



Research Symposium

Ontario Veterinary College,
Lifetime Learning Centre, Room 1713
May 5th, 2009
9:00am - 4:30pm

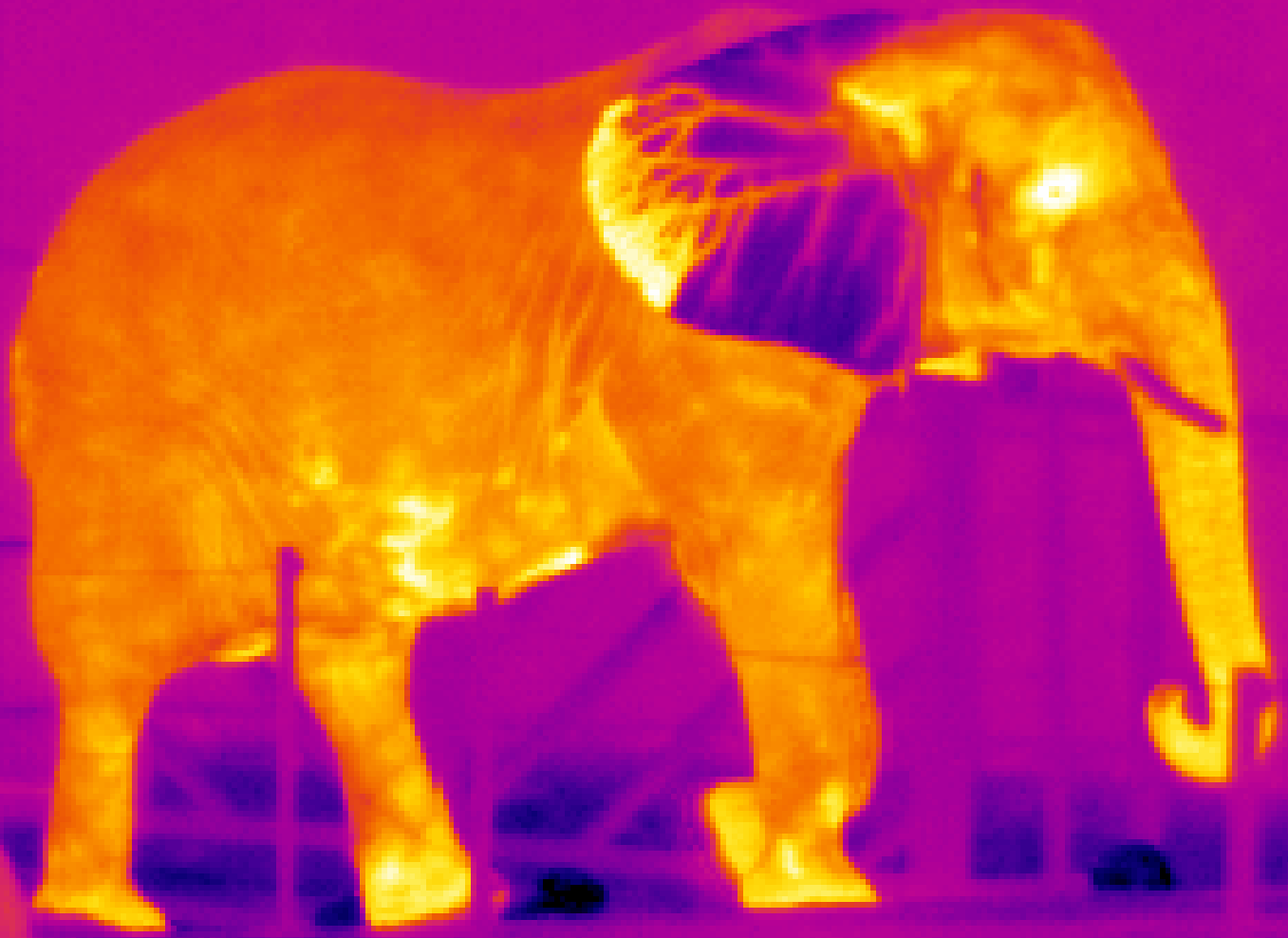


Photo: Matthew Schotsman

2009 CCSAW Research Symposium

Oral Presentations

9:00 **Welcome**
Georgia Mason, Department of Animal & Poultry Science, University of Guelph

Section I: Making inferences about how animals feel

9:05 **Stress odours in rats and mice: a review and a “low tech” method of collection**
Jamie Dallaire, Department of Animal and Poultry Science, University of Guelph

9:25 **Acute stress may induce specific forms of inactivity in juvenile mink**
Becky Meagher, Department of Animal & Poultry Science, University of Guelph
(presented by Georgia Mason)

9:45 **What it feels like: Accepting anthropomorphism in animal research**
Natalie Evans, Department of Philosophy, University of Waterloo

10:05 **Coffee Break & Poster Session**

Section II: How are animals perceived and treated? Examining the status quo

10:35 **Missing out on authenticity: Companion animals, relationships, and critical reflection**
Jean Harvey, Department of Philosophy, University of Guelph

11:05 **The role of wildlife in Botswana: An exploration of human-animal relationships**
Andrea Bolla, Department of Geography, University of Guelph

11:25 **Veterinarian Memoirs: Uncovering patterns and illustrating a process**
Marie-France Boissonneault, Ontario Veterinary College, University of Guelph

11:45 **Road transport conditions of slaughter cattle: Effects on some measures of welfare and the prevalence of ‘dark cutters’**
Laura Warren, Department of Population Medicine, Ontario Veterinary College, University of Guelph

12:05 **Lunch**

Section III: Improving how we treat animals

1:05 **Human beliefs and animal experiences: The development of animal welfare in the Gilded Age and early 20th century America**
Christi Garneau-Scott, Department of History, University of Guelph

1:25 **Evaluation of the minimum dose of dietary thyroxin sufficient to induce moult in turkey breeder hens**
Veronique Gulde, Department of Animal and Poultry Science, University of Guelph

