developed an analytical framework to quantify the cumulative loss of welfare experienced by animals in a comparative manner, based on estimates of the intensity and duration of the pain endured as a result of different sources of physical and psychological pain. By mapping aversive experiences onto a common scale with real-world meaning (time in pain), the framework enables the quantification of welfare loss based on explicit parameters with biological meaning. Here we use it to quantify the impact of reforms aimed at improving the welfare of commercial layers, specifically the transition to cage-free production currently underway in many countries. To this end, for each housing system we estimated the total time spent by the average flock member in different levels of pain intensity due to key welfare challenges (injuries, diseases, deprivations), particularly those likely to be affected by the transition to aviary systems. Indoor cage-free aviaries (single- and multi-tier systems) were found to be superior both to conventional and furnished cages, preventing thousands of hours of pain for each laying hen raised in an aviary instead of a cage. The longer time in pain in caged systems stemmed predominantly from the deprivation of behaviors hens are highly motivated to perform and the chronic state of distress associated with movement restriction. Other factors are hypothesized to potentiate the adverse effects of caged egg production found. Among these are longer laying cycles, a higher prevalence of induced molting in countries outside Europe, the impossibility to enjoy positive affective experiences, and the possibility that the salience of physical pain is higher in barren environments, where no opportunities for distraction are present. In cage-free production, most of the time in pain resulted from ailments associated with intense breeding for productivity. Specifically, keel bone fractures accounted for most of the time cage-free hens spend in pain. Pecking injuries were found to have a more limited impact, due to the shorter-lived nature of the pain. Egg peritonitis syndrome was estimated to be the main source of severe pain in all production systems. Not only was it associated with cases of severe pain prior to death (given its evolution to sepsis), but also with long periods of chronic pain in individuals surviving the disease. The estimates provided should be refined as knowledge advances and expanded through the inclusion of other welfare challenges not presently considered.

Go to poster: .pdf or comment

Back / F

DONKEYS IN THE CLASSROOM: INVESTIGATION OF DONKEYS' LEARNING CAPABILITIES THROUGH AN OPERANT CONDITIONING

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A commonplace on donkeys concerns their poor cognitive and learning abilities; despite their long history of coexistence with humans, they have been long-time considered as stubborn and dumb animals. However, what do we really know about donkeys' learning abilities? Their use as a workforce throughout the world has often entailed harsh and coercive training methods. Nowadays, donkeys are also kept as pets and involved in Animal Assisted Interventions. In this context, establishing a bond between the animal and the person involved is essential to guarantee both the safety and success of the intervention. The modern concept of animal welfare relies on the idea that individuals must experience positive emotions, besides being free from negative conditions and distress. The development of adequate training methods, respectful of animal's subjective experiences and based on positive practices, may improve donkeys' welfare and their relationship with humans.

Here we structured and applied an innovative methodology to explore donkeys' learning abilities through operant conditioning. For this purpose, 14 adult non-working donkeys of both sexes were recruited, excluding a priori the subjects with physical or behavioural problems, pregnant or lactating jennies and stallions. Information on each animal (subjective data and individual history) were recorded. The selected animals underwent a first phase of acclimatization during which they could approach the manipulandum for the first time. The latter consisted of an apparatus specifically designed, constituted by a cabin with a button on the front side. The donkey had to learn how to press the button to obtain a positive reinforcement (palatable food). The training procedure comprised learning and fixation phases. Nine donkeys completed the task. In order to evaluate donkeys' learning response, the following variables were considered: age, sex and donkeys' height at the withers, position of the researcher relative to the donkey, the number of functional button pressures or attempts, the time between pressures, if the press was voluntary, accidental or helped by the researcher.

This study presents a tested methodology for operant conditioning in donkeys, highlighting the principal issues and giving insight on donkeys' learning capabilities. This, in the light of individual variables such as donkey's age and sex. Moreover, it confirms the hypothesis that - in most cases - food can act as a positive reinforcement in operant conditioning in donkeys improving handling practice for research procedures.

Go to poster: .pdf or comment

Back

PREPARING, CARING, SHARING and *FLAGGING*: THE SCIENTIFIC AND WELFARE BENEFITS OF INCREASED COLLABORATION AND TRANSPARENCY

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Animal research is no longer an activity performed by lone scientists on a few animals in their own laboratory. Just as in the construction industry, there is no longer a Master Builder controlling all the elements of the project, but a large group of different experts, each contributing specialist knowledge. The challenge today, as each specialty gains more knowledge, is quality assurance: ensuring that all these experts discuss developments at each critical phase. In addition, problems may be discovered by those doing the practical work. So in animal research, this means that the animal carers, technologists and veterinarians must all liase closely with the scientists.

The PREPARE guidelines[2] were written to encourage scientists - with good help from animal care staff - to plan more valid, reproducible and translatable experiments which fully implement the 3Rs (Replacement, Reduction and Refinement). PREPARE includes a 2-page checklist, and a website with more information about all the topics on the checklist. PREPARE was written to help scientists realise the importance of close collaboration with animal care staff from day 1 of planning.

Since animal research is a controversial activity, it is important to maintain the physical and mental wellbeing of all those who are involved. To support this work, an International Culture of Care Network has been established[3]. This is a group of professionals, of many categories, who share ways in which we can improve the support given to personnel. This includes recognising efforts made to improve animal welfare, avoiding compassion fatigue, and developing trust so that any member of the group can raise an issue, or challenge a proposed route of action, without fear of reprisals.

Sharing advances within Refinement is a key part of the way to improve animal science and welfare. There is now a Refinement Wiki[4] where animal care staff or scientists can publish their experiences. The Wiki aims to be a halfway house between scientific publications and conversations on discussion forums.

Finally, we should encourage scientists to flag any 3R-advances which they have made during their work. This should be done either as a separate method paper, or within the title and/or abstract of the papers describing the research results. This is important because these are usually the only sections of a paper which get indexed by bibliographic databases. This point is, unfortunately, seldom made by reporting guidelines.

I therefore propose a slogan for improving the quality of animal research:
PREPARE - CARE - SHARE - FLAG!

