

10th Annual CCSAW Research Symposium – 2017

May 10th, 2017 9:00am – 5:00pm (registration at 8:30am)

ORAL PRESENTATIONS

Welcome

9:00 Dr. Malcolm Campbell, Vice-President (Research), University of Guelph

Session #1: Dairy Cattle (Chair: Dr. Anita Tucker, Population Medicine)

9:10 **Fresh cow illness detection using productivity and behavioural data in robotic milking herds**

Meagan T. M. King*, Stephen J. LeBlanc, Ed A. Pajor, Tom C. Wright, Trevor J. DeVries

9:25 **Impact of straw particle size and reticulorumen health on the feed sorting behaviour of early lactation dairy cows**

Rachael E. Coon*, Todd F. Duffield, Trevor J. DeVries

9:40 **Clinical trial of local anesthetic protocols for acute pain associated with caustic paste disbudding in dairy calves**

Charlotte B. Winder*, Stephen J. LeBlanc, Derek B. Haley, Kerry D. Lissemore, M. Ann Godkin, Todd F. Duffield

9:55 **Exploring the effect of automated milk feeding stall design on dairy calf behavior**

Tanya R. Wilson*, Stephen J. LeBlanc, Trevor J. DeVries, Derek B. Haley

Poster Introductions (Chair: Dr. Derek Haley, Population Medicine)

10:10 1-min intros to posters

10:35 **POSTER SESSION & COFFEE BREAK – 60 min**

Plenary Lecture

11:35 **Moving animal welfare forward: Drivers of change and the role of research**

Dr. Ed Pajor, Anderson-Chisholm Chair in Animal Care & Welfare, University of Calgary

12:35 **LUNCH – 60 min**

Session #2: Mink, Horses, Dogs, Cats & Pigs (Chair: Dr. Georgia Mason, Animal Biosciences)

1:35 **Differential effects of enrichment on the subtypes of stereotypic behaviour in mink**

Andrea Polanco*, María Díez-León, Georgia Mason

1:50 **Comparing the welfare of female mink (*Neovison vison*) individually housed in Canadian or European floor areas**

María Díez-León, Samuel Decker*, Nora Escribano, David Galicia, Rupert Palme, Georgia Mason

2:05 **On-farm horse welfare assessment tool: value as an educational opportunity?**

Cordelie DuBois*, Derek B. Haley, Trevor J. DeVries, Penny Lawlis, Andy Robinson, Katrina Merkies

- 2:20 Stranger-directed aggression in pet dogs: Owner, environment, training and dog-associated risk factors**
Hannah E. Flint*, Jason B. Coe, David L. Pearl, James A. Serpell, Lee Niel
- 2:35 Cat responses to scruffing, clips, and full body restraint**
Carly M. Moody*, Georgia J. Mason, Cate Dewey, Lee Niel
- 2:50 Evaluation of meloxicam and ketoprofen for pain mitigation in piglets undergoing surgical castration**
Abbie Viscardi*, Brianne Mercer, Julia Whatley, Hailey Hoffman, Patricia V. Turner
- 3:05 COFFEE BREAK – 25 min**

Session #3: Poultry (Chair: Dr. Alexandra Harlander, Animal Biosciences)

- 3:30 Assessing physical methods for on-farm euthanasia of compromised turkeys**
Caitlin R. Woolcott*, Stephanie Torrey, Patricia V. Turner, Karen Schwean-Lardner, Tina M. Widowski
- 3:45 Efficacy of Koechner euthanizing device in comparison to manual cervical dislocation and assisted manual cervical dislocation in anesthetized layer chicks**
Rathnayaka M.A.S. Bandara*, Stephanie Torrey, Anna Bolinder, Karen Schwean-Lardner, Patricia V. Turner Tina M. Widowski
- 4:00 Stereotypic behaviour in broiler breeders affected by alternative feeding strategies**
Aitor Arrazola*, Elyse Mosco, Tina M. Widowski, Michele T. Guerin, Stephanie Torrey
- 4:15 Laying hens do not avoid dirty scratch pads in enriched cages**
Bishwo Pokharel*, Luxan Jeyachanthiran, Ilka Boecker, Alexandra Harlander
- 4:30 Strain differences of laying hens in their response to social stress**
Patrick Birkl*, Peter McBride, Joergen B. Kjaer, Paul Forsythe, Alexandra Harlander

Closing Remarks & Student Awards

- 4:45** Derek Haley & Lee Niel
- 5:00** End

POSTER PRESENTATIONS

- 1. Owner perspectives of feline handling techniques used in veterinary clinics**
Madalyn Abreu*, Carly Moody, Lee Niel
- 2. Survey of Ontario veterinarians' recommendations for the socialization of young companion animals**
Justine Antunes*, Carly Moody, Janet Higginson Cutler, Lee Niel
- 3. Long term effects of population control using Porcine Zona Pellucida vaccine on the behaviour, welfare and population ecology of feral horses**
Abbie Branchflower*, Katrina Merkies
- 4. Using Big Data to determine average cat weights**
Adam Campigotto*, Theresa Bernardo, Zvonimir Poljak, Elizabeth Stone, Deborah Stacey
- 5. Impact of ration nutrient density on the energy balance and inflammatory response of dairy cows during and after dry-off**
Kaitlyn M. Dancy*, Eduardo S. Ribeiro, Trevor J. DeVries
- 6. The progression and resolution of hock and neck injuries on dairy cattle**
James R. Devos*, David F. Kelton, Amanda M.R. Armstrong, Derek B. Haley
- 7. Conservation canines in Canada: Roles, welfare, and environmental impacts**
Renée S.M. D'Souza*, Alice J. Hovorka
- 8. Breeding Swedish Mountain cattle as resistance to agribusiness: the making of a cow for alternative agrarian futures**
Camilla Eriksson*, Andrea Petitt
- 9. Decreased eye-blink rate as a non-invasive measure of stress in the domestic horse**
Amelia Garnett, Katrina Merkies*
- 10. Electroencephalogram and behavioural changes in poultry undergoing physical methods of euthanasia**
Elein Hernandez*, Tina Widowski, Stephanie Torrey, Fiona James, Karen Schwean-Laird, Patricia V. Turner
- 11. The effect of an environmental stimulus on salt consumption in horses**
Kaitlyn Lawson*, Katrina Merkies
- 12. Behavioural responses of horses to humans with and without PTSD**
Marnie McKechnie, Emily Zakrajsek, Katrina Merkies*
- 13. Evaluation of an assessment tool designed to aid dairy producers to systematically evaluate cows prior to culling**
Allison Moorman*, Todd F. Duffield, M. Ann Godkin, David F. Kelton, Jeffrey Rau, Derek B. Haley
- 14. Effects of stall improvement and regular exercise on body injuries of cows housed in tie-stall**
Santiago Palacio*, Steve Adam, Renée Bergeron, Doris Pellerin, Anne Marie de Passillé, Jeff Rushen, Derek B. Haley, Trevor J. DeVries, Elsa Vasseur
- 15. The effects of dog-assisted student stress-busters on canine stress**
Matéa David-Steel, Lee Niel, Katrina Merkies*
- 16. Comparison of health and behaviour between dairy cows with low and high SCC**
Athena Zambelis*, Ivelisse Robles, Trevor J. DeVries

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CO-ORGANIZERS:

Derek Haley (Population Medicine)
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Kimberley Sheppard (CCSAW Communications Coordinator)

SESSION CHAIRS:

Derek Haley (Population Medicine)
Alexandra Harlander (Animal Biosciences)
Georgia Mason (Animal Biosciences)
Anita Tucker (Population Medicine)
Tina Widowski (Animal Biosciences)

STUDENT PRESENTATION JUDGES:

Nate Perkins (Landscape Architecture)
Anita Tucker (Population Medicine)
Tina Widowski (Animal Biosciences)

VOLUNTEERS:

Katrina Merkies (Animal Biosciences)
Anita Tucker (Population Medicine)
Aitor Arrazzola (Animal Biosciences)
Patrick Birkl (Animal Biosciences)
Cordy DuBois (Animal Biosciences)
Lorri Jensen (Animal Biosciences)
Allison Moorman (Population Medicine)
Carly Moody (Population Medicine)
Mariana Roedell (Animal Biosciences)
Anastasia Stellato (Population Medicine)

KEYNOTE SPEAKER:

Moving animal welfare forward: Drivers of change and the role of research

Dr. Ed Pajor, Professor & Anderson-Chisholm Chair in Animal Care and Welfare
Faculty of Veterinary Medicine, University of Calgary, Calgary, AB, Canada

Abstract:

In this presentation, Dr. Pajor will identify numerous factors that are increasing the importance of animal welfare in society. The main focus will be on the role of animal welfare research. Research highlighted will include recently completed and on-going projects, primarily in the beef industry. Projects presented will cover topics such as pain management in beef cattle, rancher's perspectives on animal welfare issues, and research on animals at a variety of events at the Calgary Stampede.

Biography:

Dr. Pajor is recognized internationally for his research on the behavior and welfare of a wide variety of species as well as his expertise in animal welfare standards. His current research activities focus on beef cattle behaviour and welfare with an emphasis on 1) pain management, 2) cow-calf bonding and 3) calf processing. Dr. Pajor has served on the animal care and welfare advisory committees of numerous organizations including McDonald's, the National Pork Board, Certified Humane, Safeway, and the Calgary Stampede. Dr. Pajor earned his PhD and MSc degrees in biology from McGill University specializing in Animal Behaviour and a Honors Co-op B.Sc. Degree in biology from the University of Waterloo.