- 1:45 **Thermal comfort in zoo animals: adaptive heterothermy as a means of thermoregulation in the African Elephant, *Loxodonta Africana***
Matthew Schotsman, Department of Animal and Poultry Science, University of Guelph
- 2:05 **Could environmental enrichment make males more attractive?**
Maria Diez-Leon, Department of Animal and Poultry Science, University of Guelph
- 2:25 **Assessment of on-farm killing methods for turkeys**
Marisa Erasmus, Department of Animal and Poultry Science, University of Guelph
- 2:45 **Coffee Break & Poster Session**
- 3:15 **Pregnant, barefoot and no where to move: Sow housing research**
Ed Pajor, Keynote Speaker, Purdue University
- 4:15 **Awards for best student talk and poster**

Poster Presentations

Weaning age and welfare of the laboratory mouse

Allison Bechard, Department of Animal and Poultry Science, University of Guelph

The effect of service dogs on zoo animal behaviour at the Toronto Zoo

Patricia M. Kirby, Department of Animal and Poultry Science, University of Guelph

The health and welfare of cull cows in Ontario

Kristi Bovey, Department of Animal & Poultry Science, University of Guelph

An evaluation of the Pedometer Plus™ system for detection of activity, resting and lameness in dairy cattle

Janet Higginson, Department of Population Medicine, University of Guelph

Prevalence of overweight body condition in cynomolgus macaques at research facilities in North America

Sharon Bauer, Department of Population Medicine, University of Guelph

Examination of sickness behaviour in dogs with lymphoma being treated with chemotherapy – preliminary results

Tanya Sparling, Department of Clinical Studies, University of Guelph

Metabolic state is not predictive of abnormal oral behaviour in weaned piglets

Anita Tucker, Department of Animal and Poultry Science, University of Guelph

Too old to care? The hard-to-cure stereotypic behaviours of old animals are linked with lower motivations for environmental enrichment

Sarah-Lee Tilly, Department of Animal and Poultry Science, University of Guelph
(Presented by Georgia Mason)

Oral Presentation Abstracts

Stress odours in rats and mice: a review and a “low tech” method of collection

Jamie Dallaire & Georgia Mason

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

Signals of stress such as vocalizations and ‘alarm odours’ by animals experiencing poor welfare, can disturb nearby animals, and could also be useful non-invasive indicators of the emitters’ well-being. To facilitate their study in laboratory rats and mice, we tested whether rats’ stress odours could be collected and stored using an *enfleurage*-type technique (a method used in the perfume industry, where odours are adsorbed onto fat). ‘Donor’ rats were exposed to a compound stressor (carried approximately 75 metres inside a novel container, then euthanized with rising carbon dioxide) while on blotting paper dotted with melted vegetable lard. These sheets were then ‘bioassayed’ by a blind observer for their effects on other rats. Data were analysed using generalized linear models and Tukey tests. Compared with control sheets (exposed to unstressed rats, to CO₂ alone, or untreated), the stress-exposed sheets significantly affected the unconditioned behaviour of 16 pairs of ‘detector’ rats trained to enter an arena from their home cage to obtain sucrose. When used to line this arena, the stress-exposed sheets significantly increased both i) the time the rats took to first place their front feet into the paper-lined arena ($F_{3,43} = 26.87$, $P < 0.0001$), to completely step into the arena ($F_{3,43} = 34.12$, $P < 0.0001$), and to start eating the sugar ($F_{3,43} = 9.28$, $P < 0.0001$); and ii) ‘shuttling’ movements between the arena and home cage ($F_{3,40} = 32.90$, $P < 0.0001$). Though some possible confounds were identified, these pilot data thus suggest that odours produced by stressed rats can successfully and simply be collected. This might allow their use in practical welfare assessment – useful since rats and mice use alarm odours to signal distress, yet generally, we are oblivious to them.

Acute stress may induce specific forms of inactivity in juvenile mink

Rebecca Meagher & Georgia Mason

Department of Animal & Poultry Science, University of Guelph, Guelph, Ontario, Canada

Increased inactivity can reflect either negative emotional states, such as anxiety or apathy, or positive states, such as comfort; thus, its welfare implications are often unclear. In order to identify specific types of inactivity that are associated with stress and therefore poor welfare, pair-housed juvenile mink (*Mustela vison*) from 16 families were observed on a mink farm during a period of acute stress: immediately after removal from their mothers. Observations began on the day of weaning and continued for 6 days while the mink habituated to their new cages. Urinary cortisol was assayed on days 1 and 7, and fearfulness was also assessed on those days via latency to approach a novel object. Types of inactivity were differentiated using location in the cage, because the nest box may be used as a safe retreat when frightened, and whether the mink was alone vs. huddled with siblings, since social support serves to reduce stress in some species. ‘Stressed’ forms of inactivity were expected to decline over time and to exhibit positive correlations with fear and cortisol output. Fear of the novel object decreased over the habituation period ($T = -2.28$, $P = 0.019$), and there was a trend for decreasing cortisol ($T = 1.53$, $P = 0.078$), supporting the assumption that the mink were initially experiencing stress. In parallel, proportion of resting that occurred in the nest box decreased over the habituation period in at least one of the two sheds (Shed*Day $F_{5,55} = 16.93$, $P < 0.001$; t-test of regression slopes in Shed 3: $T = -5.39$, $P = 0.002$). Resting

in the nest box also correlated with fearfulness on Day 1 ($F_{1,13}=6.01$, $P=0.029$). Effects of stress on social huddling were less consistent and not statistically significant, but may be worth further investigation. The 'shed effects' observed might reflect on-going stress due to disturbances in one shed, which prevented behavioural habituation during the observation period. Despite this complication, overall patterns suggest that choice of resting places may be a useful way to differentiate stressed from relaxed inactivity, so aiding the use of inactivity in animal welfare assessment.

