Research Symposium

Ontario Veterinary College,
Pathobiology/AHL Building, Room 1800
April 27th, 2011
9:25am – 5:00pm

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ORAL PRESENTATIONS

9:25 Welcome

Session I - Management and environment: How can we do better?

9:30 Lighting source and the development of feather pecking in a commercial turkey facility
   Graham Duggan, Lloyd Weber, Tina Widowski, Stephanie Torrey*

9:50 An initial study of daily activity time budgets in captive giraffes with reference to potential welfare issues
   Denise Lukacs*, Stephen Miller, Jim Atkinson, Esther Finegan

10:10 Measuring cow comfort on commercial dairy farms in Canada
   Clémence Nash*, Jessica Zaffino, Jenny Gibbons, Elsa Vasseur, Derek Haley

10:30 Keynote I - Stuart Little is drowning!
   H. Davis

11:10 Break & Poster Session

Session II - Feeding for optimal welfare: How, what, where and when?

11:40 The effect of different diets and dietary regimes on feather coverage in broiler breeder hens
   Krysta Morrissey*, Tina M. Widowski, Steve Leeson, Vicky Sandilands, Hank Classen, Stephanie Torrey

12:00 Separating the stressors: a pilot study investigating the effect of a graduated weaning practice on behaviour and performance of dairy calves
   Amy Stanton*, Raymond Brooks, Patrick Gorden, Bruce Leuschen, James West, David Kelton, Rebecca Parsons, Tina Widowski, Suzanne Millman

12:40 Free-access feeding of acidified milk replacer – effects on calf performance, health and welfare
   Cynthia Todd*, Trevor DeVries, Kenneth Leslie, Jan Sargeant, Neil Anderson, Suzanne Millman
1:00  LUNCH

Session III - Assessing and treating pain and injury

2:00  Objective assessment of pain in dairy cattle with clinical mastitis
   Colleen Fitzpatrick*, Núria Chapinal, Todd Duffield, David Kelton, Trevor DeVries, Christina
   Petersson-Wolfe, Ken Leslie

2:20  Do therapeutic hoof blocks alter dairy cattle behaviour?
   Janet Higginson*, Jan Shearer, David Kelton, Pat Gorden, Gerard Cramer, Anne Marie de
   Passille, Suzanne Millman

2:40  The effect of ketoprofen following left displaced abomasum surgery on lying
      behaviour and ketosis
   Nathalie Newby*, Stephen LeBlanc, Ken Leslie, David Pearl, Marina von Keyserlingk, Todd
   Duffield

3:00  I’m not going there! Using conditioned place preference to assess the aversiveness
      of restraint and blood sampling in piglets
   Puja Wahi*, Stephanie Yue Cottle, Tina Widowski

3:20  Break & Poster Session

3:50  Keynote II - On-farm intervention to improve management practices affecting
      dairy calf and heifer welfare: Development of an advisory tool
   Elsa Vasseur*, Anne Marie de Passillé, Jeff Rushen, Daniel Lefebvre, Doris
   Pellerin

4:30  Wrap-up and Student prizes

POSTER PRESENTATIONS

Brain lesions and time to death resulting from non-penetrating captive bolt application for
euthanasia of piglets up to 9 kg
Teresa Casey-Trott*, Raymond Brooks, Patricia Turner, Stephanie Nykamp, Marcus Litman,
Suzanne M Millman, Tina Widowski

The effects of frequency of feed provision on the feeding behaviour of limit-fed dairy
heifers
Angela Greter*, Todd Duffield, Brian McBride, Tina Widowski, Trevor DeVries

Effect of milk feeding level on performance and feeding behaviour of dairy calves
Emily Miller-Cushon, Renee Bergeron, Ken Leslie, Trevor DeVries
Challenges and successes of Ontario animal shelters: Maximizing resources to impact shelter dog welfare
Amanda McKibbon, Tina Widowski, Stephanie Yue Cottee

“Please pass the Prozac” exploring the use of pharmacologic agents for studying negative emotional states in hens
Stephanie Yue Cottee, Kenner Rice, Tina Widowski
ABSTRACTS

Keynote Presentations

Speaker #1: Hank Davis

Stuart Little is Drowning!

Hank Davis

University of Guelph, Department of Psychology, Guelph, ON, Canada

Mice are everywhere: we know them as adorable images on greeting cards, children’s books and movies; as welcome participants in biomedical research; and as unwelcome visitors in our homes. We are ambivalent about them, to say the least. I will examine just how deeply that ambivalence runs, and suggest that perhaps we should channel some of our affection for mice named Mickey and Stuart Little into our treatment of the unwanted specimens we meet. It’s time to decide whether this highly successful small mammal is a friend or a foe of humanity, and start treating them accordingly.

