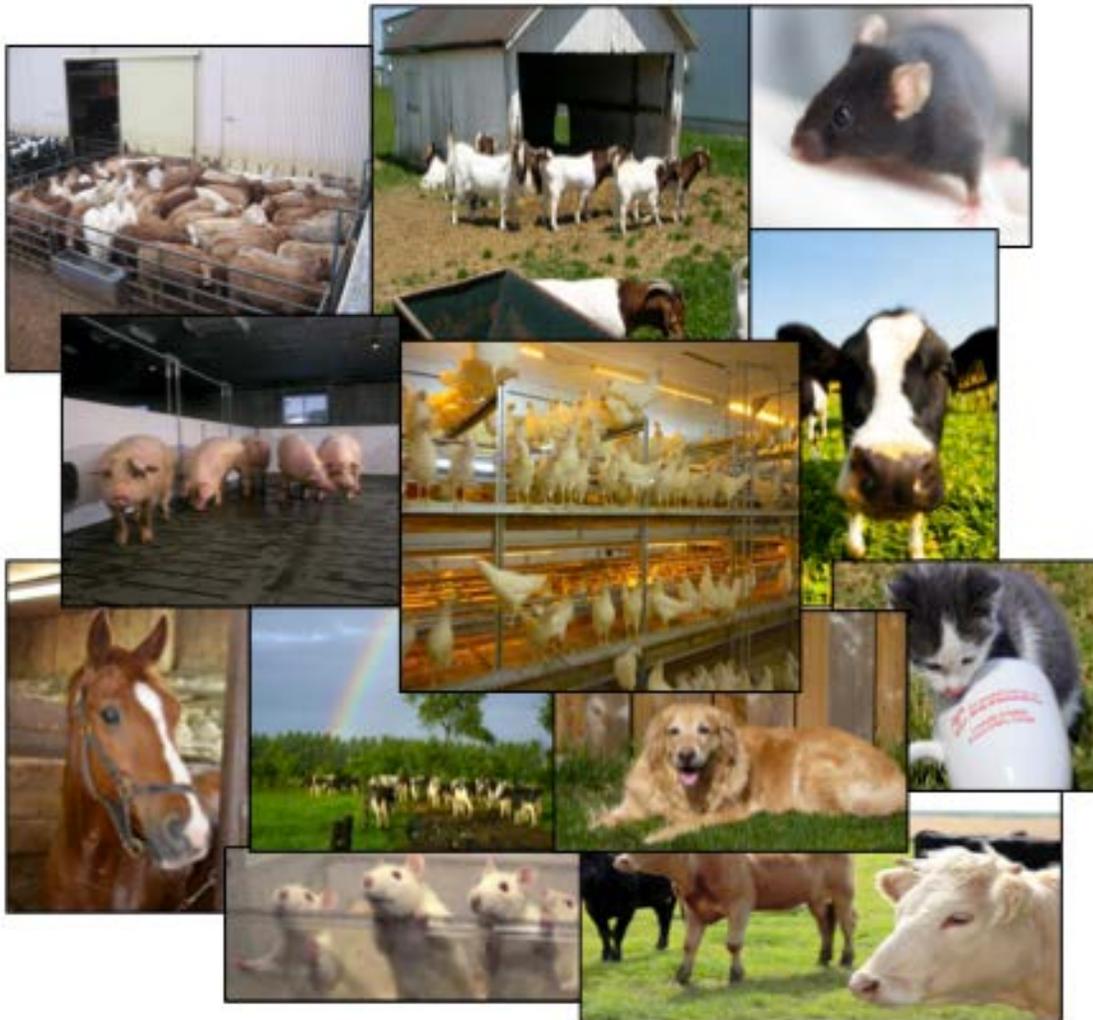




7th Annual Animal Welfare Research Symposium

Ontario Veterinary College,
Pathobiology/AHL rm 1800,
May 14th, 2014
9:00am – 5:00pm



Thank you to our sponsor:



9:00 Welcome – Dr. Tina Widowski

ORAL PRESENTATIONS

SESSION I

9:05 **Validation of triaxial accelerometers to measure the lying behaviour of adult domestic horses**

Cordelie DuBois*, Emily M. Zakrajsek, Derek B. Haley, Katrina Merkies

9:20 **Response of light horse breeds to humans in differing physical and mental states**

Emily Zakrajsek*, Helen MacGregor, Katrina Merkies

9:35 **The influence of rider handedness on rider position**

Anaëlle Faouën, Katrina Merkies*

9:50 **Comparison of continuous behaviour assessment and thermal imaging of large felids with focus on thermoregulatory behaviour**

Judith A. Stryker*, Jim L. Atkinson, Esther J. Finegan

10:00 **BREAK (30 min)**

SESSION II

- 10:30 Can you lead a cow to water – and can you make it drink?**
Ray Stortz*, Tina M. Widowski, Derek B. Haley
- 10:40 Effect on behaviour and physiological factors on dairy cows when provided with portable shade at pasture**
Santiago Palacio*, Renée Bergeron, Elsa Vasseur
- 10:55 Characterization of dairy cattle farms according to animal welfare level in the Plains of Bogota, Colombia**
Catalina Medrano-Galarza*, Aldemar Zuñiga-López, Fredy E. García-Castro
- 11:10 Keel-fracture incidence in Ontario commercial laying hens**
Mike T. Petrik*, Michele T. Guerin, Tina M. Widowski
- 11:25 Auditory startle response as an indicator of fearfulness in laying hens**
Elyse Germain*, Georgia Mason, Tina Widowski
- 11:35 How pullet rearing systems influence adaptation to furnished cages as laying hens**
Helen Prinold*, Laura Graham, Teresa Casey-Trott, Tina Widowski
- 11:45 Poster presentations: 1 min**

12:00 LUNCH & POSTER VIEWING

Presenters – please be at your poster from 1:00 to 1:30 pm

SESSION III – KEYNOTE

- 1:30 Osteoarthritis in the cat: Does it hurt?**
Eric Troncy, Professor of pharmacology, Faculty of veterinary medicine, Université de Montréal

2:30 BREAK (15 min)

SESSION IV

- 2:45 Subclinical intramammary infection prevalence at dry-off and after kidding on Ontario dairy goat farms**
Gosia Zobel*, Ken Leslie, Daniel Weary, Marina von Keyserlingk
- 3:00 Walk, run or fetch: Designing social spaces in shelters**
Kelly Hodder*, Nathan Perkins, Tina Widowski
- 3:15 How do veterinarians recognize and manage their patients' fear?**
Lauren C. Dawson*, Cate E. Dewey, Elizabeth A. Stone, Michele T. Guerin, Lee Niel
- 3:30 Do they have conscious emotions?**
Walter Sánchez-Suárez*, Liz Paul, Melissa Bateson, Georgia Mason

3:45 BREAK (15 min)

SESSION V

- 4:00 The effects of environmental enrichment on social interactions and social learning in laboratory mice**
Laura Harper*, Carole Fureix, Kathryn Reynolds, Elena Choleris, Georgia Mason
- 4:10 Improving laboratory mouse welfare and reducing animal numbers through mixed-strain housing**
Michael Walker*, Carole Fureix, Amanda Saldivia-Woo, Rupert Palme, Jonathan Newman, Jamie Ahloy-Dallaire, Georgia Mason
- 4:25 Having a ball: Simple, cheap environmental enrichments enhance welfare and productivity in farmed mink**
Georgia Mason*, Rebecca Meagher
- 4:40 Consumers and animal welfare: What they know, what they don't know and why it matters**
Mike von Massow*, Rob Anderson, John Cranfield
- 4:55 Closing Remarks & student awards**