What it feels like: Accepting anthropomorphism in animal research

Natalie Evans

Department of Philosophy, University of Waterloo, Waterloo, Ontario, Canada

In this paper, I will examine the role of anthropomorphism in sciences that study the behaviour and welfare of animals, including animal welfare research, psychology, and ethology. I will begin by explaining the common view that anthropomorphism poses a threat to the objectivity and accuracy expected among these sciences when attempting to understand animal behavior, either in the wild or in laboratories. This perceived threat is mainly raised in opposition to those who attempt to understand the subjective feelings of animals, or who address the question of 'what is it like to be an animal?' through their research. Examples of this include those who are critical of interpreting the behaviours of animals as displaying such emotions as grief, joy, depression or anxiety, for fear of attributing inaccurate human-like feelings to animals where there are none. I believe that anthropomorphism, used carefully, plays an important and necessary role in the study of animals as it allows us to identify emotions that help us determine how we ought to treat those animals. Although critics of anthropomorphism claim that their objections rest on concerns about the objectivity of science, I argue that there is an underlying fear that by accepting the legitimacy of animal emotions, and thereby also accepting that animals have more interests than the avoidance of physical pain, we would have to radically alter our treatment of them. I will briefly outline, with some examples, how we can use anthropomorphism in a way that places the animal's point of view as the main focus of scientific research. I will also describe how this would alter the nature of scientific research involving animals, given the moral obligations that would result by accepting the legitimacy of animal emotions.

Missing out on authenticity: Companion animals, relationships, and critical reflection

Jean Harvey

Department of Philosophy, University of Guelph, Guelph, Ontario, Canada

I will argue that aiming for the welfare of companion animals while making use of them is not a morally sound goal: we should be aiming much higher and constructing 'authentic relationships'. The presentation looks at the relationships between humans and their companion animals (which for time reasons, I will here restrict to dogs and cats) and examines the quite serious threats to an "authentic relationship". I will explain what this involves and I draw an important distinction between authenticity and sincerity. The threats to such a relationship are several and they exert pressures on the human companions to accept certain dubious claims, mould their relationship in accordance with certain dubious ideals, set their sights far too low in thinking about how the relationship should develop, and accept dangerously over-simplified assessments of the companion animal's "quality of life". Some threats involve socialized conceptions, some are pronounced as edicts from "the experts", but I will argue that in various ways they

distort what the relationship should be. Only by exercising serious critical reflection can human companions be less vulnerable to these ubiquitous pressures.

The role of wildlife in Botswana: An exploration of human-animal relationships

Andrea Bolla and Alice Hovorka

Department of Geography, University of Guelph, ON, Canada

This paper uses an animal geography lens to explore the role of wildlife in Botswana. A “new” cultural animal geography has emerged, focusing on human-animal relationships through studies of the spaces and places occupied by animals in human culture. This paper considers the conceptual placement of wildlife, the socio-spatial processes of inclusion and exclusion to which animals are subjected, the ability of animals to transgress placements and boundaries, and interactions between people and wildlife in Botswana. A total of fifty-five semi-structured interviews were conducted in 2008 with a minimum of ten participants from each of the following human actor groups: government officials, members of the scientific and international community, and local citizens in three study areas of Gaborone, Kasane and Pandamatenga. Interview questions pertained to people’s perceptions of, beliefs of and behaviors towards wildlife, which were categorized into the following themes: wildlife as economic development tools, recreationally valuable, integral to ecological systems, destructive to property and livelihoods and dangerous to human lives. Findings reveal people's contradictory perceptions of, and interactions with wildlife based on notions of control and respect, as well as the negotiations and adaptations made by people and wildlife to the resulting established conceptual and geographic boundaries. These findings varied across the different human actor groups and three study sites, revealing the ways in which knowledge of wildlife is constructed and contested and the influence of structural context on particular human-wildlife relationships and encounters in spaces where certain rules apply to the inclusion and exclusion of animals. This paper has begun to unravel complex human-animal relations, which provides a comprehensive starting point for addressing larger issues of animal welfare.

Veterinarian memoirs: Uncovering patterns and illustrating a process

Marie-France Boissonneault and Elizabeth Stone

Ontario Veterinary College, Guelph, ON, Canada

This presentation explores the nature of the veterinarian memoir. Eighteen memoirs were chosen for this study, with a selected sample from each decade over a span of fifty years. They were written by practitioners working with small animals and farm animals, and in circuses, military bases, zoos and conservation settings. Some thematic patterns arising concerned the impact of the veterinary career on personal and family lives, veterinarians’ communications with clients, cross-species care, euthanasia, veterinarians’ sense of humour, and the human-animal bond. All memoirs covered topics pertaining to the complexity of veterinary communications, including the cost of care, euthanasia, and interactions with the client. The public image of the veterinarian is influenced by the prototypical characterisations formed by mainstream media in, and the obstacles that veterinarians encounter is often overlooked or only tacitly suggested in the popular realm. The connection between veterinarians and their patients can also be overlooked, even though most practitioners see their patients throughout their entire life cycle. The narrative of a memoir arouses the reader to reflect on the description of events and develops a deeper personal interpretation of given contexts (Gianakos, 2007). By allowing self-reflection through the use of memoirs as a teaching tool, the

reader is engaged into drawing upon “their own sensory systems and emotions to learn about behaviour” (Persson and Persson, 2008, p.111). The use of the veterinary memoir points to real life events, enabling both the public and veterinary students to become more engaged in the learning process, and as a result, helps develop future practitioners' professional skills, and also enables readers in general to carefully consider their own values and beliefs with regard to the treatment of animals and the human-animal bond. The relationships that we form with animals inevitably shape our treatment and values towards them, and the narrative of the literary memoir stimulates reflections on the care offered by the veterinary profession. The veterinarian memoir also provides a medium through which a curious public can develop a greater appreciation and understanding of the veterinary profession and offers veterinary students the opportunity to experience the reality of their future professional responsibilities (Baños, 2007).