Go to poster: .pdf or comment

Back/ *G*

[2] https://norecopa.no/PREPARE
[3] https://norecopa.no/CoC
[4] https://wiki.norecopa.no

OPINION ON THE RELEVANCE OF DAIRY BUFFALO WELFARE INDICATORS ACCORDING TO EXPERTS, BRAZILIANS AND ITALIANS RESPONDENTS

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Society's demand and knowledge contributes for the science of animal welfare. The aim of this study was to compare the opinion of different stakeholders on the relevance of indicators for a dairy buffalo welfare assessment protocol. A questionnaire elaborated with Google form online was answered by 26 experts on buffalo production and/or animal welfare, from 13 different countries in November and December 2019. Experts were asked to select the importance of 13 animal-based indicators for a buffalo welfare protocol (thin, severe lesions, iatrogenic abscesses, can be touched, overgrown claws, nasal discharge, lame, panting, vulvar or uterine prolapse, dirty flanks or upper hind legs, ocular discharge, nose rings, and broken horn), using a 5-point Likert-type scale (Not important; Mild important; Moderate important; Very important; Extremely important). If the sum of 'Very important' and 'Extremely important' indicators was equal or over 50% of the experts' responses, the indicator was included in the questionnaire for different stakeholders from Brazil (360 respondents) and Italy (111 respondents). Respondents, stratified according to their demographic background (country, gender, age, education, stakeholder category and frequency of buffalo products ingestion), were asked to rate in Likert-type scale, same as above, between December 2019 and July 2020, the indicators selected by the experts as the most important (the first nine previously listed). Ordinal logistic regression with stepwise selection was used to determine the influence of demographic background on the importance of indicators. Significant level was set at $p<0.05$. There were differences on the opinion of respondents considering their country, gender, and stakeholder category. Brazilians attributed higher importance than Italians for eight indicators: thin (Odd ratio (OR)=0.230; Confidence interval (CI)=0.153-0.347), severe lesions (OR=0.491; CI=0.314-0.769), iatrogenic abscesses (OR=0.348; CI=0.223-0.544), overgrown claws (OR=0.525; CI=0.353-0.782), nasal discharge (OR=0.299; CI=0.200-0.449), lame (OR=0.613; CI=0.411-0.914), panting (OR=0.293; CI=0.191-0.450), and vulvar or uterine prolapse (OR=0.533; CI=0.351-0.811). Women also attributed higher importance than men for eight indicators: severe lesions (OR=0.609; CI=0.406-0.913), iatrogenic abscesses (OR=0.606; CI=0.405-0.906), can be touched (OR=0.409; CI=0.286-0.586), overgrown claws (OR=0.514; CI=0.355-0.744), nasal discharge (OR=0.432; CI=0.298-0.627), lame (OR=0.426; CI=0.293-0.619), panting (OR=0.445; CI=0.305-0.651), and vulvar or uterine prolapse (OR=0.590; CI=0.398-0.876). Consumers gave higher scores to iatrogenic abscesses (OR=2.283; CI=1.295-4.024) than academics. We conclude that there were several differences about the relevance of the selected welfare indicators according to country and gender, whereas a lower number or no differences were observed according to age, education, stakeholder category and frequency of buffalo products ingestion.

Go to poster: .pdf or comment

Back / *F*

CORRELATION BETWEEN DAIRY BUFFALO NEUTROPHIL:LYMPHOCYTE RATIO AND SELECTED WELFARE INDICATORS

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As chronic stress on animals can be assessed by the neutrophil:lymphocyte ratio (N:L), the objective of this study was to verify the correlation between N:L and animal-based welfare indicators for dairy buffaloes. Twenty-two Murrah buffalo cows were assessed on August 2019, in Lapa, Paraná, through a welfare protocol for buffaloes. Welfare indicators assessed were body condition score, dirty flanks and upper part of hind legs, dirty udders, withers hygroma, lesions of more than 20 cm or open wounds, iatrogenic abscesses, swellings, vulvar or uterine prolapse, diarrhea, nasal, ocular and vulvar discharge, broken horn, overgrown claws, panting, and lame animals. Buffalo blood sample was collected from the jugular vein and placed in a 4ml EDTA tube. Total number of leukocytes was counted using the hematological counter Mindray BC-2800Vet and blood smear analysis. Correlation test of the lymphocytes, neutrophils and eosinophils with the welfare indicators was calculated (significance level of $p<0.05$). The mean of the N:L was 1.11±0.32 which was higher than the considered normal for buffalo cows. The hypothesis for this result is the presence of endoparasites, as the mean number of eosinophils (12.4±4.79%) was high on assessed animals and, for this reason, eosinophils percentage was also included to the correlation test. None of the animal-based welfare indicators had a correlation with the studied cells, although a tendency on a positive correlation between overgrown claws and the N:L was observed (Correlation value (CV)= 0.400; P-value (P)= 0.065), as well as a positive correlation between vulvar discharge and the eosinophil percentage (CV= 0.396; P= 0.068). Advancements in terms of a general welfare index may improve the understanding of welfare and blood cells, as the overall welfare status may be more significantly related to the N:L than each indicator individually.

Go to poster: .pdf or comment

Back / *F*

CAN WELFARE-FRIENDLY PRACTICES REDUCE ANTIMICROBIAL NEED IN PIG FARMING?

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Animal welfare can play a major role on livestock resilience, since it also affects body immunocompetence. Consequently, animals are less susceptible to infectious diseases and the need for antimicrobials administration is expected to be lower. Herewith we investigated the possible relationship between antimicrobial usage (AMU) and higher standards of animal welfare in 33 Italian fattening pig farms. In particular, welfare-focused protocols included continuous veterinary support, yearly training of workers in order to improve awareness towards animal health, welfare and biosecurity, constant availability of rooting material and its frequent replacement, restrictions on tail-docking, application of pain-relief protocols during castration and periodical monitoring of the hygiene level of drinking water pipelines. Antimicrobial administration data from 2015-2017 were converted as defined daily doses for Italian heavy pigs and adjusted by the standard weight at treatment (100kg). To determine whether considered husbandry practices had any effect on AMU, we conducted a retrospective analysis in 12 "welfare-friendly" farms (WF) compared to 21 conventional farms (CF). Other structural and managerial factors were also taken into account in the analysis (i.e. farm size, stockmen per pigs, presence of outdoor area) and resulted not significant. Despite a large variability in AMU, WF exhibited significantly lower AMU levels compared to CF, where the abovementioned practices were not equally implemented. These preliminary findings, whether confirmed by a greater sample size, suggest that higher welfare standards may play a major role on animal health and consequently on AMU.

Go to poster: .pdf or comment

Back / *F*

CLASSIFIED INFORMATION: WHAT'S LACKING FROM ONLINE HERPETOFAUNA SALES?

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In the last decade there has been a massive rise in the number of animals being sold via online classified websites, with herpetofauna (reptiles and amphibians) being no exception. In response to growing concerns regarding irresponsible advertising, the Pet Advertising Advisory Group (PAAG) was established to ensure animals are sold legally and ethically, thus aiming to safeguard animal welfare and enhance consumer confidence. It works by encouraging classified websites to become members, thereby agreeing to 26 rules regarding advert content and self-regulating information that sellers provide based on these rules. It also relies on volunteers for spot-checking adverts, however, with thousands of adverts uploaded every day, it can be hard for both PAAG and its members to identify any violations of the rules.

Adverts selling herpetofauna were downloaded from three PAAG member classified websites every week throughout 2019 (n=26,378) and checked against 13 relevant PAAG rules using an SQL database and a bespoke Expert System software.

