6th Annual Animal Welfare Research Symposium

Ontario Veterinary College, Pathobiology/AHL rm 1800,
May 15th, 2013
9:00am – 5:00pm
Thank you to our sponsor:

ORAL PRESENTATIONS

9:00 Welcome

SESSION I – Looking after the welfare of our companions

9:05 Investigating anhedonia in a non-conventional species: are some riding horses depressed?
Carole Fureix*, Margaret Quinton, Cleo Beaulieu, Georgia J. Mason

9:20 The effect of human body posture on horse behaviour
Katrina Merkies*, Helen MacGregor, Marieka Ouimette, Emilie Bogart, Kayla Miraglia

9:35 Methods for measuring fecal corticosteroid metabolites in domestic horses (Equus caballus) using enzyme immunoassays
Cordy DuBois*, Katrina Merkies, Derek Haley, Laura H. Graham

9:42 Assessing impulsivity and aggression in dogs using a modified marshmallow experiment
Jacquelyn Jacobs*, Jason Coe, Lee Niel

SESSION II – Assessing welfare in practical settings

9:50 What impacts animal welfare in companion animal veterinary clinics?
Lauren Dawson*, Cate Dewey, Elizabeth Stone, Michele Guerin, Lee Niel

10:05 A comparison of three animal welfare assessment programs on Canadian swine farms
Ashley Roberts*, Penny Lawlis, Renee Bergeron, Tina M. Widowski

10:20 Adoption of practices to improve cow comfort on dairy farms
Clémence Nash*, David Kelton, Doris Pellerin, Trevor J. DeVries, Anne Marie de Passillé, Jeff Rushen, Gemma Charlton, Elsa Vasseur, Derek B. Haley

10:35 BREAK
SESSION III – Addressing welfare concerns of dairy cattle & dairy goats

10:50 Voluntary intake and feeding preferences of dairy cattle for Chicory (Chichorium intibus) and Birdsfoot trefoil (Lotus corniculatus) as related to harvest time
Danielle Lombardi*, Elsa Vasseur, Robert Berthiaume, Trevor J. DeVries, Renee Bergeron

11:05 Relationship between post-milking standing time and incidence of intramammary infection in dairy cows
Mary Watters*, Herman Barkema, Ken E. Leslie, Marina von Keyserlingk, Trevor J. DeVries

11:20 The effect of stall surface compressibility on dairy cow behaviour
Alexa Main*, Todd Duffield, Cassandra Tucker, Nigel Cook, Derek B. Haley

11:35 The effect of reduced access to teats on feeding patterns and performance of dairy calves
Emily Miller-Cushon*, Renée Bergeron, Ken E. Leslie, Georgia J. Mason, Trevor J. DeVries

11:50 Potential application of changes in activity levels for early identification of pregnancy toxemia in transition dairy goats
Gosia Zobel*, Ken E. Leslie, Daniel Weary, Marina von Keyserlingk

SESSION IV – Investigating behavior & welfare of beef cattle

12:05 The behavior of cattle unloaded for feed, water and rest during long-distance transportation in Canada
Hannah Flint*, Karen Schwartzkopf-Genswein, Ken G. Bateman, Derek B. Haley

12:20 Correlations and relevance of methods used to assess temperament of beef cattle
Tara Jones*, Derek B. Haley, Joseph Stookey, Stephen Miller

12:35 The perception of roping calf welfare before, during and after “The Show”
Shannon Nicholson*, Ian J.H. Duncan, Susan Nance

12:45 LUNCH & POSTERS (OVC cafeteria 1707 B & C)

SESSION V – KEYNOTE

1:40 The behavior & welfare of laying hens in aviaries: Challenges & possibilities for gathering data
Janice Siegford, Michigan State University

SESSION VI – Improving the welfare of poultry
Keel fracture assessment of laying hens by palpation: inter-observer reliability and accuracy
Mike Petrik*, Michele Guerin, Tina Widowski

Assessing the behaviour and welfare of broiler breeder pullets reared on different feeding schedules
Brittany Lostracco*, Tina M. Widowski, Ashleigh Arnone, and Stephanie Torrey

BREAK

Does it seem crowded to you? Nesting behaviour and nest box use in large furnished cages
Michelle Hunniford*, Stephanie Torrey, Gregoy Bedecarrats, Ian J.H. Duncan, Tina M. Widowski

Foraging and dustbathing of laying hens housed in large furnished cages is affected by cage size and stocking density
Eugenia Herwig*, Tina M. Widowski

Effect of water sprinkling during rearing on growth, environment and behavior of leghorn pullets
Leanne Cooley*, Linda Caston, Stephanie Torrey, Tina M. Widowski

SESSION VII – Exploring aspects of welfare in mink & rodents

Providing ‘get-away bunks’ and other enrichments to primiparous adult female mink improves their reproductive productivity
Misha Buob*, Rebecca Meagher, Lauren Dawson, Rupert Palme, Derek B. Haley, Georgia J. Mason

Mink play it cool: juvenile rough-and-tumble play reduces fearfulness in adulthood for Neovison vison
Jamie Ahloy Dallaire*, Georgia J. Mason

Co-housing rodents with different coat colours as a simple, non-invasive means of individual identification: validating mixed-strain housing for female C57BL/6 and DBA/2 mice
Michael Walker*, Carole Fureix, Rupert Palme, Georgia J. Mason

Environmental Enrichment Reduces Signs of Boredom in Caged Mink
Rebecca Meagher, Georgia Mason* (CCSAW funded research)

Closing Remarks & student awards
POSTER PRESENTATIONS

1. **Infrared thermography to evaluate lameness in pregnant sows**  
   Rocio Amezcua, Shannon Walsh*, Paul Luimes, Robert Friendship

2. **The importance of communication in maintaining containment within an ABSL- large animal facility during an emergency heating ventilation and air conditioning shutdown**  
   Michael Brunt*, Michelle Pitre, Marcus Litman

3. **Injurious pecking in domestic turkeys: development, causes, and potential solutions**  
   Hillary Dalton*, Ben Wood, Stephanie Torrey

4. **Inter-observer reliability of body condition scoring in dairy cattle for on-farm animal welfare assessment**  
   Sam Deelen*, Cordelie Dubois, Sarah Dykeman, Alanna Gottziaman, Brittany Lostracco, Andrea Nace, Shannon Nicholson, Santiago Palacio, Alanna Patterson, Colleen Roehrig, Elise Shepley, Stephanie Silnieks, Mike Draper, Penny Lawlis

5. **Measurement of feeding motivation in limit-fed dairy heifers**  
   Angela Greter*, Todd Duffield, Brian McBride, Tina M. Widowski, Trevor J. DeVries (CCSAW funded research)

6. **Do limit-fed heifers prefer supplementary long or short straw?**  
   Angela Greter*, Maarten Prinsen, Todd Duffield, Brian McBride, Tina M. Widowski, Trevor J. DeVries

7. **Body condition scores of Western and English discipline horses**  
   Katrina Merkies*, Cassie Eves, Kristin Hall, Veronica Peacock

8. **Effect of whip use on high and low speed index Quarter Horses while racing**  
   Katrina Merkies*, Nicole Durand, Kassie Joyce, Cecilia Zegers

9. **Assessing the ability of the synthetic cat pheromone ‘Feliway’ to mitigate post-operative stress in tigers (Panthera tigris)**  
   Andrea Nace*, William Swanson, Laura Graham

10. **Understanding early turkey poult feeding behaviour**  
    Colleen Roehrig*, Stephanie Torrey

11. **Attack intensity of pest flies and behavioural responses of pastured dairy cows**  
    Carrie Woolley*, Simon Lachance, Trevor J. DeVries, Renée Bergeron
The behavior and welfare of laying hens in aviaries: challenges and possibilities for gathering data

Janice M. Siegford

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Aviaries are housing systems that provide groups of laying hens with tiered, enriched cages and daytime access to a litter-covered floor. The cage element of aviary systems includes feeders, drinkers, nest boxes and perches, and aviaries typically provide more space per hen than other types of cage systems. Thus it may be supposed that laying hens in aviaries can perform more of their natural behavioral repertoire, such as dust bathing, perching, or nesting. However, hens in aviaries are typically housed in groups of hundreds or thousands, making collection of behavioral data is logistically difficult and few studies have been conducted in this system. Thus, we do not fully understand if hens use the provided resources and space as intended, whether such systems improve the ability of all hens to perform strongly motivated behaviors, or how hens individually behave within the system. Two ongoing studies are examining these questions. The first is being conducted on a commercial farm as part a project examining how hens use the resources provided to them, with particular attention to litter and perch use, and to understand how this affects their welfare and productivity. The second is being conducted at a new research facility to examine the behavior and resource use of individual hens in aviaries. However, in both cases, data is being gathered via live observation or through analysis of video—which are time and labor intensive processes. It is also difficult to visually follow individual hens throughout the system, even when the hens are marked. A third study aimed at developing a wireless body worn sensor capable of monitoring the location and behavior of hens in non-cage systems shows promise as a means of automatically collecting and categorizing data from individual hens in aviary systems. Data emerging from these studies indicate that hens in aviaries use nest boxes less than in enriched systems; use perches at consistent but low levels across the day and prefer upper levels of the aviary at night to perches on lower levels; dust bathe and use the litter area throughout the day but at higher numbers in the afternoon; and use the system in very individual ways.

Dr. Siegford is an Assistant Professor in the Animal Behavior and Welfare Group in the Department of Animal Science at Michigan State University. Her research examines the impacts of management practices and environment on the behavior and welfare of production animals. Dr. Siegford also works to develop non-invasive, automated methods for collecting behavior and welfare data from animals in their home environments. Currently she is working to develop a wireless sensor that can provide information about individual laying hens in non-cage housing systems. She is also studying the behavior of dairy cows in a robotic pasture-based milking system, with particular attention to behaviors that affect efficiency of robot use. In addition to her research, Dr. Siegford teaches courses in applied animal behavior and animal welfare. She received a BS with honors in Science Communication from Cornell University, a MS in Zoology from the University of Idaho, and a PhD in Neuroscience from Washington State University.
Investigating anhedonia in a non-conventional species: are some riding horses depressed?