Speaker #2: Elsa Vasseur

On-farm Intervention to Improve Management Practices Affecting Dairy Calf and Heifer Welfare: Development of an Advisory Tool

Elsa Vasseur¹ ², Anne Marie de Passillé¹, Jeff Rushen¹, Daniel Lefebvre³, and Doris Pellerin²

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Mortality and morbidity of dairy calves remain high in North America, which is a costly animal welfare concern. A survey of 115 Quebec dairy farms found mean perinatal calf mortality of 9.3 %, which producers underestimated by 40 %. Most producers felt calf mortality was not a problem on their farm. There is a need for interventions at the farm level to help producers improve calf welfare, production sustainability and consumer assurance. From this survey, we identified 9 areas of concern related to calf and heifer health and welfare: calving management, care of the newborn and painful procedures, colostrum management, weaning, calf feeding, calf housing, heifer feeding, heifer housing, and health. We developed an advisory tool to identify the critical points where management impacts the welfare of calves and heifers. We recommended targets for each area of concern and provided background explanation for those targets. For example, the area of concern “colostrum management” had many targets such as “first feeding of colostrum within first 4 h of calf’s life”. An expert committee validated the scoring system and recommendations. The tool was tested in 28 Quebec dairy farms for feasibility, producer satisfaction and repeatability. Farmers were asked to take colostrum and blood samples, and record health data. The on-farm evaluation included an interview on management practices and in-barn measurements related to calf and heifer welfare. The efficiency and usefulness of the tool was evaluated by the producers during a final debriefing. We found that we could keep farm visits
below 3 h and that we had good repeatability of our qualitative environment-based variables (Kappa value > 0.6). Our advisory tool was useful in detecting critical points and to discuss them with the producers. For some targets, producers scored on average below 50 % (on a scale from 0 %, target not reached to 100 %, target reached) in calving management, care to newborn calves and painful procedures, colostrum management, and calf feeding. Six months after the on-farm visit, producers had implemented some recommended practices. For example, a first feeding of colostrum within first 4 h of calf’s life was done by 75 % of producers (vs. only 39 % before the visit). Identifying welfare risk factors in management is essential to construct an on-farm welfare advisory tool adapted to a target population. Voluntary improvements in calf welfare were facilitated by using our tool to educate producers and help them change their calf management practices.
Oral Presentations

Separating the stressors: a pilot study investigating the effect of premixing on behavior and performance of dairy calves

Amy L. Stanton¹*, Raymond A. Brooks², Patrick J. Gorden², Bruce L. Leuschen², James K. West², David F. Kelton¹, Rebecca L. Parsons², Tina M. Widowski¹, Suzanne T. Millman²

¹ Departments of Population Medicine and Animal and Poultry Science, University of Guelph, Guelph, ON, Canada; ² Iowa State University, Ames, IA, USA

The majority of milk-fed calves in North America are individually housed and the transition to group housing following weaning can be stressful and result in increased susceptibility to disease. The objective for this research was to determine the effect of separating the stressors of post-weaning mixing and movement to a novel environment. The hypothesis was that mixing calves in a nursery prior to moving would reduce the stress associated with these changes as demonstrated by increased feed intake and decreased activity during the post-movement period. Weaned calves were randomly assigned to either a pre-mixed or traditionally raised treatment. At enrolment calves were 49 ± 9 (mean ± standard deviation) days of age. Pre-mixed calves (8 groups of 4 calves) were grouped in the nursery barn by removing dividers between pens on Day 0 to form a single large pen in which they remained for 1 week (Day 7). Traditional calves (8 groups of 4 calves) remained individually housed until Day 7. On Day 7, all calves were moved to a new barn where they were grouped by treatment in pens of 4 calves. Calves were weighed on Days -1, 6, and 13. Grain intake was measured at the group level on Day 3 through Day 12. On Day -4 an accelerometer (IceTag®) was attached to the mid-metatarsal region. Daily averages for activity and calf starter intake were calculated for baseline (Day -1 and -2), mixing (Day 0-6) and post-movement (Day 7-13) periods. Associations between treatment, behavior, starter intake and average daily gain (ADG) were analyzed using linear mixed models. Calf starter intake was not significantly different between treatments during mixing or post-movement periods (P=0.34 and 0.55, respectively). Pre-mixed calves tended to gain more during the mixing period than the traditional calves (0.9±0.5 kg, P=0.10). There was no difference in weight gain during the post-movement period between treatments (P=0.73). Treatment had no effect on the number of lying bouts during mixing and post-move periods (P=0.11 and 0.47, respectively). During the post-movement period, pre-mixed calves tended to rest longer (P=0.09) and take (327±204) fewer steps per day than traditional calves (P=0.10). Pre-mixing calves tended to increase ADG pre-mixing and reduce activity changes associated with movement to a novel environment. This indicates that pre-mixing may reduce the stress associated with movement to a novel environment.

Environment and the development of feather pecking in a commercial turkey facility

Graham Duggan¹, Lloyd Weber², Tina Widowski¹ and Stephanie Torrey¹,³*

¹Department of Animal and Poultry Science, University of Guelph, Guelph, ON, Canada; ²LEL Farms, Guelph, ON; ³Agriculture and Agri-Food Canada, Guelph, ON, Canada