Road Transport Conditions of Slaughter Cattle: Effects on Some Measures of Welfare and the Prevalence of ‘Dark Cutters’

Laura Warren¹, Ira Mandell², Tina Widowski² and Ken Bateman¹

¹Department of Population Medicine, OVC, University of Guelph, Ontario, Canada

²Department of Animal & Poultry Science, University of Guelph, Ontario, Canada

We describe here a ‘benchmark study’ to investigate slaughter cattle transportation conditions in Canada. Visits were conducted multiple times per week over a period of 52 weeks at a large federally inspected plant in Ontario. Data collected included: length of time in transit; temperature variation; season; conditions during transport; amount and type of bedding; cattle weight; number of ‘dark cutters’; sex and whether or not sexes were separated on mixed loads; number of lots and whether or not lots were separated; cattle unloading speed; cattle handling score; number of years trucking cattle; livestock trucking training course; ventilation; number lame, dead, needing assistance, non-ambulatory, panting, and sweating. Stocking densities were calculated based on carcass weights which were converted to live-weights using a 59.6% dressing percentage. Nearly 50,000 animals and 1,363 trucks were observed. ‘Dark cutters’ result from a depletion of energy (glycogen) stores in the muscle, which leads to meat that is dark red to almost black in colour. All but 0.2% of trucks arrived within the 48 hour allowable transport time and 85.7% of trucks were from within 8 hours of the plant. Trucks surveyed were at or below the recommended stocking density 49% of the time. There were 5 non-ambulatory or dead, 79 lame, and 4 animals that needed assistance of the 49,959 animals observed, which translates into 0.4%, 4.8% and 0.2% respectively of the trucks surveyed. The incidence of dark cutters (mean = 2% per truckload) was highest in mixed loads, followed by heifers and steers. Mixed loads that were not separated (steers and heifers in the same compartment) had a higher incidence of dark cutters than mixed loads that were separated. Based on these results, there are very few animal welfare concerns associated with the transportation of slaughter cattle in the population sampled. This would indicate that the industry is maintaining a high degree of animal welfare through self-regulation. Given the increased consumer demand for a high degree of animal welfare, this type of research is needed for the sustainability of the beef industry.

Human beliefs and animal experiences: The development of animal welfare in the Gilded Age and early 20th century America

Christi Garneau-Scott

Department of History, University of Guelph, Guelph, Ontario, Canada

Human attitudes towards animals changed considerably over the nineteenth century. With the growth of the middle class, development of pet keeping, rise of social reform, and new philosophies about pain and suffering, Americans began to think differently about the animals in their lives. This talk focuses on the historical development of the early animal welfare movement in the United States from the Gilded Age into the twentieth century, including the founding of the American Society for the Prevention of Cruelty to Animals (ASPCA) and the objectives of its members. Articles from the historic *New York Times* provide primary source documentation from the period of study and are supported with contemporary scholarship by authors such as Katherine C. Grier and Mark Derr. The Gilded Age followed Civil War reconstruction in the United States and was characterized by urbanization, increased wealth, and social transformation. While it is arguable that groups such as the ASPCA formed during the period solely to improve the welfare of animals, their goals were largely broad based, arising out of concerns about social morality and human security. This is demonstrated through their perspectives on ‘the trouble with boys and men’, scientific laboratory research, and public health and safety. Each of the successes of the movement was motivated heavily by human interests in the name of animal welfare, despite having a positive outcome for both people and pets. Contemporary advocates face many of the same challenges and criticisms that early reformers in the ASPCA did, suggesting that improving animal welfare is a continuing issue in American history.

Evaluation of the minimum dose of dietary thyroxin sufficient to induce moult in turkey breeder hens

Veronique A.L. Gulde¹, Robert Renema², Gregoy Bedecarrats¹

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²*Department of Agricultural, Food and Nutritional Science University of Alberta, Alberta, Canada*

Poultry kept for egg-laying show a natural decline in egg production after several months. At this point birds are usually replaced, but they can be made to start a new laying cycle via the induction of changes in physiology such as moulting, which resets their ‘reproductive clock’. However, the standard moulting method, removing feed and reducing the photoperiod, causes severe stress and mortality and alternatives needs development. Our previous study showed 10 days of 40 ppm dietary thyroxin (T4) supplementation combined with reduced photoperiod induces complete moult in turkeys. This study aimed at determining the minimal dose of T4 sufficient to induce moult while allowing hens to return into production. White turkey hens (75 weeks old; n=220) were randomly split in 8 groups (5 floor pens (replicates)/group, 5 hens each). During the first 10 d, all groups had 15 h light and a breeder’s diet, 2 groups were kept as controls and 6 remaining groups were supplemented with either 1, 10 or 20 ppm T4 (2 groups/dose). On d 10, all groups were switched to 6 h light and a holding diet. After 6 or 12 wks holding period, 1 group per treatment (control, 1, 10 and 20 ppm T4) was photostimulated with an abrupt change to 15 h light and the breeder’s diet. Egg laying, feed intake, body weight, moult and behaviour (including aggression, hunger, stereotypies, and heat dissipation, sampled for 30 s morning and evening for 4 d during T4 and after photostimulation) were monitored and data was analyzed with ANOVAs and

Tukey multiple comparisons tests. Treated hens ceased laying faster than control. All hens resumed lay 30 d after stimulation, reaching peak production 20 d later. During the T4 supplementation period, feed intake for the 20 ppm groups was lower ($P<0.05$) than for the control groups. By d 5, all hens fed T4 showed a rapid body weight loss ($P<0.001$). Control hens lost weight ($P<0.001$) by d 13. By d 18, rate of moult was significantly higher for hens fed 10 and 20 ppm ($P<0.01$). Although all hens completed moult by d 68, completion was faster for hens fed 20 ppm T4 ($P<0.05$). There was no difference in behaviours between groups throughout. In summary, although a drop in photoperiod was sufficient, a more rapid complete moult was successfully induced by 10 ppm T4 supplementation. Thus this technique could be a humane replacement for stressful 'forced moult' procedures.