POSTER PRESENTATIONS

- 1. Free solitary play behaviour in chicks of laying hens with high and low feather-pecking activity**
Stephanie Bourgon*, Margaret Quinton, Alexandra Harlander-Matauschek
- 2. Evaluating the genetic variation in beak morphology for male turkeys**
Hillary A. Dalton*, Benjamin J. Wood, Stephanie Torrey
- 3. Review of the potential genetic components underlying aggressive behaviour in the turkey (*Meleagris gallopavo*)**
Jennifer Proulx*, Stephanie Torrey, Benjamin J. Wood
- 4. Can the mouse grimace scale be used to evaluate potentially painful procedures in mouse pups?**
Po-Yan Cheng, Jessica Walsh, Abbie Viscardi, Lee Niel, Marcus Litman, Patricia V. Turner*
- 5. Development of a pig grimace scale for evaluation of pain and analgesia efficacy in preweaned pigs**
Abbie Viscardi, Penny Lawlis, Matthew Leach, Patricia V. Turner*
- 6. Methods for measuring fecal cortisol metabolites in domestic ponies (*Equus caballus*) using enzyme immunoassays**
Cordelie DuBois*, Laura H. Graham, Derek B. Haley, Katrina Merkies
- 7. Travel distance and duration of increased locomotion post-weaning in domestic pony foals**
Cordelie DuBois*, Kaitlyn J. Marshall, Severine Parois, Derek B. Haley, Katrina Merkies
- 8. Eye blink rates in horses decrease in response to induced stressors**
Eliza Sylvia, Mikaela Stogryn, Julia Schittenhelm, Sofie Bartkowski, Katrina Merkies*
- 9. Experience level of jockeys affects the use of the whip in Quarter Horse racing**
Nicole Durand, Katrina Merkies*
- 10. Correlation of estimated weight to scale weight in draft horses**
Paul Sharpe, Helen MacGregor, Katrina Merkies*

ABSTRACTS

Keynote

Osteoarthritis in the cat: Does it hurt?

Eric Troncy

Professor of pharmacology, Faculty of veterinary medicine, Université de Montréal
Contact email: eric.troncy@umontreal.ca

<http://blog.innovation.ca/cfi-funded-researchers/researchers-explain-why-grumpy-cat-is-so-grumpy>

“Researchers at the Université de Montréal have finally figured out what may be making your cat so cranky. In a study of 120 cats, Eric Troncy and his team in the Faculty of veterinary medicine confirmed the high prevalence of osteoarthritis (OA) in old cats: 80 percent are suffering from OA over the age of 11. Osteoarthritis is a painful condition affecting their elbows, backs, hips and hind limbs. But, how do you characterize such pain?”

You may not even be able to tell that your pet is in pain. “Cats were adept at hiding the degree of disability,” said Troncy, adding that his research team was surprised at first by the rates of incidence of pain in the cats tested.

According to Troncy, pet owners should watch for difficulty jumping or a reduction in their cat’s willingness to play, or decrease in activity — three behaviours that could indicate pain or inflammation associated to OA.”

A variety of types of pain are regularly encountered in the veterinary patient. These include short-lasting procedural pain (e.g., that due to venipuncture), acute pain associated with injury, illness or surgery, and chronic pain associated with chronic disease states (e.g., OA). In addition to pain that corresponds to a detectable stimulus, injury, or other disease state, pain may also: 1) exceed the stimulus in intensity, 2) outlast healing or treatment of the inciting cause, or even 3) be present in the absence of a stimulus. Such altered pain states tend to be associated with central nervous system changes in nociceptive processing. These changes may play a role in many chronic painful diseases and may explain differences in the pain experience between individuals with similar detectable pathology. Therefore we advanced the hypothesis that in OA, the biomechanical alterations will be translated in lameness quantifiable with kinetic (force) and kinematic (angular movement) dynamic assessments. Moreover, the central nervous sensitisation will lead to affective-motivational and cognitive changes leading to a decreased in activity, as well as to a nociceptive signal facilitation associated with hypersensitivity. The latter will be translated in a decreased tactile mechanical threshold, a faster response to mechanical temporal summation, activation of specific brain areas involved in pain perception and/or modulation (assessed by functional imaging) or dysfunctional neuronal networks as assessed by electroencephalography (EEG).

We addressed all these hypotheses in recently conducted studies by our group. We observed biomechanical alterations and compensations in cats affected by OA. The condition is compounded further in 30 percent of affected felines who experience

hypersensitivity, making petting or snuggling with their owners rather uncomfortable. We developed and validated a method for inducing nociceptive temporal summation with repeated mechanical stimuli, and demonstrated that specific brain areas, namely secondary somatosensory cortex, periaqueducal gray matter, and thalamus presented higher signal in OA cats with positron-emitted tomography. Finally, EEG of OA cats were different of those in healthy, non-OA cats. Most interestingly, these neurophysiological responses were modified with the use of adequate analgesics, confirming that the therapeutic approach to OA in animals (including cats) could be supported by nociception mechanisms understanding. This had influence too in our approach for questionnaires development and validation with the goal to offer to caretakers and veterinarians more subjective and practical tools to diagnose OA.

“A deeper understanding of OA and hypersensitivity is not only important for keeping our feline friends happy, but it could also offer some relief for two-legged patients. “Our first goal is to better characterize and address this issue in cats,” said Troncy, “but the high degree of transferability from cats to humans means that this will open a new avenue to test products that could end up in clinical trials.”

There is a pressing need to find a new path to new treatment options and drug discovery for OA. According to Troncy, over the past 10 years, there have been several promising new treatments developed in rat models, but none has translated into clinical successes.

In the end, finding solutions for your grumpy cat might hold the key to helping keep grandma healthy and mobile.”

Biography:

Dr. Eric Troncy is the Director of the Research Group in Animal Pharmacology of Quebec (GREPAQ) at the Faculty of Veterinary Medicine (FVM) of Université de Montréal. Laureate of the National Veterinary School of Lyon, Dr. Troncy also completed an Anaesthesiology Residency, a PhD in biomedical sciences at the Université de Montréal, and a Doctorate in Pharmacology at Louis Pasteur University of Strasbourg. He is a renowned member of the scientific veterinary community for his work on animal pain, its evaluation (pain metrology) and its management. He was awarded “Veterinarian of the year 2001” in France, “Sir of Ordre du Mérite Agricole” of the French Republic in 2009 for his devotion to the promotion of animal pain management, and “Researcher of the year 2010” and “Excellence in research 2013” by the Université de Montréal FVM. Funded by international, national, as well as provincial organizations, his applied research program is also well connected with the biomedical industry. He was granted the Best Industry – University Partnership of the year in Quebec by ADRIQ and NSERC in 2013 for the biotechnological platform developed for assessing osteoarthritic pain in cats in collaboration with ArthroLab, Inc. He has supervised 18 MSc and 10 PhD students in the last 6 years, and is an author of 113 research publications, 84 continuing education publications, 131 guest presentations and 203 scientific abstracts.

ABSTRACTS

Free solitary play behaviour in chicks of laying hens with high and low feather-pecking activity

Stephanie Bourgon^{*}, Margaret Quinton, Alexandra Harlander-Matauschek

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Solitary play is more common in children with behavioural disorders, including problems related to lack of motor control, impulsive, or aggressive behaviours. Included in this category is attention deficit hyperactivity disorder (ADHD). Feather pecking in laying hens has been suggested to represent an animal model for ADHD. We hypothesized that offspring of laying hens selected for high (H) feather-pecking activity perform higher rates of solitary play behaviour than offspring born to birds selected for low (L) feather-pecking activity. In groups of 10, 60 H chicks (1-day-old) and 60 L chicks were kept in identical floor pens littered with a mix of straw and wood shavings under conventional management conditions. Twenty minutes behavioural video observations were performed continuously per pen weekly for wks 2-7 (120 min per pen in total) to quantify solitary play. Play behaviour was defined as any sequence that contained some or all of the following characteristics: repetition, incomplete, quick, exaggerated behaviours; and that lacked final consummatory acts. Data were analyzed using PROC GLIMMIX (SAS 9.3). The number of running events—spontaneous running in circles or in straight line—was not different between the H and L chicks (22.7 ± 2.0 vs 23.4 ± 2.0 ; ns). The number of hopping events—chicks pushing off with both feet simultaneously and flapping their wings—was higher in H than in L chicks (24 ± 1.9 vs 17 ± 1.4 ; $P=0.004$). The total number of times an inanimate object (chopped straw) was dropped and picked up multiple times on a given spot (1.5 ± 0.3), and the number of times an object was dropped and picked up while the bird was running (0.7 ± 0.2) was greater in H than in L chicks ($p=0.033$). Taken together, our results show that H birds performed higher rates of solitary play. Further research is warranted to determine whether there is an association between chicks' solitary play and under-controlled or aggressive behaviour later in life.

Can the mouse grimace scale be used to evaluate potentially painful procedures in mouse pups?