ABSTRACTS:

Owner perspectives of feline handling techniques used in veterinary clinics

Madalyn Abreu^{1*}, Carly Moody², Lee Niel²

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²Department of Population Medicine, University of Guelph, Guelph, ON, Canada

In recent years, there has been a decline in the number of owners bringing their cat to the veterinary clinic. Current evidence suggests this is partly due to perceived stress during veterinary visits. Handling techniques used during examination may be a source of stress for the cat and consequently the owner, if they perceive this experience to be negative for their cat. In addition, owner attachment to their cat may also be associated with owner willingness to take their cat to the clinic. It is important to decrease feline stress during handling to improve feline welfare and improve owner perception of veterinary visits. The objective of the current study is to identify owner perspectives of feline handling techniques that are commonly used during routine examinations and procedures in clinic. An online questionnaire will be distributed to current companion cat owners, using various social media platforms. Participants will be asked questions relating to frequency of veterinary visits, level of attachment to their cat, and attitudes toward 12 different handling techniques used when their cat is calm, fearful, or aggressive. It is predicted that owners who take their cat to the veterinarian less frequently, or are more attached to their cat, will be more likely to disagree with the use of handling techniques involving greater restraint. The results of this study will be used to inform the use of handling practices that maximize owner satisfaction, with an overall aim of increasing feline veterinary visits.

Survey of Ontario veterinarians' recommendations for the socialization of young companion animals

Justine Antunes*, Carly Moody, Janet Higginson Cutler, Lee Niel

Department of Population Medicine, University of Guelph, Guelph, ON, Canada

Socialization and habituation of puppies and kittens are important for the development of normal behaviour. The early socialization sensitive period is thought to range from 3-14 weeks for puppies and 2-8 weeks for kittens. Inadequate socialization and habituation during this time can result in the development of behaviour problems, sometimes leading to the breakdown of the human-animal bond, relinquishment, or euthanasia. Veterinarians play a critical role in educating clients about appropriate methods for early socialization and habituation, and the objective of the current study was to determine what information veterinarians are routinely providing on socialization and habituation during initial consultations with owners of puppies and kittens. Veterinarians in Ontario, Canada were recruited by email through the College of Veterinarians of Ontario, and surveyed about their routine recommendations related to puppy and kitten exposure to new people, animals, and environments outside the home, in relation to age and vaccination status. Of 265 veterinarian participants, 82% reported that they regularly provide socialization recommendations during kitten consultations, and 98% claimed the same during puppy consultations. For puppy socialization, the majority of participants reported recommending puppies start interacting with new people (60%), animals (53%), and environments (62%), between 7-12 weeks of age. With respect to kittens, the majority of participants reported recommending that socialization begin between 7-12 weeks of age for new people (44%), animals (44%), and environments (47%). Veterinarians were asked whether they recommend that socialization start before vaccination (<7 weeks of age), or after the first (7-12 weeks of age), second (12-16 weeks of age) or third (16+ weeks of age) set of vaccinations; veterinarian responses were distributed across all options, with most respondents indicating that socialization to the indicated stimuli should begin after the first or second set of vaccinations. These results suggest that the vast majority of participating Ontario veterinarians are providing advice regarding socialization for both puppies and kittens; however, many veterinarians are recommending that socialization and habituation take place towards the end of the sensitive period for puppies, and after the sensitive period has ended in kittens, potentially leading to inadequate socialization. Overall, the results of the current study suggest opportunities to improve early veterinary recommendations in regards to socialization and habituation for puppies and kittens.

Stereotypic behaviour in broiler breeders affected by alternative feeding strategies

Aitor Arrazola^{1*}, Elyse Mosco¹, Tina M. Widowski¹, Michele T. Guerin², Stephanie Torrey¹

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Broiler breeders are routinely feed restricted to prevent obesity-related problems associated with fast growth. Feed restriction limits body weight gain but also leads to chronic hunger, frustration and lack of satiety. These conditions trigger stereotypic behaviour such as feather and object pecking. In North America, broiler breeders are often feed restricted using non-daily feeding programs. Non-daily feeding eliminates one or more non-consecutive feeding days per week in exchange for feeding larger quantities of feed on on-feed days. Yet, little is known about the welfare implications of such feeding programs. The objective of this research was to examine the effect of a rationed alternative diet and non-daily feeding programs for broiler breeders under simulated commercial conditions during rearing on stereotypic behaviours. At 3 weeks of age, 1,680 Ross 308 pullets were allocated into 24 pens fed with one of four isocaloric treatments: 1) daily control diet (control); 2) daily alternative diet; 3) 4/3 control (3 non-consecutive off-feed days/week); and 4) graduated control diet. The alternative diet had an inclusion of 40% soybean hulls and 1-5% calcium propionate, increasing with age. The graduated schedule allowed 4, 5 or 7 on-feed days per week based on birds' age. Ten birds (5 on on-feed days, 5 on off-feed days) per pen, were focally and continuously observed for 10 minutes at weeks 7, 14 and 18, starting 30 minutes after feed delivery. Data were analyzed with a glimmix procedure with week as a repeated measure and pen as a subject. All treatments performed similar frequencies of gentle feather pecking and object pecking; however, the occurrence of these behaviours was 0.46 ± 0.07 and 0.17 ± 0.06 bouts, respectively, higher on off-feed day than on on-feed days ($P < 0.05$). Daily treatments (1&2) performed more pecking at drinkers, 0.82 ± 0.07 bouts, and feeders, 0.67 ± 0.07 bouts, than non-daily treatments (3&4) ($P < 0.05$). Frequency of stereotypic preening was higher for non-daily treatments, 0.50 ± 0.03 bouts, compared to daily treatments, 0.28 ± 0.03 bouts ($P < 0.01$), and 4/3 and graduated performed 0.71 ± 0.08 more bouts on off-feed than on on-feed days ($P < 0.001$). Broiler breeder welfare is compromised on off-feeding days. Overall, however, daily feeding does not appear to improve welfare compared to non-daily feeding.

Efficacy of Koechner euthanizing device in comparison to manual cervical dislocation and assisted manual cervical dislocation in anesthetized layer chicks

Rathnayaka M.A.S. Bandara^{1*}, Stephanie Torrey¹, Anna Bolinder², Karen Schwean-Lardner³, Patricia V. Turner⁴, Tina M. Widowski¹

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Mechanical cervical dislocation devices are marketed to provide poultry producers with humane on-farm euthanasia methods. However, most are not yet scientifically evaluated. This study compared the efficacies of the Koechner Euthanizing Device (KED- small size), Manual Cervical Dislocation (MCD) and Assisted Manual Cervical Dislocation (AMCD; the bird's ventral neck is placed on a table edge and the back of the neck was pressed firmly) on anesthetized, healthy layer chicks (2-3 day old, BW=41.8±3.5g, n=8). Chicks were anesthetized with an intramuscular injection of medetomidine (0.3 mg/kg BW) and ketamine (30 mg/kg BW). MCD and AMCD were also evaluated using conscious chicks to determine effect of anesthesia. Time at which pupillary reflex disappeared, duration of gasping, and cessation of heart beat were recorded. Severity of damage caused by the devices was assessed by skin damage, transection of spinal cord, gross subcutaneous hemorrhage at the site of cervical dislocation (0-4 scale) and microscopic brain trauma and hemorrhage (0-4 scale). Data were analyzed by using Proc Glimmix procedure of SAS ver. 9.4. Time to loss of pupillary reflex, cessation of heart beat, and duration of gasping were longer in conscious than in anesthetized chicks (95.2±5.7 s vs 72.2±5.9 s, 170.2±11.7 s vs 138.6±12.1 s and 91.9±10.1 s vs 53.9±11.2 s respectively; P =0.002, 0.007, 0.0221). Latency to loss of pupillary reflex did not differ among the 3 methods. Cessation of heart beat (196.4±32.5 s) occurred later and duration of gasping (103.4±13.9 s) was longer for the KED (P =0.0051, 0.0233) compared to MCD (130.9±33.2 s, 32.2±16.1 s) and AMCD (137.9±32.5 s, 137.9±32.5 s). There was no skin trauma with the KED, while 16% and 12.5% of those killed with MCD and AMCD, respectively, had evidence of skin trauma. Mean score for gross subcutaneous hemorrhage of the neck was lower for KED (1.00±0.2 s) than AMCD (2.3±0.2 s) and MCD (1.87±0.2 s). The spinal cord was transected in 100% of MCD and AMCD, and 12.5% of KED. Neither subdural nor parenchymal hemorrhages were noted microscopically in the brains of chicks for any of the killing methods. Since time to loss of pupillary reflex was longer in conscious chicks, we predict that the KED will result in a longer time to onset of insensibility and cessation of heart beat in conscious birds.