Violations of 12 PAAG rules were found across the three member websites which involved 7986 individual adverts. Violations included the selling of banned invasive species (e.g. *Trachemys scripta scripta*), false information on the need for an Article 10 certificate, commercial sellers not displaying their council licence number, the selling of animals with health issues or in a gravid state, animals offered for swapping, and the selling of DWA animals without mentioning the need for a licence. There were also adverts that did not specify the species for sale (n= 371), but rather labelled the animal at taxon or class level, and in one concerning case just labelled the animal for sale as 'pet'. Member websites were also spot-checked for whether they had prominent links to PAAG buying advice and approved care information, with no websites meeting both these requirements. The only PAAG rule met by each website was that they had clear links on how to report an advert that caused concern.

Overall, these findings show that PAAG is having a positive impact on classified sales with 70% of adverts meeting PAAG rules, but due to the sheer number of adverts some violations are still slipping through. Recommendations would be for member sites to invest in a software solution to flag key words and frequent sellers, and / or require sellers to include more information via mandatory fields when uploading adverts. Further promotion of PAAG for public awareness would also be of benefit.

Go to poster: .pdf or comment

Back / W

EFFECTS OF LOW STRESS STOCKMANSHIP TRAINING ON BEHAVIOUR OF STOCKPERSONS AND DAIRY COWS

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Low stress stockmanship (LSS) is based on using the right amount of pressure and release at the edge of a cow's flight zone in combination with positioning oneself strategically relative to the cow's points of balance. This study assessed the effects of LSS training on both human and animal behaviour.

Participating stockpersons (n=17) – all employees of the same free stall dairy farm – were asked to do the same animal handling assignment on 3 different time-points: within two weeks prior to training (baseline), three to four weeks after training (short term), and approximately three months after training (long term). Participants were requested to subsequently move three lying cows of choice out of the cubicle. Behaviour of both stockpersons and cows was assessed from video-recordings by a single observer blinded to the time-point. The occurrence of the behaviours of the ethogram was recorded from the start of the assignment until the respective cow had moved out of the cubicle and had taken three steps on the walking alley. Additionally, a modified Qualitative Behaviour Assessment (QBA) was performed for each individual cow. Means of all three cows per stockperson per time-point were calculated for each behaviour separately and for pooled behaviours categorized as positive, neutral or negative and analysed for statistical differences using a mixed linear model.

LSS-training increased positive human behaviour in the short ($P=0.001$) and long term ($P=0.001$). Stockpersons more often used techniques such as exercising pressure and release, and placement of their foot near the cow's head (although the latter was only numerically – not significantly – increased on the long term). Usage of a stick (to direct, tap or hit the cow) decreased after training (although only significantly for *directing* with a stick). In the long term, neutral and negative human behaviour decreased numerically (not significantly), each approximately by half as compared to before being trained. Positive animal behaviour was observed more often in the long term compared to the baseline assessment ($P=0.016$). Some positive (calm, friendly), and some negative emotional states (frustrated, distressed) of the QBA had respectively increased ($P<0.001$) and decreased ($P<0.050$) after the training. (Negative) tail flicking behaviour was reduced in the long term only ($P<0.001$).

In conclusion, LSS training did have some positive effects on the human-animal relation. Periodically raising awareness and/or refresher trainings might bring even more LSS benefits.

Go to poster: .pdf or comment

Back / *F*

USING THE 'RAT TICKLING' MODEL TO INVESTIGATE THE NEURAL CORRELATES OF POSITIVE AFFECTIVE STATES IN FEMALE AND MALE JUVENILE WISTAR RATS

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Positive welfare is considered to be not simply the absence of suffering but also the presence of positive experiences. 'Tickling' has been shown to induce positive affective states in laboratory rats as evidenced by the production of 50 kHz ultrasonic vocalisations (USVs). The behavioural response to tickling is associated with the ascending mesolimbic dopamine system, however, any hormonal regulation of tickling has yet to be explored. This study aimed to investigate whether oxytocin and vasopressin are involved in heterospecific play, as in conspecific play in rats. We tested the hypothesis that oxytocin and vasopressin neurons in the paraventricular nucleus of the hypothalamus (PVN) are involved in regulating the behavioural response to tickling in juvenile Wistar rats. We also aimed to establish if there was any sex difference in the neural circuitry underlying the tickle response. Rats (n=32/sex) received either tickling (Tickled, n=16/sex) or no hand contact (Controls, n=16/sex). Play behaviours (approach and solitary play behaviours) and 50 kHz USVs were quantified. Rats were culled and their brains taken: double-labelled immunohistochemistry was used to quantify c-fos expression (a marker of neuronal activity) in multiple brain regions, including oxytocinergic and vasopressinergic neurons of the PVN; these neurons project to the reward circuitry and are thought to play a vital role in coding the rewarding nature of prosocial behaviours. We found that tickled rats called more than controls rats; in particular, we found that tickled female rats produced significantly more appetitive 50 kHz USVs than tickled male or control rats ($p<0.001$). Treatment had a significant effect on solitary play behaviours: tickled rats made more scampers ($F_{1, 60}= 51.9$, $p<0.001$), hops ($F_{1,60}= 5.37$, $p= 0.024$) and darts ($F_{1, 60}= 110.9$, $p<0.001$) compared to controls. Tickled rats, regardless of sex, had lower numbers of c-Fos positive oxytocin ($p=0.02$) and vasopressin ($p=0.03$) neurons in the PVN. Similarly, we found that correlations in neural activation in connected regions of the social behaviour network are disrupted in tickled, compared to control, rats. This suggests that tickled rats had lower neural activity in regions associated with social behaviours. However, hedonic 50 kHz USVs were positively correlated with the number of c-Fos positive parvocellular oxytocin neurons in the PVN ($p = 0.0016$). Therefore, tickling, while rewarding, may not be perceived as a social behaviour for rats, which may affect how we interpret future rat tickling studies.