Carole Fureix¹, Margaret Quinton¹, Cleo Beaulieu¹, Georgia J. Mason¹

¹Department of Animal and Poultry Science, University of Guelph, Guelph, ON, Canada

States involving inactivity and low responsiveness to external stimuli (a state we term 'withdrawn'), have been reported in working equids in the developing world, and, more recently, in riding horses. To determine the potential role of depression in this state, we investigated anhedonia (the loss of pleasure: a core symptom of depression) in withdrawn horses and controls from the same stable. Subjects were 20 horses (16 geldings, 4 mares, 7-20 years old, 75% French Saddlebred). The time horses spent being withdrawn was determined by a formerly trained observer using instantaneous scan sampling every 2 minutes over 1h long periods repeated daily over 15 days. We measured sucrose intake, a classic measure of anhedonia never previously applied to horses. Commercially-available flavoured sugar blocks, novel to these subjects, were mounted in each stall and weighed 3h, 8h, 24h and 30h after provision. We hypothesized that if in depression-like states, withdrawn horses would exhibit anhedonia, i.e. consume less sucrose than controls. As predicted, horses spending the most time withdrawn showed reduced sucrose consumption ($F_{1,18} = 4.65, p=0.04$) (the repeated measures model also controlled for age, sex, and the time each horse spent in its stall - thus able to eat the sucrose - during testing). We then controlled for two possible alternative explanations for this pattern: food consumption levels, and neophilia towards novel foods. Hay consumption was therefore measured over 5 days, as were subjects’ latencies to eat a meal flavoured with novel flavour (novel odour). When included in our model, high hay consumption strongly tended to predict high sucrose consumption ($F_{1,14} = 4.52, p=0.051$), and long latencies to eat a novel food predicted low sucrose consumption ($F_{1,14} = 8.34, p=0.012$), but statistically controlling for these two confounds did not eliminate the relationship between being withdrawn and consuming less sucrose (although reducing it to a strong trend: $F_{1,15} = 4.28, p=0.056$). This suggests that neither overall food consumption levels nor neophobic reactions strongly confounded our previous findings. This study therefore illustrates the methodological challenges of investigating anhedonia in non-conventional species, and suggests the possibility of depression-like states in riding horses.
The effect of human body posture on horse behaviour

Katrina Merkies¹, Helen MacGregor¹, Marieka Ouimette¹, Emilie Bogart², Kayla Miraglia¹

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²Agrocampus Rennes, France

During round-penning techniques, trainers believe body language communicates directives to the horse and horses respond with specific behaviours such as lowering the head and turning an ear toward the trainer. To test the hypothesis that eye-on-eye contact acts as a driving aid, while turning away from the horse is an indicator to the horse to slow the pace, twelve draft-type horses (age 6-15 years) naïve to round-pen training were placed individually in a familiar round pen (10m in diameter) and allowed to move freely. Behaviours were monitored every 5sec during 5min of baseline readings followed by 5min of treatment. Each horse was exposed to each of three treatments with either a familiar (FAM) or unfamiliar (UNFAM) human entering the round pen and facing the horse’s left girth at a distance of 3m, assuming one of the following postures: 1) head and shoulders turned to the horse’s head, eye-on-eye (FRONT); 2) shoulders facing horse’s head, head facing horse’s hindend (AWAY); or 3) head and shoulders facing horse’s hindend (REAR). Behaviours were scored retrospectively using video recordings to note gait (1=halt; 2=walk; 3=trot; 4=run), head position (1=below withers; 2=even with withers; 3=above withers), and ear position (1=toward human; 2=away from human). A mixed model analysis showed horses moved at a faster gait with FRONT, and moved slower with AWAY (p=0.017). Horses carried their head lower with FRONT compared to control (no human; p=0.0005). There was no difference between FAM and UNFAM in gait (p=0.52) or head position (p=0.22). Horses oriented their ears oriented more toward FAM (p<0.0001), particularly during REAR (p<0.0001). This research shows that horses do indeed move at a faster pace when the human is facing them, and horses respond by lowering their heads, although they orient their ears only toward familiar humans. This knowledge can validate techniques trainers use when round-penning horses.
Methods for measuring fecal corticosteroid metabolites in domestic horses (*Equus caballus*) using enzyme immunoassays

Cordy DuBois¹*, Katrina Merkies², Derek Haley, Laura H. Graham¹

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Changes in cortisol production have frequently been used as a physiological measure of stress in both domestic and wild animals. Non-invasive methods for measuring cortisol levels, such as salivary cortisol or fecal cortisol metabolites, have become an alternative to traditional blood sampling in an effort to remove any potentially confounding from handling or a procedural-induced stress response. Measurement of fecal cortisol metabolite concentration has been found to mirror the blood cortisol concentration with a species-specific time delay due to the time required to pass through the digestive system. In domestic horses, fecal cortisol metabolites have been used both to measure stress response to transport as well as one to two day old pain. The goal of the current project was to validate enzyme immunoassays for monitoring fecal corticosteroid metabolites as part of a larger project comparing the effect of weaning methods on mare and foal stress. Fecal samples were collected from eight domestic horses (five weaned foals and three adult mares) twice daily over a period of six days. On the morning of the fourth day, each animal was given an ACTH injection (0.1 ug/kg synthetic ACTH) to simulate a stress response. Fecal samples were extracted using an aqueous alcohol solution of eighty percent methanol (MeOH) and the supernatant stored at -20°C until assay. Three different enzyme immunoassays with different metabolite cross-reactivities will be employed to measure fecal corticosteroid metabolites and the results then compared. The most successful method will be used to measure fecal corticosteroid metabolite concentrations in samples collected from both mares and foals involved in a two-stage weaning trial in an effort to determine if the weaning method was successful in reducing both mare and foal stress at separation.
Assessing Impulsivity and Aggression in Dogs Using a Modified Marshmallow Experiment

Jacquelyn Jacobs¹*, Jason Coe¹, Lee Niel¹

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Canine aggression is the top behavioural reason for relinquishment and euthanasia, and we can potentially improve the welfare of many individuals by determining the causes of aggression. In humans, high levels of impulsivity have been associated with various psychological disorders and behavioural problems, including aggression. The objective of this study is to investigate the association between impulsivity and aggression in canines.

The famous “marshmallow” experiment investigated strategies children used to tolerate delayed gratification, a dimension of impulsivity. The children were given a choice between an immediate small reward (a marshmallow), and a larger reward (two marshmallows) but on a delayed schedule. The general methodology of this test forms the basis for similar behavioural experiments modified for use with human adults, non-human primates, rats and dogs to measure the degree of impulsivity. During a delayed reward choice test, dogs are given free choice between a small reward immediately, and a larger reward at an increasingly delayed schedule during a 10-minute testing period. The degree of impulsivity is measured as the longest delay an individual will wait for the large reward during the testing period. This test has been validated for use in dogs; results from this test have been shown to have strong convergent validity with a psychometric tool for assessing impulsivity (through owner completed questionnaires) and physiological correlates of impulsivity (Wright et al., 2012).

Our hypothesis is that aggressive dogs will have higher levels of impulsivity compared to non-aggressive dogs. A case-control study will be used to examine this relationship. Twenty-six dogs will be recruited for each group, and will be matched by breed to avoid confounding effects. Aggressive individuals will be identified through a previously validated questionnaire, and the delayed reward choice test will be used to assess the dog’s level of impulsivity. In addition, data will be collected for both groups on previously identified risk factors for aggression through an owner-completed questionnaire. This research will serve as the first step toward investigating the role of impulsivity in canine aggression.
What impacts animal welfare in companion animal veterinary clinics?

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The relationship between veterinary care and animal welfare is an interesting paradox: veterinarians are responsible for ensuring the health and well-being of their patients, yet many aspects of veterinary care have the potential to impact patients’ overall welfare. Although animal welfare in relation to pain control and euthanasia in veterinary patients has been investigated, there has been minimal research examining companion animal welfare in relation to overall veterinary care. The objective of this research was thus to identify key veterinary-related factors that are perceived to impact feline and canine welfare, using the Delphi method. Participants were animal welfare researchers across North America and Europe, Canadian and American veterinarians with welfare expertise, and randomly selected small and mixed animal veterinarians from each Canadian province and American state. Over three sequential rounds of consultation, participants were asked to do the following: 1) suggest factors related to veterinary care that impact on patient welfare; 2) assess the relative impact of each factor; 3) assess the feasibility of improving each factor. A total of 78 individuals identified 85 factors; these included aspects of care specific to the clinic environment (e.g. handling and restraint techniques) and veterinary-related factors that impact welfare in the animal’s home (e.g. provision of advice regarding nutrition, exercise, training). Amongst suggested factors, the following themes emerged: physical environment of the facility, medical and surgical procedures, routine animal care, staff-patient-client interactions, veterinarian-client communication, staff attitudes and education, and clinic management. Average assigned impact scores ranged from 1.04 to 3.78 out of 4, with 70% (60/85) of the suggested factors receiving a score greater than 3. More than 80% of all participants agreed that it would be feasible to improve 68% (58/85) of the factors. Overall, companion animal welfare is influenced by a variety of veterinary-related factors that vary in terms of perceived impact and potential for improvement. This research is ultimately aimed at enhancing welfare of companion animals in veterinary clinics by identifying key areas for improvement.
A comparison of three animal welfare assessment programs on Canadian swine farms