Strain differences of laying hens in their response to social stress

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Social stress in layer flocks can arise from aggressive and non-aggressive interactions and a non-species-specific social environment may severely compromise the wellbeing of these animals. Responses to social stress may be affected by genotype. We tested for genetic differences in response to social stress in two lines of divergently selected hens: For high (HFP) or low (LFP) feather-pecking activity and an unselected control line (C). We predicted that HFP birds would respond more sensitively to social stress by altered growth rates; altered amino acid ratios indicative of a stress response (phenylalanine: tyrosine, PHE: TYR); and increased occurrence of abnormal behavior (feather pecking) as a potential short and long-term effect. One hundred and sixty hens were housed in groups of 16 individuals per pen (HFP, n=4; LFP, n=3; C, n=9; with 10 pens in total) in floor pens. We disturbed the social order within 5 pens of birds at 16 weeks of age by mixing individuals with unfamiliar birds to induce social stress. To intensify the social stress, we performed the mixing again after 2 days. Initial body weight was measured before the first mixing and again three weeks after the second mixing. Blood was sampled one day prior to the first mixing and two days after the second round of mixing and was used to determine amino acid concentrations for calculating PHE/TYR ratios. Aggressive pecking and feather pecking were recorded prior to mixing (baseline), two minutes after mixing, one hour after mixing, and 24 hours after mixing, during 10-minute observation periods per pen and time-point. Data were analysed using a GLIMMIX procedure in SAS. PHE/TYR ratios differed between the three lines (HFP: 0.75 ± 0.01 vs LFP: 0.62 ± 0.01 vs C: 0.65 ± 0.01). Only HFP birds showed lower PHE/TYR ratios when compared to non-stressed HFP birds (HFP unmixed: 0.75 ± 0.02 vs HFP mixed: 0.70 ± 0.02 , $P < 0.02$). Short-term observations indicate that stress did not affect feather pecking (long-term effects are yet to be analysed). Weight-gain, however, showed significantly increased variability in stressed groups when compared to control groups (mixed: variance= $15.1\% \pm 0.9$ vs unmixed: variance= $4.9\% \pm 0.9$, $P < 0.001$). We found that HFP birds respond differently to social stress than LFP and C birds, indicating that selecting for feather pecking behavior alters physiological responses to stress.

Long term effects of population control using Porcine Zona Pellucida vaccine on the behaviour, welfare and population ecology of feral horses

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Immunocontraception is an alternative to large-scale removals for controlling populations of mustangs. However, immunocontraception potentially decreases welfare in treated individuals and their groups through increased behavioural and physical stress. Porcine Zona Pellucida (PZP) vaccine has been used in the Pryor Mountain mustang population since 2001. Research in other equine populations, along with anecdotal observations in the Pryors, indicates that PZP treatment may increase sexual interactions and decrease mare fidelity. Repeated mounting is associated with physical strain on males and females, and directs energy away from maintenance behaviours. The research objectives are: 1) to determine whether there is a significant increase in reproductive behaviour performed by and toward mares treated with PZP, and 2) to determine whether treated mares demonstrate decreased fidelity to the harem stallion. It is anticipated that vaccinated mares will initiate, and be subjected to, significantly more reproductive behaviours, and will demonstrate decreased fidelity to the harem stallion. Harem stallions are also expected to exhibit increased rates of reproductive behaviour. Thirty minute observations of focal harems (n=12) of sexually-mature horses in the Pryor Mountains will be conducted twice daily (7-9AM and 4-6PM) for 20-25 days. Instantaneous sampling of stallion harem-tending behaviour ("snaking" and defensive behaviour) as well as male masturbation and allogrooming will occur every minute during 30 min windows. Female/male approach, lordosis, courtship, vocalisation, aggression and mounting will be recorded through all instances sampling. Data will be analysed through a mixed general linear model with repeated measures over time, and Sidak's multiple comparisons will determine differences in the frequency of behaviours between treated and non-treated mares. A lack of harem stability correlates with aggression, and inhibits the establishment of stable harem relationships. In social species, disruptions amongst group members result in distress and interfere with important fitness and survival behaviours. A contraception-induced increase in sexual behaviour and harem changes, and disruption of time budgets, may have a significant impact on the welfare of the mustangs. Welfare implications of PZP must be carefully evaluated before further expansion of PZP programs, and means of minimizing potential physical and behavioural stressors should be investigated.

Using Big Data to determine average cat weights

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²School of Computer Science, University of Guelph, Guelph, ON, Canada

Cats are less likely than dogs to be seen by a veterinarian routinely, limiting the ability of the veterinarian to follow a cat's health. Electronic medical records from over 19 million felines patients were used to determine the average body weight (BW) of different breed and genders of cats. Using electronic medical records to examine clinical data from animals over several decades allows for uncommon occurrences to be observed sufficiently. Processing and analyzing large amounts of already existing data from medical records can help to fill the gap in this fundamental knowledge particularly for non-domestic shorthair breeds. Thus, the objective of this study was to determine the impact of breed and gender on the BW at each year of age in cats. A retrospective cohort study was performed using BW data gathered from domestic felines from 3972 unique veterinary clinics in the United States and Canada from 1981 to 2016 through electronic management records (Avimark, Cornerstone, Impromed, or Intravet) made available for analysis from a veterinary diagnostic company (IDEXX Laboratories, Inc). Initially, BW from all felines recorded in the electronic medical records (n=19,416,753) were included in the study population and examined using descriptive statistics. Linear regression was used to assess association between BW and age, breed, gender, decade of measurement and their interactions. Accuracy of predictions was evaluated on a validation dataset. Impact of decade on weight was not consistently significant in models at a 5% significance level. Larger breeds tended to reach maximum weights significantly earlier than smaller breeds. This study demonstrates that the use of Big Data could help in addressing questions of health and wellness that were previously not feasible in the area of companion animal health. This can hopefully allow for owners and veterinarians to better notice early deviations from a normal animal's health parameter trends, allowing for earlier disease interventions and a better quality of life, particularly for traditionally underrepresented breeds.

Impact of straw particle size and reticulorumen health on the feed sorting behaviour of early lactation dairy cows

Rachael E. Coon^{1*}, Todd F. Duffield², Trevor J. DeVries¹.

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Prolonged low reticulorumen pH is associated with poor cow welfare. Feed sorting has been associated with the experience of this condition. The study objective was to determine if feed sorting behaviour in early lactation dairy cows varies with straw particle size in the diet, particularly when coupled with low reticulorumen pH. Thirty-eight multiparous Holstein cows were enrolled in a trial ~2 wk before calving. During the 4 wk post-calving, cows were fed total mixed ration (TMR) that included 9% wheat straw (dry matter basis) chopped to either: 1) 2.54 cm (Short) (n=19) or 2) 5.08 cm (Long) (n=19). Fresh and orts feed samples were separated into 4 fractions: long (>19mm), medium (<19mm, >8mm), short (<8mm, >4mm), and fine (<4mm) particles. Sorting was calculated as: actual intake of each particle fraction expressed as a percentage of its predicted intake. Wireless telemetry boluses measured reticulorumen pH every 15 min, 24 h/d. Cows were classified by health status as having low reticulorumen pH (LPH) if pH fell below 5.8 for an average of >1 h/d throughout the trial (n=16; mean=175 min/d below pH 5.8) or normal reticulorumen pH (NPH) if pH did not fall below 5.8 for >1h/d throughout the trial (n=22; mean=11 min/d below pH 5.8). Data were summarized by week and analysed in a repeated measures mixed-effect linear regression model. Health status did not affect sorting of long particles ($P=0.2$). There was an interaction of health status and treatment for sorting of medium particles ($P=0.03$); Long-LPH cows (n=9) tended to sort against medium particles ($98\pm 1\%$; $P=0.1$) while Short-LPH cows (n=7) and Long-NPH cows (n=10) tended to sort in favour of this fraction (Short-LPH: $102\pm 1\%$; $P=0.1$; Long-NPH: $102\pm 1\%$; $P=0.1$). Short-NPH (n=12) cows did not sort medium particles. There was an interaction of status and treatment for sorting of short ($P=0.05$) and fine particles ($P=0.01$); Short-LPH cows sorted in favour of short particles ($103\pm 0.9\%$, $P<0.001$) and against the fine particles ($94\pm 2.0\%$, $P=0.005$) while all others did not sort these fractions. Sorting in favour of long, medium, and/or short particles of the ration and against fine particles increases intake of physically-effective fibre, which is important for buffering reticulorumen pH. These results suggest that cows experiencing low reticulorumen pH, and consuming a diet with shorter straw particles, sorted that diet to maximize intake of physically-effective fibre to ameliorate the effects of their low reticulorumen pH.

