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ABSTRACTS FROM ORAL PRESENTATIONS

SESSION 1
Behaviour when young as a predictor of feather pecking in adult laying hens: the redirected foraging hypothesis revisited

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We hypothesised that behaviour, and especially feather pecking behaviour, of domestic fowl when young predicts their feather pecking behaviour as adults. To test this hypothesis, we used behavioural data collected from 192 individual White Leghorn hens (12 focal birds/group) housed continuously from hatch in 16 floor pens. Data on 34 behaviour variables recorded when young (3 to 15 weeks of age) were subjected to principal component analysis and the resulting orthogonal factors were used as independent variables in a generalised linear model to determine their effects on feather pecking by the same birds as adults (17 to 37 weeks of age). Levels of severe feather pecking increased following the onset of lay and we found no association between levels of exploratory gentle, stereotyped gentle or severe feather pecking given by an individual bird when young and levels of severe feather pecking given by the same individual as an adult. Most of the birds were observed to perform exploratory gentle feather pecks when young. Stereotyped gentle feather pecking when young predicted stereotyped gentle feather pecking when adult. There was a positive association between a factor describing foraging when young and the rates at which severe and stereotyped gentle feather pecks were given when adult. We also found a negative association between a factor describing dust bathing when young and the rate at which severe feather pecks were given as an adult. The results suggest that, rather than foraging being substituted by severe feather pecking, birds that were more active and exploratory in general were more likely to perform severe feather pecking as adults. However, none of the individual behaviour variables recorded when young could be used to predict reliably which individuals would exhibit severe feather pecking later in life.
The foraging behavior of the domestic fowl (Gallus gallus domesticus) was compared to the predictions of optimal foraging theory and specifically marginal value theory as applies to patchy environments. Groups of domestic fowl were tested at 9 weeks of age in three group sizes of 5, 10 and 20 birds per group, to examine the mediating effects of group size on foraging behavior. Each group was placed in an arena with three small patches that varied in the ratio of food resources to non-edible ‘filler’ material. The patches were of high quality, 75% food and 25% filler, medium quality, 50% food and filler, and lastly low quality, 25% food and 75% filler. In the three-patch discrimination trials all groups consumed significantly more food from high quality patches. The number of foraging bouts and their duration, patch residence time, the number of foragers, and the frequency of aggressive interactions all increased with patch quality. Regarding group size effects, foraging duration and patch residence time decreased with increasing group size. Larger group sizes consumed the greatest amount of food. As group size increased more individuals accessed patches, suggesting that resource monopolization did not occur. Our results demonstrate that despite generations of intense artificial genetic selection for heightened performance, the foraging strategies of domestic fowl remain consistent with the predictions of optimal foraging theory.
The effects of artificial marking on the aggressive behavior in the domestic fowl

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Animals are often marked in a wide range of experiments from behavior and wildlife management, to reproduction and pharmacological studies. However, little is known regarding the consequences that marks may have for the animals, particularly when only a small proportion of group members received them. The objective of our investigation was to determine the impact of marking on the level of aggressive interactions in the domestic fowl (Gallus gallus domesticus). Specifically, we wished to determine whether the effects might be different for different experimental group sizes and when different proportions of individuals are marked. Broilers were divided at day 1 into groups of 10 and 50; within each group size we marked 20%, 50% and 100% (positive control) of the birds. Each group size by percent mark treatment combination was replicated seven times. Aggressive interactions of all individuals in the pen were observed from 3 to 10 weeks of age. Our results revealed that, indeed, marked individuals did receive significantly more aggression per bird than did their unmarked pen mates. Marked birds in both 20% and 50% groups received significantly more pecks than the unmarked birds or the birds in the positive control pens. Marked birds were also found to deliver significantly fewer aggressions when housed in groups of 50 birds than their unmarked pen mates. Pecks delivered by unmarked birds in groups of 50 during weeks 9 and 10 in both 20% and 50% pens were significantly higher than for marked birds. Our results provide strong evidences that marking affects to the level of aggression received by the domestic fowl. However the differential results obtained when the totality of the group members are marked suggest marked birds become a “target” only when some are marked.
Genetic control of sociality and adaptability in association to early growth in young fowl

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Sociality is considered to influence the welfare of intensively kept poultry. It is suggested that sociality and adaptation capacity interact in fowl. Comparisons between the ancestral breed, red junglefowl, and White Leghorns have shown that junglefowl chicks are more explorative in novel environments while layers tend to immobilize and stay closer to social stimuli. We aimed at studying if these differences between breeds are connected to a Quantitative Trait Locus (QTL) found earlier on chromosome 1. This QTL is associated with several production and domestication related traits in fowl, for example growth. To narrow down the size of the QTL, a backcross was produced, using F3 Leghorn/junglefowl intercross males segregating along the QTL and Leghorn females. The offspring was genotyped at five different marker positions along the QTL. The chicks’ genotype at each marker position could be either heterozygous junglefowl/Leghorn or homozygous Leghorn. By comparing the genotype and growth pattern of the chicks the genome region of interest was deduced to lie close to the marker MCW106 and to have a length of approximately 19 cM. Ninety-two backcross chicks raised in one batch were tested after 3-h food deprivation in a novel L-shaped maze for 10-min. The chicks had a free choice between food and social companions at opposite ends of the test arena. The results revealed that the behavioural differences between homo- and heterozygous backcross chicks closely resembled those found earlier between identically tested Leghorn and junglefowl chicks. The heterozygous chicks behaved like junglefowl: they moved more, fed more, and spent more time away from the companions. Homozygous chicks acted more like Leghorns: they were more passive and tended to spend more time close to social companions. The results suggest that the QTL affects sociality and coping capacity in young fowl in addition to the earlier observed biological effects.
Impact of male-male competition and morphological traits on mating strategies and reproductive success in broiler breeders

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The goal of this experiment was to determine the effect of male-male competition on broiler breeder mating strategies and reproductive success, and to identify behavioral and morphological traits associated with high fertility. Males were kept in groups with no competition (1 male and 10 females; 1M), or high male-male competition (3 males and 10 females; 3M). For each male we recorded the frequency of matings, forced matings, cloacal contacts and morphological traits including body weight, comb, wattle, tarsus and spur size. We determined sperm quality and the reproductive success using DNA fingerprinting. We observed the highest mating frequency during the evening hours (19:00 to 21:00). Significantly higher mating activity occurred in 1M groups compared to 3M groups. Mating frequency of 1M males, however, did not differ from the frequencies of the males with the highest mating frequency in 3M groups. After reducing the number of males from 3M to 1M in the second experimental phase we found significant increase in the mating frequency. This probably was a consequence of the reduction in the level of male-male competition or due to female response to a lower number of males. DNA fingerprinting results indicated that the males with the highest mating frequency did not always sire the most offspring within the group. The males with the highest sperm mobility or largest ejaculate volumes were equally successful. Contrary to our prediction, we did not find higher frequency of forced mating strategies in groups with high level of male competition, but forced mating was more likely to be used by heavier males or those with larger combs and wattles. We did not find any of the studied morphological traits to be reliable indicators of male reproductive potential, although this lack of association may have been a consequence of the relatively low number of males available for this study.
Alternative method to induce molt that addresses hen well-being