Ashley Roberts¹*, Penny Lawlis², Renee Bergeron³, Tina M. Widowski¹

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Standard measures used in animal welfare assessments include animal-based measures (ABM) obtained by observing animals (e.g. body condition score), resource-based measures (RBM) obtained by observing facilities (e.g. non-slip flooring in walkways), and management-based measures (MBM) obtained by interviewing farmers and checking records (e.g. written euthanasia plan). It is widely accepted that it is easy to train assessors to use RBMs and MBMs with good reliability, whereas ABMs are considered to be more direct measures of animal welfare but more difficult to achieve good agreement among assessors. However, few measures have been systematically tested. Our objectives were first to investigate inter-observer reliability (IOR) of different measures used in 3 current pig welfare assessment programs (PQA Plus, USA; Canadian Animal Care Assessment (ACA); and European Welfare Quality (WQ)), and secondly to determine the concordance of scores across the 3 assessments. Data were collected on 5 grow-finish farms using a group of 10 trained assessors who conducted assessments on the same farms simultaneously. Individual dichotomous MBMs and RBMs (found primarily in the ACA and PQA) were analyzed quantitatively for inter-observer reliability using the kappa statistic. The kappa values for the ACA and PQA were 0.806 (p=0.05) and 0.798 (p=0.05) respectively, showing a very high level of agreement for data from 4 assessors who were the only observers present on all five farms. The three assessments all examine similar welfare criteria (e.g. lack of hunger/thirst) but the ACA and PQA primarily use MBMs and RBMs, and WQ uses primarily ABMs. Therefore, overall results (ACA and PQA=Pass/Fail, WQ= Excellent, Enhanced, Acceptable or Not Classified) on 20 farrow-to-finish farms done by 2 observers were compared qualitatively to determine concordance among the 3 assessment programs in scoring individual farms. For 4 sample farms WQ scores categorized the welfare of the pigs on those farms as "Enhanced" whereas ACA and PQA resulted in “Failing” scores for those same farms. These results indicate that MBMs are, in fact, highly reliable, but may not be concordant with ABMs. Results of this study can be used to identify the best measures and revise training programs for on-farm animal welfare assessments.
Adoption of practices to improve cow comfort on dairy farms

Clémence Nash\textsuperscript{1*}, David Kelton\textsuperscript{1}, Doris Pellerin\textsuperscript{2}, Trevor J. DeVries\textsuperscript{3}, Anne Marie de Passillé\textsuperscript{4}, Jeff Rushen\textsuperscript{4}, Gemma Charlton\textsuperscript{4}, Elsa Vasseur\textsuperscript{5}, Derek Haley\textsuperscript{1}

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The Canadian code of practice for the care and handling of dairy cattle includes requirements and recommendations that aim to improve cow comfort. However, the degree of implementation of these practices at the farm level is unknown. The objective of this project was to encourage the implementation of cow comfort practices on farm and identify barriers that producers face when considering these changes. In this intervention study, we visited 40 farms in Ontario and measured the level of cow comfort on each farm through various animal (body condition, injuries, lying time), management (cleaning and feeding routine) and resource (stall design, pen design) based measures. We then provided each producer with a diagnostic tool to evaluate risk factors for cow comfort on their farm using the code of practice recommendations. We conducted semi-structured interviews with these producers 12 to 18 months later to determine if they had adopted new practices to improve cow comfort and meet code of practice requirements. Data on producer demographics, types of changes that were made and prevention to further change was also collected. The mean age of producers was 45 years (range: 27-61) with an average herd size of 115 (47-530). The sample included 23 free-stall, 15 tie-stall and 2 automated herds. Of the producers interviewed, 60\% had received post-secondary education. Following our intervention, 73\% of producers had made changes. The most commonly adopted cow comfort practices were improved bedding managements (22.7\%), improved hoof-trimming management (18.2\%) and improved stall base (18.2\%). The most commonly identified barriers for the prevention of further change were lack of funds (43.3\%), satisfaction “with the comfort of their cows” (30\%) and lack of time (23.3\%). Only 25\% of the non-adopters had identified a successor for their farm, while 64\% of the producers that had made changes had identified a successor. These results demonstrate that our intervention study was successful at encouraging change on dairy farms; however certain barriers still exist to the implementation of cow comfort practices, including farm decisions about successorship.
Voluntary intake and feeding preferences of dairy cattle for Chicory (Chichorium intibus) and Birdsfoot trefoil (Lotus corniculatus) as related to harvest time

Danielle Lombardi\(^1\)*, Elsa Vasseur\(^1\), Robert Berthiaume,\(^2\) Trevor J. DeVries,\(^3\) Renee Bergeron\(^1\)

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Condensed tannins in birdsfoot trefoil and chicory have therapeutic properties such as reducing bloat, increasing nitrogen utilization and anthelmintic effects in cows. Condensed tannins are associated with bitter taste, which can affect voluntary intake and preference. Harvest time could mitigate bitterness by differing concentration of water soluble carbohydrates. The aims of this study were to quantify voluntary intake and preference of dairy cows for these forages harvested in the morning and evening and to determine cow grazing preference when offered on pasture. The forages evaluated for intake and preference were fresh chicory (Chichorium intybus, var. PunA) harvested at 0700h (CHICAM) and harvested at 1800h (CHICPM), fresh birdsfoot trefoil (Lotus corniculatus) harvested at 0700h (BIRDAM) and harvested at 1800h (BIRDPM), birdsfoot trefoil haylage harvested at 0700h (BIHAYAM) and harvested at 1800h the previous summer (BIHAYPM), and 3\(^{rd}\) cut alfalfa (Medicago sativa L.) silage harvested the previous summer (CONTROL).

Single forages were offered ad libitum for 30 min to 14 dairy cows to determine intake in a 7X7 Latin square. To determine preference, every possible pair of forages (21 pairs) was presented for a meal (30 min) using 8 different dairy cows, and feed intake for each forage was measured. CONTROL, BIHAYPM and BIHAYAM correlated with the highest voluntary intakes. Fresh forages, CHICAM, CHICPM, BIRDAM, and BIRDPM, had the lowest intakes regardless of harvest time \((P<0.001)\). BIHAYPM was preferentially consumed over all other forages, with no differences in preference among fresh forages, which were also the least preferred regardless of harvest time \((\text{BIHAYPM} < \text{BIHAYAM} = \text{CONTROL} < \text{BIRDAM} = \text{BIRDPM} = \text{CHICAM} = \text{CHICPM})\). Grazing preferences were determined with 12 dairy cows. The tests consisted of 2 d of forced choice on one of the two pastures for 1-h, and 2 d of free choice (1-h) between 2 pastures adjacent to each other. Grazing time and location of the cows on the field was assessed through 2-min scan sampling. When given a choice, cows spent on average 71% of their time grazing on birdsfoot and 23% on chicory \((t=-40, \ P=0.2)\). Grazing times did not vary when forced to remain on either pasture. These results indicate that birdsfoot trefoil and chicory are voluntarily consumed and have the potential to be used for therapeutic purposes. However, birdsfoot haylage may be the better option, but further investigation is warranted.
Mastitis is one of the most costly diseases in the dairy industry, both economically and from a welfare standpoint. The objective of this study was to determine the relationship between post-milking standing time and the risk of intramammary infection (IMI) in dairy cows milked 3x/d. Forty Holstein cows (<200 d DIM with SCC <100,000 cells/ml) from each of 4 free-stall dairy herds, milking 3x/d, were enrolled for a total of 160 cows in a longitudinal study. Cows were followed for 3, 28-d periods. Data loggers were utilized to record standing and lying behaviour in cows for 5 d at the start of each period. Quarter-level milk samples were collected for bacteriological culture on d 1 of each period. A new IMI was defined as a positive culture sample following a negative culture. Cows were lameness and hygiene scored at the end of each 5-d recording period. Time of milking, milk production, and feed manipulation times were also recorded. A multivariable logistic regression model was used to determine the risk factors for IMI. Across the study, cows spent 9.9±2.2 h/d lying down and had an average post-milking standing duration of 79±45 min. Given variability observed in post-milking standing time following each daily milking, post-milking standing time was analyzed separately for each milking. The delay between milking time and feed manipulation was positively correlated with post-milking time 1 ($P=0.01$). The delay between milking time and fresh feed delivery was negatively correlated with post-milking standing time 2 ($P=0.006$). DIM and milking order were negatively correlated with post-milking standing time 3 ($P=0.009$ for both). A total of 385 new IMI were detected from 1767 quarters at risk for an incidence rate of 2.84 IMI/quarter-year at risk. Coagulase-negative staphylococcus (CNS) was responsible for 53% of detected IMI; IMI incidence rate = 1.69 CNS IMI/quarter-year. Only CNS IMI were associated with post-milking standing time and the relationship was non-linear. Therefore, post-milking standing time was split into 5 categories based on data distribution. Cows which stood for >84 but <115 min post-milking tended ($P=0.07$) to be at reduced risk for CNS IMI compared to those cows which stood for <55 min (reference category) post-milking (OR=0.49, 95% CI= 0.26, 0.94). These results suggest that encouraging cows to remain standing for 85-114 min post-milking may decrease the risk for a CNS IMI and that longer post-milking standing times may be encouraged through manipulation of feed around milking time.
The effect of stall surface compressibility on dairy cow behaviour

Alexa C. Main¹*, Todd F. Duffield¹, Cassandra B. Tucker², Nigel B. Cook³, Derek B. Haley¹