Impact of ration nutrient density on the energy balance and inflammatory response of dairy cows during and after dry-off

Kaitlyn M. Dancy*, Eduardo S. Ribeiro, Trevor J. DeVries

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Common practices for mediating the dry-off of dairy cows include an abrupt or gradual reduction in milking frequency, a reduction in nutrient availability, or a combination of both. These practices pose welfare concerns such as inducing an altered state of energy balance and eliciting an inflammatory response and discomfort due to elevated intramammary pressure. The objective of this study was to assess the effects of ration nutrient density on the energy balance and inflammatory response of cows during and following dry-off. Forty-eight Holstein dairy cows were dried-off over a 5-d period. At the start of dry-off (d 1), cows were randomly assigned to 1 of 2 total mixed rations (TMR) offered ad libitum: control diet (CTL; 1.48 Mcal/kg energy) and treatment diet (DIL; 1.44 Mcal/kg energy), which was diluted with extra straw. During dry-off, cows were milked 1x/d on d 1, 2, 3 and a final time on d 5. Before the start of dry-off, cows were producing 26 ± 5.5 kg/d, milking 2x/d, and consuming a TMR (1.65 Mcal/kg energy). Blood samples were collected on d 1, 5, 7, 13, 19 and 25, and analyzed to determine serum concentrations of non-esterified fatty acids (NEFA) and haptoglobin. Data were summarized by cow and day and analyzed in a repeated measures linear mixed-effect regression model. From d 5-25, all cows had lower NEFA than at d 1 ($P < 0.009$). Cows fed DIL tended to have lower NEFA on d 5 (0.08 vs 0.10 mmol/L; $P = 0.09$) and d 7 (0.07 vs 0.09 mmol/L; $P = 0.06$) than cows fed CTL. Relative to d 1 (0.20 g/L), cows experienced elevated haptoglobin on d 7 (0.29 g/L; $P = 0.005$) and d 13 (0.38 g/L; $P = 0.006$). Cows fed DIL had higher haptoglobin on d 19 than cows fed CTL (0.37 vs 0.25 g/L; $P = 0.04$). Milk yield at the final milking tended to be positively associated with haptoglobin during and after dry-off ($P = 0.09$). These results suggest that feeding a ration of lower energy density around dry-off may result in an improved energy balance, but a sustained inflammatory response. Alternatively, these results suggest that finding other ways of reducing milk production prior to dry-off will help prevent excessive inflammation at dry off, thus reducing discomfort and improving cow welfare at this time period.

The progression and resolution of hock and neck injuries on dairy cattle

James R. Devos^{1*}, David F. Kelton², Amanda M.R. Armstrong², Derek B. Haley²

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There has been research done on identifying risk factors associated with hock injuries in lactating dairy cattle, however, very little research has been done examining their progression or amelioration over time. The current work is a case study that will characterize and monitor hock and neck injuries over a 3-month period on a tie-stall dairy. Following their recent proAction® Animal Care Assessment, the farm received notice that they require corrective action on these two points. The intervention treatment will involve providing cows 60 d at pasture during their dry-off period between lactations. The outcomes of interest are whether / how the characteristics of the injuries change over time. Longitudinal scoring of the hocks and necks of all 100 cows in the herd, will take place every week to test the hypothesis that the incidence and severity of injuries will improve following the intervention. Some of the cows will be indoors and lactating the entire 3-month study period and they will serve as controls. In concert with the main objective this study is also serving as a pilot for refining methods used to score injuries. Most research to date has used a Likert scale to score injuries by integrating a number of different characteristics. On a fundamental level the presence or absence of different characteristics is likely important to the specific nature or etiology of the injuries, and this has not previously been explored or described in detail. Our scoring system will assess and measure, independently: hair loss, swelling, skin defects, and whether there is blood or purulent discharge present. In addition, lesions on hocks will be drawn and measured creating a type of “hock map” with an infrared thermography camera, allowing for a visual representation of area affected. The data gathered will be summarized to describe the variability and changes in injuries and to counsel the producer about the effectiveness of the intervention. The data will also inform follow-up studies by providing inputs for sample size calculations and selecting data analysis methods. The results will be a first step in helping us to determine a rate of improvement for injuries, a rate that could be used to promote positive changes on farms. These changes will, hopefully result in a reduction in the prevalence of injuries, and improve the well-being of dairy cattle.

Comparing the welfare of female mink (*Neovison vison*) individually housed in Canadian or European floor areas

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Larger floor areas may improve welfare by giving individuals more space to express different behaviours. But for single-housed adult mink females, floor sizes of Canadian cages (CCs) are almost half of European cages (ECs), raising concerns that CCs underperform in terms of welfare compared to ECs. We tested this hypothesis housing 64 pairs of females in either ECs (2613 cm²) or CCs (1516 cm²). Each cage had a nestbox, shelf and two enrichments (but the room layout required CCs to be closer to a wall than ECs). After 3 months, pairs were split, the remaining 64 females spending 3 additional months individually housed in their ECs or CCs. During the last two weeks, we collected data on stereotypic behaviour (SB), general time budgets (active and inactive behaviours), as well as fearful responses to handling and 'stick tests', and sampled for faecal glucocorticoid metabolites (FCM). Half the subjects were then humanely killed. *Post mortem*, we estimated tail chewing and, to assess housing effects on stress physiology, extracted and weighed the thymus, spleen, and adrenal glands, and processed subjects' mandibles for fluctuating asymmetry (FA) analyses. The remaining females were given free access to two cages: their own, and the cage they had not been raised in. After two weeks, their preference for either cage was assessed (as % of time budget compared to chance). GLMs showed that housing had no effects on SB or tail chewing, but CC-raised females tended to be more fearful (when handled: $X^2_{(dfs.1)}=3.2$, $P=0.07$; in stick tests: $F_{1,40.7}=3.1$, $P=0.08$). Organ weights were unaffected (analyses of FCM & FA are on-going). Given a choice, females allocated their overall time evenly across both cages; however, they preferentially allocated their *active* time to the EC ($t_{31}=9.7$; $P<0.001$) and their *inactive* time to the CC ($t_{31}=6.1$; $P<0.001$). Relative seclusion in CCs, and abilities to monitor the environment (easier in ECs) may have played a role; we thus plan to replicate this study. Our data cautiously suggest that EC-housed females experience better welfare, as they seem to prefer these larger floor areas when awake, and seem less fearful there, with implications for future Code revisions.

Conservation canines in Canada: Roles, welfare, and environmental impacts

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While numerous studies in human-animal and/or dog welfare realms investigate dogs working in service or security roles, few studies highlight those working for conservation initiatives. Dogs perform a variety of jobs in conservation, including scat detection of target species in order to assist with population size and range estimates; gunpowder detection to assist with hunting regulation enforcement; and protection of at-risk species to encourage population re-growth, among other tasks. The current literature on dogs who do work for conservation focuses on their utility as field tools for biologists. The aim of this research is to explore in-depth the lives of conservation canines in Canada, in terms of their roles, welfare, and impacts on the environment. The research will be exploratory, employing primarily qualitative methods. Initially, baseline data will be collected on conservation canine programs in Canada using secondary data and key informant interviews. Subsequently, three case studies will be selected to investigate conservation canines in-depth (e.g. government programs run in Ontario, Alberta, and British Columbia). These case studies will include in-depth semi-structured primary interviews with dog handlers/trainers, and will elicit information on dog breeding, training, husbandry, daily resting routines, and work roles/schedules. Throughout these case studies, dog welfare will be assessed through direct observations of key physical, emotional, and social welfare parameters, as well as information gleaned from key informants, secondary data, and site visits. Environmental impacts will be assessed through government program documents and interviews with key informants and government personnel. Through this research I will provide a thorough account of the experiences of these working dogs, helping to address a gap in the literature on conservation canines in Canada from an animal welfare and environmental perspective.

On-farm horse welfare assessment tool: value as an educational opportunity?

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The revision of the National Farm Animal Care Council's (NFACC) Code of Practice for the Care and Handling of Equines has brought to light the paucity of information regarding the welfare of horses in Canada's diverse equine industry. Previous work surveying equine professionals has suggested that ignorance is believed to be the primary cause of poor welfare within the industry. Thus, increasing the knowledge of horse owners is crucial to improving horse welfare at both the individual and industry level. This may be achieved through on-farm assessments designed to evaluate facilities and share knowledge and resources with farm owners. While used extensively for evaluating production animal facilities, horse facilities are rarely formally assessed, making it important to determine not only how well on-farm assessments could be conducted, but also how well they would be received by horse owners. As part of a larger project, an on-farm horse welfare assessment tool was created using scientific literature and pre-existing on-farm welfare assessment tools to assess the standards of care based on the requirements outlined by NFACC's Code of Practice for horses. This assessment was pilot-tested on a sample of diverse horse farms ($n=25$). Recorded and transcribed post-assessment interviews allowed participating farm owners to discuss their assessment results and provide feedback about the tool. Descriptive analysis indicated that, while some farm owners felt they took away very little from the experience, they felt that the on-farm assessment tool had the potential to be useful to newcomers to the industry and to a certification program. Farm owners which advertised boarding services were particularly interested in the latter as a way to improve their credibility to clients and differentiate their facilities from their peers. Participants also indicated areas that could make enforcing welfare standards an issue, such as horse and farm ownership. Understanding the perception of on-farm assessments – especially their perceived usefulness to experienced individuals – is of great value in gauging the potential success of assessment programs. If well-received, an industry-driven on-farm welfare assessment has the potential to better educate farm owners, and, by extension, improve the welfare of the animals under their care.