Feather pecking is a serious welfare concern for the poultry industry. While inroads have been made into understanding the causal factors involved in feather pecking in the laying hen, little research has been done to examine the problem in the domestic turkey. Environment appears to
play an integral role in feather pecking, although the relationship between environment and pecking has never been examined in commercial housing. The objective of this pilot study was to examine the development of feather pecking in two environments in a commercial turkey tom facility, with the expectation that higher light intensities would induce more feather pecking. After rearing in identical pens, 49,332 beak-trimmed male turkeys were placed in two growing facilities at 4.5 weeks of age: environmentally controlled (artificial light and ventilation; E) or curtain-sided (natural light and ventilation; C) environment (5000-7500 turkeys/pen; n=8 pens) through 15 weeks of age. Video-recordings captured feather pecking behaviour, feather condition was scored on 4 body regions (neck, back, wing and tail) and weights were measured on a randomly-selected 100 birds/pen every 3 weeks. Mortalities and culls were recorded as they occurred. Data were analyzed with a mixed-model analysis, with repeated measures used where applicable. Mortality and behaviour data were log and square-root transformed, respectively. Light intensity in E ranged from 1-338 Lux. C barns experienced intensities ranging from 150-4800 Lux. We found a difference \( (P=0.01) \) in severe feather pecking between the two environments, with 2.8 times as many pecking bouts occurring in C as in E. There was no difference in gentle feather pecking \( (P=0.84) \). Feather scores were different between the two environments \( (P=0.007) \), with C having worse plumage than E throughout the experiment. Culls and mortality were also influenced by environment \( (P=0.002) \). In E, 3.2% of turkeys were culled or died, with 1.1% of culls and deaths due to pecking. In C, 6.5% of turkeys were culled or died, with 4.4% of culls and deaths due to pecking. Growth rates did not differ between environments. In conclusion, the lack of control over the environment in a commercial setting was detrimental to turkey welfare by leading to increased feather pecking and resulting injuries and deaths.

**Objective Assessment of Pain in Dairy Cattle with Clinical Mastitis**

Colleen E. Fitzpatrick\(^1\)*, Núria Chapinal\(^{1,2}\), Todd F. Duffield\(^1\), David F. Kelton\(^1\), Trevor J. DeVries\(^1\), Christina Petersson-Wolfe\(^3\), Ken E. Leslie\(^1\)

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Clinical mastitis is a prevalent problem in the dairy industry, and has detrimental effects on the animal’s profitability, as well as negative impacts on cow welfare. As with many disease conditions in animals, it is inferred that mastitis causes significant discomfort and pain. There are many studies that present extremely useful information about discomfort with mastitis, when the animal presents the classic signs of illness, such as decreased dry matter intake and milk production, or overall restlessness. However, published documentation quantifying pain with mastitis is not abundant. This study was conducted to objectively assess pain in cases of experimentally-induced clinical mastitis, involving 24 lactating Holstein cows enrolled in a lipopolysaccharide (LPS) endotoxin challenge study. Each animal was challenged in one rear mammary quarter by intramammary infusion with 25 \( \mu \)g of *E. coli* LPS. Subsequently, a subcutaneous injection of either a placebo \((n=12)\) or non-steroidal anti-inflammatory drug (NSAID) treatment (meloxicam) \((n=12)\) was randomly allocated and administered using double-blind methods. The animals were monitored for two days prior to, and two days following, the intramammary challenge. Several behavioural and physiological parameters were monitored throughout the study period, including standing and lying activity, rumination, core body temperature, milk weights and dry matter intake. Also, at specific sampling times, rectal temperatures, serum haptoglobin, serum amyloid A, udder edema scores, pain sensitivity of the udder using a pressure measurement algometer, somatic cell counts and clinical scores of milk...
were evaluated. Using rumination and activity collars, rumination was calculated in 2 hour intervals throughout the trial period. During the first six hours after inoculation and treatment, cows ruminated 14.6 ± 2.1 min/2 h interval (p<0.001) less compared to the same baseline time period prior to challenge. Using a pain pressure algometer, the amount of pressure that could be applied to the quarter before there was an adverse reaction from the cow, was taken. The difference between the pressure applied to the control quarter was compared with the applied pressure on the challenge (infused) quarter. There was a significant difference at hour six after inoculation and treatment as compared to the baseline readings. For animals that received a NSAID treatment, more pressure could be applied on their challenge quarter than their control quarter (1.9±0.9 lbs.; p=0.0496). Animals that received the placebo treatment registered more pressure applied to the control quarter than the challenge quarter (2.5±0.9 lbs.; p=0.0119). These results indicate the potential for using continuous measurement of rumination and pain pressure sensitivity for objective assessment of pain due to illness in cases of clinical mastitis.

Do therapeutic hoof blocks alter dairy cattle behaviour?

Janet H. Higginson1*, Jan K. Shearer2, David F. Kelton1, Pat Gorden2, Gerard Cramer1,3, Anne Marie B. de Passille4, Suzanne T. Millman2