Po-Yan Cheng¹, Jessica Walsh¹, Abbie Viscardi¹, Lee Niel², Marcus Litman³,
Patricia V. Turner¹

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Although advances have been made in pain recognition in adult animals, no methods have been validated to assess pain in preweaned mice. Despite this, many potentially painful procedures, such as tail tipping for genotyping and ear notching for identification, are common practice for this age group. We have recently demonstrated that mice readily consume water containing therapeutic levels of carprofen, a nonsteroidal antiinflammatory drug, and that this can be used as a method to deliver analgesia. The objectives of this study were to evaluate and validate the Mouse Grimace Scale (MGS) and behavioural scoring as tools to assess pain in preweaned mice, and to assess the efficacy of carprofen given in drinking water. Ear notching was performed on 110 (14 litters of 6-10 pups/litter) 19-28 day old mice as part of routine colony management. Six litters received 10 mg/kg/day carprofen in drinking water beginning 24h before ear notching, 6 negative control litters received no analgesic in the water, and 2 untreated control litters received no manipulations or treated water. Litters were video recorded immediately after ear notching for 5 hr at the same time each day. For behavioural data, 21 behavioural categories were scored continuously for the first 10 min at 0, 0.5, 2, and 4 hr by an observer blinded as to pup treatment. For MGS scoring, an observer captured 363 facial images at 0, 2, and 4 hr post ear notching. Facial action units evaluated included orbital tightening, nose bulge, cheek bulge, and ear position and shape. Two individuals blinded to pup treatment scored each photo separately. Baseline MGS scores from untreated control pups were subtracted from scores obtained from carprofen-treated or untreated pups. Data was analyzed using a linear model ANOVA with post hoc Bonferroni tests. No litter-associated differences were noted in behavioural or MGS data and data was combined across litters. No differences were noted in behaviours of carprofen-treated vs untreated mice except at 4 hr, when untreated mice spent more time nursing ($F(1,96)=4.55$, $p<0.03$). There were no time or treatment differences in MGS scores. These findings indicate that ear-notching is not a highly painful or distressing procedure for mouse pups and that the MGS may have utility for evaluating pain in preweaned mice.

Evaluating the genetic variation in beak morphology for male turkeys

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Injurious pecking is a serious welfare and economic issue in turkey production. Beak trimming is a common practice in the poultry industry used to reduce the severity of injuries from destructive pecking. However, European legislation is moving towards banning beak trimming due to the perceived pain and loss of sensation resulting from the procedure. The development and causes of injurious pecking in turkeys is poorly understood, but research in other poultry species suggests genetic selection to reduce pecking can be used as a practical alternative to beak trimming. The objective of this study is to determine the amount of genetic variation in beak morphology in pure lines of male Large White turkeys. In our study, we will measure the beak dimensions of one generation of Hybrid male turkeys to obtain estimates of phenotypic and genetic variance, as well as the heritability (h^2) for each beak shape trait. For our pilot study, beak morphology data will be collected on one generation of un-trimmed Hybrid primary breeder male turkeys with known pedigree information (approx. $n=1200$). Beak measurements will be collected from toms at 5, 10, 15, and 20 weeks of age. For each data collection, three images of each bird's head will be taken: a dorsal, left lateral and right lateral view. Beak dimensions, including length, width, and tip sharpness of the upper and lower beak, will be determined using ImageJ 14.8q. The h^2 for each beak trait, along with the phenotypic and genetic variances and correlations, will be estimated as a multi-trait mixed model in ASREML 3.0. If enough genetic variability exists in beak shape, future breeding criteria can select parents to create offspring with blunt beaks and a reduced capacity to cause pecking damage.

How do veterinarians recognize and manage their patients' fear?

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Although veterinary care is an important component of maintaining animal health, certain aspects of visiting a veterinary clinic may negatively impact patient welfare. In order to receive veterinary care, cats and dogs are commonly brought into a novel environment, where they interact with unfamiliar animals and new people, often in unusual ways. As such, most cats and dogs exhibit behavioural signs of fear in the clinic setting. To explore animal welfare in the veterinary clinic setting, all companion and mixed animal veterinary clinics within a 100km radius of Guelph, Ontario were invited to participate in a larger study. As part of this study, in person interviews were conducted with 22 veterinarians, each employed at a different clinic, during which participants were asked to describe how they recognize fear in their canine and feline patients. All questions were open-ended and content analysis was performed on all responses. Aggression, body position, and ear position were the three most commonly cited signs of fear (68%, 59%, and 32% for cats; 45%, 36%, and 32% for dogs, respectively). Most veterinarians (95%) listed other fear-related behaviours (e.g. hiding, freezing, avoiding interaction) independent of or in addition to aggression; however, few veterinarians identified more subtle signs of fear, such as yawning (9%) and lip licking (14%). Within their responses, eight veterinarians (36%) suggested that the majority of the aggression exhibited by cats and dogs during routine veterinary visits is fear-based. Those surveyed also suggested the approaches and strategies they use to minimize and manage fear in their patients, such as offering treats, administering pheromones, and using towels. Overall, our results suggest that veterinarians typically recognize overt indicators of fear in their patients; however, they might not observe or correctly interpret more subtle signals. The ability to recognize and manage fear, particularly at an early stage of the patient's visit, has implications for ensuring that veterinary visits are a positive experience for pets, owners, and veterinary staff members alike.

Methods for measuring fecal cortisol metabolites in domestic ponies (*Equus caballus*) using enzyme immunoassays

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Adrenocorticotrophic hormone (ACTH) is released by the anterior pituitary in response to stressful stimuli, resulting in the release of glucocorticoids from the adrenal gland. This physiological stress response in animals is most commonly measured in blood cortisol levels. However potential procedural confounds have led to a preference for non-invasive cortisol metabolite monitoring methods, such as the measurement of fecal cortisol metabolite through radio or enzyme immunoassays. The goal of the current project was to validate additional enzyme immunoassays for monitoring fecal corticosteroid metabolites in horses as all prior work has been done in Europe using an in-house antibody which is not commercially available in North America. This study investigated the use of three corticosteroid metabolite immunoassays for monitoring adrenal status in horses: CJM cortisol, CJM corticosterone, and MP Biomedicals corticosterone (MP3). Fecal samples were collected twice daily from five weanling pony foals and three adult pony mares for three days prior to an ACTH challenge (0.1 ug/kg body weight), following which fecal samples continued to be collected twice daily for three more days. All three enzyme immunoassays were conducted on the collected fecal samples, which were extracted using an aqueous alcohol solution. The CJM corticosterone assay showed no displacement of the label with serial dilutions of the extract, rendering it unusable. Both the CJM cortisol and MP3 corticosterone assays were successfully validated using serial dilutions. Dose-response curves and physiological relevance of the measured metabolites were confirmed by peaks on day 0.5 post ACTH injection, indicating the assays were sensitive to the presence of fecal cortisol metabolites. Peak values of fecal cortisol metabolites were greater than five standard deviations above the baseline mean, suggesting that the assays were capable of measuring adrenal function. Responses to the ACTH challenge varied greatly between individuals and between mare (\min_{CJM} : 3.7 ng/g feces; \max_{CJM} : 230.05 ng/g feces) and foal (\min_{CJM} : 3.7 ng/g feces; \max_{CJM} : 129.36 ng/g feces) groups. Data continues to be analyzed as to which measure was more sensitive to changes in fecal cortisol metabolites with the hopes of validating an additional immunoassay for measuring fecal cortisol metabolites in horses.