Breeding Swedish Mountain cattle as resistance to agribusiness: the making of a cow for alternative agrarian futures

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Modern cattle breeding has, since it began to gain momentum in the mid-19th century, achieved astonishing results in dairy cows' milk production levels. A high-producing dairy breed produces at least four times what a cow did 100 years ago. The modern dairy cow is an embodiment of breeder's aspiration for continuous betterment, efficiency, capitalisation and other values associated with agribusiness. Within the research project "Changing Animal Bodies" at Uppsala University we are analysing the discourse of preserving the Swedish Mountain cattle as a purebred breed focusing on how they embody visions of agricultural futures that challenges those of the modern dairy cow. We draw on approaches from critical discourse studies while analysing member magazines of three different breeding societies breeding Swedish Mountain cattle, a rare breed originating from northern Sweden. While the breeding associations have different agendas as to how and why this particular breed should be preserved and what kind of position these cows should hold, they have in common that they can be seen as a resistance movement to agribusiness. One of the divides between breeding associations is whether the breed should be developed through selection for specific traits or whether they should maximise genetic diversity with no respect taken to production whatsoever. The latter typically positions the Swedish Mountain cattle as the last remnants of a cow designed for small scale self-sufficiency farming which is best used in emerging alternative self-sufficient lifestyles at household level today. The former envisions a future where Holstein, the dominating dairy breed today, will be abandoned due to poor health and dysfunctional behaviour resulting from inbreeding. Thus they anticipate a future revival for a Swedish Mountain cow with relatively high production of milk held in more extensive agricultural systems they also consider more sustainable. We follow how breeding goals for the Swedish Mountain cattle have been contested and politicised resulting in the breed being split up into four different breeds bred by four different breed associations that in turn reflect different desires in terms of how cows' bodies should look, how they should behave and what purpose they should serve to their owners and to society. Investigating and understanding rare breed associations as resistance to agribusiness can assist in identifying how human-animal relations can be transformed in the domain of food production to form more sustainable ways of interacting with animals and nature in the future.

Stranger-directed aggression in pet dogs: Owner, environment, training and dog-associated risk factors

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Stranger-directed aggression in dogs is both a public-safety and animal welfare concern. Aggression can result in human injuries, impair the human-animal bond and lead to an increased risk of physical punishment, relinquishment or euthanasia. Our objective was to determine risk factors for dogs that display stranger-directed aggression using the previously validated, owner-completed Canine Behavioural Assessment and Research Questionnaire (C-BARQ), with additional questions added relating to dog demographics, temperament, training, and environment, and owner demographics and personality. Data were analyzed using a mixed linear regression model with household as a random effect (N=3,264 dogs; 2,713 households). Dogs had higher stranger-directed aggression scores if they had mild ($P<0.001$) or severe ($P<0.001$) fear of strangers relative to no fear, higher impulsivity scores ($P<0.001$), were male ($P<0.001$), neutered for behavioral reasons ($P<0.001$), fed on a schedule ($P=0.038$), and were trained with head halters ($P<0.001$), no-pull harnesses ($P=0.013$), shock collars ($P<0.001$), or choke chains ($P=0.017$). Dogs had lower stranger-directed aggression scores when crated ($P=0.009$), and exercised on leash ($P=0.009$), off leash ($P=0.004$) or at the dog park ($P=0.041$). Dogs scored higher for stranger-directed aggression if the owners used physical punishment ($P=0.001$), or avoided situations where the dog performed undesirable behaviours ($P=0.017$), while dogs scored lower if the owner asked for a different behaviour ($P=0.001$). Dogs exposed to strangers less than once a month as a puppy ($P<0.001$), and dogs with a history of abuse ($P<0.001$) had higher stranger-directed aggression scores. In addition, dogs that were scared ($P<0.001$) or indifferent ($P=0.001$) towards strangers as a puppy had higher stranger-directed aggression scores compared to dogs that were excited. There was a quadratic relationship between weight and aggression ($P=0.001$), with aggression scores initially decreasing with weight and then increasing for dogs greater than 50 lbs. Finally, breed group was associated with stranger-directed aggression ($P=0.004$), with, for example, hounds scoring lower than most other groups. These results indicate that the primary risk-factors for stranger-directed aggression relate to dog and training variables, and highlight important areas for future research in longitudinal studies with the aim of identifying dogs at risk, and implementing appropriate training plans to prevent stranger-directed aggression.

Decreased eye-blink rate as a non-invasive measure of stress in the domestic horse

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Distress, as an indicator of welfare, may be measured using behavioural and physiological indicators, but behavioural measures can be subjective and obtaining physiological data can itself be stressful and intrusive. Eye-blink rate (EBR) has been used as a non-invasive indicator of stress in cattle and humans, and the objective of this study was to validate this measure in horses. It was hypothesized that EBR would decrease in response to the known stressors of 1) separation (SEP) – horse removed from visual contact with its paddock mates; 2) feed restriction (FR) – feed was withheld at regular feeding time; and 3) startle test (ST) – a ball was suddenly thrown on the ground in front of the horse while alone in the arena. Each of 15 horses were evaluated over these three treatments plus a control (CON) – horse in its normal paddock environment. Heart rate (HR) was monitored every 5sec throughout each 3min test to correlate physiological changes to behavioural changes. Movements of the right eye (full eye blinks, half eye blinks, and eyelid flutters) and behaviours (ear orientation, head height, lip movement, and restlessness) were retrospectively determined from video recordings. A GLM Mixed Model Procedure with Sidak's multiple comparisons of least squares means demonstrated that both full blinks (3.0 ± 1.6^b vs. 4.3 ± 2.5^{ab} vs. 3.8 ± 2.4^b vs. 6.2 ± 4.5^a full blinks/min \pm SEM in, SEP, FR, ST and CON respectively; a,b differ $P < 0.006$) and half blinks (8.7 ± 3.7^{bc} vs. 11.5 ± 4.7^{ab} vs. 7.1 ± 3.7^c vs. 12.9 ± 5.0^a half blinks/min \pm SEM in, SEP, FR, ST and CON respectively; a,b,c differ $P < 0.0001$) decreased during stressful situations. However, eyelid flutters were significantly higher in FR than any other treatment (1.3 ± 1.4^b vs. 4.2 ± 2.7^a vs. 1.3 ± 1.7^b vs. 1.3 ± 0.87^b flutters/min \pm SEM in SEP, FR, ST and CON respectively; a,b, differ $P < 0.0001$). FR elicited more restlessness ($P < 0.0005$) and lip movements ($P < 0.0001$). Horse HR increased with FR (44.1 ± 13.3^a bpm) but decreased in SEP (37.0 ± 6.6^c bpm) and ST (37.1 ± 8.1^c bpm) compared to CON (38.7 ± 7.8^b bpm; a,b,c differ $P < 0.0001$). FR appeared to be the most stressful situation for the horse. These preliminary results validate a decrease in full and half blinks and an increase in eyelid flutters as indicators of stress. EBR can be used as a non-invasive measure of stress in horses in conjunction with other behavioural indicators.

Electroencephalogram and behavioural changes in poultry undergoing physical methods of euthanasia

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Poultry euthanasia is required for a variety of circumstances, including control of disease and to prevent or end suffering of sick or injured birds. Information is still lacking as to the best methods of euthanasia for different poultry species. According to the Canadian Veterinary Medical Association, preferred methods of euthanasia should affect the brain first, resulting in rapid loss of consciousness, followed by cessation of cardiac and respiratory activity. The use of a non-penetrating captive bolt device (NPCB) is conditionally acceptable with training. Mechanical cervical dislocation (MCD) is another conditionally acceptable method that requires a purpose-designed device. However, there are several concerns about the use of these techniques, including the potential for prolonged time to loss of consciousness following application, particularly in larger birds. The precise times to loss of consciousness and death have not been determined for these methods in different sizes, ages, and breeds of chickens and turkeys. Loss of consciousness and death can be assessed by onset of specific behavioural and physiologic responses including neck muscle tone, eye reflexes and cardiac arrest. Electroencephalogram (EEG) is considered the most objective method for assessing time to unconsciousness and brain death for mammalian and avian species. In poultry, loss of consciousness and death correlate with specific changes in frequency and amplitude of an EEG. The objectives of this research are: 1) to determine time to loss of consciousness through use of EEG recording for different physical euthanasia methods including NPCB (Zephyr-E) and MCB (KED) on end-of-lay hens (n=6/group) and 2) to compare EEG responses with other behavioural indicators to determine the validity of these other measures in predicting time to brain death. Birds will be surgically instrumented with a telemetry transmitter to record EEG. This research should provide specific information about the utility of different euthanasia methods for humane killing of chickens of differing age and weight classes.

Fresh cow illness detection using productivity and behavioural data in robotic milking herds

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The ability to earlier identify illness using non-invasive behavioural monitoring could greatly improve dairy cow health, welfare, and productivity. Our study objective was to investigate changes in productivity and behaviour useful for illness detection in robot-milked early lactation cows. Rumination, activity, body weight, and milk data were recorded electronically for 6 mo for 605 early lactation cows in 9 commercial herds. Cases of illness were diagnosed and recorded, including retained placenta (RP; n=58), displaced abomasum (DA; n=8), mastitis (n=38), subclinical ketosis (SCK; n=198), and endometritis (n=113). Data were summarized by cow, days in milk (DIM 0 = day of calving), and day relative to the day of diagnosis (d 0) for each illness separately, and analyzed in mixed linear regression models. Before calving, rumination time of RP cows (n=22 with pre-calving data) declined by 11 min/d from -6 to -2 DIM ($P=0.01$) and by 36 min/d from -2 to 0 DIM ($P<0.001$), whereas cows with no RP only ruminated less from -2 to 0 DIM (-42 min/d; $P<0.001$). After calving, RP cows were less active ($P=0.04$), spent less time ruminating ($P=0.01$), and produced less milk ($P=0.01$) than healthy cows. Accounting for DIM, rumination time declined by 17 min/d from 6 d before DA ($P=0.02$) and by 15 min/d from 4 d to mastitis diagnosis ($P=0.006$). Milk production dropped by 2.6 kg/d from 5 d before DA ($P<0.001$) and by 2.0 kg/d from 3 d before mastitis ($P<0.001$). The week of SCK detection (-3 to +3 d) compared to the week before (-10 to -3 d), cows had greater daily differences in pellet intake and rumination time, and more negative differences in body weight and milk-to-pellet ratio. From 0 to 50 DIM, cows with endometritis (diagnosed at 28-35 DIM) produced 4.5 kg/d less milk ($P<0.001$) than cows without endometritis, with no difference in rumination time, but ruminated 30 min/d less from 0 to 12 DIM ($P<0.001$). In summary, significant deviations in milk yield and rumination behavior occurred 3 to 6 d before diagnosis of acute health disorders, whereas more subtle, substantial, changes occurred with more chronic illnesses.