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Lameness is one of the primary welfare concerns in the dairy industry. Although behavioural observation has been used for the detection of lameness, it has not been utilized for the study of efficacy of treatments such as the application of therapeutic hoof blocks for sole ulcers. Additionally, therapeutic hoof blocks may be underutilized due to producer concerns about their impact on behaviour. Therefore, the objective of this study was to examine the effects of application of therapeutic hoof blocks on the behaviour of non-lame dairy cows, with the prediction that block attachment would slightly alter activity levels of dairy cows. Wooden hoof blocks attached with Bovi-Bond (Bovi-Bond, Netherlands) were randomly assigned to the left and right medial hind claws of 10 out of 20 sound Holstein cows housed in the same freestall pen and were observed for a total of 28 days. IceTag3Ds (IceRobotics, UK) were affixed to both hind legs of 4 blocked and 4 control cows. Multivariable mixed modeling with repeated measures for cow was used to determine behavioural differences between the blocked and control animals. Behavioural changes were expected to occur shortly after block application; therefore Days 1 and 2 post-block application were compared to the day prior to application (pre-block). There were no significant differences in the number of steps taken between the two periods for either blocked or unblocked cows (p>0.05). On average, cows took 2574.3 (± 241.5) steps per day pre-block and 2414.2 (± 133.2) steps per day post-block (p=0.30). An average of 11.7 (± 1.6) and 11.4 (± 0.9) lying bouts per day were performed pre- and post-block, respectively (p=0.69). There was a trend for increased lying duration in the post-block period (pre-block = 58.1 (± 5.2), post-block = 69.6 (± 4.8) minutes per bout, p=0.07), but this was observed in both blocked and unblocked cows. There appear to be no significant changes in the activity or lying behaviour of dairy cattle during the 2 days following application of a block to a single hind claw, suggesting that the use of therapeutic hoof do not have negative behavioural implications and could be used for sole ulcer treatment.
An initial study of daily activity time budgets in captive giraffes with reference to potential welfare issues

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Giraffes (*Giraffa camelopardalis*) face unique challenges to their welfare in captivity. Nutrition, thermoregulation and abnormal behaviours may be among the key welfare challenges in captive giraffes. Giraffes are browsing ruminants, however feeding large quantities of browse in captivity is difficult. Consequently captive giraffes are fed diets based on hay and concentrates, which affect digestion and health. Ultimately, sufficient dietary energy is difficult to provide and can lead to mortality. Furthermore, thermoregulatory stress may increase energy demands. Giraffe thermoregulatory mechanisms have implications for enclosure design, including the provision of shade and night-time housing. Additionally, captive giraffes show a high rate of abnormal repetitive oral behaviours, such as tongue playing. A number of possible causes have been suggested, including insufficient rumination time, inadequate dietary fibre, or a lack of naturalistic browsing behaviour. Some tongue playing has been observed in the wild, indicating this may be a normal behaviour with an abnormal duration in captivity. However, little research has been done to establish activity time budgets in captive or wild giraffes. The preliminary study was conducted on two adult, female, captive-bred giraffes to determine daily activity time budgets. Continuous recording of behaviour was conducted for an average of 8.5 hours per day on four non-consecutive days (8:30 am to 5 pm) while giraffes were outside on exhibit. The giraffes were fed hay and concentrates, with a limited amount of browse. Daily activity time budgets appeared to vary between giraffes and observation days. The two giraffes respectively spent 11 to 36% and 33 to 48% of the day eating, 15 to 38% and 0 to 4% of the day ruminating, and 26 to 54% and 42 to 59% of the day performing abnormal repetitive behaviours (tongue playing). The results of this preliminary study suggest areas of future research, including management changes which may enhance the welfare of these giraffes. With decreasing population levels in the wild, optimal management in captivity will become more important in the future.

The effect of different diets and dietary regimes on feather coverage in broiler breeder hens

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Due to their capacity to grow quickly, broiler breeders must be severely feed restricted to maintain healthy body weights. This restriction can induce stereotypic behaviours indicative of chronic hunger, including feather pecking. It has been suggested that part of the problem may be related to redirected feeding motivation or a lack of dietary fibre. This study investigated the differences in feather coverage between 6 dietary regimes. It was hypothesized that the birds fed the most fibrous diets would have better feather coverage due to decreased feather pecking behaviour. Also, due to the perceived welfare insult of skip-a-day (SAD) feeding, it was hypothesized that daily-fed birds would have better feather coverage as well. Each treatment had 5 replicate pens of 9-12 birds. Control diets consisted of a commercial crumble. Treatment diets included soybean
hulls (SBH) as a bulking ingredient and calcium propionate (CaP) as an appetite suppressant of either a feed grade (FG) or purified (P) quality. Control and treatment diets were either fed on a daily or SAD basis. All rations were fed once daily at 8am. The SAD birds were allocated double the amount of feed as the daily-fed birds, but were fed once every other day. Daily fed birds were randomly distributed across 2 rooms and the SAD fed birds in 2 different rooms. A random selection of 5-6 birds from every pen was scored at 10, 14, 20, 26 and 36 weeks of age. Six body parts (neck, back, wings, legs, vent area, tail) were given a score from 0-5 (0 = no feather damage, and 5 ≥ 50% feather loss with tissue damage). Data were analyzed using a split plot design with Room and Frequency (daily and SAD) as main factors and Feed Type (control, SBH/CaP-FG and SBH/CaP-P) as the sub-factor (SAS 9.2). There was a significant effect of Feed Type (Control: 2.53 ± 0.45 SE; FG: 1.01 ± 0.24 SE; P: 1.38 ± 0.27 SE; P=0.0025). The control birds scored more poorly than both alternative diets (Control: 2.53 ± 0.45 SE; Alternative: 1.20 ± 0.18 SE; P=0.0192). The interaction between Frequency and Time was significant (P=0.01), with daily-fed birds scoring more poorly than SAD-fed birds for the third, fourth and fifth scoring sessions. This interaction could be explained by the possible increase in satiation as the birds became accustomed to the SAD regime. These results indicate that the addition of fibre and an appetite suppressant to increase satiety can reduce the severity of feather pecking and improve feather coverage. This reduction in feather pecking may be paralleled by a reduction in other stereotypies which could indicate an increase in general welfare for the birds.