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Molting of hens increases egg quality and production, extending the productive life of hens. The method used to molt hens has received public criticism regarding hen well-being. Traditional molting is done by withdrawing feed and decreasing light, which leads to weight loss and increased mortality. Alternative methods (feeding low nutrient density feeds or diets low in calcium or zinc), have resulted in poor post-molt performance and increased tissue damage in the hen. An alternative that results in improved post-molt performance, addresses hen well-being and is economical for producers is desired by the poultry industry. Feeding a progestin should increase hypothalamic negative feedback, decreasing support for the ovary and a subsequent loss of steroidogenic support for the oviduct and cessation of lay. We have demonstrated that incorporating melengestrol acetate (MGA), an orally active progestin, in a balanced layer diet induces molting. Hyline W-36 hens (n=48) were randomly assigned to one of three treatments for nine days. Hens were fed either a balanced layer diet containing 7.27% propylene glycol (control), the same diet containing 8 mg/day MGA in propylene glycol or received no feed (restricted). Three weeks prior to starting the experiment hens were trained to peck a disk in order to receive a feed reward based on a progressive ratio reinforcement schedule. Hens that were not successfully trained (n=33) were excluded from the experiment. Motivation of hens to acquire feed was tested for 15 minutes on days 0, 3, 6 and 9. The total number of pecks and total number of feed rewards per bird were recorded. There was no increase in the total number of pecks or total number of feed rewards in either control or MGA fed hens from day 0 to 9 (47.2 ± 8.6 and 6.8 ± 0.9). However, by day 9 there was marked increase (p < 0.05) for restricted hens in pecks (d0 33.1 ± 6.4 vs. 141.5 ± 56.0) and rewards (6.5 ± 0.9 vs. 14.2 ± 3.5). Hens that are molted by feeding MGA are not more motivated to acquire feed than control hens, and are less motivated than restricted. Therefore feeding MGA is an effective method to induce molt that also addresses the well-being of the hen.
ABSTRACTS FROM ORAL PRESENTATIONS

SESSION 2
Weaning Calves in Two Stages is an improvement over weaning by fenceline contact

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The objective of this study was to compare the behaviour of calves weaned in two stages to calves weaned by abrupt separation but allowed fenceline contact with their mothers. Both methods have been publicized as improved alternatives to the traditional method of abrupt and remote separation of cows and calves. Two-stage calves wore an anti-sucking device for 4 days prior to remote separation; the device only prevented calves from nursing. Calves were still able to eat and engage in other forms of social interaction with their mother. Calves in the fenceline contact treatment were simply separated into adjacent pens. There were 3 pens of calves per treatment and 10 in each pen. Their behaviour was observed 5 hours each day, from 14:00-19:00h. Following the same order, pens were instantaneously scan sampled every 10 minutes and the number of calves standing, lying, standing, walking, eating and ruminating (not all mutually exclusive) were recorded. Vocalisations were also recorded every 10 minutes. Each pen was listened. We also recorded the number vocalizations made by each pen during a two-minute window, every 10 minutes. Statistically, calves weaned in two stages were more vocal when prevented from nursing but the slight treatment differences are of questionable biological significance. Following separation calves weaned in two stages were less likely to vocalize, more likely to be lying and less likely to be observed standing idle. Previous research has shown fenceline contact reduces changes in the behaviour of calves after weaning, compared to remote separation. The present study demonstrates that the two-stage method of weaning reduces the behavioural response of calves further still.
Maternal investment in daughters is known to continue in some species into the daughter’s adulthood. The objective of this study was to determine if the dam’s presence affects a daughter’s ability to compete with a third unrelated beef cow for limited feeding space. Ten mother-daughter pairs and 10 unrelated cows were selected from the USDA Beltsville Agricultural Research Center herd. The age of the mothers ranged from 4 to 5 yrs and the daughters were 2 to 3 yrs old. The ten unrelated cows were either 3 or 5 yrs old. All cows were individually acclimated to the test pen and a floor-feeding device that had two compartments each with a 5-liter bowl closely positioned and each containing a calf creep feed. An observation consisted of a 5 min-period with a mother-daughter pair in the test pen with an unrelated third cow (alien). Total feeding duration for each cow was measured during an observation. Each mother-daughter dyad was tested twice each day over two consecutive days, once each with a 3 and 5 yr old alien. The eating time by dams was not different (3.1 and 3.2 min) in the presence of 3 and 5 yr old alien cows, respectively. Whereas, eating time for daughters was influenced (P<.01) by the unrelated cow’s age; 1.5 and 0.9 min (SE=0.42) for 3 and 5 yr old aliens, respectively. Time spent eating by alien cows was related (P<.01) to their age; 1.7 and 2.2 min (SE=0.42) for 3 and 5 yr olds, respectively. These results are generally consistent with the benefits of seniority from age in competition bouts. There was no significant difference in feeding time between the daughter and the alien when the two were of similar age. However, when the alien was older, her feeding duration was significantly greater than the daughter’s. These results indicate no advantage to the daughters from the presence of their dam. A major factor could be that prior to the trial the dams and daughters had a prolonged period of separation, as long as 18 to 24 months. Interestingly, in this study the longer feeding duration of the dam, sometimes in the presence of an older, unrelated cow, may suggest some advantage to the mother while feeding in the presence of her daughter.
Age at Transport Effects on Behavioral Responses in Dairy Calves to Novel Stimuli

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Transportation of neonatal dairy calves within the first week of life has become a common management practice on many dairy farms in the U. S. Stressors, including transportation, can potentially affect the animal’s behavioral responses to a novel environment, and thus its handling ease and longevity within the herd. This study was performed to evaluate the effects of age at transport on behavioral response to novel stimuli within a test environment. Eighteen Holstein dairy calves were randomly assigned to treatments in a randomized incomplete block design according to day of transport; 2-3 d (A), 4-5 d (B), or 6-8 d (C). Each calf was transported for 6h (d 0) in an aluminum, covered trailer with straw bedding. Then calves were placed in outdoor hutches until d 39 when they were moved indoors to the USDA-ARS Livestock Behavior Research Unit for behavioral testing. Testing began on d 43 (6 weeks after transport). A 21.3 meter corridor was designed with several novel objects spaced approximately 2.4 meters apart; including a red bucket, black mat, translucent plastic curtain, horizontal striped plank, darkened space, silver gates, and reflecting metal. Greater than three seconds of hesitation resulted in a sequence of applied force at three second intervals; vocalization, movement into flight zone, pat, and push. Videotaped behavioral data were analyzed using the Noldus Observer program in continuous observation. Data for the first experience with the corridor are reported here. All data were normalized and statistically analyzed using GLM procedures of SAS. Treatment A tended to take longer to cross obstacle 2, red bucket, than treatment C (12.1 and 5.6 seconds respectively, P<0.10). Less force was needed to pass obstacle 7, corner, for treatment A with no force required compared to treatment B with an average force requirement of entering into flight zone (P<0.05). All remaining objects did not create differences in the time or amount of force necessary to cross them or in the total time to complete the corridor. Age at transport produced disparate effects depending on the novel object. This indicates that transport stress applied at varying ages may differentially influence the relative perceived aversiveness of different novel stimuli, although this requires further and more refined testing. Continued analysis may show differences in the learning curve among treatments as subsequent runs are analyzed.
Circadian Rhythms in Behaviour and Cardiac Activity of Gilts and Heifers