Go to poster: .pdf or comment

Back / *I*

ASSESSMENT OF EYE BLINK RATE CHANGES ASSOCIATED WITH DISBUDDING IN DAIRY CALVES

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Blinking is a normal eye activity in human and some animal species. Investigation of the use of eye blink rate [EBR] as a non-invasive stress measure is well documented in humans and is currently gleaning research attention in animal studies. Thus, this study was designed to assess eye blink rate changes associated with disbudding, a known stressful and painful procedure in dairy calves. Thirty-one Holstein dairy calves were assigned into one of three groups: A – calves to be disbudded [n = 13]; B – calves to be sham disbudded [n = 13]; and C – control calves [n =5]. Group A calves were disbudded using the hot-iron method under cornual nerve block with procaine hydrochloride [4% Pronestetic®]. Analgesia was achieved using subcutaneous injection of meloxicam [2% Metacam® at 0.5mg/kg]. Group B calves were sham disbudded using cold iron without anaesthesia or analgesia while group C calves remained in their pen and were not subjected to any of these procedures. The EBR of calves in the three groups was assessed manually and retrospectively from video recordings on days 1 - 5 pre-disbudding [08:00am daily; 5 min/calf], before disbudding [08:00am; 5 min/calf], immediately following disbudding [3 min/calf], and on days 1 - 5 post-disbudding [08:00am; 5 min/calf]. The EBR values were transformed into average blink rate per minute. As data were normally distributed, and variances were homogenous, group comparison was performed using One-way ANOVA with Tukey HSD and Bonferroni as post-hoc tests in SPSS. Significance was accepted at $P \leq 0.05$. Results revealed no statistical difference in mean EBR between the three treatments during the pre-disbudding days [$P \geq 0.083$] and before disbudding [$P \geq 0.685$]. Following disbudding, the mean EBR of the disbudded calves was significantly higher [$F_{4, 24} = 6.86$; $P \leq 0.004$] than that of the control but did not vary significantly from the sham disbudded counterpart. The mean EBR of the three groups was also comparable during the post-disbudding period [$P \geq 0.201$]. The findings of increased spontaneous blinking within the immediate post-disbudding period suggests that both disbudding under anaesthesia and sham disbudding were stressful to dairy calves. However, the usefulness of this measure to indicate stress may be limited when the source of stress is withdrawn as was seen in the post-disbudding period.

Go to poster: .pdf or comment

Back / *F*

ASSESSMENT OF EYE BLINK RATE CHANGES FOLLOWING CALF RESTRAINT IN A CRUSH

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Dairy calves are typically restrained in a calf crush for easy handling while performing routine husbandry procedures such as disbudding and castration. This activity on its own has been established to evoke stress response in dairy calves and thus serves as a stress model. In this study, the potential for crush restraint of dairy calves to evoke stress response was investigated using spontaneous eye blink activity, a newly recognised non-invasive marker of stress in animals. A total of 31 Holstein dairy calves divided into three groups were used in this study; 26 of these calves [Groups A and B] were exposed to crush restraint while the remaining 5 calves served as control [Group C]. Group A calves [n = 13] were destined to be disbudded and thus, received a cornual nerve block with procaine hydrochloride [4% Pronestetic®]. Additionally, 5 of these anaesthetised calves also received a subcutaneous injection of meloxicam [2% Metacam® at 0.5mg/kg]. Dairy calves in group B received no anaesthetic or analgesic treatment. Baseline eye blink rate [EBR] was assessed prior to crush restraint by manual counting and from concurrent video recording [5 min/calf]. Following crush restraint [and before disbudding in Group A], EBR of calves in all the groups was determined retrospectively from video recordings [2min/calf]. EBR values were expressed as rate per minute and tested for normality and homogeneity of variance using Kolmogorov-Smirnov and Levene's statistic, respectively. Distribution of data were normal, and the assumption of homogenous variances not violated. Hence, data was subjected to One-Way ANOVA using SPSS. Mean differences were ascertained at Post-hoc using Tukey HSD and significance accepted at $P \leq 0.05$. The results of this study showed that baseline mean EBR did not vary significantly [$P \geq 0.685$] between groups while the mean EBR of group B was significantly higher [$F_{4, 24} = 11.88$; $P \leq 0.0001$] than those of groups A and C following restraint in crush. Based on the finding of increased spontaneous eye blinks following crush restraint in non-anaesthesized dairy calves and literature evidence associating stressful stimuli with increase in spontaneous blink activity, it can be acknowledged that this procedure was stressful to dairy calves. The administration of local anaesthetic may have prevented such elevation in the eye blink rate of dairy calves due to its ability to mitigate stress response in dairy calves and not necessarily because it has a direct effect on blink activity.

Go to poster: .pdf or comment

Back/ F

A MOBILE SLAUGHTER UNIT CAN REDUCE COW WELFARE RISKS

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Cows need to be fit for transport to an abattoir as prescribed by European law. Unfit cows may be killed on farm and offered to a rendering plant. To prevent waste of valuable meat and reduce the number of (illegally) transported unfit cows, a pilot with a Mobile Slaughter Unit (MSU) was conducted in The Netherlands. However, welfare risks to cull cows by using the MSU were unknown. Therefore, an animal welfare risk assessment was performed for the Netherlands Food and Consumer Product Safety Authority.

In this study, current practice to dispose of cull cows were identified, described, explored for animal welfare risks, and compared with those risks deploying an MSU. Differences between scenarios for cow welfare risks were qualitatively assessed based on the method of the European Food Safety Authority containing the following steps: 1. hazard identification or threats to welfare, 2. hazard characterization or welfare impact, 3. exposure assessment or likelihood of threats including number of animals affected, and 4. risk characterization or balancing weight of severity and probability of threats.

From December 2018 until December 2019 a number of 1932 cows (>2 years of age) were disposed of through the MSU pilot. The animals originated from 922 farms, mostly dairy farms. These farms kept a total 133,461 cows (>2 years of age). In 2019, there were 16,241 dairy farms with 1,608,550 cows (>2 years of age) in The Netherlands.

Differences in welfare risks between the MSU and the scenarios ‘conventional transport and slaughter’, ‘emergency slaughter’, and ‘other killing methods’ were revealed. MSU use resulted in equal, smaller and larger risks. Mainly smaller risks by preventing a welfare deterioration of unfit cows during the process of transport and at the slaughterhouse. Larger risk by a slightly higher probability of incorrect stunning and bleeding compared to routine slaughter, but not compared to emergency slaughter where this risk is estimated to be highest. In addition, MSU use may cause a larger risk of extended discomfort for few animals that were not approved for slaughter at the ante mortem inspection, as these cows may remain longer in their perilous situation on-farm when not euthanised.

MSU reduces animal welfare risks mainly by preventing routine transport of unfit animals and routine procedures at the slaughterhouse. With suitable measures taken to control the few potentially higher risks for cow welfare, overall the MSU is evaluated as potentially improving animal welfare compared to current practice.

Go to poster: .pdf or comment

Back / *F*

DESCRIPTIVE STUDY OF TAIL AND EAR LESIONS DURING THE WEANER-FINISHER PERIOD IN A FARROW-TO-FINISH PIG FARM

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This study aimed to describe changes in tail (TL) and ear (EL) lesion patterns in pigs during the weaner-finisher period. Weaner pigs (n = 1,573) were housed in groups of c. 36 pigs per pen and followed for 13 weeks until slaughter at 114.9 ± 11.79 kg of body weight (BW). Pigs were inspected for TL and EL on arrival at weaner (24.9 ± 5.33 kg of BW) and on transfer to the grower (33.3 ± 7.04 kg BW) and finisher (60.2 ± 7.74 kg BW) stages using a 5-point scale where 0 = no lesions and 4 = total loss of tail or ear, respectively. Changes in presence of TL and EL (score >0) across the different stages were assessed for each pig and different lesion patterns were identified. Tail lesions were observed in 2.4% of weaners, 12.4% of growers and 11.5% of finisher pigs. In total, 1.8% of pigs had TL only during the weaner stage, 10.6% of pigs had TL only during the grower stage and 10.2% of pigs had TL only during the finisher stage. A low proportion of pigs presented TL during the weaner and grower (0.6%), weaner and finisher (0.1%) and grower and finisher (1.3%) stages. No pig had a TL in all production stages. Furthermore, 39.3% of weaner, 28.1% of grower and 33.0% of finisher pigs presented EL. In total, 11.6%, 1.7% and 4.8% of pigs had EL only during the weaner, grower and finisher stages, respectively. Additionally, 3.2%, 5.1% and 3.8% of pigs presented EL during the weaner and grower, weaner and finisher and grower and finisher stages, respectively and 19.3% of pigs had EL during all production stages. Finally, a low proportion of pigs presented both TL and EL in the weaner (0.8%), grower (3.4) and finisher (3.9%) stages. In conclusion, EL were more prevalent and appeared to be more persistent than TL in pigs on this farm.