Travel distance and duration of increased locomotion post-weaning in domestic pony foals

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Current weaning practices for domestic horses have been recognized as a source of stress for both mares and foals. Foals react to the physical separation from their mothers in a variety of ways, including increased locomotion which can lead to possible injury of the musculoskeletal system, respiratory stress, dehydration, blood glucose instability, and pain related to muscular lactic acid. To date, exact changes in locomotion have not been quantified in horses. Global-positioning devices (GPS; Garmin Forerunner 305) were attached to the halters of four domestic pony foals (174 ± 14 days) to quantify the distance travelled. Foals were group-housed and monitored from 0900-1800h for eight days prior to abrupt separation from their dams; after which the foals continued to be monitored for four additional days. Foals were housed together post-separation with no visual or auditory contact with their dams. GPS devices recorded distance travelled and physical location. Data was exported into Google Earth to examine location. To analyze distance travelled, data was exported from the devices using the myGarmin online data tracker into Excel and average daily distances were calculated. Prior to separation, foals utilized virtually all of their paddock space and did not appear to spend more time in any given area, whereas after separation, there was distinct localization of movement, with some foals running the fenceline while others continued to utilize the entire paddock. On average, foals more than quadrupled their average daily distance on the day they were physically separated (1531.03 ± 337.69m/day pre-separation period average to 7240.15 ± 6702.02 m/day day of separation). Despite this increase, all foals returned to the pre-separation range within two days (1177.84 ± 621.63 m). Individuality appeared to play a pivotal role in each foal's response, as expressed by the distance travelled, and this is demonstrated by relatively large standard deviations. Although the sample size was small, the change in distance travelled suggests that the weaning process is a stressful event for foals and locomotion is increased upon separation. Although foals quickly returned to the pre-separation travel distance, the large increase during initial separation indicates a potential welfare concern.

Validation of triaxial accelerometers to measure the lying behaviour of adult domestic horses

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Examining the characteristics of an animal's lying behaviour, such as frequency and duration of lying bouts, has become increasingly relevant for animal welfare concerns. Triaxial accelerometers have the advantage of being able to continuously monitor an animal's standing and lying behaviour without requiring live observations or video recordings. Multiple models of accelerometers have been validated for use in monitoring dairy cattle. However, no units have been validated for use in equines. Onset Pendant G data loggers were tested on two mature Standardbred horses for a period of five continuous days. Data loggers were attached to a single hind limb of each of horse and set to record position every twenty seconds. Horses were monitored by two independent observers via live observations during the day and video recordings during the night. Data collected from the loggers was converted and edited using a macro program to calculate time the animal spent lying down *by* hour, day, and also the total number of lying bouts. A paired t-test compared lying bout duration calculated from video observations and data loggers. All lying events occurred overnight (3 to 5 lying bouts/night/horse). The data loggers did not distinguish standing hipshot (body standing upright with one limb "resting" under the body) from standing square. There was no significant difference between the duration of lying bouts determined from video observation recordings and the duration outputted from the data loggers ($t_{14} = -1.0732$, $p = 0.301$) and the macro was able to tabulate the correct number of lying bouts with predictability, sensitivity, and specificity all greater than 99%. This study validates Onset Pendant G data loggers in adult horses to determine the frequency and duration of standing and lying bouts when set to sample and register readings at twenty second intervals. The validation of automated data recording devices will assist in reducing the time expenditure of live observation and improve our understanding of equine time budgets with respect to standing and lying behaviours.

Experience level of jockeys affects the use of the whip in Quarter Horse racing

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The use of the whip in horse racing is being called into question as recent studies show no increase in racing speed with whip use. Although each racing association has rules regarding whip design and use, these may be written to appease public perception rather than for horse welfare. If jockeys rely more on experience, technique and strategy to win a race, they should be less reliant on the whip to encourage the best performance from their mount. It was hypothesized that jockeys with less race experience will use the whip more often during a race than more experienced jockeys. Jockeys were selected from the statistics of Ajax Downs Quarter Horse Racetrack (ON) and categorized as experienced (>800 starts in past four years; n=5) or inexperienced (<400 starts in past four years; n=5). Ten races per jockey were viewed via online race replays and number of whip hits, whip hand used, location of hits, horse speed index (SI), finish time and placing were recorded. Pearson correlations for each factor were calculated on jockey experience level, with SI included as a covariate on correlations for finish time and placing. The number of times a horse was whipped had no effect on finish time, placing or speed index ($p>0.40$). Experienced jockeys whipped their horses significantly more often than inexperienced jockeys (12.35 ± 3.8 vs 7.86 ± 2.9 total whip hits respectively; $p<0.02$). Despite whipping their mounts more frequently, experienced jockeys did not tend to place higher ($p>0.069$). There was no difference in whip hand used ($p>0.41$) or location of whip strikes ($p>0.12$) in the two classes of jockeys or on finish time or speed index. These results show that experienced jockeys struck their horses more often with the whip, however their horses did not perform better, suggesting that an increased use of a whip in Quarter Horse racing has little effect on a horse's athletic performance.

The influence of rider handedness on rider position

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Riders learn early in their riding career that the ideal riding position shows vertical alignment through the rider's ear-shoulder-hip-heel with equal weight distribution on both seat bones. Lateral dominance may affect the symmetry of a rider's position and hence impair clear communication with the horse. The aim of this study is to determine if handedness affects rider symmetry. A survey was completed by 25 female riders to collect demographic and riding information (age, weight, height, handedness and dominant leg, riding discipline, level and frequency). Each rider was videoed riding her own horse with markers affixed to both ears, shoulders, hips, knees, and ankles. Sixty still frames/gait/rider were captured from videos taken from both left and right sides and the rear while riding at the halt, walk, trot, and canter. Rider symmetry was determined by measuring the angle of displacement of a horizontal line drawn through the markers from a vertical reference line. A reference angle between the craniocaudal line of the horse and the vertical line was used as a covariate in a mixed model analysis, with dominant hand, riding discipline, the level of the rider and the gait as fixed factors and rider as a random factor. T-tests compared rider symmetry and riding position for left and right-handed riders. At the halt, the position of all riders was close to the ideal ($p > 0.20$) whereas in motion the position deviated ($p < 0.05$) and all riders differed in their positions on the left versus the right side ($p < 0.011$). Less experienced riders leaned more forward than experienced riders (10° vs. 4° respectively; $p < 0.011$). Right-handed riders leaned more forward ($p < 0.002$), tilted their head to the right ($p < 0.0001$), twisted their torso to the right ($p < 0.002$), carried their legs more forward ($p < 0.005$), and had a more open knee angle ($p < 0.028$) whereas left-handed riders tipped their head more forward ($p < 0.0001$), and pushed their right heel down farther ($p < 0.04$). Thus, handedness does appear to affect rider position. Awareness of riding position can improve communication thereby preventing inappropriate signaling that could lead to confusion in the horse and inappropriate corrections from the rider.

Auditory startle response as an indicator of fearfulness in laying hens

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Heightened fearfulness can have negative effects on animal welfare and productivity. Laying hens may exhibit fearful reactions to routine management procedures, sudden changes in the physical and social environment and to human caretakers. Inappropriate fear reactions in alternative housing systems increase the potential for collisions with physical features of the environment, pile ups of birds and smothering. Consequently, less fearful, calmer birds are desired in a production setting. Measuring the magnitude/force of the body's physical response to an auditory startle is a method of assessing affective states that has been well validated in humans and laboratory rodents. Negative affective states such as fear, anger and sadness enhance startle response magnitude while positive affective states such as joy and relaxation attenuate it. When attempting to assess the emotional reactivity of an animal, the indicators utilized must have high construct validity so as to accurately measure the intended emotion. The goal of this study is to determine the validity of auditory startle response magnitude as an indicator of affective states in laying hens. It is hypothesized that auditory startle response is a valid, accurate indicator of affective state in laying hens. Various intensities of positive and negative affective states will be induced in laying hen pullets using known positive (preferred) and negative (non-preferred) stimuli. Hens in a negative, neutral (no exposure to stimuli) and positive affective state will be tested with an acoustic startle, an air horn, in a sound proof room. Prior to being tested, hens will be habituated to the testing apparatus. Response to the acoustic stimulus will be measured using weigh scales and/or a force plate to quantify the response magnitude. If auditory startle response is a valid measure of affective states, a linear relationship between startle magnitude and affective state should be observed where positive affect attenuates startle and negative affect enhances it compared to the neutral baseline. Additionally, within a valence category, more positive and more negative affective states should alter startle magnitude accordingly. If valid, auditory startle response could be used as an indicator of fearfulness to select for less fearful, calmer hens, and could potentially help determine if different overt fear responses, freezing or fleeing, represent different intensities of fear. Overall study results will contribute to the wider scientific community by potentially providing a validated measure of assessing affective states in poultry.