The effect of an environmental stimulus on salt consumption in horses

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Barren stall environments have been associated with excessive salt consumption and stereotypic behaviour in horses, due to a lack of environmental stimuli. This study examined the effects of an environmental stimulus on salt intake and behaviour. It was hypothesized that horses presented with an environmental stimulus, in the form of a Jolly Ball™, would consume less salt while still ingesting sufficient salt to meet their nutritional requirements. Each of four treatments was administered to each of four horses (three geldings, one mare) for a four-day period, in a complete randomized block design. The treatments were: presence of salt block only (SB); presence of the environmental stimulus only (ES); presence of salt block and the environmental stimulus (SBES); and absence of salt block and environmental stimulus (CON). A control salt block (ENV) was located in the barn, away from horses. Live behavioural observations of movement, feeding, resting, interaction with the environment, interaction with the Jolly Ball™, and interaction with the salt block were collected in 15s interval samplings for 30min daily, with all occurrences of drinking, eliminating, and other behaviours (i.e. vocalizations) recorded. All salt blocks were weighed daily. Each horse's daily salt intake was calculated using the salt content and amount of grain fed. The General Linear Models procedure with repeated measures analyzed salt block weight and behaviours with Tukey's multiple comparison adjustment for post-hoc comparisons among treatments. All horses consumed sufficient salt to meet their daily nutritional requirements. No significant difference in salt consumption was observed between SBES and SB (LSM of 24.8g/d vs 23.0g/d respectively, $P=0.997$). Interaction with the salt block followed a similar pattern ($P>0.199$). Observations of interaction with the Jolly Ball™ were highest during ES and significantly differed from SBES ($P=0.001$). Interaction with the environment occurred the most during CON, and differed from all other treatments ($P<0.0001$). Movement was highest during ES and significantly differed from all other treatments ($P<0.0071$). Feeding was highest during SB and ES and differed from SBES and CON ($P<0.0003$). These results indicate that the presence of a Jolly Ball™ does not impact salt consumption, but does impact other behaviours such as movement, feeding, and interaction with the environment. These results could be applied to current management practices to improve the welfare of stalled horses by encouraging a more active state amongst horses.

Behavioural responses of horses to humans with and without PTSD

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The benefits to humans of equine-assisted activities (EAA) has been well-researched, while the welfare of horses used in EAA has not received as much attention. The role of horses as a psychotherapist in EAA may subject them to physical and emotional emanations of the human patient. This study hypothesized that horses exposed to humans with PTSD would display more signs of behavioural and physiological stress than with “neurotypical” humans. Four treatment humans clinically diagnosed with Post Traumatic Stress Disorder (PTSD) were matched physically to four neurotypical humans and individually subjected to each of 17 therapy horses in a round pen. Both horses and humans were equipped with a heart rate (HR) monitor recording HR every 5secs. Salivary samples were collected from each horse 30min before and after each trial to analyze cortisol concentrations. Each trial consisted of 5min of baseline observation of the horse alone, after which the PTSD human entered the round pen for 2min, followed by an additional 5min of the horse alone. A professional acting coach instructed the neurotypical humans in emulating the physical movements of their paired PTSD subject, after which the neurotypical human followed the same trial format. Behavioural observations indicative of stress in the horse (gait, head height, ear position, body position, distance from the human, latency of approach to the human, vocalizations and chewing) were retrospectively collected from video recordings and analyzed using a repeated measures GLM. Sidak’s multiple comparisons analyzed differences between treatments and time periods. Horse behaviours ($P>0.1$), HR ($P>0.85$) and salivary cortisol ($P>0.24$) did not differ between PTSD and neurotypical humans. In general, horses moved slower ($P<0.0001$), carried their head lower ($P<0.0001$), vocalized less ($P<0.0001$), chewed less ($P<0.0001$), and decreased HR ($P<0.0001$) when any human was present with them in the round pen. Since two of the PTSD/neurotypical human pairs were experienced with horses and two were not, a post-hoc analysis showed that horses approached quicker ($P<0.006$), stood closer ($P<0.0025$), and oriented their ears ($P<0.0003$) more toward humans who were experienced with horses. Horse HR was lower when with inexperienced humans ($P<0.0001$) whereas inexperienced human HR was higher ($P<0.0031$). Overall, behavioural and physiological responses of horses to humans is more pronounced based on human experience with horses than whether the human is diagnosed with PTSD. There is no indication that horses used EAA experience any more stress than any other situation.

Cat responses to scruffing, clips, and full body restraint

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Cats require regular examinations to ensure optimal health. However, inadequate restraint can increase fear and aggression, resulting in poor physical examinations, diagnosis, and treatment. There is a lack of science-based evidence to inform best practice for restraint, so the current study evaluated the responses of companion cats to three common restraint techniques: 1) full body (n=19; known negative control), 2) scruff (n=17), and 3) clips applied to the neck (n=16). All cats in each group were also passively handled for comparison (neutral control). During restraint, a mock veterinary examination was performed to assess previously validated measures of negative cat response to handling. Behavioural (vocalizations, ear position) and physiological (respiratory rate, pupil dilation) responses were assessed. Treatments were compared using linear mixed models that included the effects of sex and age, and cat as a random effect. Data are presented as averages or odds ratios with 95% confidence intervals. Overall, cats showed elevated responses to both full body and clip restraint. In comparison to passive restraint, cats showed larger pupil dilation, a greater number of vocalizations per minute, and a greater odds of having a negative ear position when handled with full body (pupils: 0.45[0.42,0.49] vs 0.54[0.49,0.59], p=0.003; vocalizations: 0.115[0.052,0.253] vs 0.388[0.159,0.947], p=0.009; ear: 0.336[0.170,0.662]; p=0.002), and clip restraint (pupils: 0.45[0.42,0.49] vs 0.53[0.48,0.58], p=0.006; vocalizations: 0.115[0.052,0.253] vs 0.510[0.189,1.374], p=0.007; ear: 0.441[0.220,0.8840], p=0.02). In contrast, during scruff restraint cats had reduced pupil dilation and number of vocalizations when compared to full body (pupils: 0.41[0.36-0.47] vs 0.54[0.49,0.59], p=0.002; vocalizations: 0.057[0.011-0.299] vs 0.388[0.159,0.947], p=0.04) and clip restraint (pupils: 0.41[0.36,0.47] vs 0.53[0.48,0.58], p=0.003; vocalization: 0.057[0.011,0.299] vs 0.510[0.189,1.374], p=0.02). However, the odds of having a negative ear position was greater when handled with the scruff restraint in comparison to passive handling (0.346[0.161,0.743]; p=0.008). The current results indicate that responses to clips are comparable to full body restraint, suggesting that the use of clips is negative for cats. While cats showed some negative responses to scruffing in comparison to passive restraint, it was less than that observed for full body or clip restraint.

Evaluation of an assessment form designed to aid dairy producers to systematically evaluate cows prior to culling

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According to the Health of Animals Transportation Regulations, dairy cattle in Canada must meet certain health and welfare standards prior to being transported in order to reduce the risk of unnecessary pain and suffering. However, instances of dairy cattle being transported from farm to auction markets, despite being sick or injured, have been observed and are a great concern to producers, veterinarians and consumers alike. An effort needs to be made to aid dairy producers in assessing their cattle prior to transport, to prevent the shipping of unfit cattle. This research will evaluate the effectiveness of a pre-transport form designed to aid Ontario dairy producers to systematically evaluate the cows they plan to cull. The objectives of this pilot research project are to educate dairy producers about transport requirements; to have producers use the evaluation form in order to prevent the shipping of unfit cows and subsequently change their behaviour; to assess the efficacy of the evaluation form; and to encourage development of standard operating procedures (SOPs) for evaluating cull cows. Twenty bovine veterinarians have been recruited to each enrol up to 10 of their dairy clients. Veterinarians and dairy producers were provided with a pre-questionnaire, Cull Cow Evaluation Forms, and a post-questionnaire. The pre-questionnaire assessed current attitudes and knowledge of dairy producers and veterinarians regarding culling and shipping cattle. The veterinarians then provided their clients with Cull Cow Evaluation Forms. Dairy producers have been asked to complete an Evaluation Form for every cow they cull from the milking herd from January to April, 2017. The Evaluation Forms has producers record several parameters that could impact the cow's fitness to be transported such as body temperature, body condition and gait. A post-questionnaire will then be sent out to assess if attitudes and practices have changed after using the form. Upon completion of the research period in Spring 2017, the research team will assess if all research objectives have been met and determine potential areas of improvement for the evaluation form. The potential implications of this research project include providing producers with an effective tool to help in their decision-making regarding transportation, and also encourage greater veterinary involvement with their clients.