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Optimizing the time dairy cows spend lying is critical for production, rest, and welfare. One of the most important factors influencing lying behaviour is the softness of the stall surface. Our objective was to determine whether aspects of the cow’s activity and lying behaviour change with the use of 2 stall bases, which differed in their compressibility. A foam and gel mattress were compared (gel=more compressible, 5.7 psi, vs. foam=11.6 psi). Non-lactating Holstein dairy cows (n=18) were kept individually in a free-stall barn where they had been previously housed. Each cow had access to the 2 surfaces and was exposed to a single surface in a balanced order for 3 consecutive days (6 days total/cow). Behaviour was video recorded and accelerometers were used to record standing and lying. The first 2 days on each surface were acclimatization days so this video data was not analysed. A logistic regression model with a logit transformation was run to analyse the odds ratios and the proportion of time cows spent lying, standing and perching (standing with front legs in the stall, back legs in the alley) on the final days on each surface (days 3 & 6). There was no significant difference in the odds of lying on the foam stall (OR=0.88, P=0.11), and similarly, no difference in the odds of perching on the foam compared to the gel stalls (OR=1.37, P=0.11). Cows were at a significantly higher odds of standing in the foam stall compared to the gel (OR=1.52, P=0.014). Paired t-tests calculated from the accelerometer data indicated that the mean lying bout frequency, duration and lying time were similar on both surfaces (mean±SE; bout frequency gel=9.0±0.57 vs. foam= 9.5±0.57, P=0.1656; bout duration gel=1.7±0.05 vs. foam=1.7±0.05, P=0.70; lying time foam= 15.0±0.37 vs. gel= 15.2±0.27, P=0.8769 h/24 h). These findings are consistent with previous studies that report higher standing times on firmer stall surfaces, even when no differences in lying time exist. As with this previous work, other indicators such as the preference for and long-term health implications of these surfaces are likely important and warrant further investigation.
The effect of reduced access to teats on feeding patterns and performance of dairy calves

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There is evidence that short-term reduced teat access in group-housed dairy calves decreases milk intake. This study examined the longer-term effects of consistent levels of competition for teats throughout the milk-feeding period. The hypothesis was that calves reared in a more competitive environment would adapt feeding patterns to achieve similar milk intake. Twenty Holstein bull calves were pair-housed and provided milk replacer (MR) ad libitum via either: 1) 2 teats/pen (non-competitive feeding; NCF), or 2) 1 teat/pen (competitive feeding; CF). Calves were followed for 6 weeks. Intake was recorded daily and calves were weighed 2x/wk. Feeding times were recorded from video for 3 d in each of week 2, 4, and 6. Meal criteria (minimum time interval between meals) were estimated from frequency distributions of feeding times and used to calculate daily meal frequency and meal time. For all treatment pens, meal time was also divided into synchronized or unsynchronized meal time, based on whether calves were engaged in overlapping meals, with meals defined by individual meal criteria. Data were summarized by pen and analyzed in a repeated measures general linear mixed model. Milk intake was subject to a treatment by week interaction (P=0.002), with calves in CF pens having initially lower milk intake, but compensating by increasing intake over time to a greater extent than NCF (wk 2, 8.3 vs. 9.6 L/calf/d, SE=0.6 and wk 4-6, 13.3 vs. 12.0 L/calf/d, SE=0.7; CF vs. NCF). Weight gain was also subject to a treatment by week interaction (P=0.003), but body weights were similar at the end of wk 6 (103.6 kg; SE=3.9; P=0.9). Corresponding to milk intake, milk meal frequency and meal time evolved differently over time (P<0.03), with meal time increasing in CF pens and decreasing in NCF pens (wk 2, 48.5 vs. 87.1 min meal time/d, SE=15.9, and wk 4-6, 50.8 vs. 38.7 min meal time/d, SE=4.6; CF vs. NCF). Unsynchronized meal time was also subject to a treatment by week interaction (P=0.02), increasing in CF pens and decreasing in NCF pens. These results indicate that moderate competition for teat access does not negatively affect performance, as calves adapt by increasing time spent feeding alone.
Potential application of changes in activity levels for early identification of pregnancy toxemia in transition dairy goats

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The transition from one lactation to the next is a critical period for determining the health and future productivity of dairy goats. The tendency for goats to have multiple fetuses increases the likelihood of negative energy balance in late gestation, which may result in pregnancy toxemia. This condition is typically identified only when clinical symptoms (e.g., lack of appetite, lethargy, teeth grinding) are present, and prognosis is poor. Dairy cattle literature suggests that behavioural changes can be useful early indicators of compromised health status. Therefore, the aim of this on-going work is to illustrate the potential application of monitoring changes in dairy goat activity levels for identifying pregnancy toxemia prior to the occurrence of clinical symptoms. Currently, 10 commercial Ontario farms are being studied, with 25 – 63 does per farm having been selected based on number of days until kidding. Data loggers are being attached to the rear leg of each doe, allowing for the monitoring of activity levels. Data collection begins approximately 2 weeks before kidding and ends 1 week after kidding. During this time period, blood samples (1 sample before kidding, and 1 sample after kidding) are being collected to determine ketone levels using a Precision Xtra meter. Producers are keeping treatment and mortality records. The project is currently 70% complete. Initial analysis of data logger data compared the activity levels of 10 healthy goats to that of 10 goats which went on to present ketonemia (β-Hydroxybutyrate >1.7 mmol/l), as determined by a Precision Xtra meter. Daily lying time and lying bouts were averaged for the 12 days prior to diagnosis of ketonemia. Healthy goats had fewer long (> 90 min) lying bouts (mean ± SED; 1.8 vs. 2.8 ± 0.4 bouts/d; \( P = 0.02 \)) and tended to have shorter average lying time (mean ± SED; 13.9 vs. 16.6 ± 1.3 h/d; \( P = 0.06 \)). Further analysis will aim to identify patterns indicative of when changes in activity levels occur in relation to the presence of ketonemia and clinical symptoms.
SESSION IV

The behavior of cattle unloaded for feed, water and rest during long-distance transportation in Canada

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Roughly half of the beef cattle finished in Ontario come into the province from western Canada. Transport regulations indicate that cattle only need to be rested en route (5 h minimum) if their journey is expected to exceed 52 h. There is public concern that this limit is outdated and may compromise cattle welfare. As a first step to evaluating how well cattle are coping with the stress of transit, the objective of our study was to examine the behavior of cattle being rested during long-distance transport. A total of 87 pens of cattle, from 53 different trucks, were observed at a commercial rest stop facility. Truck drivers were surveyed about their loads. During unloading and loading the number of times animals slipped or fell was recorded. The number of cattle eating, drinking and lying were recorded every 5 min for the first 5 h after unloading, using instantaneous sampling. A mixed linear regression model was used for analysis with load as a random effect. The probability of an animal being observed performing a given behavior was the outcome. The odds of an animal observed to be feeding increased as time in transit increased (P<0.01). A significant interaction was identified: heifers had a decreased probability of feeding as distance traveled increased, while steers remained constant (P=0.02). The odds of drinking increased as outside temperature at unloading increased (P=0.02) and cattle from loads with 4 slips during unloading had greater odds of drinking than those with less (P=0.03). There was a quadratic relationship between distance traveled and drinking behavior where cattle had increasing odds of being observed drinking as distance increased up to a maximum of 1633km traveled. At a greater distance than 1633km, odds of drinking decreased (P<0.01). Heifers had higher odds of lying than steers (P<0.01) and odds of lying decreased with increasing time in transit (P<0.01). Overall, these results suggest heifers may be more affected by the stress of transit, and that as journey duration increases cattle are more likely to eat and less likely to lie down.
Correlations and relevance of methods used to assess temperament of beef cattle

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Studies show that cattle with more reactive temperaments have less desirable production attributes (e.g., decreased average daily gain) and meat quality (e.g., lower tenderness). A reactive temperament may be undesirable in its own right (e.g., risk to handler safety; welfare concern if associated with negative affective states). Our study objectives were to test 3 methods of assessing beef cattle temperament and to relate those outcomes to production attributes obtained using ultrasound: marbling, backfat thickness and muscle depth. Steers and heifers (n=582) from 3 commercial feedlots in southwestern Ontario, and steers (n=126) from Elora Beef Research Station (Elora, Ontario) were assessed at (±SD) 453.73 ± 100.37 kg. Each animal was put through a handling chute to assessment temperament and perform ultrasound. A chute temperament score from 1 (calm) to 5 (extremely wild) was assigned. Chute exit speed was calculated using an electronic timing system placed 2m past the headgate. Each animals’ head was video recorded during restraint, and 2 still images per animal were analysed for exposed eye white percentage (EW). Pearson Correlation Coefficients between temperament assessment techniques, adjusting for scan date as a class effect, in Proc GLM in SAS were: chute score and exit speed (r=0.16584; p<0.0001); chute score and EW (r=0.15498; p<0.005); and there was no statistically significant relationship between exit speed and EW. The low correlation among temperament methods suggests these assessment techniques may be measuring different dimensions of temperament. A GLM procedure was used to model each ultrasound parameter from the commercial feedlot cattle (n=582), including scan date as a class effect and weight as a covariate. Weight was significant (p<0.0001) in each model. As chute score increased one unit, backfat decreased 0.187 mm (p=0.082); as chute score increased, depth of the loin muscle increased 0.844 (mm) (p<0.05); as EW increased (%), backfat decreased 0.036 (mm) (p=0.052); and as EW increased (%), marbling within the loin muscle decreased 0.008 (score) (p=0.072). Results suggest that the temperament assessment techniques employed had some significant relationships with ultrasound measures. Different temperament assessment techniques may be necessary to understand the various dimensions of temperament when investigating production parameters of interest.
The Perception of Roping Calf Welfare Before, During and After “The Show”