The effects of environmental enrichment on social interactions and social learning in laboratory mice

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Laboratory mice raised in barren environments typically show behavioural and psychological changes including increased stereotypic behaviour and impaired learning, memory and behavioural flexibility. Stereotypies resemble symptoms of human autism, suggesting that mouse stereotypies could correlate with autistic-like impairments in social functioning. We predict that highly stereotypic mice raised in barren cages will show reduced social competence. In Experiment 1, we found that enrichment successfully reduced stereotypic behaviour in C57 and DBA mice, and also reduced the performance of aggression and social displacement ($F_{1,32.2}=5.59$, $p=0.024$). We have yet to run analyses on whether the least stereotypic mice engage in the least conflict. C57 mice also received less aggression/displacement if enriched rather than non-enriched (strain*housing: $F_{1,58}=14.53$, $p=0.003$). We have yet to run analyses on whether the least stereotypic C57 mice attract the fewest negative social interactions. In Experiment 2, we will investigate social learning via assessing the social transmission of food preferences. Levels of stereotypy will be measured in enriched/non-enriched cages by scan sampling, and the abilities to socially learn or transmit food preferences will be assessed. Demonstrator mice will be fed a novel diet. A familiar observer mouse will then interact for half an hour with the demonstrator. Observer mice will then be transferred to a cage with two novel diets, one of which the demonstrator consumed. If social learning has occurred, observers will consume more of the diet they were exposed to via the demonstrator. Our predictions are that non-enriched mice will be poorer at social learning and transmitting food preferences, especially if they are stereotypic. Differences between groups will be calculated using GLMs in JMP® 11 software. This will provide one of the first examinations of how small, barren cages and stereotypic behaviour affect social competence and social learning, with implications for many species beyond mice.

Walk, run or fetch: Designing social spaces in shelters

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Dogs admitted to shelters require stimulation and enrichment in their daily routine to maintain physical and mental health. Many shelters have not been designed to foster these interactions, specifically in the outdoor environment. Living in restricted environments can lead to behaviour problems in dogs such as stress, lack of motivation, boredom, and anxiety. Although there is much research focusing on the indoor kennel environment, very little research investigates the opportunities for diversity and enrichment outside of the individual kennel. Outdoor play areas, training areas, and walking areas have the potential to provide ideal settings for fostering interactions between dogs, interactions between dogs and shelter volunteers and interactions between dogs and potential adopters. The goal of this research was to examine the outdoor environments at OSPCA branches and affiliates, and determine how existing outdoor spaces may fulfill the needs of humans and dogs. Forty-three OSPCA facilities were initially contacted for inclusion in the study through OSPCA endorsed email introduction and follow-up phone calls to shelter managers. Twenty-two facilities were evaluated through on-site or phone interviews with shelter managers, employees, and volunteers to determine how existing spaces were used. Each site was also evaluated using site inventory and analysis methods common in landscape architecture. Data collected through interviews and site inventory were compared by developing common themes and simple comparative statistics. In general, there was a wide range of results, including a number of differences between the interviewee groups. Results include the types of interaction that occurs between people and dogs (ranged from nail clipping to playing), preferences towards both leashed and off-leashed spaces, and the occurrence of conspecific play. Recommendations were provided to improve the social interaction, welfare and adoptability of shelter dogs and the quality of experience of those who work with them. Recommendations focus on the comfort of people, focusing on employees and volunteers, and variability of environment for dogs, which could help improve the welfare of shelter dogs and quality of experience of those who work with them.

Having a ball: Simple, cheap environmental enrichments enhance welfare and productivity in farmed mink

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About 50 million mink are killed annually for their pelts, representing a peak global population of 70-80 million. Housed in wire-mesh cages with wooden nestboxes, about half live in countries not recommending or requiring any enrichments. We therefore assessed the implications of various practical enrichments for welfare and productivity, with a view to improving husbandry on mink farms. Our main trial involved 2032 Black mink on three farms. One juvenile male-female pair was selected from each of 508 families and enriched (E) with two balls and a hanging plastic chain or length of hose. A second male-female pair per family acted as a non-enriched (NE) control. All were followed until pelting time 5 months later. Data were analysed using GLMs/logistic regressions in JMP. Fur-chewing was reduced in E mink ($p = 0.035$), although other stereotypic behaviours were unaffected. E mink were less likely to scream when handled than their NE siblings ($p = 0.044$), and in temperament tests, aggression was reduced on one farm ($p = 0.036$). Enrichment had no detectable effects on fur quality or feed consumption, but E cages stayed cleaner ($p = 0.028$). After pelting, < 50% of our original subjects remained, so we added 200 new females, enriched when 9 months old. In adulthood, E mink were still no less stereotypic, but in tests were less aggressive ($p = 0.005$), E males were less fearful than NE males ($P = 0.042$), and on one farm E females had lower cortisol (inferred from faecal metabolites; $p = 0.036$). Female reproductive success was also improved: approximately 0.5 more juveniles were weaned per E female than per NE female ($p=0.022$), an increase of about 10%. This effect was primarily due to decreased rates of barrenness, which were nearly halved in our original E subjects ($p = 0.0002$). Simple enrichments thus improved mink welfare, and made mink more profitable by enhancing reproduction. How such effects might be mediated, how they might apply to other colour-types and even related species (e.g. black-footed ferrets), and whether simple enrichments can become 'boring', are all topics for future research.

Characterization of dairy cattle farms according to animal welfare level in the Plains of Bogota, Colombia

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In Colombia, dairy farms are mainly pasture-based. However, to have cows on pasture does not necessarily mean good welfare; many factors can affect cows' quality of life in extensive systems. Currently, free trade agreements have aroused concern due to the high food quality, safety and welfare standards required to access international markets. Developing welfare assessment protocols is necessary to assist producers to improve cows' welfare, and thus, grant a value-added feature to their final product. The objective of this study was to evaluate the level of welfare on dairy cattle farms in the Plains of Bogota, Colombia. An observational study was done on 25 farms (two visits per farm - summer and winter 2013). We evaluated 26 variables, 14 animal-based and 12 resource-based. Overall, farms scored well for integument lesions (only one farm had more than 15% of the cows with integument lesions), mean prevalence of clinical mastitis (1.3%); and, behavior at milking (90% of cows were calm). Additionally, farms scored well for cleanliness of milking area and level of noise during milking (68.8 ± 10.2 dB). However, our results suggest that it is necessary to take action to improve fly control, and to reduce the prevalence of subclinical mastitis (mean prevalence was 31.2%), lameness (16% of the farms had prevalence over 10%), and cow's dirtiness. Additionally, it is important that farms provide appropriate shade in paddocks (only 24% of the farms provided shade), and properly clean water troughs and paths (80% and 56% of the farms had no clean water troughs and paths, respectively). Based on the assessment of each variable, the results were evaluated by a panel of experts who classified farms as excellent, good, fair or bad welfare. Forty-eight per cent of the farms received a "Good" welfare classification and 52% were classified as "Fair". Determining the level of welfare at the farm level encourages producers to find ways to make improvements, turning weaknesses into strengths in striving for excellence. This study is the first of this kind in Colombia, and could be used as a guide to promote discussions about the importance of welfare assessment schemes on farms.

Effect on behaviour and physiological factors on dairy cows when provided with portable shade at pasture

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The presence of shade can influence dairy cattle behaviour during temperate Canadian summers. The aim of the experiment was to investigate the effects of access to shade, provided with a portable structure (blocking 80 % of UV), on lactating cow behaviour and physiology. The hypothesis was that when cows were provided shade their behaviours would differ, have lower vaginal temperature and production yield compared to cows without access to shade. Over 8 weeks, a total of 24 lactating Holstein cows were separated into 2 treatments, one treatment with access to shade and a control without access to shade. The cows were divided into 6 subgroups (4 cows/ subgroup), with 3 subgroups per treatment. Behaviours performed in the shade or not (drinking, lying, grazing, other) were recorded using instantaneous scan sampling every 5min for 3h a day during the hottest part of the day (1130-1530h) 3d/week for 8 weeks. Ambient temperature and humidity were automatically recorded at 10-min intervals. Cows were fitted with a vaginal thermometer and vaginal temperature was recorded at 10-min intervals. Daily milk production was automatically recorded at each milking. Differences between treatments by week were analyzed using the generalized linear mixed model (GLIMMIX) with cow as random effect and treatment as fixed effect. Behavioural results showed that cows with access to shade drank up to 6.42 times less (LS-Mean \pm SE % of observation time; 3.94 \pm 1.82 vs. 25.30 \pm 1.82, P<0.0001), lay down up to 1.75 times more (31.24 \pm 4.27 vs 17.80 \pm 4.27, P<0.05). Cows with shade grazed up to 1.5 times more (22.27 \pm 2.63 vs. 14.65 \pm 2.63, P<0.05) but only when the temperature humidity index (THI) was above their comfort threshold (THI=72) beyond the hottest part of the day (during week 2). Vaginal temperature and milk production were not affected by treatment (except week 1 for milk production). Cows sought shade when made available, but spent less than half of their time in the shade (except week 2). In conclusion, cows sought shade when provided with portable shade at pasture. However, cows without access to shade seemed to alter their behaviour to cope with heat stress as seen from the lack of physiological differences between treatments.