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Biological rhythms are of universal occurrence in animals and it is usually easy to demonstrate adaptive explanations for them. The aim of this work was to examine circadian patterns of behavior and cardiac activity in gilts and heifers. Furthermore we wanted to establish if any rhythms present followed general sleep/wake cycles and the degree to which they were influenced by activity. Continuous behavior and cardiac data were simultaneously recorded in non-gravid gilts and heifers over a 24 h period. At a later date, 5 min scan samples were used to extract behavior data from the videotape and hourly means for all behavior, as well as the proportion of time spent active or inactive, were determined for each animal. Cardiac data were processed for errors before undergoing time and frequency domain analysis. Hourly means for all cardiac indices were also calculated. Cosinor analysis was used to evaluate circadian rhythms from which the MESOR, amplitude, acrophase, and Pearson’s correlation coefficient with level of significance were determined. Results found that gilts and heifers differed largely in their 24 h behavioral time budgets. Heifers were considerably more active (p<0.01), spent more time standing (p<0.01) and less time investigating their surroundings (p<0.01) than gilts. Overall, gilts showed more circadian rhythmicity in their behavior and heart rate variability parameters than heifers. Circadian patterns in time domain indices were generally similar, but with gilts demonstrating higher correlation coefficients than heifers in all bar one parameter. Relative to the sleep/wake cycle, rhythms in cardiac activity in gilts were closely associated with the sleep/wake cycle with mean HR being highest and parasympathetic indicators lowest at the end of the sleep period. While heifers demonstrated little circadian rhythmicity in behavior, rhythms in cardiac activity followed obvious circadian patterns, though their rhythmicity was still considerably lower than those in gilts. In summary, gilts showed strong circadian patterns in behavioral and cardiac parameters, which were strongly interrelated, whereas heifers showed much weaker evidence of behavioral circadian patterns, but exhibited surprisingly strong circadian rhythmicity in cardiac measures. Circadian trends in behavioural and physiological processes should be considered when investigating stress, as the nature of any response may be shaped by the phase of the circadian rhythm during which the stressor is applied.
Misrepresenting Animal Consciousness: Ethical and Welfare Implications

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Debates about the moral status and respectful treatment of animals revolve crucially around the question, “Do some nonhuman animals have conscious mental states in a morally relevant sense?” Exploring the nature of animal minds question (scientifically and conceptually), also figures importantly in appreciating their welfare needs. However, just what (animal) consciousness means and implies is a matter of dispute among philosophers, animal scientists and laypersons. Hence, the incommensurability problem with respect to meaning and implication has not only led to numerous talkings-past in the scientific and philosophical literature but also to stalemates regarding our treatment of animals. First, delineation of what various academics and laypersons mean when they say either that “animals are conscious or unconscious,” will be provided. Next, two theories of consciousness are discussed, namely, the extrinsic and intrinsic theories of consciousness, respectively. Exponents of the extrinsic theory of consciousness challenge the view held by many ethologists, laypersons, and philosophers that animals have conscious experiences like pain or sophisticated higher-order thoughts. Instead, they hold that animals are not conscious because they fail to have mental events that are related to other events in appropriate ways. This view still figures as a basis of biased consideration against some animals and has currency among both academics and laypersons. However, the extrinsic view of consciousness conflicts with both the “analogy argument,” and the “evolutionary argument,” both of which are often expounded by proponents of the view that animals have conscious mental experiences. A discussion of intrinsic theories of consciousness will help provide a contrast and some clarification on how to think about animal minds. Implications for animal ethics and welfare will be discussed concurrently.
ABSTRACTS FROM ORAL PRESENTATIONS

SESSION 3
Qualitative assessment of a question asked to U.S. veterinary college faculty - perceived obstacles preventing the enhancement of farm animal welfare

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During fall, 2003 we surveyed U.S. veterinary college faculty, large animal emphasis, concerning their attitudes toward farm animal welfare. The seven-page survey primarily asked for quantitative, Likert-scaled responses. However, one question asked for a qualitative, open-ended response to the following: If you feel changes related to animal welfare are needed, what do you see as the major obstacle(s) to affecting changes in our current production systems? Email addresses from 27 veterinary schools were collected. 157 responses were received after four contacts (31% response rate). Of these, 105 (67%) responded to the open-ended question. Though qualitative assessment is sometimes criticized for its inability to fit with traditional statistical analysis, it often provides a richer, more thorough understanding of a topic area and can prove especially fruitful for developing future survey questions.

Responses to the above question were typed into a Microsoft Access database to assist with content analysis, a method of coding theme areas found in notes or data (Berg, 2001, Qualitative Research Methods for the Social Sciences). Fifteen common theme categories were inductively developed and set up as column variables in the database. Text answers were then analyzed to determine which of the theme(s) were present in a respondent’s unconstrained answer. Six themes were presented in responses greater than twenty times: answers related to an economic theme (n=80); perceived lack of consumer support (n=33); producer attitudes (n=29); lack of understanding of what comprises appropriate animal welfare (n=27); politics (n=22); and tradition (n=21). Fifteen respondents volunteered an answer related to their perception that inadequate welfare science research has been conducted. An additional six related that they did not believe the welfare science research. Four respondents perceived that the welfare science research has been anthropomorphic. Nine respondents volunteered that one obstacle to furthering farm animal welfare is the issue of undereducated/underpaid employees; another nine respondents volunteered the issue of current housing designs being an obstacle to welfare enhancement.