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Tie down roping, or calf roping, is arguably the most controversial event in the sport of rodeo. Loosely based on 19th-century cattle men’s traditions of roping wild/free-range calves for veterinary attention and branding, today the event requires a mounted rider to chase down and rope a running calf, dismount, pick up and drop the calf, tie three of its four legs, then signal his finish to the judge. Various welfare problems may result since roping is a fast-paced, timed sport in which the hastiest/strongest ropers win the most money, thus are essentially rewarded for rough handling of calves. Possible welfare issues may include: while being roped, bruising or internal organ damage, sprains and broken bones, fear/stress from separation from other calves and being chased, and “behind the chutes” (backstage), stress produced by periods without food, water or shelter. This study will: 1. Make a baseline assessment of the management and welfare of roping calves at rodeo events; 2. Use that assessment to verify how various rodeo participants view and agree/disagree about calves’ needs, and the politics of tie-down roping among rodeo people. Agreements and contrasts between calf welfare issues and rodeo participants’ perception of calf “well-being” will be analyzed to explain why calf roping persists in rodeo although some participants acknowledge that it is problematic. Methods: 1. The investigator (a rodeo competitor and MSc student) will review video footage of twenty-five calf roping events to identify common welfare issues at rodeos, especially those causing stress, fear and physical injury. This basic assessment will be supplemented with on-site observations of calf housing, handling and roping at five Southern Ontario rodeos. 2. The investigator will interview up to 75 rodeo participants either in person or by online survey. Respondents will be asked to discuss their moral beliefs regarding animal use, technical knowledge of roping, and understanding of roping calves’ “well-being” and needs. They will respond anonymously but be identified according to gender, age and role in rodeo.
Keel Fracture Assessment of Laying Hens by Palpation: Inter-Observer Reliability and Accuracy

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Keel fractures are a welfare issue in laying hens; however, the reliability and accuracy of detecting these fractures in live hens by palpation has not been validated. A valid, rapid, and practical test for keel fracture detection would be a valuable addition to a welfare auditing system. The aim of this study was to validate a palpation technique to detect keel bone fractures in live laying hens. We hypothesized that eight assessors with varying amounts of laying hen experience would determine a similar prevalence of keel fractures in a flock of laying hens, and that the agreement would improve as the assessors gained experience with the technique. One hundred 68-week old ISA Brown hens from a commercial free run laying barn were palpated using a modification of a technique described by Wilkens and others in 2004, in which a thumb and two fingers were used to gently palpate the lateral aspects of the keel along the entire length of the bone, concentrating on the distal inch of the bone. A hen was deemed positive for a keel fracture if a bony exostosis, which is indicative of fracture repair, was detected. Thus, only healed fractures were detected. After each assessor evaluated the 100 birds, the hens were euthanized and dissected by an experienced poultry veterinarian. Visual examination determined the true fracture status of each hen, and the results of the assessors were compared to the true status.

Dissection of the examined hens demonstrated a true prevalence of keel fractures of 62%. The eight assessors evaluation through palpation gave prevalence rates ranging from 54 to 60%, with an average accuracy of 91.7%. Positive predictive value (PPV) averaged 72.6% and negative predictive value (NPV) averaged 68.8%. Sub-populations of the group of 100 hens were evaluated separately, showing that accuracy increased from 73.3% for hens 1-10, 84.8% for hens 1-50, to 99.5% for hens 51-100. PPV improved from 66.1% to 72.4% to 72.9%, while NPV decreased from 83.3% to 75.7% to 64.8% in the same groups.

Kappa was determined for the hens to evaluate the agreement between assessors beyond chance. Moderate kappa values were obtained at 43.7% overall. Agreement improved from 41.4% for hens 1-50 to 47.4% for hens 51-100. A high kappa value for a binomial measurement is difficult to achieve because of the high expected agreement, although the Kappa is moderate, this level, in conjunction with the high accuracy, demonstrates that palpation of keel bones can be used to accurately and consistently detect keel bone fractures in live laying hens. This technique could be a valuable addition to welfare audits or other evaluations of laying hen welfare.
Assessing the behaviour and welfare of broiler breeder pullets reared on different feeding schedules

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In today’s poultry industry, broiler breeders are selected for extremely fast growth rates, which are accompanied by large appetites. Because feeding them to satiety leads to health problems and reproductive challenges, broiler breeders are feed restricted to maintain their health and performance. However, these severe feed restriction practices also lead to chronic hunger, an important animal welfare issue. In North America, feed restriction is often managed through skip-a-day (SKIP) feeding regimens, where birds receive twice their daily allocation every other day because of the purported success of these regimens in improving flock uniformity. However, SKIP feeding regimens are banned in some European countries because of the perceived negative welfare implications. It is unknown how broiler breeders adapt behaviourally during the transition from daily to SKIP feeding regimes. Our objective is to compare the behaviour of broiler breeder hens fed on daily, SKIP, or less predictable ‘5/2’ (5 days on feed, 2 days off feed each week) feeding regimes. It is hypothesized that daily fed birds will display fewer instances of behaviours indicative of hunger compared to the other feeding regimes during the transition period from ad libitum to restriction feeding. However, we anticipate that hunger-related behaviours will decrease as the SKIP-fed birds acclimate to their feeding schedules over time. In this project, 75 Ross 708 broiler breeder pullets will be penned in groups of 5 from 1 day until 12 weeks of age. For the first week of life, birds will be fed ad libitum. During week 2, all birds will be fed a restricted amount once daily. Beginning at 3 weeks of age, pullets will be fed the same restricted amount once daily. Before, during and after feeding bouts three times per week, every other week. Feeding behaviour, aggression and behavioural indicators of hunger will be quantified. Feeding motivation will be tested using compensatory feed intake tests at 6 and 12 weeks of age. The results of this project will lead to a better understanding of feed restriction methodologies that can maintain high levels of productivity while improving welfare. This will allow for evidence-based recommendations on feed management practices for broiler breeder pullets.
Does it seem crowded to you? Nesting behaviour and nest box use in large furnished cages

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Furnished cages are designed to promote behaviour considered important by laying hens, in particular nesting. Few researchers have studied competition for nest boxes or the extent to which nest boxes actually support nesting behaviour in large furnished cages. As North America moves from conventional to furnished cages, hens may be housed at higher densities, increasing competition for nesting space. The objective was to determine the effect of density (520 vs. 750 cm\textsuperscript{2} floor space; 70 vs. 100 cm\textsuperscript{2} of nest space per bird, respectively) and cage size (small 20880 cm\textsuperscript{2}, large 41296 cm\textsuperscript{2}) on the nesting behaviour of hens in furnished cages. There were 6 replicates per cage size/density combination (group sizes of 28, 40, 55, 80). The nest area was fitted with plastic curtains and plastic mesh floors; the scratch area had a smooth plastic floor and was located on the opposite cage wall. Location of each egg laid within the cage (nest, scratch or perch) was recorded from 20-71 weeks. Scan samples of eggs on the egg belt every 15-minutes estimated the mean time of oviposition (weeks 54-55). Displacements, aggressive pecks, threats, and fights were measured at 69 weeks using scan sampling at 4 periods in the morning with 5 scans/period. Nest box use was higher in small cages (91.5\%\pm 0.22\%) than large (77.1\%\pm 0.5\%; p<0.0001), regardless of density (p=0.297). The average peak time of oviposition was from 0800 to 0845 (lights on 0500). There were more pecks (p=0.0001) and threats (p=0.0028) per bird in small cages than in large with no effect of density (p=0.3954, p=0.2057). The highest frequencies of pecks and threats occurred between 0800 and 0830, coinciding with the peak oviposition time, which may indicate competition for nest space. Nesting was affected by cage size but not density; small cages had more threats and pecks per bird and greater nest box use. Either cage or group size may be a factor influencing increased competition for nest space where the birds in the small cages appear to be less tolerant than the birds in larger cages in finding a desirable nesting location.
Foraging and dustbathing of laying hens housed in large furnished cages is affected by cage size and stocking density

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Furnished cages are intended to improve hen welfare by increasing opportunities for behaviours such as foraging (FO) and dustbathing (DB). There are different designs and sizes of furnished cage, many including a scratch mat onto which feed in delivered by an auger to serve as ‘litter’ substrate. However, little is known about their effectiveness for supporting behaviour. We compared FO and DB by hens in furnished cages with smooth plastic scratch mats. We used a factorial design with cages of 2 sizes (23,300 cm$^2$ and 47,500 cm$^2$) and densities (830 cm$^2$/hen and 580 cm$^2$/hen), resulting in group sizes of 28, 40, 55 and 80, with 6 replicates each (1218 hens). The scratch mat size was constant across treatments (2500 cm$^2$). The percentages of hens FO and DB in 6 locations within the cage were recorded from scan samples made during 1-hour observations, 4 times/day for 8 days. The difference in the percentages of hens FO and DB before and after chain feeder and/or auger activation was also assessed. Effects of cage size and density were analyzed by factorial ANOVA; paired t-tests were used to test effects of feeder and scratch auger activation; location preferences were evaluated with Chi$^2$ goodness of fit analyses. Hens FO more in small vs. large cages (30.2±.8 vs. 26.7±.9%; P=0.0065) and in low vs. high density cages (29.8±.9 vs. 27.1±.8%; P=0.0047). Feeder activation significantly increased FO for all treatments (P=0.0043). Despite a high use of the scratch mat (P<0.001), hens FO most in the area between perches and feeder (P<0.001). DB did not differ between treatments (Small=2.8±.2; Large=2.6±.2%; P=0.3475; Low=2.6±.2; High=2.8±.2%; P=0.3780). Feeder activation increased DB (P=0.0010) but auger activation did not (P=0.5860). Although scratch mats were used more than expected (P<0.001), hens preferred to DB in between the scratch and the feeder (P<0.001). In conclusion, the plastic smooth mat appears to support FO and DB because it is being used more than by random expectation. High stocking densities and large group sizes decreased the overall, and scratch mat specific, performance of FO and DB indicating that space allowance on the mat may be limiting.
Effect of water sprinkling during rearing on growth, environment and behavior of leghorn pullets