Go to poster: .pdf or comment

Back / *F*

ASSOCIATIONS BETWEEN DAMAGING BEHAVIOURS AND THEIR RESPECTIVE LESIONS DURING THE WEANER-FINISHER PERIOD IN A FARROW-TO-FINISH PIG FARM

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This study investigated the relationships between tail and ear biting and their associated lesions in pigs during the weaner-finisher stages. Twelve-week old pigs (n=1,573) were housed (c. 36 pigs/pen) and followed until slaughter (114.9±11.79 kg body weight (BW)) for 13 weeks. All occurrences of tail-(TB) and ear-directed (EB) behaviour were counted (1×5min observation/pen/week) and frequencies were averaged per each production stage. At the end of the weaner (W; 33.3±7.04 kg BW) and grower (G; 60.2±7.74 kg BW) stages, pigs were inspected for the presence of tail (TL) and ear (EL) lesions and the proportion of pigs with TL and EL was calculated. Spearman rank correlations were calculated (PROC CORR of SAS v9.4) between TB and EB during the weaner-finisher stages and between behaviours and lesions during the weaner and grower stages. TB-W and TB-G tended to be correlated (r=0.26; P=0.09) and there were no correlations observed between TB-W and TB-F or between TB-G and TB-F (P>0.05). EB-W tended to be correlated with EB-G (r=0.28; P=0.07) and EB-F (r=0.29; P<0.06). EB-G was correlated with TB-W (r=0.42; P=0.005), TB-G (r=0.62; P<0.001) and TB-F (r=0.59; P<0.001). There were no associations between TB and TL during the weaner or grower stages (P>0.05). There was a positive correlation between EB-W and EL-G (r=0.34; P=0.03). Furthermore, higher EB-W tended to be associated with lower TL-W (r=-0.27; P=0.09) and higher EB-G tended to be associated with lower TL-G (r=-0.24; P=0.10). These results suggest that behaviours observed in the weaner stage tend to carry through to the later production stages (mostly grower stage). Interestingly, ear biting performed during the grower stage was associated with tail biting in all stages suggesting that these behaviours co-occur to some extent, although it is likely that one of the behaviours was performed more frequently than the other. This would explain the negative correlation observed between ear lesions and tail lesions during the weaner and grower stages.

Go to poster: .pdf or comment

Back / *F*

BRAZILIAN DOG OWNERS' ATTITUDES TOWARDS DOG EUTHANASIA

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The Brazilian Federal Council of Veterinary Medicine (CFMV) defines euthanasia as the induction of the cessation of animal life, by means of a technically acceptable and scientifically proven method, always observing ethical principles. Veterinarians may indicate euthanasia when the animal's well-being is irreversibly compromised, when the treatment represents costs incompatible with the owner's financial resources and when the animal constitutes a threat to public health. Finally, euthanasia should never be used as a way to meet the owner's need, such as the animal's advanced age, and the economic aspect must be the last one in a scale of priorities for the indication of euthanasia. It is important to know dog owners' opinions on the issue, as they also participate in these decisions. This study aimed to investigate the influence of human-dog relationship and sociodemographic characteristics on dog owners' support of different justifications for dog euthanasia. Brazilian dog owners (n = 2,044) participated in an online survey with closed questions covering participants' demographic data (sex, age, region, income and education), dog acquisition information, human-dog relationship characteristics, participants' willingness to invest in the treatment of their dog in case of illness, and participants' support for dog euthanasia in four scenarios: a dog that needs expensive treatment, a non-adopted shelter dog, a paraplegic dog and an elderly dog. Associations between variables of interest and support for the different reasons to euthanize a dog were analysed with binary logistic regressions. Support for euthanasia differed according to the scenario (Figure 1) and was influenced by demographic and human-dog relationship characteristics (Table 1). Findings suggest that Brazilian dog owners' may not be in line with CFMV guidelines given that most participants supported the euthanasia of an elderly dog, and expensive treatment was the second most supported scenario. This study also reinforces the complexity of societal acceptance of dog euthanasia, given that participants' characteristics and their relationship with their pets, as well as the reason for euthanizing the dog, influenced support for dog euthanasia.

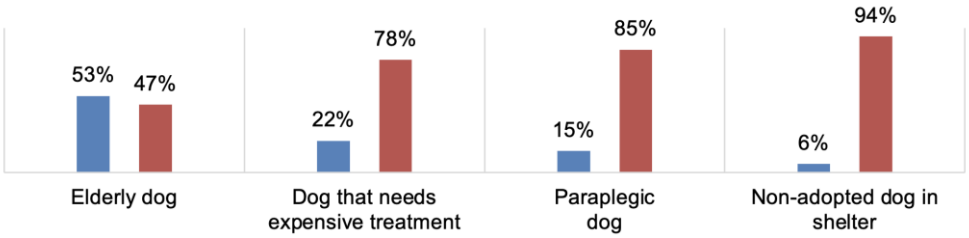

Figure 1. Support for dog euthanasia (SUPPORT= blue bars; DO NOT SUPPORT = red bars)

Table 1. Variables associated with lower chances of support for dog euthanasia (P < 0.01).