The use of qualitative analysis of open-ended responses is one way of using multiple indicators or methods to gain better understanding of complex problems and to substantiate conclusions.
The effects on domestic rainbow trout of being grouped with conspecifics of different body sizes

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Little is known about the feelings of fish that are confined with conspecifics of varying body sizes. In this study, plasma cortisol and several behavioural variables were recorded when a medium-sized fish had its familiar social group of medium, liked-sized individuals, replaced with a group of fish that were either medium-sized, smaller or larger than itself. The test fish showed very few behavioural responses indicative of stress when exposed to a new social cohort. They did not use a particular part of the tank or water column, nor did they show any significant change in locomotory behaviour. The test fish showed no difference in aggressive chasing behaviour in any of the treatments. However, the test fish were often chased by their tank-mates when exposed to the large fish treatment, and were almost never chased by fish smaller than themselves. Similarly, test fish exposed to different size treatments did not differ in plasma cortisol concentrations. These results suggest that domesticated rainbow trout, that have never had the experience of interacting with trout of a grossly different size, do not find this experience particularly stressful.
The Effects of Boar Presence on Skin Damage Sustained During Post-Mixing Aggression among group-housed sows

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When mixed, unfamiliar sows will fight in order to establish a social hierarchy. This can lead to physical injuries, which may reduce sow welfare. The objective of this study was to determine whether the presence of a boar would mediate the formation of the hierarchy, thus reduce the level of skin scratches sustained by newly mixed sows. Five groups of sows were exposed to one of three levels of boar presence (N=15): PHYSICAL (boar in pen with sows), FENCELINE (boar housed in pen opposite sows) or CONTROL (no boar present in room). Five intact mature boars (301.0 ± 10.1kg) were randomized between treatments. For each group, fifteen sows were mixed into pens measuring 2.3m² per sow (DAY 1). The boar was introduced into the pen 15 minutes before the sows were mixed and was removed from the room after one week (DAY 7). The number of superficial skin scratches on each shoulder (4 point scale: 0- no scratches; 1- less than 5 scratches; 2- 5 to 10 scratches and 3- over 10 scratches) were scored on DAY 0, 2, 6 and 8. Data from both shoulders were summed and re-categorized as NONE (score=0), MILD (score= 1,2), MODERATE (score= 3,4) or MULTIPLE (score =5,6) skin scratches. Data were analyzed using a PROC MIXED procedure with group as the experimental unit and boar as a covariate. Means were compared using a Tukey test. The PHYSICAL treatment reduced the mean scratch score on DAY 2 when compared to the CONTROL (2.05 ± 0.13 vs. 2.56 ± 0.26, respectively; P=0.05). The percentage of sows within a group exhibiting multiple scratches on DAY 8 tended to be lower for sows in the PHYSICAL treatment versus FENCELINE (1.34 ± 1.34 vs.4.00 ± 1.6 %, respectively; P=0.09). This evidence suggests that the physical presence of a boar has some influence on post-mixing aggression. The frequencies and durations of aggressive interactions between sows in the groups are currently being examined.
Aggressive and sexual behaviour in group-housed boars and barrows: What can be done about it?

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Raising boars rather than barrows for meat production has two main advantages. First, male piglets avoid the pain and stress associated with castration. Second, boars have the potential for more efficient growth, which could result in increased profits. A major problem in raising boars is the issue of boar taint. However, if that problem can be solved, the only other area of concern is the increased incidence of aggressive and sexual behaviour among boars which could lead to management problems and chronic social stress.

The objective of this study was to compare the aggressive and sexual behaviour of groups of growing boars to that of equivalent groups of barrows. Observations of all-boar and all-barrow groups were conducted via direct observation in the final 12 weeks of the production cycle (from 10 to 22 weeks of age) during which time all occurrences of aggressive and sexual behaviour were recorded. Boars exhibited higher average frequencies of aggressive behaviour than barrows (9.23 ± 0.26 vs 6.16 ± 0.20 events/pig/week; P < 0.05). Boars also showed higher average frequencies of sexual behaviour than barrows (2.66 ± 0.17 vs 0.54 ± 0.09 events/pig/week; P < 0.05). In addition, despite increased levels of activity, boars maintained a superior average feed conversion ratio to barrows (1.97 ± 0.12 vs 2.22 ± 0.12; P < 0.05). However, the increased aggression and sexual behaviour may impose a considerable welfare cost on the boars and this requires further investigation.

Another experiment was conducted to test the effectiveness of a topically-applied solution of androstenone in reducing aggression in market weight boars and barrows after being mixed with unfamiliar conspecifics. There is evidence suggesting this agent is effective in reducing aggression in growing pigs, and sows, but there is no information regarding the applicability of the technique in boars. When boars and barrows reached 105-110 kg, they were transported a short distance and mixed into new groups. Treatment animals received a 500 µg dose of topical androstenone in solution along the head, snout and nostrils. Preliminary results indicate that the androstenone treatment may have been effective in reducing aggression.
Effects of pre-natal stress on behavioral response, salivary cortisol, and body surface temperature to an LPS challenge on 8 week old pigs

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Pre-natal stress, stress applied to the pregnant dam, has unclear effects on the resulting young. The current study utilized 9 treatment combinations in a 3X3 factorial design involving three prenatal stress treatments and three challenge treatments at 8 weeks. For the prenatal stress treatments, sows received one of three treatments once a week during d 42 to d 77 of gestation: injections of ACTH (i.v., 1 IU/kg BW) (ACTH, n=19), forcefully moved up and down an alley while receiving 3 shocks from a standard electric prod over a 10-min-period (ROU, n=15), or a third group which served as a control and received no treatment (CONT, n=18). Subsequent progeny were separated into groups of 6 (2 pigs/trt/grp) upon weaning and maintained in those groups for the remainder of the study. At approximately 8 wks of age, 3 pigs from each pen were assigned one of three challenge treatments: an i.v. injection of lipopolysaccharide (LPS, n = 20/trt, 2ug LPS/kg BW), saline (SAL, n = 15/trt), and a third animal as a behavioral control (BC, n = 15/trt) which did not receive an injection. To determine whether the prenatal stress treatment affected response to the LPS challenge, several measures including: salivary cortisol, surface body temperature, and time to approach a person in the pen were collected for each of three test subjects at various time points between –1 h pretreatment through 7 h posttreatment. The BC pigs from ACTH sows had greater cortisol (p >.002) concentrations than BC pigs from ROU and CONT sows (1.37 ±.58, 0.59±0.19, and 0.71±0.17 ng/ml, respectively). During the approach test, animals receiving the LPS treatment took longer to approach (p>.006) than SAL or CONT treatments regardless of prenatal stress treatment (62.1±6.1, 16.2±4.1, and 8.9±2.5). Body surface temperature was not affected by treatment (p<.1). Our results show that prenatal stress has long-term effects on glucocorticoid release. The other physiologic and behavior parameters examined in the current study appear to not be affected by the imposed prenatal stress treatment.
The effect of co-mingling litters on piglets’ performance, behavioral tests and suckling behavior

