



THE  
UNIVERSITY OF  
BRITISH  
COLUMBIA



animal welfare  
program

## Program and Abstracts of Oral Presentations and Posters



## ISAE North American Regional Meeting June 7-8, 2006 Vancouver, Canada

Organizing Committee:

Raymond Anthony, Nancy Clarke, Anne Marie de Passillé, Derek Haley,  
Nina von Keyserlingk, Jeff Rushen, Dan Weary

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## Keynote Address

**WEDNESDAY, JUNE 7, 14:30 – 15:30**

**DR. SUZANNE MILLMAN**, University of Guelph, Canada

***Sickness motivation and why it matters for animal care & welfare***

## Peter Stratton Memorial Lecture

**FRIDAY, JUNE 9, 19:00**

**DR. CARLA FORTE MAIOLINO MOLENTO**, Universidade Federal do Paraná

***Animal Welfare and the Control of Stray Dogs in Brazil***

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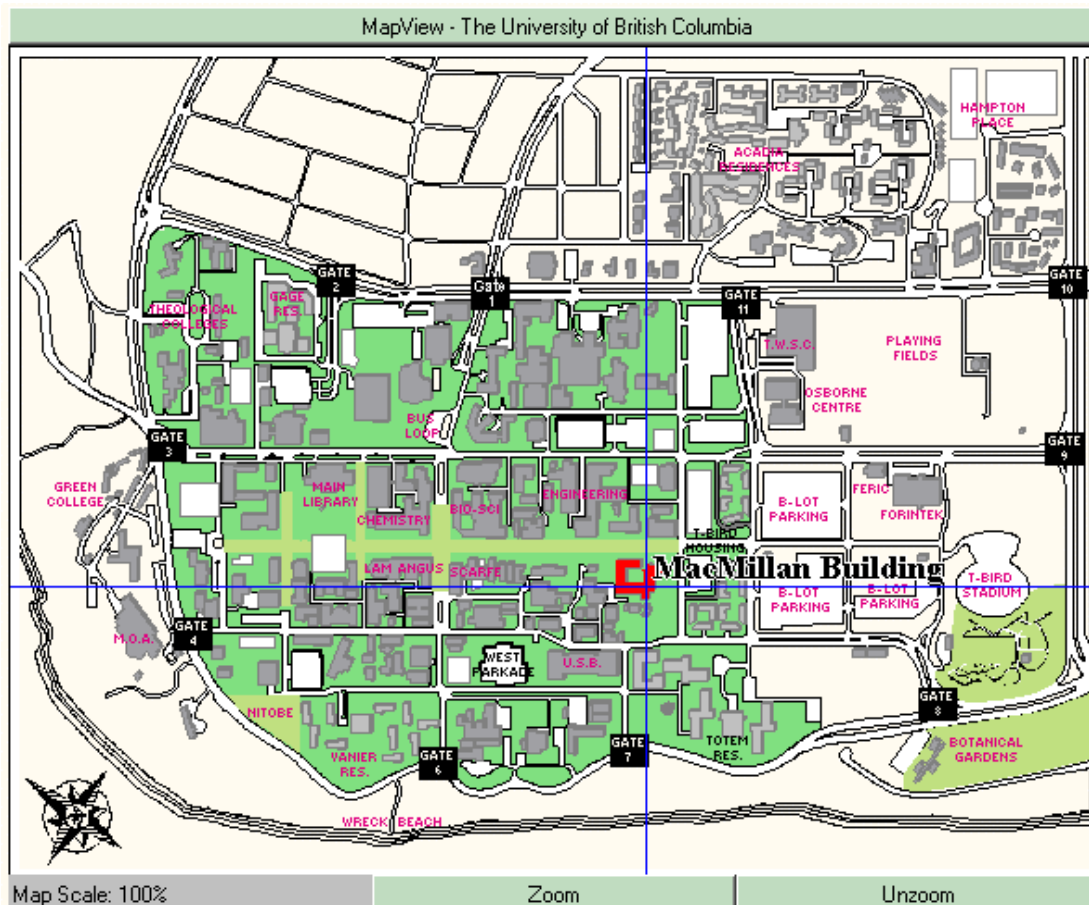
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# **ABSTRACTS FOR ORAL PRESENTATIONS**

# THE EFFECT OF PHOTOPERIOD ON BROILER BEHAVIOR AND WELFARE

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Unnatural lighting regimes for poultry, such as the near-continuous lighting that is common in commercial broiler chicken production, have been identified as welfare concerns. Providing a longer period of darkness (scotophase) could improve broiler health and provide opportunities for increased sleep and more normal activity rhythms. However, there is limited experimental evidence to support a recommendation for any particular scotophase length. We examined the effects of three lighting schedules (23L:1D, 20L:4D, or 16L:8D) on behavior and leg condition of male broilers (N = 290; stocking density = 3kg/m<sup>2</sup>). Broilers were reared under these schedules from 2-6 wk of age; illumination levels were 20 lux during the photophase and 1 lux during the scotophase. There were 3 replicate pens per treatment. Behavior was recorded using scan samples during two continuous 24-hour periods per pen each week. At 6 weeks of age, all broilers were gait scored using a 0-5 scoring system, weighed, euthanized, necropsied, and evaluated for the occurrence of leg abnormalities. There were no significant differences between treatments for body weight (mean = 3.10±0.38kg;  $F_{2,10} = 2.02$ ,  $p = 0.183$ ), feed consumption ( $F_{2,8} = 0.38$ ,  $p = 0.694$ ), or gait score (median score = 2.0;  $H = 0.08$ ,  $p = 0.96$ ). Broilers reared with 23L:1D had significantly more bruising on the hocks than those reared with 16L:8D ( $H = 11.46$ ,  $p = 0.003$ ). Resting behavior occupied a large proportion of the time budgets (71% in 23L:1D, 65% in 20L:4D, and 68% in 16L:8D). However, wakeful sitting comprised more of the resting behavior in 23L:1D (53%) than in either 20L:4D (43%) or 16L:8D (43%), while sleeping comprised more of the resting behavior in 16L:8D (23%) than in either 20L:4D (20%) or 23L:1D (16%). These findings suggest that a longer scotophase could increase sleep and improve welfare with little effect on production.

Keywords: broiler, welfare, behavior, lighting, leg problems

## **FEEDING BEHAVIOUR AND RESPONSE TO WEANING OF CALVES FED LIMITED OR AD LIBITUM MILK USING AN AUTOMATED FEEDING SYSTEM.**

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There is little known about feeding motivation in group-housed calves fed with an automated feeding system. To examine the advantages and disadvantages of increased access to milk in an automatic feeding system, we fed calves either 4L milk replacer per d or allowed ad lib intake (n=20 per treatment). Milk intake by ad lib fed calves increased from 4.5L/d on d1 to 14-16L/d from d14 to d25 and then decreased to 12-14L/d until weaning on d45. Ad lib fed calves had 11-13 rewarded visits (i.e. when they consumed milk) to the milk feeder by d5, but this number decreased to 7-9 visits by the day of weaning. Ad lib calves made few (2 to 5 /d) unrewarded (i.e. no milk received) visits. By design, limit-fed calves had only 2 rewarded visits /d. However, these calves had 26 to 38 unrewarded visits/d between d7 and d21, and 13 to 22 unrewarded visits/d between d22 and d45. Ad lib fed calves consumed virtually no concentrate before d21 and by d44 were consuming <50g/d. During the first 4 d after weaning these calves consumed <500g/d. Restricted calves gradually increased concentrate intake such that they were consuming 1.6kg/d by d45, and consumed 2kg/d during the first 4 d after weaning. Weight gains of ad lib fed calves from d0 to d21 were higher (25.2kg) than for limit-fed calves (11.9kg). However, from d21 to weaning, limit-fed calves gained more than ad lib fed calves (24.1kg versus 19.1kg). In conclusion, ad lib access to milk improved weight gain and reduced unrewarded visits to the milk feeder until d21. However, ad lib access to milk reduced concentrate consumption and the advantages were less obvious after 3 wks of age.

## TEMPERAMENT IN BEEF CATTLE: DIFFERENT OBJECTIVE METHODS OF MEASUREMENT

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Temperament is often described as, an individual trait influencing an animal's behavioural response to handling. This characteristic likely modulates the response of the animal to other environments or social situations, and is perhaps best viewed as a component of its personality. Our goals were to assess temperament using three objective measuring tools and to determine if correlations exist between these and a traditional subjective measure. The tools used were strain gauges (measures force exerted on headgate), Movement Measuring Device (MMD) (measures voltage fluctuations from load cells of weigh scale as animal moves on scale platform), and exit time (measures the time to move 2.9 m after vacating weigh scale). Subjective assessment of reactivity during handling and restraint was on a 1-5 scale. Four hundred steers ( $243 \pm 19$  kg) were used. Each animal was restrained in a head gate, while strain forces were measured over a 10s period. It then moved to the weigh scale for one min while the MMD value was recorded. After release it moved along the 2.9m race, and the exit time was measured. Exit time was correlated (Spearman correlations) with MMD observations ( $r = -0.40$ ,  $P < 0.001$ ) and strain gauge observations ( $r = -0.18$ ,  $P < 0.001$ ) and that MMD scores were related to Strain forces ( $r = 0.15$ ,  $P < 0.01$ ). When the animals were grouped into 'calm' and 'wild' based on their subjective scoring (scores 1 and 2=calm, scores >2=wild), these two groups differed (by  $P < 0.001$ ) in their mean exit times, MMD scores and strain forces (Wilcoxon test). Three objective measures yielded statistically correlated results, and therefore may quantify related aspects of a personality trait (i.e. temperament). The objective scores are related to the traditional subjective score, but they provide the advantage of eliminating observer bias and may offer better tools for temperament selection.

## **TEMPERAMENT TESTING OF MARKET HOGS IN GROUP HOUSING: TEST-RETEST RELIABILITY AND COMPARISON WITH TESTS IN ISOLATION**

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Despite similar genetics and rearing conditions, pigs show considerable variation in behavioural responses to humans and novel situations. If behavioural responses are consistent within individuals over time, they may be a useful indicator for selection of animals with calmer temperaments, or for targeted development of handling techniques to improve welfare in stress-susceptible pigs. Test-retest responses to three behavioural tests were studied in groups using 61 animals at approximately 6 months of age. Pigs were housed in 8 pens with 7 to 8 pigs per pen. Pens were bedded with sawdust and cleaned daily. Group tests included a human approach test (HAT), novel object test (NOT) and open door test (ODT). Animals were ranked on their latency to contact the human/object or leave the home pen. Tests were repeated on three days at intervals of 3-4 days. Each day the NOT and ODT were performed once, while the HAT was performed twice to compare results between handlers. After group testing, a subset of animals showing different responses in the ODT were studied in HAT and NOT tests performed in isolation. Group measures were compared between days using a weighted kappa statistic. Results showed poor agreement between test days, with weighted kappa ranges of 0.02-0.38 (HAT), 0.03-0.20 (NOT) and 0.06-0.19 (ODT). Comparison of group and individual measures showed that most significant correlations occurred with day 1 group measures. Day 1 group HAT scores were negatively correlated with HAT and NOT contact frequency in isolation ( $P \leq 0.01$ ), and positively correlated with NOT latency to approach to 0.5M, make contact and frequency of contacts over 3 minutes ( $P \leq 0.05$ ). These results indicate that the group tests of behaviour have poor test-retest reliability. Comparison to isolation testing suggests that group tests may be more valid in naïve animals, and that repeated testing at short intervals alters animals' responses.

## ARE RAINBOW TROUT CEREBRALLY LATERALIZED?

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In mammals, many cognitive functions, including the perception of external stimuli are cerebrally lateralized. Comparative analysis of the neural organization and cognitive abilities of fish with mammals is essential to assessing fish welfare. This experiment was designed to test if juvenile rainbow trout are cerebrally lateralized.