Keel-Fracture incidence in Ontario commercial laying hens

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Canadian egg producers are responding to pressures to adopt alternative housing systems for laying hens. It is important to identify risks to well-being of hens in the different systems so farmers can make informed choices. The objective of this study was to compare incidence of keel bone fractures and to benchmark several measures of well-being in hens housed in conventional cages and single tier floor housing systems. Commercial brown strain laying hen flocks were selected by convenient proximity in Ontario, Canada. There were 29 visits to flocks on 9 farms housing birds in conventional cages (CC) and 26 visits to flocks on 8 farms housing birds in floor barns (FH). The average flock size for caged hens was 16410 hens while the floor housed farms averaged 9607 hens. Each farm was visited when hens were at 20, 35, 50 and 65 wks of age. At each visit, 50 birds were sampled from different areas of the barn, weighed, palpated for presence of healed keel bone fractures, and evaluated for feather score (1-poor to 4-good feather cover on head, back, breast and vent). Farm records were used to record cumulative mortality up to each sampling age. Stats were compiled using SAS 9.3 using a mixed model ANOVA analysis. Fracture incidence was higher in FH hens compared to CC ($48.3\% \pm 0.04$ vs $24.8\% \pm 0.03$, $P < 0.0001$). Hens in CC were heavier ($1888\text{g} \pm 26.8$) than FH ($1827\text{g} \pm 28.8$, $P < 0.05$) but BW uniformity was higher (Coefficient of Variation: CC, $10.1 \pm 0.32\%$; FH $9.4 \pm 0.40\%$; $P < 0.001$). Feather score did not vary significantly between the two groups, and there a tendency for cumulative mortality to be higher in FH flocks compared to CC ($2.13\% \pm 0.42$ vs $1.29\% \pm 0.19$; $P = 0.078$). All parameters varied with age ($P < 0.0001$), which was expected. Housing hens in commercial single tier floor systems increased the amount of keel fractures that a flock suffered, and resulted in a decreased, yet more uniform body weight, compared to CC. Results from alternative housing systems need to be compared to the current industry benchmarks to ensure that progress is being made in improving the well-being of laying hens in the future.

How pullet rearing systems influence adaptation to furnished cages as laying hens

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The rearing environment for young pullets (immature female chickens not yet laying eggs, age 2 – 20 weeks) has previously been shown to affect the behaviour, health and performance of mature laying hens over a bird's lifetime. Each year over 25 million pullets raised primarily in brooding cages move into conventional cages as mature laying hens on Canada's over 1,000 registered egg farms. In response to consumer concerns about laying hen welfare, a growing number of egg producers are adopting alternative housing systems – including larger furnished cages that contain nests, perches and scratch mats. Little is currently known about rearing environments that will prepare pullets most effectively to be moved into this new style of cage. This study examines how pullets reared in either brooding cages or large, multi-bird aviary systems subsequently adapt to furnished cages as laying hens. While it is possible that aviary-reared birds will fare better in furnished cages because they develop in a more complex early environment, we hypothesize that moving pullets from rearing aviaries to furnished cages will decrease their welfare in the short term. The impact of the housing transition on hen affective states will be monitored using both a corticosterone indicator (FGCM – faecal glucocorticoid metabolites) and behaviour observations (novel object response and focal animal sampling). Two groups of 540 pullets (half reared in standard brooding cages, the other half in a pullet aviary) will be moved into furnished cages as laying hens (n=6 of aviary and n=6 of standard cage-reared birds, replicated twice). Faeces collection will be conducted before the move, throughout the week following placement in the furnished cages and again in weeks 2, 3, 9 and 12. Twice daily, cage manure belts will be cleared and after 4 hours a random sample of faeces will be collected from the belt under each cage. Faecal data will be summarized by cage and analyzed in Mixed model repeated measure. Behaviour testing using a novel object will quantify approach and avoidance behaviours while focal animal sampling will examine behaviour patterns previously shown to be associated with both frustration and positive choice. A novel object will be placed between the cage bars and hen response will be videotaped. Key behaviours such as number of pecks and latency to approach the novel object will be measured. A focal animal sampling approach that allows the estimation of cage-level frustration behaviours (such as spot pecking and pacing) and positive choice behaviours (such as preening and stretching) will be conducted by recording all instances of these behaviours in 4 birds per cage observed for a total 2 minutes each. Both behaviour tests will be conducted at weeks 1, 2, 4, 6 and 10. It is expected this study will provide farm managers with solid evidence about the rearing environment most suited to birds intended for furnished cages.

Review of the potential genetic components underlying aggressive behaviour in the turkey (*Meleagris gallopavo*)

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Injurious pecking in turkeys can negatively impact welfare and potentially decrease economic returns. Although the exact cause of injurious pecking in turkeys is unknown, undesirable behaviour can be mitigated through changes to either the environment or the bird through genetic selection. Environmental factors have been experimentally studied in order to explain and decrease injurious pecking in turkeys. Factors such as light intensity, source of light, and stocking density can affect aggressive behaviour. Although studies on aggression in turkeys are limited, there has been significant work on feather pecking in laying hens that may be applicable. Mortality from pecking in layers is common in birds selected for high production. This occurs when selection is done using individual birds traits, which fails to account for pecking behaviour occurring on a group basis. Selection for group production however, results in less mortality due to pecking as it accounts for the social aspect of the behaviour in group housing. This could imply that a genetic component may, in part, be responsible for injurious pecking behaviour and it may be beneficial to select animals based on group performance. Injurious pecking behaviour may also be related to competition for resources, such as food. Turkeys are already selected for efficient feed intake and feeding behaviour in poultry species is known to be largely variable. Although the average daily feed intake can be similar across all birds selected for a similar production goal, the patterns of their short term feeding behaviour may differ. Short term feeding behaviour can be defined as the number of meals per day, the length of the meal, or time of day of the meals. Feeding behaviour tends to have a moderate to high heritability and is known to have little effect on production traits. However, it is unknown if there are links between aggression and feeding behaviour, particularly in tom turkeys. It is therefore suggested that future studies examine the genetic relationship between short term feeding behaviour and aggression, to determine if selection for feeding behaviour traits can reduce injurious pecking.

Do they have conscious emotions?

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Consciously experienced emotions are feelings with ‘valence’ (positive/preferred or negative/aversive). Many assume that adult mammals and birds have them; however, this is far from clear scientifically and in immature animals/other taxa it is even harder to judge who has conscious emotions (cf. debates on whether fish, octopodes and crustacea feel pain). This issue is key for identifying which animals deserve moral consideration. Here we describe work aimed at identifying a behavioural task that may require conscious emotions, and so could be used to identify beings likely to have them. Our approach was inspired by studies published more than 20 years ago showing that trained rats and pigs can: 1) utilise drug-modified emotional states (e.g. anxiety; pain) as discriminative stimuli (DSs) in operant paradigms to determine which of two specific operants should be performed to obtain a food reward; and 2) generalize from these drug DSs with emotional components to apparently emotional non-drug-induced states (e.g. from states induced by anxiogenic drugs to those induced by electric shock or aggressive defeat). When animals use drug- or experience-induced emotions as DSs, they have been hypothesised to be consciously aware of them. To test this hypothesis we run 10 Web of Knowledge© searches using combinations of key topics, and mined data from those 41 experiments on humans subjected to similar drug discrimination tasks and also asked to self-report their feelings. We regressed the lowest dose that could be used as a DS (dept. var.) against the lowest dose causing reportable feelings (indept. var.). We found a tight correlation between these two types of threshold dose ($F_{1,36}=602.48, p<0.0001$). Furthermore, the slope did not differ from one, and the two thresholds did not differ ($F_{1,38}=0.307, p=0.583$). So far this suggests that the ability to use internal states as DSs is indeed a “Type-C” process in humans: one dependent on conscious awareness. Currently we are analysing individual-level data from 50 human subjects involved in four drug trials, to see if they yield the same pattern. If they do, this would show that humans’ abilities to use internal feelings as DSs involve awareness of those feelings. Given the behavioural, neuroanatomical and neurophysiological homologies between humans and other mammals, the same may also hold for rats and pigs using their emotional states in similar tasks. This operant-based approach could therefore potentially become a tool for both asking animals what they consciously like/dislike, and for identifying species that do/do not have conscious emotions.