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Leghorn pullets are reared for commercial non-cage systems on litter where air quality can be poor. Improving air quality is an important consideration to advance welfare and reduce occupational health and safety concerns. Application of course droplet sprinkler technology represents a novel dust control method. From d 0 to d 112, 11,200 ISA brown leghorn pullets, housed under commercial litter-floor conditions, were evaluated for effects of repeated sprinkling intervals on growth, environmental ammonia [NH\textsubscript{3}], and fearfulness. Four pens of 1,400 birds were subjected to regular coarse droplet sprinkling (SP) and four identical pens were used as controls (NS). Floor space allocated at 0.167 m\textsuperscript{2} (1.8 ft\textsuperscript{2}) per bird. Sprinkling commenced at d 21, repeating for 20 s every 20 minutes during the light period. The system emits 0.237 L of water over an area 152.4 m\textsuperscript{2} in 20 s. Video recordings were used during 3 Novel Object Tests (NOT) and 2 auditory Startle Tests (ST) in 3 wk intervals, beginning at d 63. [NH\textsubscript{3}] concentrations were recorded daily, and growth and uniformity data were determined daily using an automated bird weighing system. There was a significant effect of SP on growth (P=0.011) and environmental ammonia [NH\textsubscript{3}] (P<0.0001). SP increased overall bodyweight 731.3 g ± 1.63 g compared to NS at 725.3 g± 1.63 g (P=0.011). [NH\textsubscript{3}] increased with age (P<0.0001) and was also higher overall from d 21-112 for SP (3.42 ppm ± 0.78) vs. NS (2.02 ppm ± 0.78) (P<0.0001). Airborne dust was visibly reduced for sprinkled treatments. Birds exhibited a highly variable response to the NO both pre and post ST. Birds at d 63 took significantly longer (43.6 s) (P=0.029) to return to within 1.5 m of the NO than did birds at d 84 (35.3s). In this study, SP did not increase fearful behavior in leghorn pullets housed on litter, but did increase [NH\textsubscript{3}]. Ventilation management will be a key area for successful implementation of SP technology.
SESSION VII

Providing ‘get-away bunks’ and other enrichments to primiparous adult female mink improves their reproductive productivity

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Farmed mink typically live in barren cages providing few opportunities for natural behaviour, and during the nursing phase, dams have nowhere to rest away from their demanding offspring (“kits”) once kits become mobile. We investigated whether simple, cheap enrichments – “get-away bunks” (wire mesh semi-cylinders attached to cage ceilings) and small manipulable objects (balls and hanging items to chew) – could improve welfare and productivity in nursing dams. We focused on primiparous mink (n=318), living on three commercial farms. We evaluated whether providing balls and items to chew (“objects”), along with bunks in a cross-factorial design, could decrease stereotypic behaviour, glucocorticoid output (assessed via faecal cortisol metabolites: FCM), kit losses, and dam mortality (typically caused by “nursing sickness”). Objects were provided c. 10 months earlier (since the previous July, when subjects were juveniles) for approximately 60% of the object-enriched dams, and c. 5 months earlier (since January, when subjects were adults) for the remaining 40%. Bunks significantly reduced kit mortality, kits lost/litter being reduced by c. 0.3 infants. They also tended to reduce dam stereotypy levels (by about half); but had no significant effects on FCM or dam mortality. Bunk-use also co-varied with litter size, being greatest in dams with bigger litters. This adds to existing evidence that dams use such structures more, the more demanding are their litters. Objects tended to increase weaning litter size, an effect caused by dams provided with these objects for 5 months weaning 0.9 more kits per litter than controls (post hoc Tukey’s T = 2.486, P = 0.035). However, objects had no significant effects on FCM or dam mortality. Analyses also showed that effects of bunks and objects did not significantly interact for any variable, effects being additive. Females provided with both enrichments on average weaned more than an extra kit per litter than control animals (so increasing the number of kits weaned by c. 20%). In conclusion, bunks and manipulable objects seemed ineffective against nursing sickness, the leading cause of female mink mortality during lactation, and had no effect on FCM. However, both enrichments improved our subjects’ reproductive productivity, and bunks tended to reduce stereotypy, both suggesting improved welfare.
Mink play it cool: juvenile rough-and-tumble play reduces fearfulness in adulthood for *Neovison vison*

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Play is ubiquitous across mammals, yet its functions are poorly understood. One hypothesis is that play, by repeatedly exposing juveniles to surprising, temporary losses of control – awkward falls, disorientation, or being pounced on by playmates – prepares them to cope with unexpected, potentially dangerous situations. This frequent exposure to simulated danger, and resultant improved coping, may also reduce fearfulness. We investigated this in a longitudinal study of farmed American mink, which show frequent rough-and-tumble play (R&T). Using 2609 juveniles, we first tested nine modifications to housing or social groupings, identifying three that caused 22-40% higher R&T than in mixed-sex, same-strain control pairs (n≥31 cages per treatment, two-tailed t-tests, t≥2.56, p≤0.043): male-male pairs; mixed-strain, mixed-sex pairs; and trios in extra-large cages; observed at age 11-16 weeks. Extra-large cages also increased R&T above controls at 6.5-8.5 weeks, before litters were divided. Then, at age 6 months, subsets from each treatment were 'glove tested', a fearfulness assay in which mink are rated as 'confident' if they approach the experimenter's leather handling glove, and 'fearful' if they withdraw from it. As predicted, compared to control males, confident responses were more likely in male-male (n=43 vs. 45 control cages, mixed-effects repeated-measures logistic regression, odds ratio (OR)=4.03, p=0.002) and mixed-strain pairs (n=38 vs. 41 controls, OR=8.79, p=0.015), though there was no significant effect in mixed-strain females. Glove tests could not be adequately run on animals in extra-large cages, so we compared control animals to those who had previously lived in these cages at 6.5-8.5 weeks, before transfer to standard cages (c. 10 weeks). Here, formerly extra-large-caged females were less fearful than controls (n=29 vs. 34 controls, OR=0.24, z=-2.14, p=0.032), and tended to be more confident (OR=2.05, z=1.92, p=0.054). Overall, treatments that increased R&T in these mink decreased fearful behaviour months later. High levels of juvenile play may thus not only promote positive emotions in young animals, but also improve welfare in adulthood. We next plan to analyze whether these treatments have similar effects on corticosteroid reactivity to an aversive event (confinement in a carrying cage), and whether these effects translate into lower levels of chronic stress.
Co-Housing Rodents with Different Coat Colours as a Simple, Non-Invasive Means of Individual Identification: Validating Mixed-Strain Housing for female C57BL/6 and DBA/2 Mice

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Standard practice typically requires the marking of group-housed laboratory mice so that they can be individually identified. However, many of the common methods (e.g. microchipping; tail marking; ear notching) compromise welfare, and may also cause spurious results. Mixing strains of different colour within a cage would allow them to be readily visually identifiable, negating the need for marking. Here we test the impact that mixed strain housing has on the phenotypes of female C57BL/6 (black) and DBA/2 (brown) mice (n=56). We also assessed the variability in the data obtained from them (important for statistical power and thence required sample sizes). Mice were housed in either mixed strain or single strain pairs for 19 weeks. Their phenotypes were assessed using 23 different behavioural, morphological, haematological, and physiological measures widely used in research and/or important for assessing mouse welfare. All variables were analysed with general linear models that included: cage as a random effect, strain (C57BL/6 or DBA/2), cage type (single or mixed), and the strain*cage type interaction. No effects of mixed strain housing could be found on the phenotypes of either strain; thus differences and similarities between the two strains were almost all as expected from previously published studies; there was no evidence that mixed strain housing compromised welfare; and mixed strain housing did not increase the variation in data obtained: the standard errors for all variables were essentially identical between the two housing conditions (F₁,21=2.88, p=0.104). Only two main effects of cage type were detected: mixed strain pairs were less stereotypic (F₁,40=3.83, p=0.057), and had smaller red blood cell distribution widths (F₁,34=8.77, p=0.006), a measure suggesting better health (findings that now need replicating in case they were Type 1 errors resulting from our multiplicity of tests). Female DBA/2 and C57BL/6 mice can thus be housed in mixed strain pairs for identification purposes, with no apparent negative effects on their welfare or the data they generate. This also suggests that there is considerable value in exploring other combinations of strains.
Environmental Enrichment Reduces Signs of Boredom in Caged Mink

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^ CCSAW funded research

Animals in impoverished cages are often said to be ‘bored’. More seriously, they may be labelled ‘apathetic’ or ‘depressed’, particularly when profoundly inactive. However, these terms are often subjective: rarely operationally defined or validated. As a negative state caused by under-stimulation, boredom should empirically increase interest in stimuli of all kinds. Apathy (lack of interest) should be manifest as a measurable decreased interest in all stimuli, while anhedonia (loss of pleasure, a depressive symptom) should specifically decrease interest in normally rewarding stimuli. We tested the hypotheses that mink, a model carnivore, experience more boredom, apathy, or anhedonia in non-enriched (NE) cages than in complex, enriched (E) cages. We exposed 29 subjects (13 E, 16 NE) to ten stimuli categorized a priori as aversive (e.g. air puffs), rewarding (e.g. food treats; stimuli evoking chasing) or ambiguous/neutral (e.g. candles, plastic bottles). Interest was assessed via minks’ latencies to contact, contact durations, and durations oriented to stimuli. NE mink contacted all stimuli faster (P = 0.003) than E mink, and spent longer oriented to/in contact with them, albeit only significantly so for ambiguous ones (treatment*type P<0.013). With stimulus category removed from statistical models, interest in all stimuli was consistently higher among NE mink (P<0.0001 for all measures). They also consumed more food rewards (P = 0.037). Finally, we investigated whether lying down while awake and stereotypic behaviour (both increased by NE housing) predicted these responses. Lying awake positively co-varied with certain measures of increased exploration, while stereotypic behaviours did not. Overall, NE mink thus showed no evidence of apathy or depression, the two states most concerning for welfare, but displayed the heightened investigation of diverse stimuli consistent with boredom. This state was potentially indicated by spending much time lying still but awake (a result now needing replication). Boredom can thus be operationalized and assessed empirically in non-human animals. It can also be reduced by raising animals with environmental enrichment. In the future, we will investigate whether the reduced boredom of E animals depends on their enrichments being regularly changed, and how rapidly boredom-like states are reversed by adding enrichments to NE cages.
Infrared thermography to evaluate lameness in pregnant sows