A detour task was used to test fish for preferential eye use during inspection of stimuli. Individual fish swam through a tunnel towards a transparent barrier with a test object behind it. Fish could detour the barrier by turning left or right. Since each eye transmits visual information to the contralateral side of the brain, biases in detour responses may indicate lateral asymmetry in the perception of the stimuli. Each fish (n=15) performed a session of ten detour tasks daily, for three days. During each session, the fish could view one of three test objects (fishing lure, conspecifics, empty tank). A “Laterality Index” (LI) score was calculated for each fish indicating the average direction and magnitude of the detour response. An “Avoidance Response” (AR) score was calculated for each session. An AR occurred when fish bypassed the detour task and repeatedly swam the length of the tunnel. The GLM procedure (SAS™) was used to determine the effect of “test object”, “sequence”, “day” and “fish” on the LI and AR. Tukey’s Test was used for post-hoc analysis ( $\alpha=0.05$ ). Day ( $P<0.05$ ) but not test object ( $P>0.01$ ) was significant in influencing the LI. On day one, the LI was distributed at the level of chance (LI = 0.0). By day three, the LI was right biased (LI=0.33). Interestingly, the AR significantly differed on day one (AR=0.08) compared to day three (AR=0.33;  $p<0.01$ ). The laterality response on day three appears to be multifactorial, and not simply visually mediated. Cerebral lateralization appears to be present in rainbow trout.

## **AN INVESTIGATION INTO THE MOTOR PATTERNS INVOLVED IN FEATHER PECKING AND FORAGING**

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Feather pecking is a type of abnormal behaviour that has been a persistent problem in the poultry industry for many years. Feather pecking can be categorized into gentle and severe pecks and it is severe pecks that cause welfare and productivity problems. It has been proposed that feather pecking is foraging behaviour misdirected to the plumage of other birds. This experiment investigated the relationship between feather pecking and foraging pecking by examining the motor patterns involved in each.

Four-week-old female White Leghorn chicks that performed high levels of gentle (n=5) or severe (n=5) feather pecking were identified and used to measure the motor patterns involved in feather pecking and foraging. Frozen dead birds of the same type and age as the test birds were presented to the test birds with either their backs exposed for feather pecks to be measured or with their heads exposed where feather pecks could not be given. Two foraging materials were presented, sod and crumpled crepe paper, in the form of a square 30cm<sup>2</sup> in area. The forages were presented in two positions, on the floor or hanging vertically at head height. Birds were video recorded twice a week with each of these stimuli on weeks 6, 8, 10, 15, and 20 of life. Vertical (V) and horizontal (H) head angles and durations (D) of the pecks were measured from the videotapes. The PROC Mixed procedure of the SAS program was used to analyze the data, with Test week as the Repeated Measure.

It was found that severe and gentle feather pecks differ in their duration ( $P < 0.001$ ) but not in their head angles. Severe feather pecks on the bird model were similar to foraging pecks but not head pecks to the bird model for both V and H angles and D (for all  $P < 0.05$ ). Over time these differences became less clear and all pecks started to look similar. The results suggest that severe feather pecking motor patterns are related to foraging.

## **ASSOCIATIONS BETWEEN GROOM CHARACTERISTICS AND PREVALENCE OF AND SOLUTIONS USED FOR BEHAVIOUR PROBLEMS, IN RACING STANDARDBRED HORSES**

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Through handling, racehorse grooms have the potential to influence the behaviour and welfare of horses in their care. The objectives of this study were to identify groom characteristics associated with equine behaviour problems and associated solutions in the harness racing industry. A questionnaire was administered at 14 racetracks in Ontario to collect information on groom age, gender, equine experience and education, as well as prevalence of, and solutions used for, behaviour problems in horses actively racing. Response rate was 70%, with data collected for 1295 horses from 1149 grooms (429 females; 717 males). Associations between independent variables, behaviour problems and solutions used were explored using mixed models. Older grooms were less likely to have horses with behaviour problems in their care ( $P < 0.01$ ), but the same was not true for grooms with more years of experience. The use of habituation as a solution was positively associated with having horse experience outside of the racetrack ( $OR = 1.7$ ,  $P < 0.05$ ) and negatively associated with formal education of grooms. Grooms that also train racehorses were more likely to ignore behaviour problems ( $OR = 1.4$ ,  $P < 0.01$ ) or use force ( $OR = 2.5$ ,  $P < 0.01$ ) but less likely to use verbal reprimands in response to behaviour problems ( $OR = 0.62$ ,  $P < 0.01$ ). Female grooms were more likely than males to use force in response to handling difficulties ( $OR = 2.3$ ,  $P < 0.05$ ), and to offer toys to distract horses from performing abnormal behaviours or aggression when the horse was in its stall ( $OR = 2.8$ ,  $P < 0.01$ ). These data support the hypothesis that grooms may influence behaviour problems in horses, and suggest that education and years of experience do not necessarily lead to superior handling techniques.

## CHANGES IN FEEDING BEHAVIOUR BUT NOT DRY MATTER INTAKE IDENTIFY DAIRY COWS AT RISK FOR METRITIS

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Dairy cows experience a high incidence of disease during the transition period. Early identification of cows most at risk for disease could help reduce this incidence. Previous work by our group has shown that cows most at risk of metritis after calving are those with reduced feeding times in the days before calving, but it is not clear if this association was due to reduced DMI. The objective of the current study was to determine if changes in DMI could also be used to identify cows at risk for metritis. We followed behavior and intakes of 52 Holstein dairy cows beginning 3 weeks before and ending 3 weeks after calving. Every 3 days after calving the severity of metritis was rated on a five-point scale that incorporated rectal body temperature and condition of the vaginal discharge. Data were analyzed using a mixed model in SAS where period (pre- and post-calving) and health (healthy and sick) were treated as fixed effects and cow was treated as a random effect. During the experiment 21% of the cows were diagnosed with metritis. After calving, DMI were lower in metritic cows ( $14.4 \pm 0.79$  kg/d) compared to healthy animals ( $18.8 \pm 0.41$ ;  $P < 0.001$ ), and the metritic cows also spent less time feeding ( $164.2 \pm 11.04$  min/d compared to  $204.9 \pm 5.72$  min/d for healthy animals;  $P = 0.002$ ). As in our previous work, metritic animals spent less time feeding during the pre-calving period ( $185.3 \pm 11.04$  min/d) compared to cows that remained healthy ( $214.8 \pm 5.72$  min/d;  $P = 0.002$ ). However, there was no difference in DMI between these two groups before calving. These results indicate that reduced time at the feeder pre-calving is a better indicator for identifying dairy cows at risk for metritis than reduced DMI.

Keywords: Transition, Feeding, Metritis

## DUSTBATHING BEHAVIOUR IN FURNISHED COLONY CAGES: IMPLICATIONS FOR LAYING HEN WELFARE

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The behaviour of White Leghorn hens housed in furnished colony cages was observed to evaluate the contribution of a dustbath to hen welfare. Cages (120x110cm) (n=24) housed 26 hens and incorporated a nestbox (60x50cm), perch (120x5cm) and dustbath (60x20cm). In 12 cages (CWDB), the dustbath opened daily at 1300 h and was manually filled with peatmoss. In the remaining 12 cages (CWODB), a small amount of peatmoss was distributed along the edge of the closed dustbath, to simulate filling action and control for substrate ingestion. Continuous video footage of 8 randomly selected cages per treatment was recorded at 35 and 60 weeks. Recordings were scanned for dustbathing behaviour in the dustbath and nestbox, and on the cage floor, between 1200 and 1500 h. Bout frequency (BF), total duration (TBD), mean duration (MBD) and latency to onset were determined on a per cage, per location basis. Incidence and duration of pecking, scratching, vertical wing shaking, bill raking, head or side rubbing, feather ruffling and aggression were recorded. Data were analyzed using GLM for mixed effects. Treatment effects were significant at  $P \leq 0.05$ . Availability of a dustbath in CWDB did not prevent sham dustbathing on the cage floor, however TBD and MBD were significantly higher in the dustbath ( $P < 0.01$ ), and significantly higher than sham dustbathing in CWODB ( $P < 0.01$ ). Although the incidence of aggressive and feather pecking was significantly higher in CWODB ( $P < 0.05$ ), displacement and bout interruption was prevalent in the dustbath, often causing CWDB hens to reattempt bouts on the cage floor. BF and MBD in CWDB were significantly ( $P < 0.01$ ) reduced in the second hour post substrate addition. These findings indicate that provision of a dustbath in cages improves hen welfare by permitting natural dustbathing behaviour and reducing aggression and feather pecking, however adequate space and substrate availability are necessary to minimize frustration.

## **STRENGTH OF AVERSION TO CARBON DIOXIDE IN RATS DURING A GRADUAL-FILL EUTHANASIA PROCEDURE**

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Rats avoid high concentrations of CO<sub>2</sub> used for killing, but it is not known how aversive rats find this exposure. In two replicate experiments, 7 male Wistar rats aged 15 months (replicate 1), or 10 months (replicate 2), were required to choose between leaving a chamber that was gradually filling with CO<sub>2</sub> and remaining to consume an attractive food (Cheerios), at various levels of food deprivation. The gas was turned on at the moment the rat started eating and flowed at a fixed rate of 16.5% of cage volume per min. Subjects were tested at 7 levels of food deprivation, defined as percentages of estimated ad libitum intake given in the preceding 24 hours: 0%, 17%, 33%, 50%, 67%, 83% and ad libitum, in a Latin square design. Test trials were separated by a 2-3 day wash-out period with ad libitum feeding and an air re-training trial. It was found that on all trials, regardless of deprivation level, rats left the chamber before CO<sub>2</sub> rendered them unable to do so (at 16.6 ±0.5% CO<sub>2</sub> on average). GLM analysis showed there was no linear effect ( $P > 0.05$ ) of food deprivation time upon measures of willingness to stay in the chamber, but there was a significant quadratic effect upon most measures, including latency to stop eating ( $P < 0.05$ ), latency to leave the chamber ( $P < 0.01$ ), the CO<sub>2</sub> concentration at which subjects left ( $P < 0.01$ ), and the number of Cheerios consumed ( $P < 0.01$ ). Most measures peaked at a food deprivation level of 83% of ad libitum, corresponding to a deprivation time of about 8 h. Pending a further experiment to confirm that willingness to stay increases with food deprivation up to 8 h, our provisional conclusion is that rats are more strongly averse to CO<sub>2</sub> than they are to hunger after 8 h without food, and hence that the welfare of rats may be poor during gradual-fill CO<sub>2</sub> killing.

## TO WORK OR NOT TO WORK? THE INFLUENCE OF CIRCULATING GONADAL STEROIDS ON CONTRAFREELoADING IN LAYING HENS

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Contrafreeloading occurs when animals choose food that requires greater effort to exploit although more easily exploited food of the same nutritional value is freely available. Previous studies with domestic fowl suggest that there are sex differences in the performance of contrafreeloading, with males preferring food that can be quickly consumed and females of egg-type strains showing greater contrafreeloading. We hypothesized that sex differences in propensity to contrafreeload arise from differences in circulating gonadal steroids. We conducted foraging choice tests with female (n=40) Lohmann Brown hens implanted with testosterone, estradiol, progesterone, estradiol+progesterone, or blank silastic tubes (control). We predicted that contrafreeloading would be lower in hens treated with testosterone than in the other treatments. Individual birds were presented with a choice of whole pellets and ground pellets in two phases: 1) 24-h choice test, and 2) 5-min choice test following 2 hours of food deprivation (to simulate feeding behavior). During the 24-h tests, hens consumed more ground (mean  $\pm$  SE,  $104 \pm 6$  g) than whole ( $62 \pm 6$  g) pellets ( $t=3.71$ ,  $P=0.004$ ). In contrast, during the 5-min choice tests, hens consumed more whole ( $6 \pm 0.7$  g) than ground ( $4 \pm 0.3$  g) pellets ( $t=2.49$ ,  $P=0.015$ ), which may reflect a preference for large particles after a short period of deprivation. Nevertheless, in the 5-min tests, hens directed more pecks at ground (median=147) than whole (median=47) pellets ( $S=733$ ,  $P=0.0002$ ), thereby expending greater effort to consume ground (median=36 pecks/g) than whole (median=10 pecks/g) pellets ( $S=1192$ ,  $P<0.0001$ ). Contrary to our prediction, there was no effect of gonadal steroid treatment on the amount of each food type consumed during the 24-h ( $F_{4,35}=0.86$ ,  $P=0.499$ ) or 5-min ( $F_{4,35}=0.82$ ,  $P=0.522$ ) tests. It is suggested that the brain may need to be masculinized during embryonic development to provide a substrate for activational effects of circulating testosterone on adult foraging behavior.

