

exogenous steroids maintained elevated IGF-1 levels from d 28 to 84 suggesting higher metabolic rate in winter resulted in faster exogenous steroid payout.

Key Words: Growth Promotants, Feedlot Heifers, Season

348 Evaluation of initial implants on performance and carcass quality in feedlot heifers. T. B. Farran*¹, G. E. Erickson¹, T. J. Klopfenstein¹, G. Sides², B. Dicke³, and J. S. Drouillard⁴, ¹University of Nebraska-Lincoln, ²Intervet, Inc., ³Cattlemen's Consulting, ⁴Kansas State University.

A commercial feedyard experiment was conducted to compare a new low-dose implant to a more traditional high-dose product as the initial implant for feedlot heifers. Heifers (n = 1,124; initial BW = 278 kg) were implanted with either Revalor-IH[®] (Rev-IH; 8 mg estradiol, 80 mg TBA) or Synovex-H[®] (Syn-H; 20 mg estradiol benzoate, 200 mg testosterone propionate) at initial processing. Each group of incoming cattle constituted a treatment replication, providing a total of six replications per treatment (12 pens total). Heifers were kept separate by arrival date and assigned to treatment by every other animal during initial processing. After processing, pens were immediately group weighed to establish initial weight of the pen prior to experiment initiation. Replicates of heifers were reimplanted with Revalor-200[®] (20 mg estradiol, 200 mg TBA) as the common terminal implant 81 d (range 69 to 85 d) prior to slaughter. Cattle were fed for an average of 177 d (range 147 to 202 d). DMI was similar between treatments. Implanting heifers initially with Rev-IH improved feed efficiency (0.190 vs. 0.186; P = 0.03) and tended to increase ADG (P = 0.10) with a 4-kg difference (P = 0.15) in hot carcass weight compared to heifers implanted with Syn-H. Furthermore, Rev-IH implanted heifers had higher marbling scores (P < 0.07), with 8.7% more carcasses (P = 0.02) achieving the upper two-thirds Choice category compared to heifers initially implanted with Syn-H. Fat depth and longissimus area were not different (P > 0.25), but calculated yield grades were higher for heifers administered Rev-IH (2.60 vs. 2.71; P = 0.09). Syn-H heifers contained 29.0% empty body fat compared to 29.4% for Rev-IH implanted heifers (P = 0.12). Results indicate that in commercial feedlot size pens, Rev-IH can improve feed conversion,

marbling scores, and carcass quality with no negative impact on growth performance.

Key Words: Implants, Feedlot Heifers, Carcass Quality

349 Relationships of chute-side measurements to carcass measurements. J.C. MacDonald*, T.J. Klopfenstein, G.E. Erickson, C.N. Macken, and J.D. Folmer¹, ¹University of Nebraska - Lincoln.

Three data sets were compiled to determine relationship of body weight (BW), hip height (HH), and ultrasound fat thickness (FTU) to hot carcass weight (HCW) and carcass fat thickness (FTC). Data set one (DS1) included every steer calf from a herd (n = 41). Data set two (DS2) included steers (n = 200; BW = 366; SD = 19 kg) on a 112d feeding trial in which no treatment differences were expected or observed. Steers on this trial had been sorted to meet a specific weight range. Data set 3 (DS3) related initial weight and reimplant weight to HCW in calf-fed steers. DS3 includes steers (n = 352; BW = 285; SD = 22 kg) from three calf-fed trials. Steers were included in the data set if was similar to control treatments within trial. Relationships were established using correlation coefficients which were considered to be significant at P = 0.05. DS1 indicated that birth weight is not related to HCW or FTC. The relationship of BW to HCW improved from winter period to summer period and feeding period (r = 0.71, 0.82, 0.81, respectively). HH was a less precise indicator of HCW during winter period (r = 0.32) and finishing period (r = 0.50) and was not an indicator of HCW during grazing period. HH was not an indicator of FTC. FTU was related to HCW during grazing period only (r = 0.55), and was related to FTC during grazing and finishing periods (r = 0.51 and 0.53, respectively). DS2 suggests that relationship of BW to HCW improves with time on feed and is not an indicator of FTC. The relationship of HH to HCW does not greatly change during finishing period (r = 0.43 to 0.50) and is not related to FTC. The relationship of FTU to FTC ranged from r = 0.47 to 0.50 during finishing period. DS3 suggests that relationship of BW to HCW improves from initial weight to reimplant weight (r = 0.18 and 0.76, respectively). BW is the best indicator of HCW and FTU is the best indicator of FTC. Relationships for both measurements improve as marketing date approaches.

Key Words: Ultrasound, Hip Height, Carcass Characteristics

Teaching

350 The University of Missouri internship in reproductive management of beef cattle. J. E. Stegner*¹, T. A. Strauch¹, J. E. Williams¹, P. A. Kunkel², K. D. Switzer², R. F. Hill³, D. E. Broek³, D. J. Patterson¹, and M. F. Smith¹, ¹University of Missouri, Columbia, ²KABA/Select Sires, Louisville, KY, ³Cache Valley/Select Sires, Logan, UT.