Effects of stall improvement and regular exercise on body injuries of cows housed in tie-stall

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Ensuring proper comfort in the stall along with providing regular exercise may be a sustainable option to improve cow welfare. The objectives of this study were to evaluate how regular exercise (access to pasture during the season and/or winter exercise) and stall design improvements (eg: tie-rail adjustment, increase of chain length) affected the welfare of lactating dairy cows housed in tie-stalls. Over 12 months 12 tie-stall farms (8 providing regular exercise, 4 that did not) were visited and the welfare of 20 cows/ farm was assessed 4 times. Visit 1 was conducted towards the end of the pasture season, visit 2, 9-30 days after stall improvements were applied, visit 3, towards the end of winter, and visit 4, 1 year after visit 1. Stall improvements were applied on half of the study cows within each farm with the most common change being re-adjusting the tie-rail. Cow welfare assessments were conducted at each visit and consisted of animal-based and housing measures, and a management questionnaire. Comparisons in body injuries between farms that provided exercise and farms that did not, as well as cows kept in improved stalls or unmodified stalls were analysed in a mixed linear model. On visit 1, results showed 31% and 13% less cows with neck and knee injuries, respectively, in herds that provided exercise access ($P < 0.01$). On visit 2, we found 19% ($P < 0.05$) fewer cows with neck injuries when provided with exercise and 13% ($P < 0.05$) fewer when kept in improved stalls. Towards the end of winter (visit 3) access to exercise resulted in 16% fewer cows with hock injuries ($P < 0.05$). In addition, exercise provision and improved stalls lowered the number of cows with neck injuries by 39% and knee injuries by 28% ($P < 0.05$). On visit 4, access to exercise reduced cows with hock injuries by 39% ($P < 0.05$). Our results showed that providing tie-stall cows with regular exercise can help improve cow welfare by reducing body injuries. Furthermore improving stall design might have an additional benefit in reducing neck and knee injuries during the winter season.

Laying hens do not avoid dirty scratch pads in enriched cages

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Enriched cages for laying hens provide scratch pads for foraging. Not only do birds forage on scratch pads, they also defecate on these pads causing them to become dirty. How a bird perceives a dirty scratch pad and what this means to them from their point of view has never been tested. The present study was conducted to determine the relative preference of laying hens for clean or dirty scratch pads. A total of 288 laying hens were housed in 16 enriched cages (18 hens/cage), with each cage having two identical compartments joined by a pop hole to allow free movement of hens between compartments. On a daily basis, half of the scratch pads (1 in each compartment) were removed and cleaned, while the other half were cleaned and covered with 550 g of conspecific feces. Clean and dirty pads were then put back into the cages in a random order, avoiding side bias. Feed as litter substrate (~ 5 g/delivery/scratch pad/hour) was delivered automatically onto the scratch pads by a spiral conveyor pipe. After identifying the time when hens were most active using video recordings (mid-day), the number of visits and the total time spent scratching/foraging on clean and dirty pads were video recorded for 10 min/day, 3 times a week, over a period of 4 weeks. The observation period started when the feed was delivered on each scratch pad. Data were analysed using GLIMMIX procedure of SAS. Laying hens showed a relative preference for dirty pads. Birds visited more frequently (3.6 ± 0.13 vs. 3.2 ± 0.13 visits/min; $P < 0.01$) and spent more time foraging (106.1 ± 4.95 sec vs 96.7 ± 3.51 sec; $P < 0.05$) on the dirty than on the clean pads. Interestingly, laying hens did not avoid dirty scratch pads. Scratching/foraging on dirty scratch pads to get feed required more effort to obtain the feed and might explain why laying hens kept in enriched cages showed a relative preference for foraging on scratch pads where feed was delivered on top of the feces. Additionally, the relative preference for dirty pads suggests the necessity of substrates for laying hens in enriched cages.

Differential effects of enrichment on the subtypes of stereotypic behaviour in mink

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Stereotypic behaviours (SBs) are common in farmed mink and other captive animals, and typically reflect poor welfare since they are more common in suboptimal housing. In carnivores, SBs typically involve whole-body movements (e.g., route-tracing and whole-body bobbing) or head-only movements (e.g., head-twirling). Farmed mink may also repeatedly scratch at the cage walls (“scrabbling”), often in response to the presence of neighbours. Environmental enrichment is commonly used to treat SBs, but typically does not fully eliminate them. We therefore explored whether different subtypes vary in the degree to which they are reduced by enrichment. We assessed enrichment effectiveness on the different SB subtypes of 31 farmed male mink who were individually-housed in standard non-enriched cages from 7 to 12 months of age and then transferred to larger, enriched cages at 14 months old. SB observations (i.e., ‘whole-body’, ‘head-only’, and ‘scrabbling’) were conducted in the mornings during two 6-day periods in standard housing and during an 8-day period in enriched housing. The amount of change in time spent stereotyping in each subtype was calculated using two indices: absolute reduction (SB pre-enrichment minus SB post-enrichment) and relative change (1 minus SB post-enrichment/SB pre-enrichment). Wilcoxon-Signed Rank Tests comparing these metrics between whole-body and scrabbling SB (head-only SB being omitted due to a small n) revealed a significant difference in relative change, whole body SBs being reduced more (whole-body SB: $Mdn=1$, $IQR=0$; scrabbling: $Mdn=0.93$, $IQR=0.46$; $z=-2.43$, $p<.05$), but not for absolute change. Mink were also scored as to whether or not each subtype was “cured”, with “yes” indicating that the SB was no longer performed post-enrichment, and “no” indicating continued performance (even if at reduced levels). A logistic regression, with “cured” as the dependent variable, and SB subtype and mink ID (a random factor) as the independent variables, revealed a trending effect of SB subtype ($\chi^2=5.32$, $p=.07$). Specifically, scrabbling was the least likely to be cured by enrichment ($p<.05$). Together, the results indicate that scrabbling is less likely to be reduced by enrichment than are other SBs. Thus, not all types of mink SB are equally reduced by environmental enrichment, with scrabbling being more resistant to change.

The effects of dog-assisted student stress-busters on canine stress

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Research on animal-assisted activities (AAA) carried out with dogs has shown inconsistent results on whether the dogs participating experience distress. This study investigated the frequency of distress behaviours displayed by dogs while at the University of Guelph Take-a-Paws student stress-buster. It was hypothesized that the dogs would display more distress behaviours when students were present compared to when they were not. St. John Ambulance certified therapy dogs (n=10) participated in six two-hour sessions (four dogs/session) divided into six 15-minute periods with students separated by five-minute breaks. Dogs were videotaped for the middle four minutes of each of the six periods, and immediately after the 6th period with only their owners as a control. Lip licking, yawning, head/body shaking, self-chewing, self-scratching and paw lifting were sampled continuously, while panting, tail position, student and owner interactions, posture, ear position and belly exposure were sampled instantaneously every 30 seconds. Data were analyzed using a general linear mixed model with repeated measures, using Sidak's multiple comparisons to determine differences in behaviour frequencies by period, dog age, gender, length of certification, number of sessions attended that week and average weekly time spent in therapy activities. None of the behaviours differed significantly between any period and the control ($P>0.05$). Older dogs showed significantly less lip licking, head/body shaking and more self-chewing than younger dogs (11.5 ± 1.97 vs. 16.0 ± 3.29 ; 0.2 ± 0.08 vs. 0.6 ± 0.21 ; 0.5 ± 0.19 vs. 0.05 ± 0.048 mean \pm SEM for lip licking, head/body shaking and self-chewing in dogs >5 yrs vs. dogs <5 yrs respectively, $P\leq 0.0004$), while dogs certified for therapy longer exhibited less yawning, self-chewing and belly exposure than dogs more recently certified (0.7 ± 0.17 vs. 1.0 ± 0.14 ; 0.1 ± 0.07 vs. 0.6 ± 0.26 ; 0.4 ± 0.12 vs. 0.5 ± 0.15 mean \pm SEM for yawning, self-chewing and belly exposure in dogs certified >2 yrs vs. dogs certified <2 yrs respectively, $P<0.05$). The results suggest that older, more experienced dogs display fewer behavioural indicators of stress during AAA. To determine whether welfare was compromised, a control session with greater independence would be required to more accurately determine if distress behaviours increased during the AAA compared to baseline.

Evaluation of meloxicam and ketoprofen for pain mitigation in piglets undergoing surgical castration

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Millions of boar piglets in North America are surgically castrated each year, to minimize boar taint and aggression. While this procedure is known to be painful, and as of July 1st, 2016, legislation in Canada mandates that piglets be provided with appropriate analgesia to control post-procedural pain, many piglets are not given anything for pain relief. This has a significant impact on piglet welfare. The objective of this study was to assess the efficacy of meloxicam (0.4mg/kg and 1.0mg/kg) and ketoprofen (6.0mg/kg) in reducing pain in castrated piglets, using validated behavioural scoring techniques. Fifteen litters of 5 day old piglets (n=80) were used and boar piglets within a litter were randomly assigned to one of eight possible treatments: 0.4mg/kg meloxicam-castrated, 0.4mg/kg meloxicam-uncastrated, 1.0mg/kg meloxicam-castrated, 1.0mg/kg meloxicam-uncastrated, 6.0mg/kg ketoprofen-castrated, 6.0mg/kg ketoprofen-uncastrated, saline-castrated, or sham-castrated (n=10 piglets/treatment group). Injections were given intramuscularly 20mins prior to surgical castration. Piglets were video recorded for 1h pre-procedure, immediately post-castration for 8h and for another 1h, 24h post-procedure (10h total). Twenty-one behaviours and postures were scored continuously for the first 15mins of every hour by four observers blinded as to experimental time and piglet treatment using Observer XT software. Data was analyzed using a mixed model ANOVA with repeated measures and a post-hoc Tukey test. Castrated piglets were significantly less active 3h and 4h post-castration ($p= 0.0007$ and $p<.0001$, respectively) while uncastrated piglets had unvarying levels of activity throughout the observation period. Castrated piglets also displayed significantly more tail wagging and pain-related behaviours (e.g., spasms, rump rubbing, trembling, stiffness) than uncastrated piglets ($p<.0001$). The use of meloxicam or ketoprofen was not associated with a reduction in pain behaviours or postures. Our findings indicate that the use of NSAIDs at recommended doses are not effective in alleviating castration-associated pain in neonatal pigs.