## **A RETROSPECTIVE VIDEO ANALYSIS OF THE BEHAVIOR OF PERIPARTURIENT DAIRY CATTLE**

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The objective of this study was to measure variables associated with difficulty calving, and to identify the associations of parameters with periparturient behavior. Previously recorded videotapes of 23 cows on day -1, 0 and +1 relative to calving were analyzed. Data included frequency and duration of standing and lying behavior, calving difficulty score, duration of calving and calf body measurements. Calving difficulty was scored as: 0-unassisted, 1-easy pull, 2-hard pull. Video information was analyzed, interpreted and entered. Data was analyzed using logistic and linear regression with Statistix. Heifers were more likely to require assistance during calving ( $P < 0.01$ ). Male calves weighed significantly more than female calves ( $P < 0.05$ ). Cow standing and lying behavior differed on the day of calving. Pre-calving, heifers lie for 18 fewer minutes per lying bout compared to cows ( $37.1 \pm 3.8$  versus  $55.1 \pm 6.4$  minutes per bout,  $P < 0.02$ ). Mean pre-calving lying time was also influenced by calving difficulty, as cows requiring assistance spent 15 minutes less lying per bout ( $P < 0.05$ ). Post-calving, heifers lie for 13 minutes less per bout than cows ( $40.4 \pm 3.1$  versus  $53.7 \pm 8.8$ ,  $P = 0.09$ ). Cows taking longer to calve lie for fewer minutes each bout ( $P < 0.02$ ). Finally, dams that had hard pulls lie for 12.5 fewer minutes each bout ( $P = 0.11$ ). When mean lying bouts post-calving was analyzed, controlling for pre-calving mean lying time, only calving duration remained significant. Calving duration also positively influenced the number of post-calving lying bouts ( $P = 0.05$ ). Lying behavior, both pre and post-calving, was the most significant measurement related to calving. Cows with longer calvings spent less time lying down after calving. Differences between lying time for cows and heifers merits further investigation. It is possible that this difference is related to the presence of pain, and there may be pain management opportunities at calving.

Keywords: calving, behavior, lying

## **CATS AND DOGS IN BRAZIL: POPULATION CONTROL DEPENDS ON THE WELFARE OF STRAY ANIMALS**

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From 2001 to 2003, surgical castration and veterinary care were offered to dogs and cats in ten Rural Villages (RV) in Paraná, Brazil, in single interventions per RV. All 330 homes were visited and 261 pets were sterilized, representing 52.9% of the total population of 518 animals. The objective of this work was to verify the impact of surgical intervention after on average 39 months (50 – 28 months). In 2005, RV were revisited and a questionnaire on pet population was applied; in one RV data on human population was also collected. Data was analyzed through descriptive statistics using Microsoft Office Excel 2003. There were 172 bitches, 242 male dogs, 57 queens and 97 male cats, totalizing 568 animals. Within 39 months, 116 dwellers adopted new animals. Considering animals who received castration during initial intervention, only 21% were present: 6,1% were bitches, 8% male dogs, 2,7% queens and 4,2% male cats. There was information on 29,6% of the 79% castrated animals that disappeared during the 39 months interval. Reported reasons for pet disappearance were: 9,5% death by poisoning, 6,0% death by unknown reasons, 3,8% donation, 3,4% road accident, and other causes in 6,9%. Data suggest a high flow in cat and dog population in RV, showing that the effort employed in initial intervention was mostly lost after 39 months. There were 3.2 inhabitants per home, dog:human ratio was 1:2.7 and cat:human ratio was 1:5.2. In order to extend the benefits of interventions aiming at cat and dog birth control and welfare improvement, special attention should be given to fostering increases in their life expectancy. This should be taken in consideration when programs are offered; otherwise, efforts might be under productive. Results strongly confirm education on responsible pet guardianship as the most powerful element in population control.

## **WHEN DOES PAIN COUNT? VETERINARIANS' PERCEPTIONS REGARDING THE MORAL IMPORTANCE OF ANIMAL PAIN AND SUFFERING.**

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Veterinarians frequently encounter situations where the interests of their patients conflict with the interests of their client. For example, producer imposed economic constraints limit the use of anesthesia or analgesia by veterinarians. The tension between protecting the patient and honouring the autonomy of the client is coined 'the fundamental question of veterinary ethics'. How do veterinarians negotiate these conflicts and juggle their responsibilities to both patients and clients? Semi-structured interviews with 41 veterinarians and over 100 hours of participant observation were used to explore veterinarians' decision-making processes. Interviews were transcribed and content analysis was facilitated using qualitative data management software QRS N6. Results showed that a number of factors influenced veterinarians' decisions but animal pain and suffering was a major factor. The severity, type, and duration of pain affected whether a veterinarian counted pain as morally significant. Most participants agreed that pain evaluation was subjective and open to interpretation. Food animal practitioners appeared less convinced that their patients suffered significant pain during or after surgical procedures. Beyond the evaluation of pain, veterinarians held different attitudes towards patient pain and suffering. Those involved in food animal practice were more accepting of short-term pain than were companion animal practitioners, even if pain was presumed 'severe', 'intense', or 'exquisite'. Interestingly, some companion animal practitioners were more accepting of pain or suffering associated with chronic disease or end of life medical treatment. These attitudes are likely linked to the patients' use as either food or as companions. As animal health professionals, veterinarians' opinions regarding pain and suffering are frequently sought by animal owners as well as governmental, educational, and research institutions. The lack of consensus amongst veterinarians in defining and evaluating pain and suffering, and the diversity in attitudes regarding the acceptability of pain and suffering, may significantly affect the treatment of animals at both the practice and policy level.

## **EFFECTS OF NOVELTY ON AVERSION TO CARBON DIOXIDE BY LABORATORY RATS**

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Laboratory rats are routinely euthanized using a gradually increasing concentration of carbon dioxide (CO<sub>2</sub>) gas, but recent evidence suggests that rats find exposure to this gas aversive. The objective of this study was to determine whether rat aversion to CO<sub>2</sub> is due in part to the novelty of the gas. We examined changes in aversion during a series of CO<sub>2</sub> exposures using an approach-avoidance test in which a food reward was paired with gas exposure. Nine Wistar rats, individually housed in two cages connected by a tunnel, were trained to enter the lower cage for a food reward of 20 Cheerios. During testing, gas flow started at a rate of 17% of the cage volume per minute when the rat began to eat the food reward. Rats were tested with medical air as a control on days 1, 4, and 17 and with CO<sub>2</sub> on days 2, 3, 4 and 16. From days 5 to 15, rats were tested with air and CO<sub>2</sub> for a separate experiment. We recorded the time spent eating and the CO<sub>2</sub> concentration when the rats left the lower cage. On the three control days with air, rats consumed the entire food reward and ate for 266 ± 4s, on average. On the four CO<sub>2</sub> test days, rats ate for just 30 ± 2s, on average, and left before losing consciousness. Responses to CO<sub>2</sub> did not change across the first three days of testing, but on day 16 rats showed a modest increase in time eating (26 ± 2 vs. 41 ± 2s; GLM:  $F_{1,8} = 21.3$ ,  $p < 0.005$ ) and tolerated higher CO<sub>2</sub> concentrations before leaving (14 vs. 18%; GLM:  $F_{1,8} = 15.2$ ,  $p < 0.005$ ). These results demonstrate that despite some habituation to the procedure, rats continue to find CO<sub>2</sub> aversive after repeated exposure.

## **EVALUATION OF A BEHAVIOURAL REHABILITATION PROGRAM FOR REDUCING INTER-DOG AGGRESSION IN SHELTER DOGS**

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Inter-dog aggression (aggression between dogs) frequently results in animals being relinquished to an animal shelter, and it may reduce the dog's chances of being adopted and result in long-term confinement or euthanasia. This study evaluated the effectiveness of a rehabilitation program to reduce inter-dog aggression in shelter dogs. The behavioural responses of 60 shelter dogs in an inter-dog aggression test were scored on four characteristics (aggression, fearfulness, excitability and playfulness) using 5-point Likert-type scales, and the presence or absence of 62 behavioural elements were recorded. Sixteen dogs met the study criteria of medium inter-dog aggression. Participant dogs received a 10-day treatment of daily rehabilitation for 30 minutes (rehabilitation group,  $n=9$ ) or daily release in an outdoor enclosure for 30 minutes (control group,  $n=7$ ). Rehabilitation consisted of desensitizing and counter-conditioning dogs to the approaches of other leashed dogs. Most rehabilitation dogs showed a decline in aggression scores when tested on the day after the last treatment (Day 11), compared with their pre-treatment scores (Day 0). Compared with control dogs, rehabilitation dogs showed less frequent aggressive body postures (leaning forward, stiffness, facing the stimulus dog), performed less growling and muzzle licking, and were more likely to have their ears back. Control dogs showed either an increase or no change in aggression scores on Day 11. The change in aggression score from Day 0 to Day 11 differed significantly between the groups ( $U=8.5$ ,  $P<0.01$ ), but the difference was no longer significant when a reduced sample of dogs was tested one week after rehabilitation ended (Day 18). No significant differences were found for fearfulness, excitability or playfulness. This study provides evidence of short-term reduction of aggression through a rehabilitation program, but further work is needed on effective ways of maintaining the behavioural change.

## THE EFFECTS OF A SYNTHETIC MATERNAL PHEROMONE ON SEPARATION DISTRESS IN YOUNG PIGLETS

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Separation from the sow at an early age is known to be a major stressor in piglets. This study evaluated the effect of Suilence® (Ceva Santé Animale, Libourne, France) on signs of distress during a short-term isolation test in 10-day-old piglets. Suilence® is a commercial product containing the synthetic maternal pheromone Apaisine® which is claimed to reduce stress in pigs. Six piglets from each of ten litters were removed from their farrowing crate and placed in a holding pen. Half of the piglets from each litter were assigned to pheromone treatment (n=30) and half to control (n=30) while balancing for body weight. Piglets were individually placed in either the control pen (1.2x1.2x0.5m) or the treatment pen that was sprayed with 2 ml Suilence®. Locomotion, quantified by floor sections entered, and escape attempts, defined as piglets jumping or standing on rear legs at the walls were recorded by direct observation for 10 minutes. Vocalizations were recorded and stored as digital audio files for analysis using the Raven Acoustical Analysis Software (Ithaca, NY). Calls were counted and grouped by frequency as LOW: <250Hz, MEDIUM: 250-500Hz and HIGH: >500Hz. Results from all 60 piglets showed that control piglets performed twice the number of escape attempts ( $12.9 \pm 1.6$  vs  $6.5 \pm 1.0$  / 10 min;  $P < 0.001$ , Proc GLM) and entered more floor sections ( $72.7 \pm 6.5$  vs  $56.8 \pm 4.8$ ;  $P = 0.001$ ) than pheromone treated piglets. Preliminary data on 2 litters shows that control piglets gave three times as many HIGH calls as the pheromone piglets ( $182.8 \pm 40.8$  vs  $63.2 \pm 17.9$ ;  $P = 0.0228$ ), but there were no differences in LOW or MEDIUM calls. It has previously been shown that HIGH calls are symptomatic of distress. These results show promising evidence that a synthetic maternal pheromone may be used to reduce distress in early weaned piglets.