Correlation of estimated weight to scale weight in draft horses

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Body weight is a common measure used for welfare assessment and daily management routines such as feed ration formulation and medication dosages. Since very few horse farms have scales for weighing horses, a body weight estimation formula is often used. It has been suggested that this formula does not accurately measure the weight of various body types and breeds of horses. Another method for determining body fat in horses is the body condition scoring (BCS) scale. The accuracy of either a calculated formula or BCS was compared to actual scale measurements of nine mature draft horses (6 Percheron, 1 Percheron x Friesian, 1 Shire, 1 Clydesdale). Each horse's heart-girth was measured in centimetres posterior to the elbows, over the sternum, with the tape measure as vertical as possible and crossing the middle of the withers, and body length was measured in centimetres from the point of the shoulder to the point of the buttocks. Weight was calculated in kilograms using the formula $(\text{heart-girth}^2 \times \text{length})/11,800$. Each horse was then measured on an electronic livestock scale (Salter Brecknell). Finally, the BCS of each horse was determined by an independent observer using photographs. Pearson correlations between scale weight, calculated weight and BCS were calculated in SPSS. For four horses, the scale weight was higher than the calculated weight and for five horses the reverse was true. The average scale weight was 750.9 ± 78.2 kg and the average calculated weight was 768.1 ± 107.6 kg. The difference of 17.2 kg was 2.3% of the average scale weight. The coefficient of correlation between the scale weight and calculated weight was 0.975 ($p < 0.0001$). The coefficient of correlation between BCS and scale (0.229) or calculated weight (0.058) was not significant ($p > 0.55$). Thus, the body weight formula provides an accurate estimation of body weight of draft horses with a high degree of reliability, whereas BCS does not appear to be correlated to body weight.

Eye blink rates in horses decrease in response to induced stressors

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Horses demonstrate a variety of responses when introduced to stressful situations, e.g. ears pinned back, restless, head high. In other species such as humans or cattle, eye blink rate (EBR) is used as an indicator of stress. Increased EBR is associated with anxiety, lack of concentration and decreased performance in humans. Little research has been done on EBR in horses in response to stress, but it is hypothesized that a horse will display increased EBR when exposed to a stressful situation. Eye blink rates (blinks/min) from six horses were evaluated over four different treatments: 1) Control - horse in its normal paddock environment; 2) Separation – horse was removed from its paddock mates; 3) Feed restriction – feed was withheld at regular feeding time for 5min; and 4) Fear test – an umbrella was suddenly opened and closed while horse was alone in the arena. Eye blink rates were retrospectively determined by two independent observers from video recordings of each horse's right eye for a duration of 1 minute. A one-way ANOVA was used to determine the effect of treatment on EBR, and Tukey's Honest Significant Difference test was used to determine differences among treatments. Eye blink rates were highest in the Control treatment (38 blinks/min^a), and decreased when varying stressors were introduced to the horses: 20 blinks/min^b during separation; 18 blinks/min^b during feed restriction; 10 blinks/min^c during the fear test; a,b,c, differ $p < 0.0001$. Thus, our hypothesis is rejected. As prey animals, when horses perceive danger, they will raise their head to scan their surroundings and prepare for flight if the situation warrants it. The reduction in EBR in response to stressors may be caused by an increase in concentration, as has also been documented with humans. While this study is limited due to the low number of subjects and lack of physiological measures, it provides a basis for further research.

Can you lead a cow to water – and can you make it drink?

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The long-distance transportation of cattle in Canada raises a number of potential welfare issues. Transporting cattle from western Canada to Ontario can involve long periods of feed and water deprivation, and long periods spent standing. Providing feed, water and rest is required by federal law for journeys that will exceed 52 hours. We are interested in the behaviour of cattle during these rest periods, both to assess how well they are coping with the stresses of transport, and to ensure that their time at the rest station is well-managed. Previous observations at one of two rest stations near Thunder Bay, ON showed that cattle rarely maximized use of the water source, possibly due to neophobia. This study will test whether an auditory cue of running water at the trough will attract cattle to the water source. Cattle from a subset of loads arriving at the same rest station will be randomly divided into two pens identical in nature, except one pen will contain a water trough being filled by a hose that splashes the water, while the water surface in the other pen will be stationary. For the first 5 hours of the rest period, by interval sampling, the number of cattle eating, drinking and lying in each pen will be recorded every 5 min. A subset of 5 focal animals in each pen will also be observed on the same schedule to better assess activity of cattle over time, and to determine how drinking is prioritized. To control for possible pen effects, the running water treatment will be moved between the two observation pens, for different loads of cattle. A mixed model repeated measures analysis will be used to compare the proportion of animals drinking at a given time under control and experimental water source conditions, and mixed linear regression models will be used to test for any associations between drinking behaviour and possible explanatory variables (e.g., temperature, transport duration, etc). Findings from this study will improve our understanding of whether the presence of running water would alter the drinking behaviour of cattle when they are unloaded for rest during long-distance transportation.

Comparison of continuous behaviour assessment and thermal imaging of large felids with focus on thermoregulatory behaviour

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Felids originating from a variety of habitats are kept in zoos in climates that may drastically differ from that of their typical home range. To date no comparative studies of behaviour repertoire or thermoregulation have been conducted with species from the *Panthera* genus. Thermoregulatory behaviour inherent to all homeotherms could be used to investigate differences among these species in captivity. It is hypothesized that species from differing habitats should exhibit different thermoregulatory behaviour strategies and thermoneutral zones. A case study approach will be used to investigate daily maintenance and thermoregulatory behaviours via continuous behaviour observation, along with infrared thermography images, measurements of ambient air temperature, relative humidity, wind speed and solar radiation recorded every 15 minutes throughout the observation period. Data was collected at Lowry Park Zoo, Tampa, Florida where Malayan tigers (*Panthera tigris jacksoni*) and cougars, a subpopulation of *Puma concolor* isolated to southern Florida, are housed. In addition, data was collected at Toronto Zoo in Ontario, Canada where lions (*Panthera leo*), jaguars (*P. onca*), tigers (*P. tigris summatrae* and *P. tigris altaica*), cougars (*Puma concolor*) and snow leopards (*P. uncia*) are housed. There are indications that some behavioural and thermoregulatory needs differences exist across species related to natural habitat of origin. Time budget assessments have yielded insight into potential gender differences in addition to a potential influence of dominance hierarchy within groups on the performance of some thermoregulatory behaviours which place an individual in a vulnerable position, for example loin exposure. The case study approach is welcomed by the zoo research community who realises the limitation of low animal numbers housed at these institutions as a common limitation of zoo animal research. This work should have an immediate impact on the animals involved in the study and has the potential to provide a new diagnostic health tool for zoo veterinarians. There is an immediate need for work in this area and for the development of a non-invasive method of core body temperature assessment for routine health examinations that are not yet available for dangerous carnivorous species.