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Previous research indicates that allowing litters to interact prior to weaning, improves piglets’ ability to cope with weaning stress. Various behavioral tests have been developed to measure coping ability. The purpose of this study was to determine how social enrichment, achieved through co-mingling litters, impacted piglet growth, suckling behavior and the results of behavioral tests before weaning. Thirty sows and their respective litters were housed in standard farrowing crates until piglets were 12 days old. At 13 days of age, the partition between two neighboring pens was removed for 20 litters allowing piglets to interact (n=10, 2 litters per group). The remaining litters served as controls (n = 10). All piglets were weighed and checked for injuries 2, 4, 9, 12, 15 and 18 days after birth. There were no differences in weight gained between treatments. Co-mingled litters presented a higher number of injuries immediately after mixing (day 15, P<0.01 Wilcoxon) but these differences disappeared by day 18. Suckling behavior was collected on days 5, 8, 10, 14, 16 and 18 after birth. There were no differences in teat fidelity, suckling frequency and mother fidelity between treatments. The social challenge, isolation and back tests, were performed before and after day 13. Three piglets from each litter, representing a range of weight gained between 2 and 4 days of age, were tested. Between the first and second time the social challenge was performed, co-mingled piglets increased the time spent in non-aggressive proximity to one another (P< 0.001 Wilcoxon) compared to control piglets. In the second social challenge, co-mingled piglets spent more time together (P< 0.05, Wilcoxon) and tended to be less aggressive (P= 0.06, Wilcoxon) than control piglets. Allowing litters to co-mingle before weaning did not affect growth or suckling behavior and resulted in fewer aggressive interactions between piglets during the social challenge. However, the back test and the isolation test failed to detect treatment differences. Behavioral tests require additional critical investigation before being used to routinely assess coping abilities.
ABSTRACTS FROM POSTER
SESSION 1
Welfare Indicators of Sows Housed in Stalls at Different Stages of Gestation

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A study was conducted at the University of Minnesota, SROC, Waseca to assess the welfare status of sows housed in pens (12.75m x 6.75m, fully slatted floors) with single walk-through ESF (2.2-2.6 kg feed/sow), at post-breeding mixing days (days 5 and 19), mid-gestation (day 56) and late gestation (day 108) in terms of behaviors, cortisol concentration and injury levels. Sows were added in two batches, post-breeding, at 14 days interval to achieve a group size of 40 per pen and the trial involved 4 pens. Ten (focal) sows were randomly identified before weaning from each first batch to be allotted to the different pens and data were collected from 36 focal sows as four of them returned. A time-lapse VCR was used to tape the behavior for 24 hours at each stage of gestation. The salivary cortisol concentrations were assessed using radioimmunoassay. Injuries on different body parts of sows were scored and added to get the total injury score (TIS). The TIS except that on limbs, udder, vulva and tail were added together as the TIS-aggression score since the injuries on these body parts were unlikely to be due to aggression. ANOVA for repeated measures, Friedman’s chi-square test and correlations were used for data analysis. The proportion of time spent queuing was lower (P<0.05) at first mixing than at second mixing and on day 108. The number of queuing was lower (P<0.05) on day 56 than on day 108. Aggressions (performed and received) and queuing numbers were similar on the mixing days. Aggressions were lower on day 56 than at second mixing and on day 108 (P<0.05 for both). Cortisol concentrations were similar on day 56 and at second mixing and were lower (P<0.05) than the other stages. The TIS-aggression was higher (P<0.05) at first mixing than other stages. TIS at mixing days were similar and higher (P<0.05) than the other stages. The number of ESF entries did not differ with gestation stage. Aggressions performed and received were positively correlated (P<0.05) with proportion of time spent queuing, queuing number and ESF entry. Cortisol was positively correlated with aggressions performed and received (P<0.05). The results indicate that feeder is a major source of aggression and stress. Both mixing periods and late gestation were also stressful periods.
The Effect of Feed Restriction on Behavior of Piglets Weaned at 18 – 22 Days of Age

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Belly-nosing is a behavior pattern most common to early-weaned piglets. Since it resembles massaging the sow’s udder, it has been suggested that this behavior may be associated with feeding or hunger. The objective of this study was to determine the effect of feed restriction on the behavior of newly weaned piglets. During weeks 1, 2 and 3 post-weaning, control piglets (8 groups of 4; n=32) were fed ad libitum while treatment piglets (8 groups of 4; n=32) were fed ad libitum during weeks 1 and 3, and feed restricted during week 2. During restriction, ad libitum intake from the previous day was determined from control groups, averaged, and treatment piglets were provided with 65% of this amount. At this feeding level treatment piglets were consuming 1.2 times their maintenance energy requirements while control piglets were consuming 3.2 times maintenance requirements. While both groups continued to gain weight during the restriction period, ADG was significantly lower for restricted piglets compared to controls (P<0.05). Behaviors were observed on days 5, 7, 9, 12, 14, 17, and 20 post-weaning using a 5-minute scan sampling method for 6 h/d. Data was analysed using the Proc Mixed (SAS) procedure and the square root of the arcsine transformation was employed when necessary. During the period of restriction, treatment piglets spent less time at the feeder (5.3±0.9%; controls, 8.6±0.6%, P<0.05) and more time rooting at the pen (4.1±1.0%; controls, 1.4±0.4%, P<0.05) compared to controls. During the post-restriction period, treatment piglets engaged in significantly more belly-nosing behavior (1.8±0.6%; controls, 0.5±0.2%, P<0.05), while nosing and chewing the ears and tails of pen-mates remained similar between the two groups. Hunger affects different oral-nasal behaviors in complex ways. While it stimulates foraging behavior directed at the pen during the period of hunger, it is not until pigs are once again eating to appetite that differences in belly-nosing are apparent.
Marked for Stress!

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We have shown that domestic fowl (Gallus gallus domesticus) marked for identification purposes receive higher levels of aggression from their unmarked counterparts. Differential aggressiveness due to manipulation of physical appearance suggests that birds may also be subject to differential levels of stress and exhibit differential catecholamine responses. One-day-old male broilers were housed from 1 to 10 weeks of age in groups of 10 and 50 and containing 20%, 50%, or 100% of birds marked with black marker. Each group size by percent mark treatment combination was replicated seven times, although blood samples were collected from only six of the replicates. Body mass (BM), tonic immobility (TI), and fluctuating asymmetry (FA) were assessed and blood samples were collected for hormonal analysis from three marked and three unmarked birds per group. BM from 2 to 5 wk of age was significantly lower in marked birds than unmarked birds in 20% and 50% pens, which suggest that marked birds may be more stressed. No significant differences were found between birds of different percentage marked groups. Plasma catecholamine concentrations following manual restraint, revealed a suppressed epinephrine (EP) response and an increase in plasma dopamine (DA) in marked birds of 20% pens. Interestingly, EP response did not differ between the unmarked birds of 20% pens and the 100% marked groups. No significant differences were found in norepinephrine (NE) response. These findings suggest an increase in stress on marked birds as well as a decrease in activation of the active (fight or flight) response to stress in groups where marked birds are a small proportion of the group. These results suggest that marking may affect the performance of the birds as well as their stress levels, particularly when only a small proportion of group members are marked.
Repeatability of Serving Capacity Scores in Male Goat Requires Prior Sexual Experience