Exploring the effect of automated milk feeding stall design on dairy calf behavior

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There is evidence that the health and welfare of young dairy calves may be improved by increasing milk allowance and providing milk through a teat. These aspects are easily incorporated into automatic milk feeding (AMF) systems, which promote group housing, demonstrated to be important for social development of calves. Little is known about how calves interact with AMF. We investigated the effect of stall design features on calves learning to use the AMF. The hypothesis was that solid stalls would result in a longer latency to approach and feed from the AMF compared to gated style. Sixty-six male and fifty-three female Holstein calves were enrolled at 4 d of age and introduced to a group pen and trained on an AMF; calves were allowed to suck on a trainer's fingers and guided to the teat. Calves were allocated to 1 of 2 stall designs: with gated (open) side walls ($n=59$), or with solid side walls ($n=60$). For a 72-h period after training to the AMF, data from the AMF were collected and calf behaviors were monitored by video. Main outcomes measured were latency to first voluntary visit to the feeder, latency to first feeding, time spent in feeder, amount of milk consumed, and exploratory behaviors such as sniffing and licking of the feeder. Data were analyzed using a mixed-effect linear regression model, or a poisson model for the outcome of retraining. Stall design had significant ($P=0.0337$) impact by itself for the outcome of time to first stall explore, with calves on the gated design taking 2.11 times longer (CI 2.38, 19.42) than those on the solid style. Stall design often had an interaction with ease of training, and for calves that were intermediately easy to train, there were significant differences between stall design. These calves took 2.19 times ($P=0.0034$; CI 1.30, 3.67) longer to lick/bite at the nipple, and 2.10 times ($P=0.0009$; CI 1.37, 3.23) longer to first voluntarily drink. Results from this experiment show that simple features of a stall can influence how quickly calves adapt to an AMF. Based on these results, calves adapted to using the AMF quicker with solid stall walls versus gated style.

Clinical trial of local anesthetic protocols for acute pain associated with caustic paste disbudding in dairy calves

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Painful procedures, including disbudding and dehorning, have been identified by stakeholders as key welfare issues in the dairy industry. Caustic paste disbudding is becoming more commonplace in North America, but few studies have evaluated pain control for this procedure. The objective of this clinical trial was to evaluate the effects of either a lidocaine cornual nerve block or a topical anesthetic incorporated into caustic paste on the acute pain of caustic paste disbudding. Seventy-two Holstein-Friesian calves housed in groups with an automated milk feeder were enrolled into 18 replicates balanced on age and assigned to one of four treatments: sham (S), a placebo paste and a saline cornual block; topical (T), a novel caustic paste containing lidocaine and prilocaine, and a saline cornual block; cornual block (B), commercial caustic paste and a lidocaine cornual nerve block; and positive (P), commercial caustic paste and a saline cornual block. All calves received 0.5 mg/kg meloxicam SC at the time of the block. Researchers were blinded to treatment group. Primary outcomes were validated pain behavior responses and pain sensitivity measured by algometry. Secondary outcomes consisted of respiratory and heart rate, latency to approach the evaluator, play behavior, feeding behavior, and standing and lying bout characteristics. Data were analyzed using linear, Poisson, and negative binomial regression models. Cornual-blocked calves had less pain sensitivity to 180 minutes after disbudding than all other groups ($P<0.001$); T and P calves had more pain sensitivity than S calves for the same time period ($P<0.001$). Compared to T and P calves, B and S calves had fewer pain behaviors until 120-minutes post-disbudding ($P<0.05$) and decreased respiratory and heart rates ($P<0.01$). S calves exhibited more play behavior than other groups ($P<0.001$) and tended to have a shorter latency to feed than T or P calves ($P<0.10$). Caustic paste appears to be acutely painful for at least 180 minutes, and this is reduced by a cornual nerve block but not by our novel paste. We recommend that calves disbudded with caustic paste receive local anesthetic by a cornual nerve block to mitigate acute pain.

Assessing physical methods for on-farm euthanasia of compromised turkeys

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On-farm euthanasia is an important welfare issue in the poultry industry and is particularly difficult to perform in turkeys due to their large size. Reasons for on-farm euthanasia include, but are not limited to, injury, disease/sickness and reduced performance. The objective of this study was to determine the effectiveness of two commercially available non-penetrating captive bolt devices (Bock Industries, USA) for on-farm euthanasia. The Zephyr-EXL is hose-connected to an air compressor, whereas, the TED (Turkey euthanasia device) is cordless and powered by a propane fuel cell and battery. Both devices were used by 10 stock people to euthanize turkeys from 6 commercial farms. They were tested at three stages of production: 4 weeks (n=41, n=51), 10 weeks (n=39, n=40), and 15-20 weeks (n=42, n=40). After application, brain stem reflexes were monitored every 15s to assess insensibility. Convulsions and heart beat were recorded to determine estimated time of brain death and cardiac arrest. Brain hemorrhages and skull fractures were scored to evaluate traumatic brain injury. Data were analyzed using SAS University Edition. Fisher's Exact test was used to test whether the presence of nictitating and pupillary light reflexes were independent of killing method. A mixed model ANOVA was used to test for main effects and interactions among device, sex, and age for measures of convulsion end time and cardiac arrest. The Zephyr-EXL resulted in a greater percentage of immediate insensibility compared to the TED (97.5% vs. 89.3%, $P=0.0108$). Reasons for device failure included incorrect placement, and incorrect adapter selection (TED). For birds rendered insensible, interactions were seen between device and age for end time of convulsions and cardiac arrest. End time of convulsions took longer in birds that were 15-20 weeks of age (209 ± 10.14 s) compared to birds that were 4 weeks of age (139 ± 13.26 s) when using the Zephyr-EXL ($P<0.0001$); however there was no age effect for the TED. For both the Zephyr-EXL and TED, birds in older age groups took longer to reach cardiac arrest ($P=0.0004$). Macroscopic scoring indicated moderate to severe subcutaneous hemorrhage in 71% of birds and severe skull fracture in 97%. Although both devices were effective in the majority of cases, the Zephyr-EXL was more reliable and consistent in causing immediate insensibility and traumatic brain injury leading to death.

Comparison of health and behaviour between dairy cows with low and high SCC

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An elevated somatic cell count (SCC) in dairy cattle can indicate the presence of a potential mastitis infection. The objective of this study was to examine associations of gait score, lying behaviour, hygiene, and body condition score (BCS) between cows with low and high SCC. Cows from 14 commercial free-stall dairy farms were enrolled in a cross-sectional study. Herd enrollment was based on monthly participation in Dairy Herd Improvement (DHI) milk testing. Each farm was visited for a total of 3 observation periods (at ~5-wk intervals) on 2 occasions per period (7 d apart) until 3 DHI milk tests were completed. Upon immediate receiving of the results of each DHI test, lactating Holstein cows were selected according to SCC. Cows with the highest 10% SCC in the herd ($\geq 200,000$ cells/mL) were first selected and matched for parity and DIM to cows with low SCC ($\leq 100,000$ cells/mL). Lying behaviour was recorded for 6 d after each milk sampling using data loggers. On the visit where data loggers were attached, cows were scored for gait (1=sound to 5=lame) and hygiene of udder, lower legs, and upper legs/flank (1=clean to 4=dirty). On the visit where data loggers were removed 7 d later, BCS (1=thin to 5=fat) and hygiene were scored. Cows were then classified into each of the scoring categories for hygiene (dirty: ≤ 2 , clean: ≥ 3), BCS (high: ≥ 4 , normal: 3-3.5, low: ≤ 2.5), and gait (sound: ≤ 2 , lame: ≥ 3). Association of cows being high ($n=352$) and low ($n=362$) in SCC with lying behaviour, BCS, gait score, and hygiene score were tested in mixed-effect linear and logistic regression models. As compared to normal BCS cows, low BCS cows were at a greater odds of having a high SCC (OR=1.57, 95% CI=1.00-2.47, $P=0.049$). These cows were also at a higher odds of having dirty lower legs (OR= 2.64, 95% CI=1.08-6.46, $P=0.03$), spent less time lying down (-27.2 ± 12.5 min/d, $P=0.03$), and produced more milk ($+2.90 \pm 0.88$ kg/d, $P < 0.01$). On average, cows with high SCC produced 2.2 ± 0.72 kg/d less milk ($P < 0.01$) than those with low SCC. These results suggest that cows with low BCS, which were at greater risk of having high SCC, were also the highest producing, had poorest lower leg hygiene, and spent the most time standing.