Thermal comfort in zoo animals: adaptive heterothermy as a means of thermoregulation in the African Elephant, *Loxodonta africana*

Matthew Schotsman, Jim Atkinson, Esther Finegan, Stephen Miller

Department of Animal and Poultry Science, University of Guelph, Guelph, Ontario

Thermal comfort is an important part of zoo animal welfare. Elephants are large homeothermic mammals (ie mammals with stable body temperatures), with a comparatively small surface area compared to body size. As such they face considerable difficulty losing excess heat gained during the day. Because of this, elephants in zoos may acquire a large heat load over the course of the day, and consequently experience heat stress if they cannot lose it. It has been suggested that elephants may store diurnally-gained excess heat, and lose it back to the cold sky at night, through vaso-dilation in their ears and sides: a process described as adaptive heterothermy. We believe that if adaptive heterothermy is occurring it would be expected that the elephants' skin or ear temperatures would remain high for at least some portion of the night to enhance heat loss by longwave radiation, a heat loss process which increases with increasing surface temperature. If this is the case, elephants may benefit from being allowed access to the outdoors at night. Six female African elephants were observed from an hour before sunset until an hour after sunrise for ten nights during June and July 2009. They were housed at Toronto Zoo, and are kept outside at night during the summer. Throughout each observation night, infrared images were recorded every 15 minutes for each elephant to determine the surface temperature of the animals' bodies including the outer surface of the ears. Air temperature, relative humidity, wind speed and cloud cover were also recorded every 15 minutes. Infrared images of urination were taken as a means of estimating core body temperature. Side and ear temperatures decreased faster on cold nights (slopes of -0.11 to -0.21) than warm nights (slopes of -0.03 to -0.21). Both side and ear temperatures were more variable (R^2 between 0.14 and 0.90 for sides and R^2 between 0.15 and 0.87 for ears) on warm nights. Core body temperatures decreased overnight by as much as 4 degrees Celsius. These findings indicate heat storage during daylight hours with subsequent heat loss during the hours of darkness. It is therefore suggested that the opportunity to lose heat at night by longwave radiation is an important part of thermoregulation in the African elephants studied, and that by giving animals this opportunity for nocturnal heat loss by housing them outdoors overnight as well as during daylight hours during the hot summer months, increases their welfare and decreases the likelihood of serious heat stress.

Could environmental enrichment make males more attractive?

María Díez-León & Georgia Mason

Department of Animal and Poultry Science, University of Guelph, Ontario, Canada

In many species, females invest time and energy choosing between potential mates. Females seem interested in male attributes that signal enhanced resilience to stress and well-functioning immune systems. Furthermore, when females are allowed to choose their own mates, they can have better reproductive output (e.g. larger litters of fast-growing pups). If females find signs of stress unattractive, they should be most motivated to mate with males who have good welfare (for example because raised in good housing conditions) but least motivated to mate with males with poor welfare. To test this hypothesis we raised 32 male American mink (*Mustela vison*) from birth in either nonenriched (NEE) or enriched (EE) environments, which differentially impact welfare. In two successive annual breeding seasons, these males were offered as mates to 16 females (8 NEE; 8 EE), a different set of 16 'choosers' in each year. Each female had a choice between one non-enriched male and one enriched male, all housed identically for the experiment so that she could not tell each male's treatment group from his housing. During a 3 week period, the number of visits, and number and duration of copulations, were recorded daily. As predicted, females mated with the enriched males more often ('male' as random: $p=0.047$, $F_{1,14}=3.20$; 'male' as fixed: $p=0.014$, $F_{1,14}=5.88$) and for longer ('male' as random: $p=0.031$, $F_{1,14}=4.10$; 'male' as fixed: $p=0.027$, $F_{1,14}=4.43$). Data on offspring paternity, and also the number, size and mortality rates of offspring, will be collected next to assess whether enriched-housed males were more successful reproductively. If captive environments compromise male welfare and thence attractiveness, this could help explain why captive wild animals sometimes have poor breeding success. Also, if females have evolved to choose males with care, then preventing mate choice in captivity could frustrate females, as well as resulting in fewer, slower-growing offspring.

Assessment of on-farm killing methods for turkeys

Marisa Erasmus¹, Penny Lawlis², Patricia Turner³, Bruce Hunter³,

Ian J.H. Duncan¹ and Tina Widowski¹

¹*Department of Animal and Poultry Science, University of Guelph, Ontario, Canada*

²*Ontario Ministry of Agriculture, Food and Rural Affairs, Canada*

³*Department of Pathobiology, Ontario Veterinary College, Guelph, Ontario, Canada*

In Canada, accepted methods for poultry euthanasia include cervical dislocation for young birds and blunt trauma for older birds. Furthermore, it is sometimes recommended to use a tool such as bovine burdizzo castration forceps for mechanical cervical dislocation of larger birds. However, these methods may not be humane, depending on the skill of the operator. The purpose of this research was to evaluate the effectiveness of a non-penetrating captive bolt (Zephyr) for euthanasia of turkeys, and to compare the Zephyr to mechanical cervical dislocation and blunt trauma. Two experiments were conducted to determine the effects of these killing methods on loss of sensibility, time to cessation of convulsions, and degree of brain trauma. In order to determine when insensibility occurred, the nictitating membrane reflex and pupil constriction were tested at 15-second intervals. In Experiment 1, data were collected at a facility that routinely uses mechanical cervical dislocation. Turkey hens ($11.4\pm 0.9\text{kg}$) were killed with mechanical cervical dislocation using a burdizzo ($n=26$) or the Zephyr ($n=46$). Reflexes were present and gasping occurred in 100% of hens killed with the burdizzo, versus gasping in 7% ($\chi^2=48.8$, $P<0.0001$) and reflexes present in 17% ($\chi^2=45.5$, $P<0.0001$) of