Variable	Elderly dog	Dog that needs expensive treatment	Paraplegic dog	Non-adopted dog in shelter
Older participants	x	x		
Female participants		x	x	
Considers own dog their child		x	x	x
Participants that think consider death of own dog more traumatic	x	x		
Participants that would invest more time to treat sick dog		x		
Lower income	x			
Did not pay to acquire dog			x	

Go to poster: .pdf or comment

Back / *C*

ON THE IMPACT OF FIN CLIPPING IN SWIMMING PATTERNS: A PRELIMINARY STUDY USING A MODEL FISH SPECIES

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Danio rerio, a small cyprinid most commonly known as Zebrafish is a model species extensively and widely used in biological and medical research. In 2013 it was estimated that more than 3250 institutes in more than 100 countries worked with this small organism, and in 2021 that number is likely to have increased considerably. Although its use is strongly established, in part due to its rapid development and high genetic homology to humans, there is still a lot to be learned about these animal's welfare. Fish welfare has received some public attention over the last few years, but the rapid development of aquaculture and housing facilities for research purposes has been focused on economization and maximization of production, rather than on fish welfare. In Europe Zebrafish are legally protected by the European Directive on the protection of animals used for scientific purposes (Directive 2010/63/EU), which has a legal requirement to minimize or, if possible, avoid pain altogether in adult fishes. Furthermore, the refinements in husbandry practices can increase animal welfare which, in turn, promote the reliability of scientific data. One of the most commonly used techniques for DNA sampling in fish is fin clipping. This approach, which makes use of anaesthetics to remove a small portion of the individuals' fin, still doesn't have an established methodology meaning that researchers can choose which fin to clip, disregarding the potential welfare impact. In the present work, the team has analysed Zebrafish welfare after the clipping of four different fins (dorsal, right pectoral, superior and inferior caudal lobe) to determine which one of the clippings has a less negative impact on the individuals' welfare. The team recorded five minutes of video *pre* and after clipping to evaluate the differences in movement and swimming patterns. The analysis was made using custom made MATLAB video-tracking code, which was used to scrutinize the movements of fish in the aquaria. Results from this work may be extrapolated to animals outside a laboratory environment, ultimately resulting in a deeper comprehension of animal welfare, for instance, of wild specimens after field sampling. A preliminary interpretation of the results shows that there isn't a significant difference on the movement of fishes, meaning that any one of the fins might be clipped without causing much distress or negative consequences to Zebrafish's swimming pattern.

Go to poster: .pdf or comment

Back / *L*

VALIDATION OF AN ALTERNATIVE FEATHER SAMPLING METHOD TO MEASURE CORTICOSTERONE

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Studies on birds' welfare or their stress physiology are often complemented by measuring corticosterone levels in feathers. Until now, the common standard for this method is to collect feathers by plucking, a procedure which on living birds is presumed to be painful. Therefore, in most European countries an animal experiment application is required. The Directive 2010/63/EU requires the full implementation of the 3-R Principle of Russel and Burch in animal experiments. The aim of this study was to validate an alternative, possibly less invasive sampling method: cutting the feathers close to the skin. The examined species were geese (*Anser anser domesticus*) and ducks (*Anas sterilis*) from a conventional poultry husbandry. Feather samples were collected by cutting as well as by plucking between the shoulders from each individual, directly after slaughter for meat production. Feather corticosterone levels were measured with Enzyme-Linked Immunosorbent Assay (ELISA). The results were compared using Bland–Altman plots and concordance correlation coefficients (CCC). Comparing the mean corticosterone values of each species with their respective standard deviations, the differences between the methods were negligible. In addition, the differences between the individuals were markedly higher than the differences between the methods. The determination of corticosterone levels in cut feathers is valid compared to using plucked feathers. In conclusion, it is reasonable to assume that feather cutting could be established as an alternative sampling method for measuring corticosterone. Nevertheless, we recommend further research on other species to confirm these results.

Go to poster: .pdf or comment

Back / *F*

INVESTIGATION INTO OWNER-REPORTED DIFFERENCES BETWEEN DOGS BORN VERSUS IMPORTED INTO CANADA

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It is estimated that over 1 million dogs are imported into the United States and roughly 40,000 dogs to the United Kingdom yearly. However, this data does not currently exist for Canada. Nevertheless, local animal rescue leaders estimate that thousands of dogs are imported into Canada each year. Dog importation may be increasing globally while regulation and surveillance is still limited, resulting in concerns for the health and temperament of imported dogs. Currently, few studies have investigated how the source location of dogs influence the owner-dog relationship. An online survey was distributed to a representative sample of dog owners (n = 803) in British Columbia, Canada, containing questions on various aspects of the owner-dog relationship, including questions from the Lexington Attachment to Pets Scale, Canine Behavioral Assessment and Research Questionnaire, Human Animal Bond questionnaire, Monash Dog Owner Relationship Scale, and constructed questions about source, training practices, expectation, and health. Approximately 7% of respondents reported owning a non-Canadian-sourced dog, with majority of these dogs coming from the United States. Multivariate regression models were used to predict whether the source of the dog, while taking into account other investigated variables, had an effect on owners' responses. We found no evidence of a poorer human-dog relationship in non-Canadian-sourced dogs. In fact, owners of Canadian-sourced dogs used aversive training methods more frequently and had higher expectations for their dog. Although our findings suggest that imported dogs are not at risk for compromised human-dog relationships, future research can investigate the experiences of imported dogs as they travel and habituate to their new environments.

Go to poster: .pdf or comment

Back / *C*

IMPACT OF DAM REARING ON VEAL CALVES

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Dairy calves are typically separated from their dam within 24h of birth. Calves not wanted for replacement are commonly transported to veal farms around 2wk of age. Separation from the dam at an early age may present animal welfare concerns. We studied the impact of dam-rearing on various aspects of veal calf welfare. Calves (N=79) born March-October 2019 on one dairy farm were either reared with their dam fulltime or individually in igloos. All calves were transported to one of 8 veal farms at 2 or 4wk of age. Transport age is not presented here.

Growth: Calves were weighed weekly on the dairy farm, at arrival at the veal farm and at slaughter. Dam-reared calves were heavier in weeks 3 and 4 at the dairy farm and at arrival at the veal farm (mean±sem kg: week 3: 58.1±1.5 vs 63.3±1.6; week 4: 63.0±2.1 vs 72.9±2.4; veal farm: 63.1±1.7 vs. 69.6±2.0; P<0.05), but not at slaughter (carcass kg without and with dam: 166.2±5.0 vs 168.2 ± 5.1; P=0.873).

Health: Calves were attributed a binary score of 1=sick or 0=healthy every week at the dairy farm, and antibiotic treatments were recorded on both farms. At the dairy farm, the first 2wk had the highest prevalence of disease (weeks 1-2: 75%; weeks 3-5: ≤62%; P<0.001). There tended to be a higher prevalence of sick dam-reared calves in week 5 (P=0.056). No impact of dam-rearing could be found on individual antibiotic treatments.

Immunology: Immunoglobulins (Ig) G, M and A were sampled in week 1 at the dairy farm, the day prior to transport, and in weeks 2 and 10 after arrival at the veal farm. No impact of dam-rearing was found. Further, white blood cells were studied prior to transport and 2weeks after arrival at the veal farm. Dam-reared calves had more white blood cells, lymphocytes, and monocytes (63% vs. 27%; P<0.05).

Behaviour: Two forced-human-approach tests were done 5 and 7wk after arrival at the veal farm: scores from 1 (no eye contact) to 4 (two steps and physical contact) were attributed. Dam-reared calves had lower scores, i.e. were more difficult to approach (1.3±0.1 vs. 2.1±0.1; P<0.001).