Measuring cow comfort on commercial dairy farms in Canada

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Much research has been done under experimental conditions looking at ways to improve cow comfort and the welfare of dairy cattle (e.g., provide deep, dry bedding). Few studies, however, have attempted to validate and extrapolate the results of experimental studies to the real-life situations that exist on working dairy farms. The present cross-sectional study involves visiting a total of 240 tie-stall, free-stall and automated dairy farms in Ontario, Alberta and Quebec. Only farms milking 40 or more Holstein cows will be enrolled in the study. Data collection within each housing system is being spread over both summer and winter periods to balance for seasonal effects. To date 30 farms have been visited and assessed. The main objective of this research is to gather information about a variety of housing and management factors known to affect the welfare of dairy cows and to examine their relationship with relevant animal-based measures. For instance we hypothesize that cows on farms that provide more bedding will have fewer injuries than cows on farms that provide minimal bedding. Measures are being taken over the course of two visits to each farm, spread 5 to 7 days apart. The behavioural outcome of average daily lying time is being measured by validated automated behaviour recording equipment (HOBO data loggers). Other animal-based measures include the prevalence of hock and knee injuries, body condition scores, lameness and cow cleanliness on the same 40 cows used to record lying behaviour. Inter- and intra-observer reliability for recording these measures is being maintained at a minimum of 75% exact agreement. Housing and management factors being measured include aspects of stall design, bedding quantity, bedding wetness and the type of stall flooring. This talk will discuss how these measures were taken and why they may be good indicators of cow comfort on-farm. Qualitative data on lying time, injuries and stall design will also be presented based on the data collected to date. These cow comfort evaluation methods are being developed into a cow
comfort assessment tool which would be available to dairy producers to assess, monitor and manage cow comfort on their farm.

**The effect of ketoprofen following left displaced abomasum surgery on lying behaviour and ketosis**

Nathalie C. Newby¹*, Stephen J. LeBlanc¹, Ken E. Leslie¹, David L. Pearl¹, Marina A.G. von Keyserlingk², Todd F. Duffield¹

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Surgical correction of left displaced abomasum (LDA) is common in lactating dairy cattle, but it is not common practice to administer analgesia following LDA surgery although surgery is normally associated with pain. The objectives of this research were to examine the effect of administering a label dose of the non-steroidal anti-inflammatory drug ketoprofen on lying behavior and ketosis (blood $\beta$-hydroxybutyrate (BHB)), as well as on farmer perception of recovery following LDA surgery. A total of 148 Holstein cows were enrolled in a field study following LDA surgery (standing right flank (RF) or paramedian (P) approaches selected by the veterinarian). Using a double-blind randomized method, each animal was assigned to receive either 3 mg ketoprofen/kg body weight or saline by intramuscular injection, immediately following surgery and 24 h post-operatively. A subset of cows (n=37) were fitted with a 3-axis accelerometer on the hind leg to assess lying activity. Farmers were asked to provide information on the cow’s appetite in the days following surgery. Lying time data were analyzed using multivariable linear models with a random effect for cow and binary outcomes were analyzed using a mixed logistic model. Cows subjected to P surgery lay down less ($\beta$= -3.8 h; 95% C.I.: -2.3, -5.4 h; $P<0.01$) in the first 3 d, and had higher heart rate ($\beta$= 9.4 beats/min; 95% C.I.: 6.9 – 12 beats/min; $P<0.05$) d 2-4 after surgery, compared to animals that underwent RF surgery. In all cows, regardless of surgical procedure or ketoprofen treatment, BHB significantly decreased from surgery to d 2-4 ($\beta$= -1.9; 95% C.I.: -2.1, -1.7; $P<0.001$) and d 8-10 ($\beta$= -2.0; 95% C.I.: -2.2, -1.8; $P<0.001$). Based on observations by producers (who were blinded to treatment status), animals that received ketoprofen were more likely to begin eating when provided fresh feed on the first 3 days following surgery compared to those that received saline (OR= 4.2; 95% C.I.: 1.4, 12.5; $P=0.01$). These results suggest that P surgery of LDA may result in more pain than the RF approach, and that ketoprofen did not have any effects on post-surgical pain. Further investigation of assessment and management of post-surgical pain is warranted in order to further investigate the role of NSAIDs for the alleviation of this pain.

**Free-access feeding of acidified milk replacer – effects on calf growth, health and welfare**

Cynthia Todd¹*, Trevor DeVries², Kenneth Leslie¹, Jan Sargeant¹, Neil Anderson³, Suzanne Millman⁴

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The aim of this research was to examine the effects of milk replacer acidification for free-access feeding on the growth, health and welfare of veal calves. Holstein male calves were randomly assigned at birth to free-access feeding of A) milk replacer (22% CP, 17% fat; n=32) or B) acidified milk replacer (n=31). Milk replacer was fed to the calves via a rubber teat. Calves were weaned off milk replacer at 42 d. Milk replacer, starter ration and water intakes were measured daily from birth until weaning. Preweaning BW gain was determined weekly. After weaning, calves were transitioned to a growing / finishing diet for grain-fed veal, weighed every 2 weeks and slaughtered at 6 months of age. Disease information was recorded from birth until slaughter. At slaughter, the right and left lungs for each calf were collected and evaluated for gross pathological changes. The dressed weight of each carcass was obtained. Multivariable regression models were constructed to examine the effects of treatment on milk replacer intake, time to onset of starter consumption, BW gain and carcass weight. Differences between treatment groups for disease events and death were tested using Pearson’s $\chi^2$ and Fisher’s exact test.