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In many animal species, development of male sexual behavior is best described as a learning paradigm in which males associate female sexual stimuli with the sexual act. By definition, these animals require multiple sexual behavior tests to show adult-like performance. In contrast, research suggests that male goats, cattle and swine do not require prior sexual experience as juveniles to exhibit their full potential in serving capacity tests as adults. Our laboratory has noted that juvenile male goats display profound separation anxiety when removed from pen mates and this impairs performance in a variety of behavior tests, suggesting that there may be differences in how a sexually inexperienced goat learns to identify sexual partners versus how a goat habituates to a novel situation. Here, we revisit the hypothesis that male goats do not require sexual experience to exhibit consistent adult-like sexual performance. Over eight consecutive weeks, we individually exposed six sexually-naïve male goats to 15 minute serving capacity tests with sexually-receptive females and recorded the frequency of ejaculations and latency to ejaculate. Prior to being tested each male was allowed to observe pen mates’ serving capacity tests. Mean ejaculation frequency was significantly lower during the first week of testing than during Weeks 6-8 (<0.05). Mean latency to ejaculate was higher during the first week compared with subsequent weeks (<0.05). The results of this experiment suggest that juvenile male goats require at least one, and as many as six, sexual interactions with a receptive female before stable performance scores are achieved. This contradicts the hypothesis that male goats do not require prior sexual experience to exhibit adult-like sexual performance. Furthermore, the pattern of our data suggests that sexual conditioning is occurring in the male goat and may be an important factor in the development of a male goat’s sexual behavior. Supported by NJAES #06144.
Motivation for Group Housing in Gestating Sows

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Gestating sows are increasingly housed in groups, but the evidence that they are better off in groups than in stalls is equivocal. Physiological measures of welfare have yielded contradictory findings, while behavioural measures have proved difficult to interpret. This study set out to ascertain how important group housing is to dominant sows housed in stalls, using a measure of motivation.

Subjects were housed in a stall and permitted to work for a day’s access to a fully slatted group pen containing two familiar, subordinate sows at a stocking density of 2.7m2/pig. Social ranks were determined by observations at mixing and also by observations and feed competition tests before and after the experiment. ‘Work’ consisted of pressing a panel on an ascending series of FR schedules. The highest schedule reached (reservation price) was used as a measure of motivational strength. To interpret this measure, it was compared with the highest schedule subjects reached when working for access to the last 1/16th of their estimated daily ad libitum food intake after having consumed the first 15/16ths free.

Four subjects were tested, working for the group pen first. All subjects reached a higher schedule working for food than for the group pen (FR60, 70, 70, 40 for food; FR40, 10, 20, 10 for pen). Overall, subjects attached less importance to a day’s access to the group pen than to the last 1/16th of estimated ad libitum food intake (t=4.38, p=0.011). It is likely that they were close to satiation when working for food. Consumption frequently fell substantially short of the ‘ad libitum’ allowance (mean food left uneaten was on average 6.6% of this amount). These preliminary results suggest that dominant sows are only weakly motivated to be in a group pen. Four additional subjects will be tested, working for food first.
The Use of Animal-Based Parameters to Evaluate Tie Stall Design and Stockmanship on Dairy Farms in Ontario

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A cross sectional study was designed to test the relationship between tie stall design and the following variables: hock and neck lesions, arched backs, rotation of the hind claws, cleanliness of the udder and hind limbs, teat injury and broken and docked tails. The study design also encompassed testing for associations between the listed variable and milk production, somatic cell count and culling rates. Information was gathered from 317 Ontario dairy farms. All lactating cattle on the study farms were scored for each of the variables. Data were analyzed descriptively and for correlation between the outcome variables and tie stall length, width, tie rail height and chain length. Average herd size of the study farms was 56 lactating cows. Descriptive results are summarized in Table 1.

Table 1.

<table>
<thead>
<tr>
<th>Parameter scored</th>
<th>% of farms with no affected cows</th>
<th>% of farms with 10% or more of cows affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arched Back</td>
<td>47</td>
<td>8</td>
</tr>
<tr>
<td>Hindclaw rotated outwards</td>
<td>6</td>
<td>76</td>
</tr>
<tr>
<td>Neck abrasions</td>
<td>71</td>
<td>13</td>
</tr>
<tr>
<td>Hair loss from hocks</td>
<td>3</td>
<td>88</td>
</tr>
<tr>
<td>Open wounds on hocks</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>Significantly dirty udder</td>
<td>48</td>
<td>13</td>
</tr>
<tr>
<td>Dirty hindlimbs (manure up and over hock joint)</td>
<td>13</td>
<td>57</td>
</tr>
<tr>
<td>Docked tails</td>
<td>81</td>
<td>9</td>
</tr>
<tr>
<td>Broken tails</td>
<td>61</td>
<td>7</td>
</tr>
</tbody>
</table>

The average herd size of the study farms approximates the average lactating herd size of Ontario dairy farms. The prevalence of lameness, cleanliness and injuries of cattle on Ontario tie stall farms was not previously known. Benchmarking these values allows individual farms to assess their own herd scores and thereby to determine their farm’s strengths and weaknesses.

The occurrence of several cows in a herd with the same types of injuries suggests a problem. Understanding the relationships between injuries is the first step to improving husbandry, cattle housing and ultimately productivity.
The Effects of Pre-Slaughter Handling and Group Size on Meat Quality and Behaviour of Pigs

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The objective of the experiment was to determine the effects handling quality and group size in lairage before slaughter, on behaviour and meat quality of pigs (10 blocks of 80 animals). During unloading from the truck, pigs were either handled negatively (quickly with an electric prod) or positively (slowly with a plastic board), and the frequency of mounting, slipping and about turning was recorded. In lairage, pigs of each handling treatment were either kept in groups of 10 or 30 animals. During the 1st hour in lairage, behavioural observations (standing, lying down, drinking and aggression) were made on all animals in the two groups of 10, and on 10 animals in each group of 30. When pigs were moved to the restrainer, they received the same handling treatment as during unloading, but the electric prod was replaced with a whip. The frequency of mounting and about turning was recorded on all pigs that had been kept in groups of 10. After slaughter, measures of meat quality (pH45, pH24, drip loss, electric conductivity, skin blemish scores) were taken on all animals observed in lairage.

Upon unloading, the rough handling increased the number of mounting (P< 0.05), slipping (P< 0.01) and about turning (P< 0.001). In lairage, pigs kept in large groups were observed more often standing (P< 0.05), fighting (P< 0.001) and involved in agonistic interactions (bites and head knocks) (P< 0.05), than pigs kept in small groups. Pigs handled roughly were observed less often drinking than pigs handled gently (P< 0.01). When pigs were moved to the restrainer, gentle handling reduced mounting behaviour (P< 0.05). Rough handling slightly reduced pH45 (P< 0.01), and increased skin blemish scores (P= 0.06), drip loss (P< 0.05) and electric conductivity (P< 0.01). Group size had no effect on meat quality. The pH24 (P< 0.001) was significantly higher for pigs kept in the larger group size, but the difference observed had no impact on meat quality. In conclusion, the higher level of activity and aggression observed in the larger group did not affect meat quality, whereas rough handling had a negative impact on behaviour and meat quality.
Failure of the Straight-Arm Runway to Test Sexual Motivation in Male Goats