hens killed with the Zephyr. Convulsions ceased sooner with the burdizzo (mean±SEM, 114.1±10.0s) than with the Zephyr (202.8±8.0s, $t=-6.14$, $P<0.0001$). In Experiment 2, male turkeys (13.1±2.0kg) on commercial farms were killed with blunt trauma (n=32) or the Zephyr (n=46), and post-mortem examinations were conducted to score the severity of skull fractures and haemorrhage. Reflexes were present in 2% of turkeys killed with the Zephyr and 6% of turkeys killed with blunt trauma ($\chi^2=0.06$, $P=0.8$). Time to cessation of convulsions did not differ (mean±SEM, Zephyr=199.5±6.7s, Blunt trauma=217.9±11.8s, $t=1.43$, $P=0.16$). Although skull fracture scores were higher for the Zephyr (mean±SEM, Zephyr=3.1±0.1, Blunt trauma=1.69±0.14, $t=-7.98$, $P<0.0001$), haemorrhage scores did not differ. Results demonstrate that blunt trauma and the Zephyr produce immediate insensibility by directly disrupting brain function, whereas mechanical cervical dislocation using a burdizzo results in cervical crushing and anoxia, and does not produce immediate insensibility.

Pregnant, barefoot and no where to move: Sow housing research

Ed Pajor, Keynote Speaker

Purdue University, West Lafayette, Indiana, USA

The swine industry is under pressure to consider alternatives to the conventional methods used to house sows during gestation, including group-housing, alternative floor surfaces and the provision of environmental enrichments. In a variety of experiments, we have set out to ascertain how important such forms of enrichment are to sows, using measures of motivation, preference testing and a combination of behaviour and physiological measures. Initially, dominant stall-housed sows appeared to be only weakly motivated to gain access to a fully slatted group pen. Subsequent experiments provide evidence that access to an enriched pen is important to sows, regardless of their social status, although when/which enrichments are used may differ. A final motivational experiment demonstrates that sows in breeding stall have higher motivation to gain access to compost compared to straw. In a second set of experiments sows from group housed systems and stall housed systems demonstrate both, a strong preference for free-access stalls and increased heart rate in anticipation of being able to choose a free stall environment. Finally, future directions for research in sow housing will be discussed.

Poster Presentation Abstracts

Weaning age and welfare of the laboratory mouse

Allison Bechard and Georgia Mason

Department of Animal and Poultry Science, University of Guelph, Guelph, Ontario, Canada

Millions of mice are bred annually for research purposes, and standard management removes them from the mother at 21 days. Dispersal studies of wild mice suggest this may be premature, having implications for welfare. To test this hypothesis, we investigated the effects of delaying weaning until 35 days on the welfare of CD-1 and C57BL/6 (B6) mice, and found that delayed weaned subjects become less anxious adults, as measured by an acoustic startle response test ($P < 0.05$), and B6 females suffer less from barbering-related alopecia ($P = 0.05$). Next, young B6 mice demonstrated their preferred early environment across day 14-35, by spending time in the home cage with the mother, or leaving for a distant cage via a tube too small for the

mother to fit through. Two cage-types in widespread use, and differing in design, were used for generality. All mice preferred the maternal environment beyond 21 days, however, mice in different cage-types progressed towards behavioral independence at unequal rates ($P < 0.01$); and, in addition, lower weights were noticed in these slower progressing mice ($P < 0.1$). Re-analyzing data using pup weight, instead of age, to predict behavior removed the significance of cage-type, suggesting developmental stage may be a more accurate predictor of independent behavior. A final experiment attempted to replicate the delayed weaning results, but was unsuccessful: delayed weaning did not improve the welfare of B6 mice housed at this facility. However, the mice here were significantly lighter than the mice in our initial experiment ($P < 0.05$), supporting the possibility that they were still not ready to be weaned at 35 days. Together, we conclude that weaning at 21 days is premature for all mice, and delaying weaning could be a useful refinement to improve mouse welfare; however, the development of mouse pup independence is greatly affected by the early environment, and this in turn, may affect the impact of weaning age.

The Effect of Service Dogs on Zoo Animal Behaviour at the Toronto Zoo

Patricia M. Kirby¹, Ian J.H. Duncan¹ and Dave Barney²

¹*Department of Animal and Poultry Science, University of Guelph, Ontario, Canada*

²*Toronto Zoo, Toronto, Ontario, Canada*

Service dogs are trained to perform tasks and increase the quality of life of disabled people. Although they have been used as aids for decades, previous to this study they were not permitted into the Toronto Zoo for fear of disease transfer and harm to the animal collection. This study investigated the behavioural responses of zoo animals to the presence of a service dog outside their exhibit, examined the reaction of service dogs when exposed to zoo animals on exhibit, and reviewed the potential harm that dogs could do while visiting the Toronto Zoo.

Ten service dogs were walked individually through the zoo by a familiar handler, while an observer recorded both zoo animal and dog behaviour for 6 minutes at each exhibit. An 11-point scale was used to score zoo animal behaviour in response to the service dog, ranging from extreme fear (-5) to extreme interest (+5). Each of 118 species of zoo animal was observed 5 to 11 times, depending on exhibit availability and accessibility. The majority of zoo animals displayed either positive, neutral, or only slightly negative reactions. Many of the primates showed positive interest in the dogs, but the interactions were fragile and easily became antagonistic if the dog showed interest or became startled. The Great Horned Owl, Barn Owl, Rufous Banded Owl, Grevy's Zebras, Llamas, and Lion-tailed Macaques were the only species to display moderate to severe fear (fleeing) or aggression (charging, threatening facial displays), and are therefore most at risk of suffering physical or psychological harm from the presence of service dogs.