Calves assigned to the acidified treatment consumed less milk replacer than the control animals (10.1 vs. 11.3 L/d, SE=0.2, $P < 0.01$) and had earlier onset of starter intake (32.0 vs. 39.5 d, $P < 0.05$). Milk replacer acidification tended to be associated with reduced preweaning ADG (0.9 vs. 1.0 kg/d, SE=0.1, $P < 0.10$), but did not affect weaning BW (85.1 vs. 87.8 kg, SE=2.0, $P > 0.05$), postweaning ADG (1.2 vs. 1.2 kg/d, SE=0.01, $P > 0.05$) or dressed carcass weight (150.2 vs. 149.2 kg, SE=3.3, $P > 0.05$). Calves did not differ by treatment for the occurrence of diarrhea (A vs. B: 36.1 vs. 42.6 %, $P > 0.05$) or death (A vs. B: 3.2 vs. 1.6 %, $P > 0.05$) during the study. There was, however, a tendency for fewer acidified milk replacer-fed calves to have lung tissue affected with lesions of pneumonia (6.9 vs. 19.0 %, $P < 0.10$). These results indicate that under free-access feeding conditions, acidification of milk replacer does not negatively affect long-term growth performance of calves, but may support improved respiratory health and welfare.

I’m Not Going There! Using Conditioned Place Preference to Assess the Aversiveness of Restraint and Blood Sampling in Piglets

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Conditioned place preference (CPP) is used to determine the degree of positive/negative reward associated with specific experiences by pairing experiences with distinct locations and measuring animals’ avoidance of or attraction to those locations. Three groups of twelve piglets were used in 3 experiments to investigate the relative aversiveness of restraint and blood collection using CPP. Expt 1 was used to establish proof of concept and examined whether preferences developed for a pen in which piglets explored with a littermate (E) over that where they were restrained in a v-restrainer (R). Expt 2 tested preferences for pens in which piglets were either restrained (R) or restrained in an identical manner and blood sampled from the suborbital sinus (SO). Expt 3 tested preferences for pens in which piglets were restrained and blood sampled from either the SO or the jugular vein (JV). Paired t-tests compared the duration of time that isolated piglets spent in each of the two pens during a 4 min pre-conditioning test vs. a 4 min post-conditioning test that followed 5 days of pairing each experience with a specific pen. In Expt 1 piglets developed a clear preference for the exploratory pen over the pen paired with restraint (Pre-conditioning: 113.3 ± 14.0 sec in E vs. 126.7 ± 14.0 sec in R; $P=0.640$; Post-conditioning: 180.9 ± 9.0 sec in E vs. 59.1 ± 9.0 sec in R; $P < 0.01$). In Expt 2, piglets tended to spend less time during the post-conditioning test in the pen where both restraint and blood collection occurred compared to the pre-conditioning test (Pre-conditioning: 140.6 ± 25.3 sec vs. Post-conditioning: 107.1 ± 28.3 sec in SO; $P=0.079$). Expt 2 also showed no significant difference between time spent in SO and R pens.
in either the pre or post-conditioning tests (Pre-conditioning: 140.6 ± 25.6 sec in SO vs. 99.4 ± 25.6 sec in R; P=0.441; Post-conditioning: 107.1 ± 28.3 sec in SO vs. 132.9 ± 28.3 sec in R; P=0.657). Finally, Expt 3 showed no preference for either pen where the different blood collection techniques were performed (Pre-conditioning: 117.5 ± 19.6 sec in SO vs. 122.5 ± 19.6 sec in JV; P=0.90; Post-conditioning: 103.8 ± 14.9 sec in SO vs. 136.2 ± 14.9 sec in JV; P=0.30). These data indicate that CPP can be used to determine the relative preference/aversion for different handling experiences (Expt 1); that piglets prefer restraint only to restraint with blood collection (Expt 2) but they do not find blood sampling from the SO any more/less aversive than sampling from the JV (Expt 3).
**Poster Presentations**

**Brain lesions and time to death resulting from non-penetrating captive bolt application for euthanasia of piglets up to 9 kg**