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Sexual performance is the combination of competent physical ability and motivation to mate receptive females. However, serving capacity tests given to young replacement males may be inaccurate for evaluating a juvenile’s future sexual performance because physical and psychological factors affecting sexual behavior may develop at different rates. Sexual motivation may be well developed but inadequate size and lack of strength, endurance, and coordination may impair mating. Research in sheep suggests that sexual motivation develops early and may be a better predictive indicator for young males. To test this hypothesis, six sexually naïve and 10 sexually experienced male goats were tested individually in a straight-arm runway. A goal box which was either empty or contained an estrous or a non-estrous female served as the stimulus. The male was exposed to the stimulus for 5 min during which time he could see, hear, and chemo-investigate the female, if present. A wire partition prevented mounting. The male was then placed in the start box and released. The time required for the male to reach the goal box was recorded as a measure of sexual motivation. Stops and retreats were also recorded. A retreat was defined as the male moving away from the goal box. Males traversed the runway significantly faster and made significantly fewer stops and retreats when a female, irrespective of her estrous state, was in the goal box compared to when the goal box was empty. Sexual experience did not affect run time, but sexually naïve males tended to make more stops and retreats. The fact that the female goat stimulus enhanced run times irrespective of her estrous state suggests that the males’ actions were socially motivated, not sexually motivated. The straight-arm runway is not appropriate for testing sexual motivation in goats. Further studies are underway using a Y-maze, in which the male goat must make a choice between various social and sexual stimuli. Supported by NJAES #06144.
ABSTRACTS FROM

POSTER

SESSION 2
Welfare indicators of sows housed in pens with electronic sow feeders (ESF) at different stages of gestation

Leena Anil

Department of Veterinary Population Medicine, College of Veterinary Medicine, University of Minnesota

A study was conducted at the University of Minnesota, SROC, Waseca to assess the welfare status of sows housed in pens (12.75m x 6.75m, fully slatted floors) with single walk-through ESF (2.2-2.6 kg feed/sow), at post-breeding mixing days (days 5 and 19), mid-gestation (day 56) and late gestation (day 108) in terms of behaviors, cortisol concentration and injury levels. Sows were added in two batches, post-breeding, at 14 days interval to achieve a group size of 40 per pen and the trial involved 4 pens. Ten (focal) sows were randomly identified before weaning from each first batch to be allotted to the different pens and data were collected from 36 focal sows as four of them returned. A time-lapse VCR was used to tape the behavior for 24 hours at each stage of gestation. The salivary cortisol concentrations were assessed using radioimmunoassay. Injuries on different body parts of sows were scored and added to get the total injury score (TIS). The TIS except that on limbs, udder, vulva and tail were added together as the TIS-aggression score since the injuries on these body parts were unlikely to be due to aggression. ANOVA for repeated measures, Friedman’s chi-square test and correlations were used for data analysis. The proportion of time spent queuing was lower (P<0.05) at first mixing than at second mixing and on day 108. The number of queuing was lower (P<0.05) on day 56 than on day 108. Aggressions (performed and received) and queuing numbers were similar on the mixing days. Aggressions were lower on day 56 than at second mixing and on day 108 (P<0.05 for both). Cortisol concentrations were similar on day 56 and at second mixing and were lower (P<0.05) than the other stages. The TIS-aggression was higher (P<0.05) at first mixing than other stages. TIS at mixing days were similar and higher (P<0.05) than the other stages. The number of ESF entries did not differ with gestation stage. Aggressions performed and received were positively correlated (P<0.05) with proportion of time spent queuing, queuing number and ESF entry. Cortisol was positively correlated with aggressions performed and received (P<0.05). The results indicate that feeder is a major source of aggression and stress. Both mixing periods and late gestation were also stressful periods.
Is there a correlation between dominance and learning ability in the domestic chicken (Gallus gallus)?

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Over the past 80 years much has been documented about the social behavior of the domestic chicken. However, little is known about the relationship between social behavior and cognitive abilities of the chicken. For instance, it is uncertain whether dominant birds have a cognitive advantage over subordinate birds which facilitates their superior position in the social hierarchy. Likewise, it is unknown whether subordinate birds compete successfully with higher ranking birds because their cognitive capacities compensate for any physical deficits. In this study, the relationship between the chicken’s position in the dominance hierarchy and its performance on a cognitive task was explored. Ten pairs of New Hampshire domestic roosters (Gallus gallus) were observed to determine dominance or subordinance within a pair. All birds were then trained and tested on a visual discrimination learning task. Discriminative stimuli were orange and green plastic discs. Correct stimuli (orange or green) were randomly assigned to birds. Placement of the discs (left or right of center) was also randomly assigned and counterbalanced to avoid a side bias. Birds were rewarded with food for pecking at the correct disc. A trial ended when a bird pecked at either disc. Criterion for task completion was 80% correct responses on three consecutive test sessions or 86% correct or greater on two consecutive sessions. All subjects were able to attain the test criterion. Average test session length was 15 trials. The number of trials to criterion was compared between dominant and subordinate birds using a paired t-test. No difference was found in performance between dominant and subordinate birds (P > 0.05) suggesting that in chickens, learning ability is not well correlated with social position. However, additional studies, particularly using different learning paradigms, are needed to confirm these results.
Influence of Patch Location Mediated by Group Size on Use of Space and Aggression in Domestic Fowl

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Use of space and aggressive interactions in the domestic fowl (Gallus gallus domesticus) were investigated under various group sizes, patch locations and levels of patch accessibility. Birds were tested in three experimental group sizes of five, 10, and 20 individuals per group and three patch location arrangements. This experiment consisted of two phases; during phase one groups had free access to all patches but in phase two patch access was restricted to a single individual. Groups were moved to a testing arena containing a single large patch, two medium-sized patches or four small patches. In all situations the total amount of food resources was identical. Individual and total core areas, as well as maximum, minimum, and nearest neighbor inter-individual distances were affected by group size, patch location, and patch accessibility. Birds in different experimental group sizes responded differently to patch locations. The minimum inter-individual distances for groups of five birds were affected by patch location while groups of 10 and 20 individuals were not. As expected maximum inter-bird distances and total core areas increased with GS. Aggression increased with group size only when patch access was restricted. Because the three experimental group sizes were temporarily created from a larger home group housed together, the results of this experiment demonstrate the capability of domestic fowl to immediately adapt their use of space and inter-individual distances according to environmental conditions, and responded in ways that are consistent with the predictions of optimal foraging theory.
The effect of increased air velocity on chewing behavior directed at rope tail models in growing pigs

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Poor ventilation systems that cause drafts are often blamed for tail biting, but any direct relationships between climatic conditions and pig behavior have rarely been explored. The objective of this study was to determine whether exposing growing pigs to drafty conditions affected their tendency to chew on rope tail models flavored with salt or blood. Eight growing pigs (35-45 kg) were used in three experiments (N=24). They were individually held in an environmental chamber where temperature and air movement were controlled. Each pen had a panel holding three rope tail models. In all experiments, ambient temperature was 20-21.5°C with air velocity less than 0.3 m/s. During treatment periods, pigs were exposed to four one-hour periods of draft per day: Expt. 1: 0.7 m/s at ambient temperature; Expt. 2: 1.3 m/s at ambient temperature; Expt. 3: 1.3 m/s with and without a 3°C reduction in air temperature.