Development of a pig grimace scale for evaluation of pain and analgesia efficacy in preweaned pigs

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In North America, a number of painful procedures are conducted on neonatal pigs, including iron injection, teeth clipping, ear notching/tagging, and castration. Given that over 200 million pigs are slaughtered in North America annually, at least 50% of which are male, developing and validating cost-effective procedures to minimize pain and distress associated with castration and processing will have a significant and positive impact on animal welfare. The objectives of this study were to develop and validate a Pig Grimace Scale (PGS) in association with behavioural scoring techniques to assess pain in castrated neonatal pigs and to assess the analgesic efficacy of meloxicam and EMLA (topical anesthetic cream) given prior to castration. Castration was performed on 4 litters of 5 day old pigs (n=21) with treatments randomized across litters: meloxicam + EMLA, meloxicam + nonmedicated cream, saline + EMLA, saline + cream, and no treatment (4-5 pigs/treatment). Pens were video recorded for 1hr 24 hours prior to castration, immediately after castration for 7h, and for 1h at 24h post-procedure. Thirty behaviours or postures were scored continuously for the first 10min at -24, 0, 1, 2, 4, 5, 6, 7, and 24h by an observer blinded to treatment. For PGS scoring, an observer blinded to treatment captured 627 facial images across the 9 timepoints. Facial action units and an associated scale were developed using ear position, orbital tightening, and cheek bulge. Two individuals blinded to treatment scored each photo separately. Baseline PGS scores from -24h pigs were subtracted from scores obtained post-castration. Data was analyzed using a GLM ANOVA with Bonferroni post hoc tests. Pigs demonstrated significant behavioural changes up to 7h post-castration and the use of meloxicam and EMLA were not associated with a reduction in painful behaviours or postures. No litter-associated differences were noted in behavioural or PGS data so data was combined across litters. There were no treatment differences in PGS scores; PGS scores at 0, 3, 4, and 5h were significantly higher than those at 7h post-castration ($F(8,1019)=2.243$, $p<0.02$). These findings indicate that the PGS may have utility for evaluating pain in preweaned pigs.

Consumers and animal welfare: What they know, what they don't know and why it matters

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The discourse on animal welfare standards in production agriculture is polarized between the “activists” and the industry. The consumer will play an important role in driving standards in the future. Consumer perceptions of animal welfare are poorly understood, particularly in Canada. We endeavour to provide a preliminary understanding of the level of understanding and concern of Canadian consumers of issues in animal welfare, with a particular focus on eggs and pork. We completed a survey of more than 1,000 English speaking Canadians in the fall of 2013. The questions were included as part of a regular panel survey conducted through Ipsos Reid and participants are broadly representative of the Canadian population. The surveys were completed by phone and asked consumers about their purchase habits, priorities when purchasing foods for consumption outside the home and understanding and perspectives of animal production and animal welfare. The data was analyzed using non-parametric tests to highlight differences in attitudes and preferences between different groups. Animal welfare is increasingly in the consciousness of Canadians (50% say more information would drive their purchase decisions) and for a segment of the population (20%) animal welfare commitments already affect their purchase decisions. What is also very clear from the data is that animal agriculture and animal welfare is poorly understood by consumers. The trust consumers have relative to their food is based on a poor understanding of how that food is produced. It is clear that consumers want to learn more – half agree or strongly agree that labels should more clearly indicate the conditions under which the animals were raised and only 20% disagreed or strongly disagreed. Less than half of consumers surveyed felt definitively that animal welfare standards should be based purely on science which has implications for how we communicate with them. We present these summary findings and discuss the implications and future research going forward. Consumers are thinking about animal welfare and want more information. The industry needs to consider how best to proactively provide the information.

Improving laboratory mouse welfare and reducing animal numbers through mixed-strain housing

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All common identification methods for laboratory mice (e.g., ear notching) can impair animal welfare. Furthermore, many experiments utilize homogenous populations that inadvertently contribute to low external validity and poor reproducibility. This work aimed to validate mixed-strain housing as a way to remove the need for marking; increase variation in the study population; and utilize a more statistically powerful experimental design (because every strain is represented in every cage, the number of independent replicates is increased). We raised 3-4 week old female mice of three inbred strains, C57BL/6, DBA/2, and BALB/c, in single-strain or mixed-strain trios (n=219) and in two housing treatments, standard (n=108) and enriched (n=108). At 3-5 months of age, mice were assessed for 26 different behavioural (e.g., stereotypies), physiological (e.g. blood glucose), and haematological (e.g., white blood cell counts) variables. A diverse set of variables was chosen to make the results as applicable as possible across disciplines. Variables were analysed using general linear models that included: cage as a random effect, strain, cage type (single or mixed), enrichment (yes or no), and all of the interaction terms. Single- and mixed-strain housed mice did not differ in any measured variables. Several strain differences were detected: all were in the expected direction. Furthermore, the magnitude and direction of typical strain differences was unaffected by whether or not animals were housed with same-strain cage mates (there were no interaction effects). Enriched mice showed signs of improved welfare (e.g., less stereotypic behaviour; $p < 0.0001$), and these effects were similar for both single- and mixed-strain housed mice. Thus, mice in mixed-strain trios retained their strain-typical traits. Mixed-strain housing also reduced inter-individual variation across all variables ($p = 0.0012$). Ultimately, we were able to demonstrate that mixed-strain housing is a potentially valid experimental paradigm with the following benefits: it does not involve any invasive or stressful procedures; it systematically increases variation in the study population which increases the generalizability of the results; and it increases the statistical power of the experiment by reducing inter-individual variation and increasing the number of independent replicates, which means fewer animals need to be used in order to detect effects.

Response of light horse breeds to humans in differing physical and mental states

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Recently there has been a growing interest in equine-assisted therapy (EAT) as the benefits of interacting with horses to overcome physical or emotional trauma manifest in the success stories of participants. Such participants unfamiliar with horses may involuntarily emit physiological fear or distress signals such as increased respiratory or heart rates (HR). Interpreting how horses respond to these messages is important for safety and to ensure a positive experience for both human and horse. Recent research in this lab demonstrated behavioural and physiological differences in draft horses exposed to humans with elevated heart rates due to physical exercise versus psychologically-induced elevations due to fear of horses¹. Other research has shown distinct differences in personality and reactivity among horse breeds², thus we wished to test repeatability of results using light horse breeds. Horses (n=8) loose individually in a round pen were randomly allocated to each of four treatments: 1) no human (CONTROL); 2) calm human comfortable around horses (CALM); 3) physically-stressed human (PHYS; human exercised by stationary jumping to 70% maximum HR); and 4) psychologically-stressed human due to fear of horses (PSYCH). Both humans and horses were equipped with a HR monitor set to record at 5 second intervals. Nine humans (6 females, 3 males) individually stood motionless in the centre of the round pen for 5min while behavioural observations of the horse (gait, head position relative to the withers, distance and orientation toward human, orientation of horse's ears) were recorded every 5sec. A mixed model analysis with horse and human as random effects was used to analyse the data. Similar to the draft horses, all horses moved faster around the pen in CONTROL ($p<0.001$), possibly indicating stress at being alone. Horses moved slowest ($p<0.018$) and had lowest HR ($p<0.001$) in PHYS while human HR was lowest when the horse was touching the human ($p<0.002$). This may indicate that light horse breeds respond best to humans who are exercised but mentally calm and that humans respond positively to touch, the implications of which may be used to improve EAT programs.

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Subclinical intramammary infection prevalence at dry-off and after kidding on Ontario dairy goat farms

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For many dairy goat producers, a key deciding factor for keeping does in the herd is the animal's ability to maintain milk production. Subclinical intramammary infections decrease milk production in does. The highest risk period for infection is when animals are transitioning from one lactation to the next. The aims of this study were to determine the prevalence of subclinical intramammary infections during this period and to assess the attitudes of the producers regarding these infections on their farms. We followed a total of 308 does on 8 commercial farms in Southern Ontario (39 ± 19 does per farm). For each doe, two aseptic milk samples were collected from each udder half, at the end of lactation (last day of milking, or "dry-off") and in the next lactation (6-10 days after kidding). Bacteriological analysis was performed according to established methodology, and samples were flagged as infected when 1 or more bacterial colonies were isolated. Mixed models were used to compare infection prevalence at dry-off and kidding. The relationship between producer attitudes and prevalence was established with a regression model. Subclinical infection prevalence in at least one udder half was high, and increased from dry-off to after kidding (mean \pm SE: 40 vs. $49 \pm 3.7\%$; $P = 0.02$). The prevalence of infection in both sides of the udder was similar before and after kidding (mean \pm SE: 12 vs. $14 \pm 2.7\%$; ns). The spontaneous cure rate was high (mean \pm SD: $26 \pm 18\%$), this was matched by a high rate of new infections (mean \pm SD: $30 \pm 8\%$). When asked about subclinical intramammary infection on their farms, most producers expressed little to no concern, and there was no relationship between concern and prevalence ($R^2 = 0.08$; ns). Overall, subclinical infection prevalence was high among farms, and there was a disconnect between producer concern and prevalence of intramammary infections in goats under their care. Next steps are to inform the producers of the impact of these infections on doe welfare and milk production and recommend practices for reducing prevalence.