The service dogs showed little reaction to the zoo animals. When the dogs did react, it was usually with curiosity and interest. Aggressive behaviour was negligible. The intensity of the dogs' reaction towards the zoo animals tended to mirror their work status, with retired or dogs in training responding most strongly. The results of this study indicate that while the introduction of service dogs to the Toronto Zoo may be harmful to a very small number of species, the majority of zoo animals will be unaffected or positively enriched.

The Health and Welfare of Cull Cows in Ontario

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Beef and dairy cows are culled for reasons including lameness and decreased productivity, and are then sold at auction. A survey was carried out in Ontario, Canada between May and August 2008 to assess the health and welfare of these cull cows. Data were collected from three sale barns on days with the expected highest volume of culls. Data collection at ringside allowed for the longest evaluation of the largest number of cows. Each spent approximately 30 seconds in the ring. A scoring system was used to assess cull cows on the following parameters: type (1=beef, 2=dairy); body condition score (BCS) (1=clinically emaciated, 2=thin, 3=average, 4=heavy, 5=fat); gait (1=normal, 2=uneven gait, 3=mildly lame, 4=lame, 5=severely lame); and udder (large/pendulous, impedes locomotion =1, or not =0). A total of 1390 cows were assessed, of which 72.7% were dairy. The average BCS for all culls was 2.80 ± 0.02 , with beef cows having a slightly higher average than dairy ($P < .0001$, Mann-Whitney test). BCS 1, indicative of clinical emaciation, was present with 6 times greater frequency in dairy culls than beef ($P < .0001$, χ^2 -test). Gait scores for all culls averaged 2.26 ± 0.03 , with frequencies of gait scores 3 through 5 being 6.2, 10.8 and 0.8%, respectively, for beef cull cows and 21.7, 24.6 and 1.8% for dairy. An udder score of 1 was assigned to 18% of all animals, with dairy cows representing 98% of that number. The most compromised culls were held for veterinary inspection and are not included in this data. The results of this study show that cull dairy cows are more likely to suffer reduced welfare due to increased incidence of lameness and decreased health at sale barns than cull beef cows. It reaffirms that on-farm decisions to cull or euthanize dairy and beef cows need to be made more promptly.

An evaluation of the Pedometer Plus™ system for detection of activity, resting and lameness in dairy cattle

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The objective of this study was to validate the Pedometer Plus™ system (SAE Afikim, Israel), an accelerometer, in terms of activity, standing and lying behaviour for use in lameness research in dairy cattle. The device provides information regarding the number of steps taken, the duration of lying time, and the number of lying bouts. Sixteen Holstein cows housed individually in maternity stalls were used for the validation in the fall of 2008. In stage one of the trial, eleven cows had a Pedometer Plus™ tag on one hind leg and a previously validated IceTag™ (IceRobotics, UK) on the opposite hind leg. Allocation of devices to right or left legs was random. Digital video recordings were made throughout the validation process, with each cow being observed for three days. The duration of lying time and the number of lying bouts were recorded from video analysis. Pearson product-moment correlation between the two devices for the number of steps taken was $r = 0.73$ ($p < 0.0001$). This lower correlation was unexpected; however video analysis revealed that during bouts of lying, there was movement of the upper leg while the lower leg was immobile. This could account for differences in pedometric activity recording between the two legs, and hence the two devices. In stage two, five cows were fitted with Pedometer Plus™ tags and IceTags™, with both tags on each hind leg. Correlation between the two devices for the number of steps taken was $r = 0.82$

($p < 0.0001$). Additionally, the number lying bouts and the duration of lying time were highly correlated for all cows, $r = 0.98$ ($p < 0.0001$) and $r = 0.90$ ($p < 0.0001$), respectively. The Pedometer Plus™ device appears to be a useful tool for the measurement of activity, including steps taken, number of lying bouts, and duration of lying time in dairy cows. In addition, differences in activity measurements in the initial experiment may in part be attributable to differences in movement of upper and lower legs during bouts of lying, and should be considered in the interpretation of data from pedometers.

Prevalence of overweight body condition in cynomolgus macaques at research facilities in North America

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Excessive weight gain has been reported in indoor-housed mature cynomolgus macaques with little to no change in diet. Overweight condition can result in development of hyperglycemia and Type II diabetes. The impact of this tendency on management of colonies and group-housed macaques has not been reported and the number of overweight animals in research facilities is not known. The purpose of this study was to conduct a survey to assess the prevalence of overweight cynomolgus macaques in North American research facilities including breeding colonies, short-term and long-term facilities; and to describe current methods used to assess body condition. The survey consisted of 51 questions in the following sub-categories: animal population demographics, body weight and body condition scoring, feeding, and behaviour. Voluntary participants included clinical veterinarians and animal care managers. Respondents from 13 facilities completed the survey and information was collected on approximately 17,500 cynomolgus macaques. The majority of the surveyed facilities housed young adult and juvenile macaques. Prevalence of obesity ranged between 0 and 20% in cynomolgus populations, and was reported more frequently than expected in animals younger than ten years. Management factors such as social housing and feeding strategies varied among facilities. Most facilities had weight reduction strategies to deal with overweight animals. The results of this survey demonstrate that most North American facilities housing cynomolgus macaques recognize the importance of tracking body condition regularly. Due to adverse conditions that may arise in overweight animals, facilities should have a clear means of regularly tracking body weight as well as an action plan for managing overweight animals.