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Within litter bearing species, variability in size, weight, and vigour among littermates is not uncommon. For swine, in order to reduce unnecessary suffering of the compromised piglets, timely euthanasia is recommended. Currently, blunt force trauma is the most commonly practiced method of euthanasia for suckling piglets; however, recent concerns regarding the aesthetics and repeatability of the method have led to a call for alternatives. The overall objective of this project was to test the effectiveness of a non-penetrating captive bolt (NPCB) for the euthanasia of piglets up to 9 kg. The study was completed in two trials. Trial 1 tested the effectiveness of a NPCB on 100 low viability piglets < 72 hours of age. Results indicated that a NPCB was highly effective for euthanasia of neonatal piglets based on immediate and sustained insensibility from the time of NPCB application until full cardiac arrest (FCA). Trial 2 assessed the brain lesions caused by a NPCB in 20 piglets in 4 weight classes (n=5 piglets: 3, 5, 7, or 9 kg) as compared to brain lesions of the neonatal piglets (1.04 kg±0.04 SE) from Trial 1. Since this was a novel technique for piglets ≥ 5.5 kg, they were anaesthetized (71.4 mg/ml ketamine, 14.3 mg/ml xylazine and 1.4 mg/ml butorphanol 0.2 mL/kg IM) prior to NPCB application to ensure insensibility. Following NPCB application, piglets were monitored for rhythmic breathing, neuromuscular leg spasms, and heart beat until FCA. Macroscopic, histological, and Computed Tomography (CT) scans were scored post mortem to assess degree of brain lesions. Statistical analysis was completed comparing brain damage between Trial 1 and Trial 2, and is currently underway assessing differences between the weight classes of Trial 2. On average, leg spasms ceased in 148 sec (±12.4 SE). One piglet required an alternative method due to a sustained heartbeat. All other piglets reached FCA in an average of 371 sec (±17.9 SE). Moderate to severe macroscopic damage was reported in ≥ 90% of piglets. Histological analysis showed mild to moderate subdural (SD) hemorrhage and minimal to mild parenchymal (P) hemorrhage. CT scan results reported an average fracture displacement (FD) of 9.38 mm (±0.84 SE). In comparison to the brain lesions of neonatal piglets, damage was less severe in the anaesthetized piglets (Mann-Whitney test for ordinal data: SD: P=0.007; P: P=0.041) despite greater FD (t-test: P=.019). Although damage was less severe in the larger anaesthetized piglets, NPCB still caused parenchymal brain lesions and effectively induced cardiac arrest. The next trial will test the effectiveness of a NPCB on conscious piglets up to 9 kg. Success of this technique has potential to provide producers with a humane, aesthetically acceptable method that could be used for euthanasia of piglets from birth into early stages of the nursery.

**The effects of frequency of feed provision on the feeding behaviour of limit-fed dairy heifers**

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Limit feeding is a feeding management strategy that may improve feed efficiency and reduce costs. However, it also poses behavioural concerns such as an increase in inactive standing, potentially contributing to lameness, and a decrease in daily feeding time, thereby preventing heifers from meeting foraging behavioural needs. The objective of this study was to determine the effect of feeding frequency on the feeding and competitive behaviour of limit-fed dairy heifers. We hypothesized that heifers would spend more time feeding and engage in less competitive behaviour when fed more frequently throughout the day. Twenty-four Holstein dairy heifers (178.2 ± 9.3 d old) were divided into six groups of four and exposed to each of three treatments using a replicated 3x3 Latin square design with 28-d periods. A high-concentrate ration (39% forage, 61% concentrate) was provided in a limited amount (2.05% of BW): 1) 1x/d (0800 h), 2) 2x/d (0800 and 1600 h), and 3) 4x/d (0800, 1200, 1600, and 2000 h). There was sufficient bunk space (0.34 m/heifer) for all heifers to feed simultaneously. Feeding behaviour was recorded for the last 14 d of each period. Competitive behaviour was recorded on d 23, 25, and 27 of each period. Lying time was recorded for the last 7 d of each period. Dry matter intake (DMI) was recorded daily and average daily gain (ADG) was recorded weekly. Data were analyzed in a general linear mixed model. DMI (4.9 kg/d; \( P = 0.5 \)) and ADG (0.8 kg/d; \( P = 0.6 \)) were similar between treatments. Daily feeding time was greatest when heifers were fed 1x/d (61.5 min/d, SE=0.9; \( P = 0.01 \)), followed by when fed 4x/d (51.8 min/d) and then when fed 2x/d (44.5 min/d). When fed 1x/d heifers displaced each other more than heifers on the 2x treatment (0.07 vs. 0.04 displacements/min, SE=0.01; \( P = 0.04 \)). Lying time (802.5 min/d; \( P = 0.4 \)) was similar between treatments. These results suggest that although competition at the feed bunk may be slightly greater, it may be beneficial to feed limit-fed dairy heifers 1x/d as this treatment increased the amount of time spent feeding each day, allowing greater opportunity for these animals to express natural foraging behaviour.

Challenges and successes of Ontario animal shelters: Maximizing resources to impact shelter dog welfare

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The welfare of dogs housed in animal shelters can be impacted through attending to various behavioural, environmental and social factors. The Ontario Society for the Prevention of Cruelty to Animals (OSPCA) faces a wide variety of challenges and opportunities in applying such strategies. This project had 2 main goals: 1) to determine the range of programs and services currently in place at OSPCA branches and affiliated shelters; and 2) to understand how basic shelter factors, such as availability of funding, number and training of staff/volunteers, and quality and quantity of space present challenges and/or contribute to the capability of shelters to engage in the above strategies. An online survey focused on information related to shelter dog welfare was completed by managers at 21 OSPCA shelter locations. Descriptive statistics revealed that the use of behaviourally based strategies varied widely across shelters, with 76% and 48% of shelters having performed behaviour assessments and having a training program in place, respectively. Similarly, while all shelters reported employing various environmental strategies the degree to which they engaged in such practices varied widely (e.g., frequency of walks and toy rotation, type of furniture and toys, etc.). This variable pattern was repeated again in shelter reports of the quality (auditory, visual, physical) and quantity of social interaction with humans and other dogs. Challenging ratings for implementing the various strategies (1=not at all challenging,
5=very challenging) revealed that contact with humans was rated among the least challenging factors to implement ($M=2.24$; range=1-4). From a list of basic shelter factors considered to impact shelter dog welfare nearly half of shelters managers (47%) ranked funding as most important. These findings revealed that shelters vary widely in the quantity and quality of strategies aimed at enhancing shelter dog welfare, and that funding is an especially important factor to consider. Given the reported relative ease of providing human interaction, the potentially low cost (i.e., volunteers), and that human interaction is considered by researchers to be an especially potent factor for impacting dog welfare it is recommended that shelters focus on maximizing contact between humans and shelter dogs.