## UTILIZING NATURAL ROOTING BEHAVIORS AS A MEANS TO MEASURE MOTIVATION IN SWINE

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Feed restriction of sows is a common practice in the swine industry. Our objective was to develop a novel method for measuring food motivation in swine by: 1) utilizing natural rooting behaviors; and 2) including force exerted, and hence energy expended as a measure of motivation. Sixteen crossbred barrows,  $90.8 \pm 2.78$  (SD) kg, were assigned to one of four treatments (4 per treatment): 21, 33, 45, or 57 h of food deprivation. Barrows were trained to root up on a bar at varying forces for a food reward. They were then food deprived according to treatment and given access to the rooting bar for a 5-minute test during which they did not receive a reward. In this testing period, the force of each root was recorded and plotted against time to calculate: total number of roots, maximum weight rooted, and area under the curve. Rooting extinguished during the testing period. Mean and SE in extinction curves were calculated by averaging across all barrows in the same treatment and then analyzed using multiple polynomial regression. Extinction curves for mean number of roots ( $F_{1,13}=51.27$ ;  $p=0.001$ ) and area under the curve ( $F_{1,14}=9.41$ ;  $p=0.008$ ) showed complex treatment effects. In contrast, the variation in the number of roots declined in a linear fashion with increasing deprivation periods ( $F_{1,16}=11.25$ ;  $p=0.004$ ). The variation in maximum weight rooted varied with treatment ( $F_{1,14}=4.95$ ;  $p=0.043$ ) such that at the beginning and end of the trial higher deprivation groups showed less variation in maximum weight rooted. These data indicate that as food deprivation period increases, barrows as a group became more focused on the task. We successfully validated our method, and discovered that it is vital to consider the variation in a population of animals when quantifying motivation rather than only looking at the mean value of the measures.

Keywords: swine, hunger, motivation

## **FENCELINE AND TWO-STEP WEANING: DIRECT COMPARISON OF NON-ABRUPT WEANING METHODS IN BEEF CALVES**

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Traditional abrupt weaning of beef calves causes behavioural and physiological stress, reduced weight gain, and decreased immune function in calves which may persist for days to weeks. Fenceline and two-step methods provide calves with varying degrees of maternal contact while nursing is prevented and may better simulate the natural weaning process thus reducing distress. This research directly compared the effects of three weaning methods on 1) calf behaviour, 2) amount of walking by calves and 3) weight gain. Calves were evenly allocated by weight and sex into three groups: 1) abrupt-weaned (AW); 2) fenceline-weaned (FW); and 3) two-step-weaned (TW). On day 0 (d 0) calves were fitted with pedometer/accelerometers and prevented from nursing by completely separating AW calves and dams, placing FW dams and calves across a fence, and fitting TW calves with a plastic noseflap. On d 5, TW and FW dams were relocated out of contact with their calves. Instantaneous observations of behaviour and interactions were performed on 10 calves/pairs per treatment every 10 minutes from 0900-1200 and 1400-1700 on d 1-2, d 6-7 and d 10-11. Pedometers recorded activity and number of steps from d 0-14. Weights were recorded upon feedlot entry. All data were analysed with SAS using Proc Mixed. Count data were analysed using a Poisson distribution (Glimmix macro). Upon weaning, pedometer data showed that AW calves stepped more ( $P<0.01$ ), were more active ( $P<0.00001$ ) and lay less ( $P<0.002$ ) than FW and TW. AW calves were observed walking more than FW and TW ( $P<0.00001$ ) and grazing less than TW ( $P<0.03$ ). When dams were removed, TW took more steps than AW and FW ( $P=0.02$ ) and were observed to walk more than AW ( $P=0.03$ ). Weights did not differ by group. Non-abrupt weaning appears less behaviourally stressful on calves, though this may not translate to increased weight gain.

Keywords: beef, calf, stress, behaviour, pedometer

## THE EFFECTS OF HOUSING GROW-FINISH PIGS IN TWO DIFFERENT GROUP SIZES AND FLOOR SPACE ALLOCATIONS

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Crowding of grow-finish pigs reduces growth and is considered a welfare issue. Most crowding studies have been limited to smaller group sizes than are currently being considered in the swine industry. It has been hypothesized that pigs in large groups require less space to maintain growth and welfare. The objective of this study was to examine the effects of group size and space allowance on the performance, health, behaviour and welfare of grow-finish pigs. The study consisted of eight blocks, each with four experimental units in a 2 x 2 factorial arrangement of group size (18 vs. 108 pigs/pen) and space allowance (0.52 vs. 0.78 m<sup>2</sup>/pig). Health assessments were conducted daily; production data were collected weekly; injury scores, behaviour and salivary cortisol data were collected bi-weekly; and carcass and adrenal gland data were collected at slaughter. Gains were lower for crowded pigs, but the effects were limited to the final week of the study. Crowded pigs spent less time at the feeder and had a lower feed efficiency, which followed a trend similar to gains over time. Gains were lower for pigs in large groups, but only during the first two weeks after group formation. Pigs in large groups had a lower feed efficiency and more injuries. Lying behaviour of pigs in large groups indicated that they were able to utilize free space more efficiently than pigs in small groups. Analysis of feeding patterns suggests that pigs in large crowded groups can manoeuvre around their environment more easily, yet their performance was similarly affected by space restriction as that of pigs in small groups. Pigs in large crowded groups were more susceptible to lameness. There was no indication that pigs in large groups required less space, or could perform as well at reduced space allowances, than pigs in small groups.

## BEHAVIOUR OF GRAZING SHEEP AND TRANSMISSION OF PATHOGENS THROUGH WATER

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The practice of allowing livestock access to riparian areas has come under scrutiny because of the risk of transmission of pathogens through water. The objectives of this study were to determine the extent to which sheep graze and camp near natural water sources on pasture, and their effect on levels of foodborne zoonotic pathogens in water. Ten Ontario sheep farms were visited weekly for twelve weeks during the summer of 2005. Behavioural data was collected using direct observation during one 4-hour period each visit. Flock behaviour was continuously recorded for all occurrences of grazing and resting. The number of and behaviour of individual sheep located within 5m of the water was recorded by scan sampling at 10-minute intervals. Samples of faeces, water and soil were collected and tested for the presence of *Escherichia coli* O157:H7, *Campylobacter*, *Salmonella* and *Yersinia*. Data was analyzed as repeated measures over time, using mixed models. Sheep were observed near water on seven of the ten farms, and proximity to water did not change over the season ( $p=0.99$ ). Sheep spent more time near water on farms that provided access to both sides of the waterway ( $p=0.0008$ ). On farms with higher stocking density, sheep spent more time grazing ( $p=0.0018$ ), and more time near water when environmental temperatures were high ( $p<0.001$ ). At higher environmental temperatures, sheep also spent more time near water on farms that did not provide access to a barn ( $p=0.025$ ). Neither *Salmonella* nor *E.coli* O157:H7 was cultured from any of the samples. The prevalence of positive *Campylobacter* or *Yersinia* samples was not associated with the time spent by sheep near water (*Campylobacter*  $p=0.46$ , *Yersinia*  $p=0.99$ ). The results of this study indicate that sheep do graze near riparian areas, but do not present a significant risk for transmission of foodborne zoonotic pathogens.

## THE EFFECTS OF MELOXICAM THERAPY ON THE BEHAVIOUR OF CALVES WITH DIARRHEA

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Diarrhea is a significant health problem among neonatal dairy calves; however, there is limited research on the behavioural impacts of this disease. The objectives of this trial were to examine the efficacy of Meloxicam as an adjunct therapy in the treatment of calf diarrhea and to study the effects of Meloxicam on the behaviour of calves with diarrhea. For this double-blind controlled trial, sixty-two Holstein bull calves were purchased at birth and then transported to a calf research facility. At the naturally occurring onset of diarrhea, the calves were enrolled in the study and randomly assigned to receive a single subcutaneous injection of Meloxicam (0.5 mg/kg BW) or an equal volume of placebo solution. Starter ration and milk intakes were determined daily for each calf. Following the onset of diarrhea, feeding behaviour of the study calves was observed for five consecutive days. In addition, resting behaviour, standing posture, and general activity was also monitored daily for each study calf. During the trial, fifty-five calves developed diarrhea and were treated with either Meloxicam (n=27) or placebo solution (n=28). The mean age for the onset of diarrhea was 11 and 10 days for the Meloxicam-treated and placebo-treated calves, respectively ( $p>0.05$ ). Generalized linear mixed models, which accounted for correlation using repeated measures statements, were constructed for feed intake, resting behaviour, and activity. During the study, calves receiving Meloxicam consumed significantly more starter ration than the placebo-treated calves ( $p<0.05$ ). Resting behaviour and mean daily activity did not differ between the Meloxicam and placebo-treated calves ( $p>0.05$ ). Given the improved feed intake and appetite of the Meloxicam-treated calves, these results suggest that calves with diarrhea may benefit from this non-steroidal anti-inflammatory therapy.

## **MORE WATER PLEASE: THE EFFECT OF WATER DRINKER TYPE ON PIG BEHAVIOUR**

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During the first few days after weaning, pigs often experience weight loss, which may be partly due to their substitution of drinking for feeding. Using drinker devices other than the standard nipple drinker may ease piglets' transition at weaning by facilitating initiation of feeding and preventing the development of behaviour problems. The objective of this experiment was to determine the effect of drinker type on water and food intake, growth rates and belly-nosing. Two hundred seventy pigs were weaned at  $18.1 \pm 0.14$  days of age into pens of 15 pigs. Each pen was assigned to one of three drinker types: push-lever bowl (PL), float bowl (F) or nipple drinker (N). Water usage, wastage and consumption and feed intake were measured daily for 14 days. Pens were video-recorded and belly-nosing and other behaviour were observed by scan sampling three two-hour periods on days 9 and 10. Data were analyzed using a mixed model. Pens with nipple drinkers used more water than other pens ( $P < 0.01$ ; PL:  $0.92 \pm 0.83$  L/pig/d, F:  $0.82 \pm 0.11$  L/pig/d, N:  $1.93 \pm 0.08$  L/pig/d), while those with the float bowl consumed less water than other pens ( $P < 0.01$ ; PL:  $0.76 \pm 0.05$  L/pig/d, F:  $0.46 \pm 0.06$  L/pig/d, N:  $0.86 \pm 0.05$  L/pig/d). There were no differences between treatments in feed intake or weight gain throughout the experiment. There was a tendency for a difference in belly nosing, with pens of pigs given the push-lever bowl belly nosing the least ( $P = 0.099$ ; PL:  $4.2 \pm 0.5\%$  of time; F:  $5.7 \pm 0.5\%$  of time; N:  $4.7 \pm 0.5\%$  of time). It appears that the use of the push-lever bowl can minimize belly nosing and water wastage while not negatively affecting feed intake or growth rates.