Examination of sickness behaviour in dogs with lymphoma being treated with chemotherapy – preliminary results

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Chemotherapy has become a common treatment for dogs with cancer, offering a 60-90% remission rate for dogs with lymphoma. However, chemotherapy can result in toxicities and alterations in behaviour (i.e. fatigue, vomiting, and anorexia). There has been little research focused on the behavioural changes experienced. Hence, this project investigated sickness behaviour in dogs with lymphoma treated with chemotherapy. We hypothesized dogs with lymphoma would experience a clinically

significant decrease in the level of sickness behaviour exhibited following treatment. To investigate this hypothesis, we utilized questionnaires, physical exams, and Actical activity monitors (MiniMitter Biotelemetry) to acquire information regarding activity level, anxiety, pain, appetite, and side effects of dogs with lymphoma being treated with chemotherapy at the Veterinary Teaching Hospital. Owners were asked to act as proxy for their dogs. Presently, 16 dogs have been enrolled in this eleven week study and data is available from 8 dogs that have completed the study. Owners reported a 2 point increase (on a 5 point scale) in welfare and energy between the beginning and end of the induction phase of the chemotherapy protocol. These dogs also exhibited an improvement in overall clinical condition. Owners reported that the dogs improved from a restricted condition to a normal condition. A 'restricted' condition refers to a dog that has restricted activity compared to pre-disease level, but is able to perform as an acceptable pet; and a 'normal' condition refers to a dog that is fully active and able to perform at pre-disease level. Based on the preliminary data, it appears that dogs with lymphoma are experiencing an increased quality of life during the induction phase of chemotherapy. Further knowledge in this area of cancer treatment will allow clinicians and owners to judge treatment response in individual animals and ensure overall welfare and quality of life.

Metabolic state is not predictive of abnormal oral behaviour in weaned piglets

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In commercial piglets, belly nosing is an abnormal behaviour that can develop in response to conventional weaning practices. As the motor patterns resemble the characteristic teat massage that piglets perform on the sow, the behaviour is thought to be redirected suckling. As piglets obtain the majority of their nutrition from the sow prior to weaning, the performance of belly nosing after weaning may signal nutritional need. Individuals performing higher levels of belly nosing spend less time at the feeder and have lower weight gains, however it remains unclear as to whether low feed intake induces the behaviour or performance of the behaviour results in low feed intake and weight loss. To determine whether low feed intake elicits belly nosing, the effect of feed restriction on both behaviour and metabolic serum parameters were examined in 128 18-d weaned Yorkshire piglets. All pigs were fed ad libitum during wk 1, and during wk 2, half of all pens (N=8) were restricted to 65% of ad libitum intake. Blood samples were collected on d 3 and 10 after weaning and behaviour was observed from video recordings on d 5 and 12. Piglets were classified as early 'nosers' or early 'non-nosers' based on their behaviour on d 5. Mixed model ANOVAs were used to analyze treatment differences.

Feed restriction resulted in elevated non-esterified fatty acids (NEFAs) ($P < 0.0001$), beta-hydroxybutyrate (BHB) ($P = 0.006$) and both lower glucose ($P < 0.0001$) and a NEFA/glucose ratio ($P = 0.0006$), but belly nosing was not affected ($P > 0.05$). Piglets classified as 'nosers' did not have blood profiles indicating they were in greater nutritional need compared to 'non-nosers' in the first week of weaning ($P > 0.05$), nor did they increase belly nosing or other piglet directed behaviours when restricted in wk 2 ($P > 0.05$). Overall, no associations were found between blood parameters indicative of nutritional stress and belly nosing ($P > 0.05$). This study identifies serum glucose, BHB and NEFA as well as the glucose/NEFA ratio as useful indicators of nutritional stress in

newly weaned piglets. The poor feed intakes and weight loss that occur in piglets who develop belly nosing appear to be a consequence rather than a cause of belly nosing.

Too old to care? The hard-to-cure stereotypic behaviours of old animals are linked with lower motivations for environmental enrichment

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Stereotypic animals vary in their responses to environmental enrichment: an enrichment may reduce stereotypic behaviour (SB) in some individuals, but have no impact on it at all in others. Individuals with hard-to-treat SBs are often elderly. Why enrichments come to have little effect on their SBs is unclear. Typical explanations are that the SB has become a 'fixed habit'. An alternative – one with different implications for welfare – is that for these animals, enrichments are no longer 'enriching'. Using 10 and 6 month old C57BL/6 mice as a model, raised under standard lab cage conditions, we assessed the degree to which their SBs were reduced when moved to large enriched cages. We then 'asked' the mice how much they valued those enriched conditions, by moving them back to their standard cages but allowing them to access the enriched cage via a tunnel contained a one-way door which we made steadily heavier to push. The weight at which mice stopped working to reach the enrichments (their 'Maximum price paid': MPP) indexed how much they valued them. If hard-to-cure SBs are just habits, mice with these SBs should work as hard as other mice to access the enrichments; but if hard-to-cure SBs reflect a fundamental failure of the enrichment to 'work', mice with these SBs should not work as hard to reach them. Moving to enriched conditions successfully reduced SB ($F_{1,22} = 96.7, p < 0.0001$). The effectiveness of the enrichment was assessed in three ways: absolute reduction in SB, proportionate reduction (% change), and the magnitude of the residual for each mouse, from the line of best fit for 'Baseline SB' versus 'Enriched SB'. There was a trend for Old mice to have smaller relative reductions than Young mice ($F_{1,22} = 3.97, p = 0.059$); they also had significantly smaller reductions of stereotypic behaviour as assessed by the 'Residuals' measure ($F_{1,22} = 6.19, p = 0.034$). Thus as predicted, Old mice were harder to 'cure'. Furthermore, when required to pay to access enrichments, within the Old mice, the effectiveness of the enrichment on SB predicted their MPP: thus the MPP positively covaried with Absolute reduction ($F_{1,8} = 7.90, p = 0.023$) and Relative reduction ($F_{1,8} = 11.48, p = 0.010$, arcsin square root transformed); while it negatively co-varied with the Residuals measure ($F_{1,8} = 8.44, p = 0.020$). This suggests that hard-to-cure SBs are not merely habits; instead 'stubborn' stereotypers seem to receive less welfare benefit from enrichments.

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