Internships provide students with the opportunity to develop critical thinking and problem solving skills. An internship program was developed in cooperation with Select Sires, Inc., and the University of Missouri-Columbia (F.B. Miller Endowment Fund) to provide students with practical training in reproductive management of beef cattle. [Update of J. Anim. Sci. 77: (Suppl.1): 276]. Objectives of the internship are: 1) to provide students with practical training in the development and execution of estrus synchronization (ES) and artificial insemination (AI) programs, and 2) to provide extensive hands-on experience in ES, estrus detection (ED), semen handling (SH), and AI. Most students do not have prior experience with the preceding techniques before the internship. Students are required to attend weekly classroom or on-farm training sessions, and a 3 d Select Sires AI training school. Other responsibilities include: formulating a statement of specific learning objectives, a written protocol of overall plans, and participation in ES, ED, SH, and AI on designated farms and ranches. Students accompany AI industry personnel to assist in on-site ES, ED, SH and AI, and are exposed to diverse beef production systems. Over the past 5 years, 66 students have participated in ES, ED, SH and AI on beef farms and ranches in CO, IA, IN, KY, MO, MT, ND, NE, OR, SD, and WY. Students have worked with approximately 90,000 heifers and cows on farms and ranches in these various states. Student-faculty interaction and student-producer interaction is facilitated through the internship. Participation fosters a greater working appreciation of beef cattle reproductive management,

creates ties for students with allied industry, and expands career opportunities following graduation.

Key Words: Internship, Estrus Synchronization, Artificial Insemination

352 Retention of non-traditional agriculture students in animal sciences. M. Diekman*, B. Delks, and R. Allrich, Purdue University.

In the fall of 2001 and 2002, entering freshmen in the Department of Animal Sciences (ANSC) initially indicated the following options within the department: agribusiness, 8%; science, 75%, production/management, 13%; and products, 4%. Within the science option, 52% of the students (75% female, 25% male) are majoring in pre-veterinary medicine with the majority interested in companion animals. In March, 2002, 53.6% of 125 ANSC majors indicated they had an interest in companion animals or zoo/exotic animals. Of the ANSC students that matriculated in 1996-99, approximately 40% received their B.S. degree in ANSC. Of the ANSC students that matriculated in 2000 and 2001, 48.4 and 67.9% of ANSC students have remained ANSC majors, respectively. Of the students that transferred from ANSC in 2001-02, 23 of 48 (48%) and 15 of 28 (54%) remained in the School of Agriculture, respectively. With support from the Lilly Endowment, Inc., a freshmen orientation class was developed and required for ANSC majors in 2000. Topics for the course include: creating an on-line resume, preparation of plan of study, interaction with senior undergraduates and faculty, and participating in an overnight trip visiting animal enterprises. In addition, retention efforts of freshmen have been enhanced by the availability of Animalia, a program that offers a living/learning community to agriculture students. Students in Animalia reside in the same residence hall and are

clustered in English, Animal Sciences and Biology courses. Employment summaries indicate an increase in the number of jobs obtained in the non-traditional careers in the past four years. In 1999-2000, only two graduates accepted positions in the exotic or companion animal areas while 10 students accepted similar positions in 2001-02. Membership in Purdue Zoo Club has grown to more than 25 members. With the addition of two companion animal courses and a specialization in well-being/behavior, the curriculum should be more conducive to non-traditional ANSC students completing their degree in ANSC.

Key Words: Curriculum, Animal Sciences, Companion animals

353 Integrating practical elements into a theoretical applied animal behavior course for Animal Science undergraduates. K Laughlin*¹ and A.J. Zanella¹, ¹*Michigan State University.*

The teaching of applied animal behavior is of increasing importance to Animal Science undergraduates in North American universities. Building on the growing interest in animal welfare, and the potential opportunities for research and employment in this field, it is essential to deliver a body of students with a high level of knowledge, expertise and interest in this area of study.

The theoretical teaching of applied animal behavior principles in the classroom can be optimized by the integration of practical laboratory sessions, utilizing the wide range of facilities and livestock on hand at

most Land Grant universities in the US. We have developed a curriculum, in which parallel weekly laboratory sessions first familiarize students with the fundamental techniques of behavioral observation, including sampling and recording methods. Subsequent sessions gradually introduce greater complexity of experimental design, formulating and testing hypotheses, statistical analysis of data and interpretation of results. Throughout these lessons, we focus on different aspects of behavior (e.g. reproductive behavior, fear responses, social organization and motivation), thus consolidating information presented in lectures, whilst providing hands-on interaction with a variety of farm animal species. In collaboration with other organizations, we are also able to educate students on behavior and welfare issues of captive wild and companion animal species.

Students are required to submit reports throughout the course, which are graded on, among other things, the standard of scientific writing and critical evaluation of the study. The final assignment is an in-depth field research project, presented in written and oral form, allowing individuals to utilize the range of tools and techniques acquired during the semester, including peer review.

We propose that such an integrated teaching approach enhances the understanding of the theory underlying applied ethology, maximizes the appreciation of the practical considerations necessary in research, and stimulates a level of interest that may not be attained solely in the classroom.