To conclude, veal calves reared with their dam: 1. were heavier at arrival at the veal farm, but lost this advantage by slaughter, 2. tended to have more white blood cells, though this did not, in our study, translate into improved clinical health, and 3. were more difficult to approach.

Go to poster: .pdf or comment

Back / *F*

EFFECTS OF PASTURE ACCESS ON PRE-WEANED DAIRY CALVES IN NEW ZEALAND

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Pre-weaned dairy calves in North America and Europe are rarely provided pasture. Our aim was to determine the effects of pasture access on the feeding development, fearfulness and problem-solving abilities of pre-weaned dairy calves. Calves were paired at 5d of age and semi-randomly assigned to treatment: indoor (24h/d in 10.5m^2 indoor pens; n=8) or outdoor (0830–1530h on pasture: 312m^2 pen/pair, with shelter, 4m^2; 1530–0830h housing identical to indoor treatment; n=8). Each calf was offered 4L of milk twice/d from a teat-bucket, and weaned at 8wk. All calves had *ad libitum* access to concentrates, water, and long-stemmed hay. Daily concentrate intake was recorded from d25–d70. To explore differences in the development of feeding behaviour and fearfulness, 30min food neophobia tests were conducted on d46 and d70; calves had access to 2 buckets, one with their usual concentrates, one with a novel food (d46- fresh-cut lucerne; d70- beet pulp). To assess problem-solving ability, calves were tested in a detour task at d50. A V-shaped hurdle with a milk feeder inside the tip of the V was placed in the middle of the pen. Calves had 5min to walk or run around the hurdle to reach the opening and access milk. All tests were video recorded in the home pen. We noted no differences in concentrate intake before (<d30) or after weaning (>d53) but indoor calves consumed 0.43±0.18kg/d (*P*=0.03) more concentrates than outdoor calves during the weaning period (d30–d53). Though we did not measure grass intake, indoor calves may have spent more time eating concentrates due to lack of environmental stimulation. Indoor calves were more reactive to novelty, spending almost twice as much time orally manipulating the food neophobia buckets compared to outdoor calves (concentrates: 4.4 vs 2.7min; SE=0.62; *P*=0.009; novel: 2.8 vs 1.6min; SE=0.5; *P*=0.04). Indoor calves also spent more time running during the detour task than outdoor calves (0.17 vs 0.02min; SE=0.05; *P*=0.003). Indoor calves tended to spend more time eating novel food (1.9 vs 1.3min; SE=0.3; *P*=0.07), though there was no difference in latency to approach novel feed, or novel food intake. Instead of reacting to novelty, outdoor calves appeared to spend more time eating concentrates (3.0 vs 2.1min; SE=0.6; *P*>0.05). There were no treatment differences in the food neophobia test at d46, nor in time taken to solve the detour task. We conclude that pasture access reduces calf reactivity to changes in their environment.

Go to poster: .pdf or comment

Back / *F*

MEASURING THE EFFECT OF TRANSPORT ON MARINE MAMMAL WELFARE THROUGH SALIVARY CORTISOL CONCENTRATIONS

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The Ohio State University's Center for Human-Animal Interactions Research and Education (CHAIRE) and the Columbus Zoo and Aquarium (CZA) have partnered for a longitudinal study to assess the welfare of their California sea lions (*Zalophus californianus*) as they undergo a relocation process from a temporary facility to permanent habitat at CZA. Presented here is the phase of the larger study aimed at measuring the animals' welfare throughout the process of transporting the animals between facilities. Given the frequency with which marine mammals are transported between institutions, and there are known stressors associated with transport, salivary cortisol concentrations (SCC) were measured to assess the animals' welfare throughout this process. We found that SCC was highest post-transport (LSMean = 21.50 nmol/L, $t_{73} = 6.48$, $p < .01$), although only significantly different from pre-transport ($t_{73} = -3.88$, $p < .01$) not the transport period ($t_{73} = -0.30$, $p = .76$). There was no effect of sex ($F_{1, 74} = .02$, $p = .88$) or age ($F_{5, 70} = .81$, $p = .55$) on SCC. We also established a range of SCC for California sea lions to be 12.37 ± 18.88 nmol/L, a novel contribution to marine mammal physiology. Additionally, we measured environmental parameters of temperature, relative humidity, and shock to the vehicle, and found fluctuations in these parameters between vehicles, with mean temperature 21.85 ± 2.09 ℃, mean relative humidity 77.43 ± 4.54 %rH, and mean shock to the vehicle 2.47 ± 0.014 g for the duration of transport. Differences in these parameters had no effect on SCC, with considerably greater variation within trucks (301.31) than between vehicles (3.15). These findings offer evidence that measurement of cortisol concentrations through saliva is feasible and valuable in this species. The elevated SCC post-transport may indicate a response to the novelty of staff and environment the animals were exposed to upon arrival at the permanent habitat, although it is important to note it cannot be conclusively determined whether this response is positive or negative with respect to welfare. In order to better evaluate the welfare implications of this finding, results from this phase will be compared to the longitudinal measures of welfare from the comprehensive study, offering a more holistic view of the impact of transport on these animals' welfare. These findings will contribute to the growing field of marine mammal welfare science and hopefully inform future transport and relocation practices to minimize potential consequences to animal welfare.

Go to poster: .pdf or comment

Back / W

BACK TO SCHOOL: EXPLORING THE REASONS WHY ADOPTERS DO NOT PLAN TO TAKE THEIR RECENTLY ADOPTED DOG TO TRAINING CLASSES

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Attending dog training classes has been associated with improved dog trainability and an increase in engagement in shared activities with the owner which may strengthen the dog-owner bond.

Dogs Trust, a UK based dog welfare charity, recommends that new owners of dogs adopted from rehoming centres attend a bespoke training course (Dogs Trust Dog School; DTDS), where suitable. However, a proportion of referred owners do not attend classes. Here we investigated reasons for non-attendance and compared these with potential dog-related risk factors including the age and sex of the adopted dog.

Data were collected from 7,099 post-adoption call surveys completed by owners 2-weeks after rehoming a dog from 20 UK Dogs Trust rehoming centres. Of these, 3,515 (49.5%) owners were recommended to attend DTDS, of which 1,818 (51.7%) reported that they did not attend and/or were not planning to attend a class. The most commonly reported reasons were that the adopter was an experienced trainer and/or would prefer to train the dog themselves ('experienced owner'; 419/1818, 23%) and the dog didn't need training, was already trained and/or well behaved ('training not needed', 307/1818, 17%). Chi-square tests were used to explore the association between these reasons and both the age and sex of the dog. Dog age was categorised as: puppy (0 to <6months), juvenile (6 to <12 months), young adult (1 to <2 years), mature adult (2 to <7 years), senior adult (7-11 years) and geriatric (12+ years).

'Experienced owner' and 'training not needed' reasons were both more likely to be reported as age of the dog at the time of adoption increased ($P=0.001$ and $P<0.001$, respectively). There was no evidence of an association between dog sex and either of these two reasons for not attending and/or not planning to attend a class.