Effect of milk feeding level on performance and feeding behaviour of dairy calves.

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In calves, restricted milk feeding influences milk intake patterns, causing larger, less frequent meals. Early experiences may play a role in the development of long-term feeding patterns; thus, milk feeding may be improved to deter feeding in large, infrequent meals, a meal pattern associated with sub-acute ruminal acidosis. The objective of this study was to determine how milk feeding level affects calf performance and the development of longer term feeding patterns. Twenty individually-housed Holstein bull calves were randomly assigned at birth to a daily milk allotment, fed via a teat, for 6 wks: 1) ad libitum (ADL), or 2) 5 L/d, in two feedings (LIM). Concentrate was provided ad libitum during the milk-feeding stage. Calves were weaned during wk 7 by incrementally reducing milk amount, and then fed a novel pelleted diet ad libitum for 7 wks. Behaviours were recorded from video for 3 d in each of wks 6, 8, and 14. Data were analyzed using a repeated measures mixed model. ADL calves consumed 2.5x more milk (SE=0.8, $P<0.001$) in more meals/d (7.2 vs. 2.0, SE=0.8, $P<0.001$); however, all calves had similar sucking time/meal (6.0 min, $P=0.8$) and intake/meal (2.8 L, $P=0.2$). During milk-feeding, solid feed intake patterns differed; LIM calves consumed 7.4x more (SE=0.08, $P<0.001$), had longer meals (9.3 vs. 2.3 min/meal, SE=1.4, $P=0.001$), and tended to have more meals/d (10.2 vs. 7.5, SE=1.4, $P=0.07$). ADL calves had greater average daily gain (ADG) than LIM during milk-feeding (1.2 vs. 0.6 kg/d, SE=0.07, $P=0.001$) resulting in greater weaning weights. After milk-weaning, calves had similar ($P=0.2$) intakes (4.7 kg/d), average meal durations (15.4 min/meal), and meals/d (13.6 meals/d); however, calves previously fed LIM had greater rates of intake during meals (10.4 vs. 7.3 g/min, SE=1.5, $P=0.04$). Meal patterns changed over time ($P<0.001$), and were similar by week 14. Meal frequency increased by 15.3%, meal duration decreased by 25.1%, and rate of intake increased by a factor of 3.3, resulting in an increase of 0.19 kg/meal. There was no long-term treatment effect on ADG (post-weaning mean of 1.2 kg/d, $P=0.9$). Thus, greater body weights for calves previously fed milk ADL were maintained. The results indicate that calves fed different milk levels develop similar meal patterns despite exhibiting unique milk and solid feed meal patterns early in life.
“Please pass the Prozac” exploring the use of pharmacologic agents for studying negative emotional states in hens.

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Understanding the presence and mechanisms of emotional states is central to animal welfare. One method for investigating evidence for negative emotional states is to use pharmacological agents known to affect the central mechanisms controlling fear or anxiety and then to determine their effects on behaviour. If a certain behavioural response is considered to be a sign of a negative emotional state, then the administration of a drug known to reduce that state should also reduce or eliminate the accompanying behaviour. Social reinstatement behaviour in domestic poultry chicks has been used for screening a wide variety of drugs with the potential for treating depression and anxiety in humans (Feltenstein and Sufka, 2008); In this model, socially-raised chicks are isolated from their conspecifics and the social separation causes an activation of the general stress response system. Dose response curves and efficacies using this chick model are available for a number of compounds. Thus, parts of this model might also prove valuable to study of animal welfare. In this study, White Leghorn hens were given one of three different drugs or a control and observed under different tests validated for fear in domestic poultry. Imipramine (tricyclic antidepressant), antalarmin and R121919 (CRF-1 receptor antagonists) were given either orally or intramuscularly prior to the hens being tested by blinded experimenters under the novel object or tonic immobility paradigm. The Novel Object test involves exposing a hen to an object it has never encountered before. Less fearful hens will approach or show interest in the object whereas more fearful hens will avoid it. In the Tonic Immobility test, the experimenter simulates a predator, by restraining the bird on its back with one hand and elicits the anti-predator response of remaining completely motionless or ‘death feigning’. Longer durations of immobility are reflective of higher levels of fearfulness. Along with a control group, all birds were also blood sampled for corticosterone 30 minutes after the induction of the fearful event. It is hypothesized that hens receiving these drugs will show decreased fearful behavioural responses to the frightening stimuli and lower levels of the stress hormone.