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Early detection of lameness in reproductive sows is important to reduce economic losses and improve animal welfare. Mild-to-moderate lameness is difficult to diagnose in sows. The objective of this study was to evaluate infrared thermography (IRT) as a method of detecting lameness in sows under farm conditions. A total of 297 sows were visually assessed using the following gait scoring system: 0) normal, 1) slightly lame, and 2) obviously lame. Obviously-lame sows were matched with score 0 and 1 sows. Sixty-five sows’ rear limbs were examined by IRT. Sows were washed, dried and allowed to acclimatize to ambient environmental conditions. Images including the tarsus, upper and lower metatarsus and phalanges were obtained using a FLIR T300 camera. FLIR software was used to analyze temperatures. The associations between mean temperatures of the affected legs of different sows, temperatures of the affected and sound leg within a sow, and temperatures of the anatomical areas within the affected leg were analyzed using the Kruskal-Wallis test. IRT temperatures of the low metatarsi and the phalanges of the affected leg differed between score 0 and scores 1 and 2 (P<0.05). The temperature between the phalanges and other anatomical areas, as well as the lower metatarsi and tarsi differed between score 0 and scores 1 and 2 (P<0.05). The temperature difference between the affected and sound leg were not significant. The association of mean IRT temperatures of the affected leg with specific sow characteristics was also evaluated. Temperatures of sows with normal or straight limbs were lower than those with their hind limbs positioned too far forward (P<0.05). Temperatures of the upper and lower metatarsi were lower in parity >2 compared to parity 0 sows (P<0.05). Obese sows had lower temperatures than normal/thin sows (P<0.5). Phalanges and lower metatarsi were more affected by lameness. The application of IRT on pig farms may face unique sow anatomical and behavioural challenges. Additional studies are needed to confirm our results.
The Importance of Communication in Maintaining Containment Within an ABSL-2 Large Animal Facility During an Emergency Heating Ventilation and Air Conditioning Shutdown

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Containment is of paramount importance when working with infectious pathogens to protect the health and welfare of animals and personnel. An emergency steam interruption, with an outdoor temperature of two degrees Celsius, triggered an eight hour heating, ventilation and air conditioning system shutdown. Normally to minimize the risk of pathogen escape, entry into primary or secondary enclosures are arrested once air pressure differential between airlocks can no longer be maintained. Additionally, most research protocols in the ABSL-2 facility are time sensitive and require additional animal health monitoring and supportive care. The ABSL-2 facility of interest was operating a clean and dirty corridor system with 28 rooms equipped with anterooms. It was housing 350 animals infected with one of nine different pathogens. The Quality Assurance technician immediately set up an email communication network between facility staff, facilities management, research teams, physical resource repair staff and veterinary services. The facility technicians and facility veterinarian devised and implemented a plan to meet the needs of the research teams and adequately monitor and treat infected animals while maintaining containment within the facility. All rooms had exterior observation windows that were utilized for clinical observations of illness and heat stress. Animal rooms necessitating entry such as calves requiring bottle feeding and chickens requiring clinical illness scoring, were accessed from the dirty corridor with disposable personal protective equipment donned at the room threshold. The facility staff and research team members were required to remain in the dirty corridor for the duration of the procedures, thereby preventing contamination of the clean corridor and communication between the clean and dirty corridors was accomplished by telephone. Heat accumulation within the rooms provided further challenges for some agricultural species. The frequent communication between all stakeholders allowed for the development of a strategy to initialize the HVAC every three hours thus accommodating the divergent homeostatic requirements of agricultural animals and that of rodents. The rapid activation of a communication network facilitated the prompt and ongoing transfer of information between all stakeholders to prevent unintentional breaches of containment, ensure project-specific needs were met, and maintain the highest level of animal welfare.
Injurious pecking in domestic turkeys: development, causes, and potential solutions

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Injurious pecking is a serious concern for commercial turkey production and welfare. In turkeys, this damaging social behaviour can appear in three forms: head pecking, severe feather pecking, and cannibalism. Head pecking is a form of aggression that typically follows a social disturbance, and is often used to retain dominance. This type of pecking is usually directed at the head, neck and/or snood of another bird. In contrast, feather pecking involves the repeated pecking or plucking of another bird’s plumage, usually targeting feathers on the back, tail, base of the tail, and the wings. Feather pecking is considered severe when forceful pecking results in the removal and consumption of pulled feathers. Cannibalism in turkeys refers to the repeated pecking of the exposed skin of another bird, leading to haemorrhaging, and the removal of blood and tissue, which may then be consumed by the pecking bird.

Injurious pecking is thought to represent re-directed ground foraging, but the development and causes are poorly understood with little supporting literature. In the initial development of the behaviour, early lighting regimes and social facilitation may play contributing roles. Other factors such as the availability of foraging material, lighting, diet composition, stocking densities, and group dynamics may also affect levels of injurious pecking. Incidences of head pecking primarily result from the social organization or environmental disturbance. In contrast, severe feather pecking and cannibalism appear to be multi-factorial products of genetics, environment, and nutrition. Given that commercial turkeys are group-housed, alternative breeding techniques, like group selection based on social effects, might successfully reduce mortalities from pecking without detracting selection pressure from economic traits. However, the multi-factorial nature of injurious pecking suggests genetic improvements will be limited without environmental and nutritional adjustments to support the behavioural needs of domestic turkeys. To develop practical solutions, further research is required to clearly understand the development and maintenance of injurious pecking in turkeys.
Inter-observer reliability of body condition scoring in dairy cattle for on-farm animal welfare assessment

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On-farm animal welfare assessment programs are becoming standard practice in many jurisdictions. A good animal welfare assessment program should include all types of measures, including animal-based measures. Body condition scoring (BCS) is an animal-based measure that estimates body fat composition, and is often included in on-farm animal welfare assessment programs. A healthy BCS (3-3.5) for dairy cattle is often related to superior farm profitability. The objective of this study was to investigate the inter-observer reliability of scoring dairy cattle, and to determine if BCS is reliable enough to be included in an on-farm animal welfare assessment program. Students participated in two one-hour BCS in-class practice sessions using photographs prior to the trip to the sale assessment. In February 2013, 11 graduate students, as well as a highly trained expert with OMAFRA, body condition scored 50 cull dairy cows on a 1 to 5 scale, with 0.5 increments, at a livestock auction. Cull dairy cows were observed as they walked through the auction ring, and observers were given 20-30 seconds to score each animal. A paired t-test (R 2.15.1) indicated that there was no significant difference (P=0.4048) between the expert’s assessment of body condition and the average of the 11 graduate students (t= -0.8403, df= 49). Fleiss’ kappa of 0.154 (n= 10, z= 18.6, P<0.0001) was determined for the graduate students at the sale barn, which indicated slight agreement between individuals. Overall, students performed similar to the OMAFRA expert, such that the student average score was comparable and agreeable. Yet, inter-observer reliability between the students was low, as per Fleiss’ kappa results. Results suggest that BCS can be a reliable animal-based measure, and that BCS can be included in on-farm animal welfare assessment programs. However, the results also indicate that more training is necessary to achieve an acceptable level of inter-observer reliability.
Measurement of Feeding Motivation in Limit-Fed Dairy Heifers

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The objective of this experiment was to determine whether, and how hard, limit-fed heifers were motivated to work, both immediately post-feeding and following a short-term period of feed deprivation, for parcels of a low-nutritive feedstuff (i.e. oat straw). Ten Holstein heifers (291.6 ± 39.2 d of age, weighing 324.2 ± 61.2 kg) were exposed to each of 2 dietary treatments, in a random order, over two successive 26-d treatment periods (14-d adaptation and a 12-d data collection) using a crossover design. The treatments were: 1) a high-forage control TMR (60% DM; C) and 2) a limit-fed, low-forage TMR (50% DM; LF) at 2.05% BW. During the data collection period, heifers were fed at 1100 h and then tested for feeding motivation using a push-door apparatus 3 h later (1400 h) and 21 h later (0800 h). Intakes and feeding behavior were recorded during the last 7 d of each period. Rumination was recorded during 3 d of each period. The amount of weight pushed as a % of BW and latency to access the push-door were recorded 3 times for each heifer at each time point on each treatment. Data were analyzed in a general linear mixed model. DMI was greater on the C treatment (12.9 vs. 7.2 kg/d; SE=0.6; \( P<0.001 \)). Heifers on the C treatment spent more time feeding (209.3 vs. 82.4 min/d; SE=6.2; \( P<0.001 \)) and ruminating (452.2 vs. 318.3 min/d; SE=15.8; \( P<0.001 \)), as well as consumed their feed slower across the day (0.06 vs. 0.09 kg/min; SE=0.004; \( P=0.001 \)) than heifers on the LF treatment. On the LF treatment heifers tended to push more weight at 3 h (4.5 vs. 1.9% of BW; SE=1.0; \( P=0.09 \)) and did push more weight at 21 h (9.3 vs. 2.8% of BW; SE=1.0; \( P<0.001 \)) after feed delivery. Latency to access the door was similar between treatments at 3 h (96.7 ± 45.0 sec) and 21 h (113.8 ± 45.0 sec) after feed delivery. In summary, heifers will work harder, spend less time feeding and ruminating, and consume feed faster when provided a low-forage, limit-fed ration compared to a high-forage, ad-libitum-fed ration, suggesting that limit-fed animals are experiencing feelings of hunger and may not be physically or behaviorally satisfied.
Do Limit-Fed Heifers Prefer Supplementary Long or Short Straw?