Adopters of older dogs may have perceived their dog as being already well trained/behaved compared to adopters of younger dogs. However, dog training classes can be beneficial to dogs of all ages, for stimulation and enrichment, dog-owner bonding and for preventative behaviour advice. More research is needed to understand why adopters, especially of older dogs chose not to attend training classes and how attendance rates could be increased.

Go to poster: .pdf or comment

Back / *C*

EXPLORING THE USE OF NOVEL TOOLS FOR ASESSING WELFARE IN AMERICAN TOADS (*ANAXYRUS AMERICANUS*)

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Amphibian welfare research has trailed behind other taxa, perhaps due to difficulty applying methods that have been developed for mammals and birds that rely on quantifying active behaviors. Two experiments were carried out using nine zoo-housed American toads (*Anaxyrus americanus*), a species that displays long periods of sedentary behavior, to test the use of novel welfare indicators and measure habitat preferences.

In experiment one, the effects of housing type were considered. “Basic” housing consisted of a thin wood chip substrate, two hides, and a shallow water bowl. “Enriched” housing added deep soil to burrow in, a live plant, a dripping water feature, and climbing opportunities. Toads (n=9) were pair-housed (except for one) and tested in an A-B-A design with the first housing condition (basic or enriched) varying by pair. Over the three-week study period, cortisol samples were collected non-invasively via dermal swabs. An observer recorded posture and approximate breathing rates, and activity levels were calculated based on continuous camera data. Analyses did not reveal significant differences in cortisol, approximate breathing rates, nor activity between housing conditions. There was a significant effect of housing condition on posture, with lower, potentially more “relaxed” postures being more likely to occur on the enriched side. We hypothesize that this postural difference is due to reduced threat perception when toads were provided more dark spaces to take cover on the enriched side.

Experiment two sought to determine if toads would show a preference for the enriched side when given the choice. Toads could move freely between the two housing conditions over a one-week period and their location was noted every hour based on continuous video data. Results were mixed with some toads spending a majority of their time on the basic side and others on enriched. We suspect that mating status may have had a stronger effect on side preference than housing type as toads that were seen in amplexus tended to stay on the same side as each other whether it was basic or enriched. Overall, how toads used the space suggests that provision of large dark spaces for hiding and soil for burrowing is important for promoting good welfare in this species.

Go to poster: .pdf or comment

Back / W

DO CHIMPANZEES ENJOY INTERACTIVE ARTS? THE POTENTIAL USE OF INTERACTIVE TECHNOLOGIES AS A FORM OF ENVIRONMENTAL ENRICHMENT FOR ZOO-HOUSED CHIMPANZEES (*PAN TROGLODYTES*)

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Environmental enrichment is essential for the well-being of zoo animals. Incorporating technologies into such efforts may advance enrichment techniques by increasing flexibility and reducing time constraints. The arts may add educational and animal-welfare value by making technology-based enrichment more attractive to humans and animals. The purpose of this study was to investigate whether interactive arts can be used as a form of environmental enrichment. We implemented interactive movies designed by an artist in an indoor enclosure of chimpanzees at Kyoto City Zoo in Japan. The theme of the interactive movie was 'a forest of chimpanzees'. The movie comprised three scenes that were inspired by the behaviours and situations of wild chimpanzees. The interactive feature of the movies allowed the chimpanzees to change the movie contents by approaching or touching the sensors that were set up in several locations of the indoor enclosure. We did not use any food reward during the experiment, and the indoor enclosure was connected to an outdoor enclosure so that the chimpanzees could choose between the interactive movie or outdoor recreation. We established baseline behaviour by observing six chimpanzees between March 16 and 20, 2020 (baseline condition); the behaviours were recorded between 21 and 29 March, 2020 (experimental condition). We made direct observations and video recordings to investigate the effects. During direct observations, we recorded their behaviours every 3 mins between 10am to 3pm. The baseline and experimental behaviours were then compared with each other. We analysed the video recordings to measure the rate of interactions, emotional expressions and preferences of the chimpanzees during each interactive movie scene. The results revealed that the chimpanzees spent more time in the indoor enclosures when the interactive movie was presented (experimental condition) than during the control condition. There was no evidence of habituation as the rate of interactions did not decrease. Three chimpanzees, including two juveniles, used the interactive movie more than the others. The juvenile chimpanzees sometimes showed playful expressions when interacting with the arts and interacted more during one particular movie scene. The activity budgets did not change much, but the chimpanzees decreased foraging behaviour and increased locomotion activity. These results suggest that there were no aversive effects of interactive arts on chimpanzee behaviours, and some of the chimpanzees showed positive responses. This study introduces a novel possibility that guides the incorporation of technology and arts into environmental enrichment programmes in zoo habitats.

This project was conducted as a part of KYOTO STEAM − International Arts × Science Festival

Go to poster: .pdf or comment

Back / W

INVADING HABITATS OF FEMALE BEARS WITH CUBS: HOW TO DECREASE THE RISK OF CONFLICT

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The increasing number of human-bear conflicts leads to increased hunting and diminishes conservation efforts. The traditional precautions that are taken to reduce human-bear conflicts, however, lack sufficient scientific evidence. The success of each recommended precaution is hard to evaluate, because encounters are rare, and failure may be fatal. On the other hand, absolute success is unknown, as people do not always notice the presence of a bear nearby. We assume that anecdotal stories, if treated with some caution, may contain meaningful and accurate details about bear behavior. We categorized as desirable behavior when bears tried to increase the distance as soon as they noticed people, while different behavior was considered as potentially dangerous. Our aim is to clarify them in the next stages of a project. We collected 1870 responses to a Russian survey conducted on the Internet between 2018 and 2019. Then we selected 168 questionnaires that corresponded with the following criteria: the encounter was accidental; responses contained detailed descriptions of situations; the bears were close enough to see people and potentially able to do them harm; bears were females with cubs. According to previous studies, females with cubs account for 47% of overall attacks and 28% of fatal attacks. Respondents were tourists (34%), foresters (17%), wild harvest gatherers (13%), and others. Encounters took place in the Arkhangelsk Region (27%), Bashkiria (17%), Karelia (16%) and others. In 36% of cases, females demonstrated threatening behavior - hit with a paw (three cases), attacked, approached people while growling, growled from a distance. In 64% of cases, females tried to increase the distance as soon as they noticed people, and could be followed by cubs. Females behaved dangerously more often than safely if people were accompanied by a dog (86% vs 14%), if the cubs were in a tree (65% vs 35%), or if people screamed (60% vs 40%). Bears while crossing the road never approached people. A female showed less threatening behavior if the bear cub cried (20% vs 80%), or if people were backing away (40% vs 60%). The cub's approach to humans did not increase the risk of attack (46% vs 54%). Future research will further examine the impact of the factors mentioned above and the possible differences compared to encounters with male bears.

Go to poster: .pdf or comment

Back / W