## **BEHAVIOURAL RESPONSES OF PIGLETS TO TEETH CLIPPING AND SUBSEQUENT EFFECTS ON CASTRATION RESPONSE**

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While the benefit of teeth clipping for reducing facial injuries is well established, any pain associated with the procedure has not been thoroughly examined. Human studies indicate that infants experiencing a painful procedure without anesthetic are more reactive to painful procedures performed later in life. The objectives of this experiment were to determine the effects of teeth clipping on the behaviour of piglets 1) immediately following and during the first few days after the procedure and 2) after castration. Three males and three females, from 10 litters (N=60) were assigned to one of two treatment groups (Clipped or Unclipped). Litters of piglets were teeth clipped or sham-clipped within 24 hours of birth in matched pairs. Each pair was observed for one hour immediately following clipping (day 0) and 1, 5 and 7 days later using focal animal sampling. Recorded behaviour included shaking, lowered head carriage and other activities previously shown to be affected by castration. On day 6, all male piglets were castrated and all females were sham-castrated. Clipped (n=30) and Unclipped (n=30) piglets behaved similarly immediately after clipping, but more Clipped piglets (40% versus 17%; chi-square analysis  $p < 0.05$ ) were observed shaking 24 hours later. Immediately following castration or sham-castration only 3% of females were observed with lowered head carriage compared to 52% of males ( $p < 0.001$ ). Similarly, only 16% of females versus 48% of males were observed shaking ( $p < 0.01$ ). Clipped males (n=13) were observed more often under the heat lamp ( $p = 0.03$ , Mixed analysis of variance), less often walking ( $p = 0.05$ ) and tended to be seen less frequently at the udder ( $p < 0.10$ ) compared to Unclipped males (n=16). On the day following castration, 23% of Clipped males and no Unclipped males were observed shaking ( $p < 0.05$ ). These results indicate that while there were few responses to teeth clipping itself, teeth clipping did affect subsequent behavioural responses to castration.

# **ABSTRACTS FOR POSTERS**

## **THE IMPACT OF FEEDING SEVERAL COMPONENTS OF THE SEAWEED *ASCOPHYLLUM NODOSUM* ON TRANSPORTED LAMBS.**

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Feeding the seaweed *Ascophylum nodosum* (ANOD) has been shown to mediate the body temperature of lambs during transport in hot weather while also negatively impacting antibody production. The aim of this study was to determine if fucoidan, salt, or betaine, were the causative agent for the effects seen in previous studies. Each compound was fed at a rate comparable to 2% of dry matter intake (DMI) of ANOD. Two additional groups were fed ANOD at a rate of 2% or 0% (controls) of DMI. Fifty-five lambs averaging 25 kg swallowed three gelatin capsules twice daily filled with the appropriate amount of compound for 14 d. ANOD supplemented lambs had suppressed ( $P < 0.05$ ) IgG and IgM antibody titers in response to administration of ovalbumin, and tended to have higher white blood cell counts ( $P = 0.10$ ) than the controls post supplementation. Post supplementation ANOD and salt lambs had lower cortisol concentrations ( $P = 0.08, 0.12$ ) and all treatments showed a slight trend for lower aldosterone concentrations ( $P = 0.10, 0.07, 0.14, 0.09$ ) than the controls. All lambs had similar minimum and maximum body temperature during transport, though ANOD lambs were generally lower during transport. During transport the salt lambs had significantly lower cortisol ( $P < 0.05$ ), concentrations than the controls. Control lambs had higher plasma sodium and chloride concentrations ( $P < 0.05$ ) post transport than ANOD and fucoidan lambs. Post transport, no differences were observed in the latency for lambs to drink, eat, or lay. None of the components studied appeared to be impacting the mediation of body temperature that ANOD previously exhibited. However, the salt in ANOD appears to be affecting both adrenal and immune function, though further studies are needed to determine the mechanism and effects of these alterations.

## THE WELFARE IMPLICATIONS OF THE TRANSPORT OF PIGS: THE SCIENTIFIC BACKGROUND OF CURRENT INTERNATIONAL LOADING DENSITY STANDARDS

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A review was conducted of current Canadian recommendations and regulations on pig welfare during transport, which were then compared with international standards and current scientific literature. Focusing on loading density during transport, we limited our comparison to Canada, the United States (US), the European Union (EU), United Kingdom, Ireland, South Africa, Australia and New Zealand. The current Canadian Health of Animals Act prohibits the overcrowding of animals during transport, however quantitative loading density limits are not specified. In comparison, the 2001 Recommended Code of Practice for the Care and Handling of Farm Animals –Transportation recommends a space allowance of approximately 0.36 m<sup>2</sup>/100 kg pig and notes that swine are often transported lying down. Canada's current space allowance guidelines tend to agree with those recommended in the US, Australia, and New Zealand. However, below 50kg and above 100kg, there is very little in the way of space allowance recommendations provided by the US, Australia, or New Zealand. With the use of equations to extrapolate comparisons between Canada's space allowance recommendations to those of the US, Australia, and New Zealand, it appears that at weights above 100kg, Canada provides for more space per animal than the other three countries. However, both the EU and Ireland recommend even greater space allowance (0.425 m<sup>2</sup>/100kg) than Canada (0.36 m<sup>2</sup>/100kg), with the greatest space allowance being recommended by the US at 0.50 m<sup>2</sup>/100kg. South Africa recommends the least amount of space per animal at a mere 0.30 m<sup>2</sup>/100kg. Based on scientific data in regard to posture during transport, the literature suggests that space allowances of animals in Canada should be greater than 0.36 m<sup>2</sup>/100 kg but not exceed 0.425 m<sup>2</sup>/100kg. Current regulations in both the EU and Ireland cite 0.425 m<sup>2</sup>/100 kg. Thus, if Canada increased its current space allowance guidelines, it would fall more in line with both the scientific literature and the EU.

## **THE WELFARE IMPLICATIONS OF THE TRANSPORT OF PIGS: THE SCIENTIFIC BACKGROUND OF CURRENT INTERNATIONAL TRANSPORT DURATION STANDARDS**

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A review was conducted of current Canadian recommendations and regulations on pig welfare during transport, which were then compared with international standards and current scientific literature. Focusing on journey duration during transport, we limited our comparison to Canada, the United States, the European Union (EU), United Kingdom, Ireland, South Africa, Australia and New Zealand. The current Canadian Health of Animals Act and the 2001 Recommended Code of Practice for the Care and Handling of Farm Animals–Transportation recommend that pigs not be confined without food, water and rest for longer than 36h after which time pigs must be given at least 5h to feed, drink and rest. Amongst the international regulations and guidelines reviewed, a consensus exists on key points in regard to transport duration for pigs, including: (1) loading and unloading of pigs is extremely stressful for the animals, (2) transported pigs have a feed and water requirement, and (3) transport duration may be further limited depending on the type of transport vehicle (eg. basic versus “higher standard”). Overall, the physiological data does not support transporting pigs prior to slaughter and short journeys may be more detrimental than longer journeys. Instead, keeping animals on the transport vehicles, providing continuous access to water, providing proper dung removal during transport, and adequate space to rest have found more support. The scientific literature demonstrates that transport can be prolonged up to 24h, provided transport conditions (i.e. ventilation and density) are good and water is available on the transport vehicle. Similar recommendations are reflected in current EU guidelines in which transport duration limits are determined by the type of vehicle and whether it is “basic” or “higher standard”. Similar guidelines may be advisable in Canada in which animals transported short distances (eg: 8h or less) can be transported without food or water in “basic” transport vehicles, however for longer transport durations (eg. up to 24h) pigs must be transported on “higher standard” vehicles in which water is available at all times.

## **OWNED AND SEMI-OWNED DOGS CENSUS IN CURITIBA AND SURROUNDINGS, BRAZIL**

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Strategic management of urban dog population depends on knowledge of dog population size and dynamics. Average population age across time can be an indicator of the efficiency of control strategy, since effective birth control will increase average population age. Although the WHO proposes a human:dog ratio of 7:1 in developing countries, studies in Southern Brazil have shown lower ratios. In this study, a statistical method employing random sampling was used to estimate dog population in four areas of Curitiba City and surroundings, Brazil. In Vila Osternack, Curitiba, (total of 3,000 houses and 16,500 inhabitants), the human:dog ratio was 3.4:1, and proportion of bitches was 42.8%. In Quatro Barras City (total of 1,000 houses and 4,800 inhabitants) a human:dog ratio of 3.6:1 was observed, being 42.1% bitches. In Vila Torres, Curitiba, (total of 2,000 houses and 9,800 inhabitants) the human:dog ratio was 3.8:1, being 41.5% bitches. In São José dos Pinhais City (5,000 houses and 25,000 inhabitants), the human:dog ratio was 3.5:1, and proportion of females was not estimated. The overall average human:dog ratio for Curitiba and surroundings was 4:1, and variation was small across different areas, in agreement with the small variation found between studies conducted in other Brazilian States. Percentage of female dogs seems to be similar through the surveyed areas, around 42%. Dog age was studied in Quatro Barras, and average age was 3.7 years. Strategies to increase population age tend to increase the duration of animal-based interventions such as spaying/neutering, since effects will last as long as animals stay alive. In conclusion, actions related to dog population control in Brazil should employ a human:dog ratio of 4:1, since WHO numbers lead to an important underestimation of dog population size. An open effort should be undertaken to increase average age, to prolong the effects of surgical sterilization programs.

## Effects of microflora change on resting behaviour in grouped pigs

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Illness is known to lead to increases in slow wave sleep in an animal as part of the sickness behaviour response that aids in the combat of illness. Lack of sleep is associated with increased mortality from disease and reduced immunity, but little is known about how sickness alters rest in socially housed animals. The objective of this study is to determine if an intestinal microflora change in an individual leads to behavioural alterations by the individual and its penmates. Weaned pigs were housed in 21 groups of three pigs, over three replicates. In 11 Treated groups, one pig received three doses of 250 mg/kg ampicillin orally and penmates received placebo doses. In 10 Control pens, all pigs received placebo doses. Pens were video-recorded and interval scan-sampled every 10 minutes for 24 hrs/day on Days -1, +1 and +3 relative to dosing. Proportion of total rest, resting in isolation and heat pad use were statistically analysed as a repeated measures mixed model. Fecal samples were collected directly. Treatment was not associated with clinical signs of diarrhea. However, microbiological analysis revealed a significant microflora change on Day +3 for Treated pigs ( $p=0.006$ ). For Treated pigs, proportion of time resting was not affected by treatment [treatment x day:  $F(10,169) = 0.33, p=0.973$ ]. Furthermore, there was no evidence that Treated pigs spent more time resting in isolation after dose [treatment x day:  $F(10,152) = 0.59, p=0.819$ ]. Although there was no significant treatment x day interaction for heat pad use [ $F(10,152) = 0.95, p=0.4894$ ], contrasts show that all pigs in treated pens rested on heat pads less on day +3 than on day -1 (RR: 0.555; 95% CI: 0.408, 0.756;  $p=0.0002$ ). We found no evidence that an intestinal microflora shift alters resting behaviour by socially housed pigs.

## **POST GRADUATE EDUCATIONAL OPPORTUNITIES FOR APPLIED ANIMAL BEHAVIORISTS**

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The field of animal behavior has a variety of sub specialities; one of which is applied animal behavior. Applied animal behavior involves working directly with animals in an applied setting, such as zoological parks, livestock handling and welfare, animal shelters, and private practice consultation with the pet owning population. The general approach in education is to earn a BA/BS in a variety of disciplines including Biology, Animal Sciences, Zoology, and Psychology and then a Ph.D. with a specialization in animal behavior. These programs are available in nearly every part of the country. While they provide the broad basic background needed in animal behavior principles, few offer specific courses or opportunities in companion animal/zoo animal behavior or clinical experience. A high-quality graduate program will also include a strong foundation in research methods and statistical analysis. The most important element when choosing a graduate program is to find a faculty member that is willing to support an applied approach, and allows flexibility in taking interdisciplinary courses. The purpose of this presentation is to review the opportunities available to students when looking for post graduate education and experience within the applied animal behavior field.