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The objective of this study was to determine whether limit-fed heifers will choose to consume long, rather than short, particles of a low-nutritive feedstuff to ameliorate rumen function and meet foraging needs. Ten Holstein heifers (261.6 ± 39.2 d of age, weighing 303.3 ± 56.2 kg) were exposed to each of 2 dietary treatments, in a random order, over two successive 7-d treatment periods (4-d adaptation period and a 3-d data collection period) using a crossover design. The treatments were: 1) provision of long particle oat straw (85% of particles >8 mm; LS) and 2) provision of short particle oat straw (45% of particles >8 mm; SS). Both treatments were offered following consumption of a limit-fed, nutrient-dense TMR fed at 2.05 % of BW. Following these 7-d periods of exposure to each type of straw (long and short), heifers were given access to both types during an additional 2-d preference period. Individual intakes, feeding and lying behavior were recorded during the last 3 d of each treatment period. Intake and behavior data were analyzed in a general linear mixed model. Preference ratio (LS consumed/total straw intake) was tested for a difference from 0.5 using a t-test. Dry matter intake of both the TMR (6.3 ± 0.4 kg/d) and straw (0.36 ± 0.06 kg/d) was similar between treatments. Heifers fed LS spent more time feeding (197.7 vs. 175.2 min/d; SE=5.7; P=0.01) than heifers fed SS due to the increase in time required to consume long particles in the LS (59.8 vs. 34.2 min/d; SE=5.0; P=0.007). Daily lying time (974.7 ± 11.4 min/d) and time spent standing without eating (278.9 ± 10.4 min/d) was similar between treatments. The preference period showed a strong preference ratio for LS rather than SS (preference ratio=0.83; SE=0.06; P<0.001), with heifers consuming 0.43 ± 0.2 kg/d of LS and 0.07 ± 0.1 kg/d of SS. In conclusion, heifers will consume similar amounts of supplementary long or short straw if provided to them alongside of a limit-fed TMR. Limit-fed heifers do, however, show a clear preference for LS when offered the choice, suggesting that they find LS to be more satisfactory for achieving rumen fill and/or meeting their behavioral foraging needs.
Body condition scores of Western and English discipline horses

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Obesity in horses is an escalating problem that is exacerbated by the public’s lack of perception. A body condition scoring (BCS) system is a process used to determine the amount of fat stored in the body. It can establish whether an animal is overweight, underweight or at a suitable condition for its physiological state and performance requirements. The Henneke BCS is the industry standard using a range of 1 [poor] to 9 [obese] with 4-5 being ideal for a working horse. Higher BCS have been linked to improved performance in reproduction and endurance racing, however, recent studies have shown obesity to be prevalent in mature horses. Due to selective conformational and performance preferences, Western discipline horses may tend to be kept at a higher BCS than English horses. To determine if there is a difference in BCS between disciplines, ten horses were evaluated by visual appraisal and tactile pressure using fingertips on six body areas where fat tends to accumulate in a predictable pattern. The five Western horses were all Quarter Horses (10.2±2 years) while the five English horses were a mix of Thoroughbred and Warmbloods (7.7±3 years). Each horse was regularly exercised 3-6 hours/week and fed an individualized diet prescribed by its owner. English horses averaged a BCS of 6.2, which differed significantly from the Western horses’ average of 7 (Student’s t-test; p<0.0001). Thus, Western horses appear to be flesher than English horses, however both disciplines maintain BCS above recommended values. Obesity in horses is a serious issue that requires more research to determine if the cause is due to overfeeding, conformation or genetics.
Effect of whip use on high and low speed index Quarter Horses while racing

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Quarter Horse racing is a high intensity sport requiring the horse to run short distances at a full gallop. Jockeys use tools such as strategy, stamina training, and the use of the whip to increase horse speed and performance in the race. The use of the whip in racing is an accepted form of urging the horse to run faster and thus finish better. The Ontario Racing Commission (ORC) governs Quarter Horse racing rules in Ontario, and stipulates that only humane riding crops may be used to urge a horse, and the horse must be allowed time to respond before using the crop again. The use of the whip during Quarter Horse racing has created controversy regarding its humane application and the effectiveness at increasing the horses’ speed. In Quarter Horse racing, horses are rated according to their speed index, which is calculated by adding or subtracting points according to their finishing time in relation to the average speed for a specific distance at a specific racetrack. This provides a uniform comparison of horses that are raced at different tracks in different conditions. Two horses with a low speed index (avg=56) and two horses with a high speed index (avg=86) were each observed in three different races and the number of whip hits was recorded. A Student’s T-Test determined that horses with a low speed index were hit more often than horses with a high speed index (9.2 hits versus 8.5 hits respectively; p<0.0003). There was no correlation between the number of times a horse was hit and its placing in the race (Spearman -0.19; p>0.55). Slower horses appear to be hit more often than faster horses, however the more the horse is hit does not affect its racing time.
Assessing the ability of the synthetic cat pheromone ‘Feliway’ to mitigate post-operative stress in tigers (*Panthera tigris*)

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Tigers are currently under threat in their range countries from poaching and habitat loss and all tiger subspecies are listed as endangered by the International Union for the Conservation of Nature. Zoos are playing an important role in tiger conservation by maintaining genetically diverse captive populations as a safety net against extinction. To effectively manage captive tiger populations it is often necessary to relocate animals from one zoo to another for breeding, which is stressful for the animal and may decrease breeding success. An alternative to relocation is to use assisted reproduction techniques like artificial insemination (AI). However, AI may still cause a stress response in tigers, as this procedure requires two prior hormone injections as well as a surgical plane of anesthesia for the insemination, which is performed by laparoscopy. The goal of our study was to test if the commercial domestic cat pheromone ‘Feliway’ reduced post-operative stress in tigers undergoing AI. A total of 7 tigers underwent the AI procedure as per AZA Species Survival Plan breeding recommendations. Feliway (25 mls/day) was administered to the post-operative recovery area on the day of AI and Day 2 and 5 following the procedure in four of the seven tigers. Fecal samples were collected for 3 weeks prior and for 3 weeks following the AI to monitor ovarian and adrenal hormone function in all tigers. Fecal corticosteroid metabolites during the week following the AI were reduced on average in tigers treated with Feliway, but the differences were not significant between the treated and control groups (162.38 ng/g vs. 253.65 ng/g; p=0.17). For future investigations, it would be beneficial to increase the sample size and obtain more consistent fecal sample collection to better assess the adrenal response to AI and the effect of Feliway.
Understanding Early Turkey Poulト Feeding Behaviour

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Approximately 12 million turkeys are reared for meat production in Canada annually. These birds are genetically selected for fast growth rates, but this may have had unintentional negative impacts on behaviour. In the wild, turkey poults learn to feed by mimicking the hen. In commercial environments, they are housed with same aged cohorts, without the opportunity to learn feeding behaviour from older conspecifics. As a result, many turkey poults experience poor starting performance for reasons that are not well-understood. Some poults have difficulty developing initial feeding behaviour which results in mortality rates of 1 to 5% within the first week of life. Post mortem examinations of these birds have shown that they have no feed in the digestive tract (referred to as ‘Starve-Outs’). Additionally, a small percentage of birds are compromised when they fall onto their backs or sides and cannot right themselves (referred to as ‘Flips’). Previous research has focused on reducing early mortality through stimulating feeding behaviour by colouring the diet, changing the feed form, attracting the birds with lights or sounds or using a trainer bird to help attract the poults to feed. While these methods attracted birds to the feeder, they did not have any effect on reducing mortality due to starve out. To better understand early feeding behaviour in turkey poults, we will study the development of exploratory and feeding behaviour through the first week of life, and explore the relationship between feeding behaviour and early mortality. The hypothesis of this project is that poults develop an established and repeatable feeding pattern over 48-72 hrs after hatching. We also hypothesize that pens of turkeys with longer latencies to initiate feeding behaviour will have higher mortality levels. In July, 24 pens of 40 female turkey poults will be transported from a commercial hatchery to a research facility. The latency to first feed and feeding behaviour through the first week of life will be observed. Body weights will be recorded at 1 and 7 d of age. Mortalities will be recorded as they occur, and post-mortem examinations will be performed to determine cause of death.
Attack intensity of pest flies and behavioural responses of pastured dairy cows

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Pest flies are a welfare concern in dairy cattle as they can cause pain, stress and disease. Economic losses due to pest flies are a major concern to producers and can include fly control methods, disease treatment, and reduced weight gain and milk production. The objective of the study was to evaluate the effectiveness of an organic repellent on reducing fly attack intensity and on fly avoidance behaviour, grazing, milk production and stress of dairy cows. Twenty lactating, Holstein dairy cows were randomly divided into 2 groups. Cows were on pasture 24 h/d except at morning and evening milking. During a 9-wk trial period, an essential oil organic fly repellent (2.5% lemongrass, 2.5% geranium, 95% sunflower oil) was manually applied to cows according to a switch-back design, in which groups 1 and 2 switched between treated and untreated each week. Once a week, trained observers performed direct observations for fly counts and 6 minutes of direct continuous observations of defensive behaviours (full tail flick, partial tail flick, skin twitch, head throw, leg stamp, lick side, bunching) on each cow. Each cow was fitted once per week with an IGER grazing halter and GPS to electronically record grazing, rumination and pasture travel for a 3-hour period. Milk weights were recorded and milk samples collected to measure cortisol. Cows treated with the fly repellent had significantly lower mean fly densities in comparison to untreated cows (213 ± 6.8 vs. 69 ± 3.1 flies/cow; P<0.0001) throughout the entire trial. Treated cows had lower (all P<0.0001) rates of tail flicks, skin twitches, head throws, leg stamps and bunching. In comparison to untreated cows, treated cows spent significantly more time grazing (119.1 ± 5.6 vs. 108.1 ± 3.3 min; P=0.002) and travelled smaller distances on pasture (0.79 ± 0.03 vs. 0.86 ± 0.05 km; P<0.001). There were no differences in milk yield or milk cortisol between treated and untreated cows. In summary, the treatment of cattle with an essential oil based fly repellent reduced pest fly attack intensity, cattle defensive behaviours and increased grazing time.