Key Words: Animal Behavior, Undergraduate Teaching, Practical Experience

Undergraduate Student Competitive Research Papers

354 Injury levels of sows in gestation: stalls vs. group housing. K.G. Bhend* and G.W. Onan, *University of Wisconsin River Falls.*

In order to address increasing public concern about housing of gestating sows, alternative systems need to be investigated. It is imperative that quantitative objective data comparing sow welfare from various housing systems be obtained. This study compared traditional confinement stalls to an alternative group housing system with electronic sow feeders (ESF). In order to quantitate sow welfare an injury scoring system was established using a linear scale that accounted for location, number, and depth of injuries. The injury scores of pregnant sows housed in stalls (100 sows) and in dynamic groups in pens with ESF (100 sows) were recorded over a period of 60 days. Scores were compared in order to determine whether there were any differences in injury incidence and severity between sows in stalls versus pens with ESF. Total injury scores were found to be significantly higher in pens ($P < 0.001$). Regression analysis of injury levels and body weight was also performed. As body weight of sows in stalls increased, injury scores increased ($P < 0.01$). There was no significant effect of body weight on injury levels of sows in pens, however there was a trend toward decreasing total injuries with increasing weight. When injury scores were compared in the dynamic pens, it was found that subsequent groups of sows added to pens had higher levels of injuries than the initial groups ($P < 0.01$). Two of the touted benefits of group housing of gestating sows include greater freedom of movement and greater opportunity for social interaction. The increased injury levels that result from aggressive social interaction, however, may offset any benefits.

Key Words: Sow Gestation Housing, Injury, Group Pens

355 Performance of *HMGA1* as a candidate gene for growth traits in the pig. N. T. Nguyen*, K. S. Kim, H. Thomsen, J. Helm, and M. F. Rothschild, *Iowa State University.*

Quantitative trait loci (QTL) analyses using molecular markers have successfully detected several important genomic regions for growth and fatness traits in pigs. Knowledge of individual genes associated with human obesity may be important to understanding variation in the pig by providing candidate genes for growth and fatness traits. Our specific interest has focused on pig chromosome 7 (SSC7), which has been assigned several significant fat QTL. The improved comparative map between human and pig chromosomes has revealed large homology between the QTL regions of SSC7 and human chromosome (HSA) 6 as well as HSA15. A positional and biological candidate gene, the $\langle i \rangle$ high

mobility group A1 (*HMGA1*) gene was studied as the *HMGA1* is involved in the regulation of cell growth and differentiation. Especially, the *HMGA1* protein may play a role in reducing adipocyte cell hyperproliferation. The *HMGA1* gene was then mapped to a position within the backfat and growth QTL region identified in a Berkshire x Yorkshire family. A single nucleotide polymorphism (SNP) identified in the gene was significantly associated with observed variation in F2 animals of a Berkshire x Yorkshire family, for backfat and growth traits using single marker analyses. Phenotypic associations of this polymorphism were also found to exist in several commercial populations. Our results suggest that the *HMGA1* gene is a good candidate for the growth and fat QTL reported in this region. Furthermore, this gene could be useful for marker-assisted selection of growth and fat traits in the pig.

Key Words: *HMGA1*, Pig Chromosome 7, Candidate Gene

356 Effect of d α -tocopherol alcohol or acetate in water soluble or emulsified form to the drinking water of weaning pig. T.A. Specht*¹, D. C. Mahan¹, N. D. Fastinger¹, and R. L. Stuart², ¹*Ohio State University, Columbus, OH,* ²*Stuart Products, Bedford, TX.*

A study involving 80 weaning pigs evaluated the effects of d α -tocopherol in alcohol or acetylated form added to the drinking water in a water soluble or emulsified form. The experiment was a 2 x 2 + 1 factorial conducted in four replicates as a RCB design. Vitamin E source (d α -tocopherol or d α -tocopheryl acetate) was the first factor while the second evaluated each in an emulsified or water-soluble form. A fifth group did not receive supplemental vitamin E in the diet or drinking water. Pigs were fed conventional nursery diets with 5% added fat and no supplemental vitamin E. Tap water served as the water source, but vitamin E was added to each group at 100 IU/L. Water mixtures were prepared daily, maintained at 4 °C, added as needed, with water disappearance calculated weekly. Pigs (18 \pm 1 d) were allotted to treatment pens based on weight and litter. Blood was collected at weaning and weekly for a 28-d period. Serum was analyzed for α -tocopherol and triglyceride concentrations. The results showed that vitamin E source had no effect on ADG or ADFI. Pigs consuming the water soluble form of vitamin E tended to have higher gains ($P < 0.05$) and higher feed intakes ($P < 0.05$) than the emulsified form. Serum α -tocopherol declined from weaning to 28-d in the control group. The pigs on vitamin E treatments had higher ($P < 0.01$) serum α -tocopherol from 7- to 28-d than the control group. The emulsified form of d α -tocopherol form had higher serum α -tocopherol concentrations than the water-soluble form at each measurement period but was significant ($P < 0.05$) only at d 7