## **IMPROVED METHODS FOR DETECTING LAMENESS IN DAIRY COWS AND THE EFFECTS OF HOOF TRIMMING.**

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Lameness is one of the most serious welfare problems of dairy cattle but detection of lameness is not simple. Improved gait scoring techniques and automated means of assessing weight distribution or time spent standing have great potential to improve early detection. Lameness is often treated by hoof trimming but we know little about how hoof trimming affects gait or the other behavioural changes associated with lameness. We examined the gait using video-recordings, hoof health, and resting behaviour of 96 lactating dairy cows before and after hoof trimming. Gait scores were based on judgements of the changes in the components of gait known to be affected by lameness: tracking up, head bobbing, swinging out, arched back, joint flexion, reluctance to bear weight and asymmetric stepping. Prior to hoof trimming, lame cows spent less time standing than non-lame cows. The gait of lame cows was not affected by hoof trimming. Gait scores of non-lame cows worsened after hoof trimming and this was true for all components of the gait and was still evident 6 weeks after hoof trimming. The time spent standing also decreased after hoof trimming due to a reduction in mean bout duration of standing. The effects of hoof trimming were complex and varied according to the hoof health of the cow and the time since hoof trimming. The results confirm the ability of our improved gait scoring technique and automated measures of activity to identify cows with hoof problems. While hoof trimming leads to improved hoof health in the long term, we found no evidence that hoof trimming improves the gait or mobility of cows in the short term.

## DO GILTS FROM LOOSE HOUSING NEED MORE TIME TO ADJUST TO FARROWING CRATES THAN GILTS FROM STALLS?

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Gilts from loose housing systems with no previous experience of physical restriction exhibit more restlessness and appear to have a more difficult time adapting to a farrowing crate than gilts held in stalls during gestation. However, any effect of the interval of time from moving into the crate until the onset of parturition on peri-parturient behaviour or farrowing duration is not known. The objective of this experiment was to determine the effect of gestation housing and length of adjustment period in the farrowing crate prior to parturition on posture changes, duration of farrowing and interbirth interval. Twenty primiparous sows were kept in either Loose housing (N=10) or Stalls (N=10) during gestation. Half of the gilts from each housing system were moved into the farrowing crate on either day 108 (Long) or day 112 (Short) of gestation. All gilts were injected with 175µg of cloprostenol while in the farrowing crate on day 112 to induce farrowing and farrowed  $31.22 \pm 2.79$  hours later. Posture changes were observed continuously from video recordings during the 4-hours before birth of first piglet (Pre-partum) and between births of the first and last piglets (Farrowing). Preliminary data indicated no treatment differences due to gestation housing (Loose = 4 and Stalls = 5 gilts). However in Pre-partum, Long gilts (N=4) tended to spend more time sitting ( $23.38 \pm 3.68$  vs.  $9.02 \pm 3.72$ /min;  $P < 0.10$ ; Proc Mixed) and had a greater frequency of sitting and standing than Short gilts (N=5) ( $18.00 \pm 2.52$  vs.  $10.20 \pm 2.7$ /min and  $8.75 \pm 2.78$  vs.  $1.20 \pm 2.71$ /min;  $P < 0.05$ , respectively). During Farrowing, Long gilts had a greater frequency of both sitting and lying sternally than Short ( $4.03 \pm 0.69$  vs.  $0.89 \pm 0.64$ /hr,  $P < 0.05$  and  $6.18 \pm 1.39$  vs.  $2.11 \pm 0.92$ /hr,  $P < 0.10$ ; respectively). These preliminary data suggest that a longer period of adjustment does not reduce restlessness at farrowing.

## CASE STUDIES ON THE EFFECT OF SOLE ULCERS ON KINEMATIC MEASURES OF DAIRY COW GAIT

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Lame cows rarely suffer from a single hoof injury. We investigated how number of hooves affected by sole ulcers influence gait. Video-recordings of Holstein cows from 2 herds (n=38, 30) were digitized using motion analysis software. Stride length and height, stride, stance and swing durations, speed, and proportion of triple support were calculated and hoof trajectories plotted. Most cows had multiple injuries on multiple hooves, but several cows had an ulcer on one or two hooves. Cow A had one ulcer on a rear hoof and had shorter stride lengths (119.1 vs. 139.5cm,  $P(Z \text{ test}) = 0.005$ ) than 'healthy' cows with no injuries from the same herd. Maximum stride height was lower for the injured and contralateral hoof than for healthy cows (7.6 vs. 10.4cm, 7.3 vs. 9.7cm,  $P(Z \text{ test}) = 0.000, 0.054$ , respectively) and the ipsilateral hoof swung 4.1cm lower mid-stride. This cow also spent longer in triple support than healthy cows (85.1 vs. 65.1%,  $P(Z \text{ test}) = 0.000$ ). Cow B had ulcers on both rear hooves. This cow did not differ in stride length or height but spent longer in triple support than healthy cows (72.5 vs. 65.1%,  $P(Z \text{ test}) = 0.123$ ). Cow C had one ulcer on a front hoof. Both the injured and contralateral hoof swung 2.4 and 1.7cm lower than for healthy cows, although stride length and rear hoof trajectories did not differ. Cow D had ulcers on both front hooves. Hoof trajectories did not differ and stride and stance durations were only >5% longer than healthy cows ( $P(Z \text{ test}) = 0.59, 0.61$ ). These case studies indicate that an ulcer on the front versus rear hoof generates different gait and these patterns become increasingly complicated as more hooves are affected, illustrating the need for more detailed work on the effects of specific injuries on gait.

## EFFECTS OF RUNNING WHEEL ENRICHMENT ON MALE CD-1 MICE

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Laboratory mice show a strong preference for running wheels, which are therefore suggested as beneficial additions to cage housing. However, their use could lead to increased aggression if there is competition for access. We determined the effects of a running wheel on the behavior of male CD-1 mice. Mice ( $n=59$ ) were housed in standard polycarbonate cages (4-5 mice per cage) for 2 weeks (BASE), and then placed in either: 1) A standard cage with bedding (CONT), 2) Same as CONT, but with the addition of a Bio-Serv® mouse igloo/running wheel (WHEEL) and 3) Same as WHEEL, but with the running wheel glued in place so that it could not rotate (FIXED). Social behavior and dominance ranks were assessed at the end of BASE and 2 weeks after imposition of treatments. There was increased escalated aggression in enriched cages (FIXED, Tukey:T8 = -8.31;  $p = 0.0003$ ; WHEEL, Tukey:T8 = -4.577;  $p = 0.0153$ ), and decreased stereotypy in WHEEL (Tukey:T8 = 4.226;  $p = 0.0237$ ). There was also a decrease in dominance hierarchy linearity in enriched treatments (FIXED, Tukey:T9 = 3.653;  $p = 0.0433$ ; WHEEL, Tukey:T9 = 6.273;  $p = 0.0014$ ) and a negative correlation between linearity and escalated aggression overall (GLM:  $F_{1,7} = 61.41$ ;  $p < 0.001$ ; partial  $r = .90$ ). Thus, providing a running wheel had a negative effect in increasing potentially injurious aggression. Additionally, the decrease in hierarchy linearity suggests that the social structure in enriched groups was disrupted. The cause of the decrease in stereotypies in WHEEL is unknown, but could be due to a shift in the time budget, since mice used the wheel extensively (67% of the active period). Running wheels are therefore not a recommended environmental enrichment for conventionally housed male CD-1 mice, although females or males of other mouse strains might respond differently.

## EFFECTS OF AGE AND MILK ALLOWANCE ON RESPONSES TO ABRUPT WEANING IN DAIRY CALVES

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There is much interest in alternative feeding programs for milk-fed calves, but little is known about how these calves can best be weaned. Our objectives were to quantify the effects of age and milk allowance on responses to abrupt weaning. Thirty-six Holstein calves were randomly assigned to either ad libitum or restricted (10% BW) access to milk and weaned at either 4 or 8 wks of age. Calves were reared in a group pen with milk provided by a computer-controlled feeder. Time standing, body weight and number of visits to the feeder were monitored from 1 wk pre until 1 wk post weaning. An average of the pre-weaning values was used as a baseline in comparing responses post weaning. All calves showed increases in standing time ( $9.5 \pm 0.2$  vs.  $6.9 \pm 0.2$  h/d;  $P < 0.001$ ) and feeder visits ( $61.7 \pm 3.8$  vs.  $13.9 \pm 3.7$  visits/d;  $P < 0.001$ ) during the 24 h after weaning. The restricted-fed calves tended ( $P < 0.1$ ) to return to baseline values faster than the ad libitum-fed calves, but weaning age had little effect. Calves weaned at 8 wks from the restricted ration gained  $0.74 \pm 0.23$  kg/d before weaning and tended to gain more ( $1.12 \pm 0.15$  kg/d;  $P = 0.06$ ) during the week after weaning. However, all calves fed ad libitum and all calves weaned at 4 wks experienced a growth check at weaning. Growth rates of these calves decreased ( $P < 0.05$ ) from  $0.82 \pm 0.08$  kg/d before weaning to  $0.18 \pm 0.09$  kg/d during the week after weaning. In conclusion, all calves showed a distress response to abrupt weaning, but calves weaned early and from higher milk rations showed increased behavioral responses and the greatest reductions in growth after weaning. These results illustrate the need for alternative weaning practices to accompany new milk-feeding methods.

## **COLOR PREFERENCE OF CAGE ENRICHMENT DEVICES IN ORANGE-WINGED AMAZON PARROTS (*AMAZONA AMAZONICA*)**

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Cage enrichment devices, i.e., cage “toys,” are often provided to captive parrots as a means of promoting a behaviorally more stimulating captive environment. However, it is not clear whether particular properties of enrichment devices are more effective than others in eliciting interaction. We investigated whether color affects the use of an enrichment device by captive Orange-winged Amazon parrots (*Amazona amazonica*). Parrots (N = 8, mixed-sex, 4-5 years of age) were individually caged (0.84 x 0.64 x 1.73 m) and fed a formulated diet (Roudybush low-fat maintenance; Sacramento, CA) in addition to occasional, assorted fruits, vegetables and nuts. Photoperiod was held at 12 hr light:12 hr dark. Wooden blocks (approx. 3.8 x 3.8 x 3.8 cm) constructed of Douglas Fir were dyed with icing color (Wilton Industries; Woodridge, IL) in eight different colors: red, orange, yellow, green, blue, violet, brown, natural (or un-dyed) and suspended from the tops of their cages. Each block was attached to an omnidirectional switch (Model #80111; LaFayette Instruments, Lafayette, IN), two per cage. Switch closures, elicited by movement in any lateral direction of the block, were continuously monitored by computer. Daily averages for each color (two to six days per color) were computed for each bird and subjected to analysis of variance. Yellow-colored enrichment devices were significantly more utilized than all other colors ( $P < 0.05$ ;  $F = 5.84$ ). Orange, red, and brown enrichment devices were not significantly different from each other; however, they were more frequently used than green, blue, violet or natural (LSD t-test;  $\alpha = 0.05$ ). The basis of the color preference is not clear, though similarity to plumage color – yellow is the predominant non-green head color – and ripe fruit is noted. Regardless, our results suggest that color influences behavioral interaction with enrichment devices. Other stimulus properties might be similarly investigated to develop more behaviorally engaging cage enrichment devices.

## **THE IMPACT OF ROUTINE PIGLET PROCESSING PROCEDURES ON WELL-BEING. I. TEETH RESECTION, TAIL-DOCKING, AND CASTRATION**

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Several potentially painful procedures are performed on piglets soon after birth. These procedures include teeth resection, tail docking, and castration. Several experiments were conducted to determine if less painful alternatives could be identified. Three experiments were conducted to compare: 1) teeth resection (TR) – clip vs. grind; 2) tail-docking (TD) – cold vs. hot-clip; 3) castration (CA) – cords cut vs. torn. Eight to ten litters of eight, 2-3 day-old piglets were assigned to each procedure. Within each litter 2 piglets were assigned to 1 of 4 possible procedures: the two alternative methods, a sham procedure, and a sham procedure plus blood sampling. Blood was sampled before, and at 45 min, 4h, 48h, 1wk, and 2wks post-procedure and assayed for cortisol and beta-endorphin. Procedures were video-taped to evaluate the time taken to perform the procedure and the number of squeals, grunts and escape attempts. Piglets were weighed before the procedure and at +24h, +48h, +1wk and +2wks. Wounds were scored on a 0 to 5 scale on TD and CA pigs at +24h, +1wk and +2wks. The pigs from the TD experiment were euthanized and tails collected to determine the extent of neuroma formation. For TR, grinding took about 20s longer than clipping and resulted in greater cortisol concentrations overall, poorer growth rates, more escape attempts and longer vocalizations ( $P<0.05$ ). For TD, hot clipping took longer ( $P<0.05$ ) and resulted in more, longer and higher frequency squealing ( $P<0.001$ ). Neuromas were greater in cold-clipped tails but all of these pigs had damage due to tail biting ( $P<0.05$ ). For CA, tearing took longer and resulted in more squealing ( $P<0.05$ ). Treatment effects could not be separated from the fact that those treatments proving to be more detrimental require more time to perform. Producers should choose processing procedures that are quick in order to minimize stress to pigs.