Each pig was subjected to control or draft treatment for one week and then treatments were switched so that all pigs received both treatments. Behavior observed from video records included frequencies and durations of postures, head in feeder and chewing the tail models. There were no differences in behavior when pigs were exposed to air velocity of 0.7 m/s compared to control (P>.10; Expt. 1). In Expt. 2, pigs exposed to air velocity of 1.3 m/s stood for longer (P<.05), changed behavior more often (P<.05), spent more time at the feeder (P<.05) and tended to mouth the tail more frequently (P<.07) but duration of chewing the models was not different (P>.10) compared to control. Exposing pigs to increased air velocity in Expt. 3 again resulted in more time standing (P<.05), more behavioral transitions (P<.05) and a greater frequency of chewing rope models (P<.05) but not duration of chewing models (P>.10). Cold draft increased time spent standing even further (P<.05) but there was no additional effect on chewing tail models. Exposing growing pigs to very high air velocities mainly resulted in restlessness. This led to greater frequencies of approaching and chewing the rope models, but it did not stimulate longer time spent on chewing them.
A model for exploring sickness behaviour in swine


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In acute states of illness, animals display overt behavioural changes such as lethargy, anorexia, increased thermoregulatory behaviour, increased slow-wave sleep, avoidance of social contact, and reduced exploratory behaviour. This “sickness motivation” is a highly organized evolutionary strategy to combat infection and injury. In this study, we developed a model to induce sickness motivation in piglets to be used in further experiments exploring effects of sickness on behaviour needs and social behaviour.

Twelve purebred Yorkshire piglets were obtained at four weeks of age from the University research herd over a course of 3 trials. Piglets were housed in male/female pairs in 4”x 8” pens with metal slatted floors. To facilitate thermoregulatory behaviour, each pen was equipped with rubber mats placed below a heat-lamp, in a temperature-neutral area of the pen and on the cold plate. An open-end box with rubber flooring provided escape from bullying and a wall-mounted scrub-brush and a hanging chain facilitated play-related behaviour.

At 5-6 weeks of age, gastrointestinal distress was induced by feeding 250-300 mg/kg of ampicillin, mixed in strawberry jam, on two consecutive days. Diarrhea developed 24 hours after the first dose and persisted for 24-48 hours. Diarrhea was scored on a 4-point scale, whereby a score of 0 represented firm feces, and a score of 3 represented extremely fluid, projectile feces. Piglet behaviour was scored from timelapse videorecordings using 5-minute scans over 21-hour periods on days –1, +1 and +2 after dosing: “Control”, “Sick-day1” and “Sick-day2”.

Piglet response to ampicillin was variable, with average fecal scores of 1.8, 0.8, and 0.5 for trials 1, 2 and 3 respectively. Preliminary results suggest that frequency of lying decreased on sick days, but lying together and lying position were unaffected. Although no consistent changes in frequencies of feeding or of oral-nasal contact with the environment were observed, nine of the twelve piglets showed a decrease in oral-nasal behaviour towards a conspecific. Statistical analysis is currently underway to evaluate behavioural differences and interactions.

In conclusion, ampicillin-induced diarrhea is a promising model for exploring sickness motivation in swine. Further studies are required to refine the dose-response relationship in weaned piglets.
Housing Effect on behavior and physiology during feed withdrawal molt in laying hens: furnished cages vs. conventional cages

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The effect of caging systems during a feed withdrawal molt of laying hens was examined. At 19 wk of age, White Leghorn hens were randomly assigned into conventional cages at 6 hens per cage (645 cm$^2$ of floor space/hen), or furnished cages at 10 hens per cage (610 cm$^2$ of floor space/hen). Furnished cages contained nests, perches, scratch pads, and dust baths (Big Dutchman, Germany). Feed withdrawal molt was initiated at 72 weeks of age. Feed was withdrawn on Day 0, cracked corn was returned on Day 7, diet was changed to pullet feed on Day 14, and then to layer ration on Day 21. Physiological data was collected via blood collection on days −13, 0 (prior to feed withdrawal), 1, 5, 7 (prior to feed returned), 14 and 35 and included serotonin, epinephrine, norepinephrine, dopamine, and corticosterone levels, epinephrine norepinephrine ratio, and heterophil lymphocyte ratio. Behavioral data were collected on days 0, 2, 4, 6, 8, 9, and 17 using continuous observation from 0900-0930 and 1430-1500. There were no significant differences between furnished and conventional cages in overall hormone levels or heterophil lymphocyte ratio during the molting period (ANOVA, P>0.05). Behavioral observations during the feed withdrawal period indicated that hens in conventional cages spent more time sitting on the cage floor than hens in furnished cages (ANOVA, P=0.0429). Hens in conventional cages also spent more time inactive than hens in furnished cages (ANOVA, P=0.0055). Hens in both conventional and furnished cages increased their time spent preening (ANOVA, P=0.004) and exploratory pecking (ANOVA, P<0.001) when feed was withdrawn. In furnished cages hens increased dust bath usage (ANOVA, P=0.0162) during the feed withdrawal period. These results indicate that housing conditions do not fully compensate for the physiological stress induced by feed withdrawal molt.
Development of a Maze Task to Measure the Effect of Hippocampal Enhancement on the Stress Response of Pigs at Weaning

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Learning and memory, particularly spatial cognition, and regulation of the stress response are mediated by the hippocampus. Conditions piglets are housed in may not adequately activate hippocampal pathways. Exposing piglets to biologically relevant hippocampal-dependent tasks may better integrate cognitive processing of this region thus ensuring development and adaptive stress response. We used a hippocampal-dependent maze task to measure short-term effects of hippocampal enhancement in response to weaning.

Thirty-six female pigs from six litters were used with two piglets from each litter randomly assigned to one of three treatments: hippocampal enhancement (HE1, HE2), isolation control (IC1, IC2), or control with sow (CS1, CS2), then combined into two groups (1 = HE1, IC1, CS1; 2 = HE2, IC2, CS2). Training and testing for the HE task (HET) occurred from 5-11 day of age. A wait-suckle-wait schedule, (35 min wait then 15 min suckle for 6 wait-suckle periods/day) regulated suckling intervals, providing motivation to complete the task. At the start of suckle periods, HE animals navigated a maze to access to the sow to suckle. To control for influence of isolation on HE animals, IC animals were isolated for the time taken for HE animals to navigate the maze while CS animals, controlling for impact of the wait period were returned to the sow at the start of the suckle period. Groups 1 and 2 alternated training/testing so that, each HE and IC pair were trained/tested 3 times. Saliva was collected pre- and post-HET on day 5 and day 11 to measure cortisol. Weaning by litter occurred at 12 days, with saliva collected pre- and post-weaning and behavior video recorded. Data (i.e., cortisol levels, latency to navigate the maze, and behavior at weaning) will be presented examining effects of hippocampal enhancement in coping with stress while improving the health and welfare of piglets and other animals.