## **EFFECT OF DENSITY AND SEASON ON THERMOREGULATORY BEHAVIOUR DURING TRANSPORT OF EARLY WEANED PIGLETS.**

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The objective of this experiment was to assess piglet response to transport in summer (S), winter (W) and spring (SP). Two groups of 48 Cotswold piglets were weaned at  $17 \pm 1$  day of age and transported (24h) each season. Subgroups (16 pigs) were transported at standard (S- $0.06 \text{ m}^2/\text{pig}$ ), low (L- $0.048 \text{ m}^2/\text{pig}$ ) or high (H- $0.12 \text{ m}^2/\text{pig}$ ) space allowance. Scan sampling (20/h) of thermoregulatory behaviour (exposed vs unexposed), during the mid h, in each 6-h period allowed piglets to be classified as exposed for 0-25% (C1), 25-50% (C2), 50-75% (C3) or 75-100% (C4) of observations. Differences between exposure categories were analyzed using chi square. Percentages are reported for ease of comparison. Temperatures were analyzed using a Mixed Procedure in SAS. Average truck temperatures varied with season (S- $26.5^\circ\text{C}$ , SP- $16.4^\circ\text{C}$ , W- $0.9^\circ\text{C}$ ; SEM-2.24,  $P < 0.01$ ). In summer more piglets (85.7%) were exposed for 75-100% of observations (chi square 235.6, 3 d.f.  $P < 0.01 = 11.34$ ). In the winter piglets showed a preference for reduced exposure (C4 vs C1-3, chi square = 6.75, 1 d.f.  $P < 0.05 = 3.84$ ). However, only 31.3% of piglets were minimally exposed and 11.9% were maximally exposed, a possible welfare concern. Spring patterns followed winter or summer patterns depending on the temperature. Low space allowances resulted in higher air temperatures (L- $15.1^\circ\text{C}$ , S- $14.7^\circ\text{C}$ , H- $14.0^\circ\text{C}$  seasons averaged; SEM-1.30,  $P < 0.04$ ) and higher ear surface temperatures (L- $27.6^\circ\text{C}$ , S- $26.6^\circ\text{C}$ , H- $26.9^\circ\text{C}$  seasons averaged; SEM 1.28,  $P < 0.04$ ). In summer, at low space allowance fewer piglets were able to stay exposed to the air for 75-100% of the time (H-58.6%, S-86.2%, L-89.3%, chi square 10.3, 2 d.f.  $P < 0.01 = 9.21$ ). Based on this data reduction in space allowance put piglets at higher risk in summer. Low space allowance in winter was not as clearly detrimental, possibly because the higher temperatures were beneficial and because piglets tended to huddle irrespective of space available.

## **THE IMPACT OF ROUTINE PIGLET PROCESSING PROCEDURES ON WELL-BEING. II. IDENTIFICATION, IRON ADMINISTRATION AND COMBINED PROCESSING.**

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After birth, piglets undergo procedures likely to cause pain. Our aim was to evaluate responses evoked by alternative methods for performing the following: identification (ID) – ear notch vs. tag; iron administration (FE) – injection vs. oral; combination (ALL) – teeth grinding, hot iron tail-docking, ear notching, oral iron dosing, castration with cords torn (MOST aversive) vs. teeth clipping, cold tail-docking, ear tagging, iron injecting, castration with cords cut (LEAST aversive). Ten litters of eight, 3 day-old piglets were assigned to each procedure. Within each litter, 2 piglets were assigned to each treatment: the two alternative methods, a sham procedure, and a sham procedure plus blood sampling. Blood was sampled before, and at 45 min, 4h, 48h, 1wk, and 2wks post-procedure. Procedures were video-taped to determine the time taken to carry out the procedure and the number of squeals, grunts and escape attempts. Piglets were weighed before the procedure and at +24h, +48h, +1wk and +2wks. Wounds were scored at +24h, +1 wk and +2wks. For ID, notching took 11s longer, resulted in higher wound scores ( $P<0.05$ ), more and higher frequency squealing ( $P<0.001$ ), more escape attempts ( $P<0.01$ ) and tended to result in higher cortisol concentrations ( $P<0.1$ ). For FE, oral dosing took 4s longer and resulted in more squealing ( $P<0.05$ ). The MOST combination took 45s longer than LEAST and MOST pigs performed more squeals than the two control treatments ( $P<0.07$ ) and these were higher in frequency ( $P<0.05$ ). ALL male pigs in both processed treatments exhibited elevated plasma cortisol at +45 min as compared to Control pigs ( $P<0.001$ ). When studied singly, notching significantly increased multiple indicators of welfare compared with tagging and oral dosing iron increased some indicators compared with injecting. However, when applied collectively, MOST procedures showed little disadvantage over LEAST, perhaps indicating that the time taken to process collectively results in fairly maximal stress responses regardless of the techniques used.

## COMPARATIVE EFFECTS OF INFRARED AND HOT-BLADE TRIMMING ON FEEDING BEHAVIOUR AND PRODUCTIVITY

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The purpose of this research was to examine the impact of a relatively new method of beak trimming on poultry welfare. Seventy-two layer chicks were assigned to hot-blade trimming (HB), infrared treatment (IR) or a control (C) group at 1d of age. Chicks were pair housed by treatment and body weight (BW) and feed intake (FI) were monitored weekly until the birds reached 10-wks of age. A specific feeding test was performed during weeks 3, 5, 7 & 9 to elucidate any treatment related differences on feeding behavior and feeding efficiency (intake/peck). Effects of treatment on BW emerged 5d after trimming when IR and HB weighed less than C ( $P<0.05$ ). BW in HB remained suppressed until 9-wks post-trimming relative to C ( $P<0.05$ ), and was lower than in the IR group between weeks 2-4 afterwards ( $P<0.05$ ). Weight in IR did not differ from C after 3-wks and by the final week of the study there were no apparent differences among any group. FI was noticeably higher in C, intermediary in IR and lowest in HB birds until 9-wks post-treatment ( $P<0.05$ ). For the feeding test itself, HB birds took longer to approach the feed and initiate feeding than C or IR birds ( $P<0.01$ ). Treated groups performed more head flicks than C ( $P<0.05$ ), and HB exhibited more beak scratching than C or IR ( $P<0.05$ ). Intake during testing was highest in C, intermediate in IR and lowest in HB ( $P<0.05$ ) and finally overall feeding efficiency was inferior in the trimmed groups ( $P<0.05$ ) but there were few differences between the trimmed birds themselves. To conclude, it appears that HB had a more pronounced impact than IR but most differences had dispersed by 10-wks of age.

## **EFFECTS OF A NON-INFECTIOUS GASTROINTESTINAL MICROFLORA SHIFT ON RESTING AND SOCIAL MOTIVATION OF WEANLING PIGS**

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Our objectives were to explore the effects of a non-infectious gastrointestinal microflora shift on behavioural needs of weaned pigs. Nine pigs received three oral doses of 250 mg/kg ampicillin over 36 hours, a model we developed to cause mild to moderate diarrhea for 24-48 hours. Pigs were tested individually in an 8ft x 4ft pen with resources for feeding, drinking, rooting, and warmth. A separate social area of the pen provided visual and nose-to-nose contact with two familiar healthy penmates. Behaviour was scored from time-lapse video recordings using 5-minute scans over eight one-hour periods on days -1, 0, +1 and +2 relative to dosing. Diarrhea was assessed on a 4-point scale, whereby 1=normal and 4=severe. Data were analyzed using a generalized mixed model examining repeated measures effects over time, with trial, room and pig as random effects. Tukey adjusted P-values are reported. On average, pigs spent 82.9% of their time in the social area. Probability of spending time in the social area significantly differed by day ( $P < 0.0001$ ), with odds of spending time in the social area being 1.8 times greater on day 0 compared to the average of days -1, +1, and +2. There was also a significant effect of diarrhea score on probability of spending time in the social area ( $P = 0.048$ ). On average, pigs rested 86.9% of the time. There was suggestion of a day effect on time spent resting ( $P = 0.0529$ ), with odds of resting being 1.4 times greater on day 0 compared to the average of days -1, +1 and +2. There was a significant effect of diarrhea score on probability of resting ( $P = 0.0042$ ), with the probability of resting being 91.7% when fecal score was  $>1$  versus 85.6% when fecal score was 1. This study shows that a non-infectious gastrointestinal microflora shift affects resting and social motivation.

## PHYSICAL HEALTH INDEXES OF CONFINED PHEASANT WELFARE

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The use of pheasants (*Phasianus colchicus*) as a source of meat is increasing, and a system proposed for layers maintenance is intensive confinement. The objective of this work was to study physical health parameters as indexes of pheasant welfare during confinement in six 1.55 m<sup>2</sup> cages, with straw bedding, in densities of four, five or six birds/cage, one male/cage, in two repetitions, totalizing 30 experimental animals. After seven months of confinement, blood was collected from one male and one female per cage, then these animals were slaughtered and necropsy exams were performed. Statistical analyses were performed through ANOVA, employing SAS Statview Program. Test for blood data showed a low statistical power ( $0.06 < \delta < 0.25$ ), due to low number of observations per cage density. Raw averages of hematological values were:  $2,168,591 \pm 768,378$  erythrocytes/mm<sup>3</sup>,  $33.5 \pm 3.9\%$  hematocrit,  $14.3 \pm 2.8$  g hemoglobin/dL, packed cell volume  $14.8 \pm 2.2$  fL, mean corpuscular hemoglobin concentration  $42.6 \pm 6.1\%$ ,  $23,454 \pm 5,802$  total leucocytes,  $8,367 \pm 2,810$  heterophils and a ratio H:L of  $0.89 \pm 0.44$ . Necropsy exam revealed aerosacculitis in nine out of 12 pheasant, of a severe degree in one bird; hemorrhagic lesions were found in the breast muscle, trachea and digestive tract of 11 animals; mucous secretion was found in the digestive and respiratory tract of three pheasants. Necropsy data suggest that pheasant confinement in conditions described here lead to a restriction of physical health, regardless of a density of four, five or six birds/cage. Blood data needs further research to verify whether H:L ratio presents diagnostic power in terms of pheasant welfare. In conclusion, pheasant maintenance in the confinement conditions reported here provides important restrictions to their physical health. This reduction in welfare degree must be considered when decisions are made regarding the system to be employed for commercial pheasant production.

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## IMPACT OF PERCH USAGE ON BROILER WELFARE

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Although literature presents reports of low perch usage by broilers, variability in results seem to warrant further studies, specially considering the practical viability of this strategy to improve welfare. This work was performed to test the impact of perches on broiler welfare. The treatments were: (1) pens without perches and (2) pens with perches. One-day old chicks were divided in 12 groups of 30 birds each; six groups were randomly distributed to each treatment, at a stocking density of 7.1 birds/m<sup>2</sup>. Behavioural observations were performed twice a week, six times daily, through instantaneous scan sampling. Physical examination was performed when broilers were 40-days old, to observe breast blisters and leg problems. Behavioural parameters were analysed through Mann Whitney and final weight through ANOVA. Results are presented in the following order: treatment (1) followed by treatment (2). Group weight at slaughter was 78.6 ± 3.9 and 74.6 ± 3.7 kg; when corrected for the effect of final number of birds per pen, no effect of treatment on final weight was observed (P>0.05). Broilers used perches during the last third part of their lives, and perching events represented 2.6% and 5,1% of total events observed for the fifth and sixth weeks of life, respectively. For weeks five and six, bedding pecking events were higher and events of agonistic behaviour were lower for treatment (2) compared to treatment (1)(P<0.05), suggesting an improvement of Behavioural Freedom. The severity of breast blisters showed a different pattern between treatments, and no leg disorders were observed; more research is needed to test the effect of perches on these variables. Future research should develop strategies for perches to be used earlier in birds lives, as well as compare the proposed treatments under higher stocking densities, closer to the densities commonly used in Brazilian poultry production systems.

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## CHANGES IN DAIRY COW STANDING BEHAVIOR DURING THE TRANSITION PERIOD

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Dairy cows are exposed to many stressors during the transitional period around calving, and may therefore have special requirements for suitable lying areas at this time. This study sought to describe changes in standing behavior over the period around calving and to determine if these changes were consistent between primiparous and multiparous cows. Twenty-six primiparous and fifty-seven multiparous Holstein dairy cows were used in the study. For each cow the number of standing bouts and the total time spent standing per day were collected and summarized for three periods: pre-partum (d-14 to d-1), day of calving, and post-partum (d+1 to d+14). Period and parity means were compared using paired t-tests. For all cows, total daily standing times were lowest on the day of calving ( $810.7 \pm 16.68$  min/d) and highest during the post-calving period ( $859.2 \pm 16.40$  min/d). On the day of calving there was a dramatic increase in the number of standing bouts ( $17.3 \pm 0.52$  bouts) compared to the pre- and post-calving period ( $11.7 \pm 0.51$  bouts and  $11.2 \pm 0.51$  bouts). Moreover, in both the pre- and post-partum periods, primiparous cows had a higher number of standing bouts than multiparous cows ( $13.3 \pm 0.61$  vs.  $10.7 \pm 0.48$ ), but there were no parity differences on the day of calving. The results of this study indicate that regardless of parity the lying behaviour of dairy cows change at calving, suggesting that special requirements for a comfortable lying and standing surface are necessary at this time.

## **LOCAL ANAESTHETIC AS A MEANS TO VALIDATE MEASURES OF LAMENESS IN DAIRY COWS.**

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To validate two potential methods for detecting lameness in dairy cows, we gait scored lame and healthy lactating Holstein cows (n=12) while walking and measured the percent (and variability) of weight placed on each leg while standing, before and after injections of a local anaesthetic into the leg judged as most responsible for the lameness. Before injection, healthy cows had lower gait scores than lame ones. After injections, gait scores of healthy cows remained more-or-less constant, while gait scores of lame cows were reduced over 15 min. Lidocaine injections reduced scores on some of the components of the gait score, most noticeably head bobbing, tracking up, joint flexion, asymmetric stepping, and reluctance to bear weight. However, there were no significant effects of lidocaine on swinging out or back arch. Healthy cows placed their weight more evenly among their four legs than did lame cows. Lame cows placed less weight on the injured leg and placed more weight on the contralateral leg than did healthy cows. Furthermore, the variability in weight applied to the injured and the contralateral leg was much higher for lame cows than for healthy cows, suggesting more frequent shifting of weight between contralateral legs. Furthermore, the percent of weight applied to the injured leg was increased and the variability in weight applied to the injured and contralateral legs was reduced. The system of gait scoring and the measure of weight applied to each leg were both able to detect lame cows and were both sensitive to local anaesthetic, indicating some degree of validity, although some of the components of the gait scoring system appeared not to be related to the pain of lameness. Lameness is most apparent in weight shifting between contralateral legs rather than in a reduction in weight applied to one leg.

## **OBJECTIVE MEASUREMENT OF PAIN AND FEAR IN CATTLE USING INFRARED THERMOGRAPHY**

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The aim of the present study was to investigate the ability to non-invasively and objectively detect pain and fear in a bovine model using infrared thermography of the orbital (eye) region. Twenty one crossbred beef calves averaging 350 kg were used in the study. Animals were randomly assigned to three treatment groups designated as control (C, no interference), pain (P, two brief 1 second applications of a conventional electric cattle prod) or fear (F, the sudden shaking of a plastic bag in front of the animals head and the accompanying shout of a fearful word). Each animal was brought into a conventional cattle restraining chute and allowed a five minute rest period. Continuous infrared images were then collected from a distance of 2 meters using a FLIR S60 broadband infrared camera for a further five minutes before and after treatment. A sudden drop in orbital temperature occurred in both F ( $-0.36 \pm 0.11$  C) and P ( $-0.47 \pm 0.10$  C) over the first 50 seconds after treatment ( $P < 0.05$ ). There was a delayed return to baseline in P compared to F and orbital temperature was still lower than baseline in P at 50-100 and 150-200 seconds after treatment ( $P < 0.05$ ). The data suggest that it is possible to non-invasively detect both acute pain and fear in cattle and potentially differentiate between these two stressors.

## **BELLY 'NOSERS' AND 'NON-NOSERS' – EFFECT OF FEED RESTRICTION ON PHYSIOLOGY & BEHAVIOUR**

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Piglets developing high levels of belly nosing after weaning tend to have lower growth rates indicating potential metabolic or feed intake problems in response to weaning. Our objectives were to see if (1) 'noser' and 'non-noser' piglets have different blood chemistry responses to weaning, (2) whether they respond differently to hunger as imposed by feed restriction, and (3) whether a substrate can increase feeding/foraging behaviour, thus reducing the development of belly nosing.

Over 2 trials, 128 piglets were weaned at 19 days with either a foraging substrate or no substrate. Only during week 2 were half of the pens feed restricted to 65% of the *ad libitum* fed pigs' previous day consumption (N=8). In week 3 all pens were again fed *ad libitum*. Weights and blood were collected on days 0,7,14,21 and 3,10,17 respectively. Serum was analyzed for Ca, P, Mg, Na, Cl, K, glucose, non-esterified fatty acids (NEFA), and beta-hydroxybutyrate (BHB). BHB is a ketone body which becomes increasingly elevated as the body undergoes a state of energy deficit. Restriction resulted in elevated P, BHB and NEFA values ( $p=0.011$ ,  $p=0.018$ ,  $p=0.0006$  respectively, Proc Mixed), and lower serum glucose ( $p=0.0013$ ), suggesting these parameters can be used as metabolic indicators of nutritional stress. Instantaneous scan sampling for 9 behaviours were recorded for each pig at 5 min intervals for 6 hours per day on days 4, 5, 8, 9, 12, 15, 18, and 19. 'Nosers' were classified based on whether belly nosing was performed in week 1 which was verified by overall mean differences.

Nosers only displayed higher serum phosphorus 3 days after weaning ( $p=0.015$ , Proc Mixed). There were no other behaviour or production differences between groups in week 1 or in response to feed restriction during week 2. Providing a substrate did not reduce belly nosing in week 1, however, it did reduce other nosing on pen-mates. As some non-nosers developed high levels of belly nosing after week 1, classification of nosers based on week 1 data may not be appropriate.

## DO COWS HAVE A DOMINANCE HIERARCHY?

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At the feed bunk, dominance is expressed when an individual consistently manages to displace another one from the resource. This “priority of access” can lead to a linear hierarchy if the dominance relation is transitive (A>B>C>D...). The hypothesis of a linear hierarchy has never been evaluated in cattle. In this study, a sociometric analysis on all of the displacement behaviours displayed at the feeder ( $\bar{x} \pm \text{S.E.}$ : 113  $\pm$  16.7 interactions per day and per group) by six groups of 12 cows during three days was performed *via* matrix analyses (MatMan, Noldus). The average Linear Index  $h'$  was 0.57  $\pm$  0.05 and a significant linear hierarchy was found in five groups over six (Improved Linearity Test  $p < 0.05$  – Linear Index for each group: 0.74; 0.56; 0.47; 0.65; 0.63 and 0.38 for the non-significant group). The animals of each group were ranked according to the best-fitted model of linear hierarchy but this model is arguable. First, we found differences between the MatMan ranking method and the use of social dominance/success indexes cited in the literature. Second, even for the groups for which the linear model fits, many circular triads (A>B; B>C; C>A) have been found ( $N_{\text{triads}} = 31.5 \pm 3.9$ , the maximum being 70), which is in opposition to the definition of a real linear hierarchy. Third, only 41.9  $\pm$  4.5 % of the dyads had a dominant animal that won all the encounters: displacements behaviours are often bilateral (% of two-way dyads = 52.0  $\pm$  5.9). Fourth, the highest animal in the hierarchy never completely dominated all the others: it can be displaced and even dominated by one or more individuals in the group. We conclude that the dominance phenomenon in cattle relies on complex individual and environmental determinants that lead to a pseudo-linear hierarchy. For example, we hypothesize that the expression of dominance depends on the state of the resource at a given time (quantity and/or quality) and on the individual motivation to obtain access to that resource, which can be influenced by intrinsic or extrinsic factors.

## HUNGER BEHAVIOUR IN DAIRY CALVES

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Hunger is an important affective state in animals but little work has attempted to document the behavioural indicators of hunger. Under conventional management calves are fed only about half of their *ad libitum* intake of milk. The aim of the current study was to describe the behaviors associated with hunger in dairy calves fed with a computerized milk feeder. We compared calves fed conventional amounts of milk (two milk meals weighing a total of 10% of the calf's body weight;  $n = 12$ ) or provided milk *ad libitum* ( $n = 12$ ). Calves were kept in groups of four, from 7 to 14 days of life, with treatment assigned within group. We recorded the number of visits to the feeding stall when the calf received milk ('rewarded' visits), the number of unrewarded visits, the number and duration of sucking bouts, the interval between these bouts, the number of calf-to-calf contacts at the feeder, the number of cross-sucking events, time spent standing, and number of vocalizations. *Ad-libitum*-fed calves gained about 4-times more weight ( $P < 0.001$ ) and ingested twice as much milk as calves fed conventionally ( $P < 0.001$ ), indicating that the conventionally fed calves were experiencing hunger. Calves fed restricted amounts of milk performed 12 times more unrewarded visits to the feeder than did calves fed *ad libitum* ( $P < 0.001$ ). Restricted calves also initiated more contacts with other calves ( $P < 0.003$ ) and spent one extra hour standing per day ( $P = 0.05$ ). We found no effect of hunger on the number of vocalizations or the frequency of cross-sucking events and disease incidence. In conclusion, these results indicate that hungry calves are more active, more aggressive, and spend more time occupying the feeder. These behaviors may be useful in identifying milk feeding practices that prevent feelings of hunger in dairy calves.

**The UBC Animal Welfare Program**  
presents

**The Peter Stratton Memorial Lecture**

**Animal Welfare and the Control of Stray Dogs in Brazil**

**by Dr. Carla Forte Maiolino Molento**

Professor of Animal Behaviour and Welfare  
Universidade Federal do Paraná  
Paraná, Brazil



For decades, Brazil has attempted to control its stray dog population mainly by trapping and euthanasia. This strategy has created unacceptable suffering to both animals and humans, and has failed to achieve effective population control. However, dog population control is still required for the purposes of both human and dog welfare. What should we do? We might begin by viewing stray dogs as our allies on the road to reaching a more desirable population equilibrium. This mind-set can lead us to control measures that are both more effective and more humane.

**Professor Carla Forte Maiolino Molento** holds a degree in veterinary medicine and M.Sc. and Ph.D. degrees from McGill University in Montreal, Canada. Dr. Molento's other animal welfare activities include membership on the Committee on Zoonosis and Animal Welfare for the Veterinary Regional Council of the State of Paraná, and the Southern Brazil consultant for the World Society for the Protection of Animals.

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