

being used to gather data for genetic evaluations in breeding and feedlot cattle. Instead of relying on progeny testing based on the collection of actual carcass data, beef sires are being evaluated at a younger age with a high degree of accuracy. Several breed associations are currently using ultrasound data to estimate carcass EPDs. Research has indicated ultrasound is effective in sorting cattle in the feedlot for more optimum finishing and sorting prior to feeding. The future of carcass ultrasound includes continued update of current software system models and algorithms, development of an automated software package, and potential use in identifying factors determining tenderness. Practical applications of ultrasound in the beef industry will become normal practice in the near future. Data generated will have a positive impact on both reproductive efficiency and carcass quality.

Key Words: Beef Cattle, Ultrasound, Applications

733 Evolution and use of ultrasonic technology in the swine industry. S.J. Moeller*, *The Ohio State University, Columbus OH.*

The use of ultrasound to measure biological tissue dates back to at least 1950 (Wild, 1950), with early ultrasonic work focusing primarily on human medicine. The application in livestock species was somewhat slow due to the cumbersome, fragile machines and high investment costs. Historically, the application of ultrasound to swine has focused upon composition and reproductive status assessment, with most of the research carried out through universities and land-grant institutions. Hazel and Kline (1959), Price et al. (1960), and Stouffer et al. (1961) using various ultrasonic systems were among the first to report results relating ultrasound readings with carcass measures of composition. However, the accuracy of the early amplitude-depth (A-mode), single-crystal devices was often quite variable. The introduction of B-mode (brightness modality) ultrasound, using multiple-crystal transducers and displayed in real-time (RTU) greatly enhanced the accuracy of live animal composition evaluation (Alliston et al., 1982; Forrest et al., 1986; Turlington et al., 1990) and provided an understanding of extraneous effects on accuracy of measurements. In 1993, the U.S. swine industry implemented a national ultrasound training and certification program for composition assessment on live swine. Early research in the reproduction area utilized Doppler ultrasound systems that measured fluid flow within the uterus (Fraser et al., 1968, 1971). A-mode systems were evaluated by

Lindahl et al. (1975) and Hansen and Christensen (1976). Doppler and A-mode devices, while relatively inexpensive and accurate within specified time frames during gestation, are less accurate than RTU. Research indicates RTU is an accurate system of pregnancy detection as early as 22 d after first mating (Inaba et al., 1983; Jackson, 1986; Almond and Dial, 1987). Enhanced technology, increased portability and reduced cost have allowed ultrasound to be a common tool used in swine units, packing plants and research institutes. Future research in the areas of composition, muscle quality, and reproductive biology, along with enhanced imaging capabilities, will lead the way to new, innovative applications.

Key Words: Swine, Ultrasound, Composition

734 Ultrasound as a tool to assess reproductive status in poultry. J.D. Kirby*, R.W. Rorie, V. Melnychuk, and N.B. Anthony, *University of Arkansas, Fayetteville, AR 72701.*

Ultrasound has been used to evaluate reproductive status in humans and other mammals for many years. In the domestic fowl, the primary reproductive organs of both sexes are completely internalized making visual evaluations of reproductive status difficult. Additionally, due to the low relative value of each individual hen or rooster in an integrated production and management system there has been little effort to evaluate the reproductive performance of individuals, resulting in group management schemes. Over the past few decades, the genetic resources used to develop production parent stock has been consolidated into a limited number of elite lines owned by only a few companies. These companies use intense selection, typically only the top 0.1 to 10% are retained, to produce the elite "pedigreed" breeding stock. These elite breeders are then used to develop multiplier great- and grandparent populations. Due to the potential fecundity of poultry, pedigree males and females can ultimately be responsible for many millions of pounds of product produced. We have been able to use ultrasound to assess reproductive potential, primarily in hens, of broiler breeder and layer type chickens. Our results suggest that ultrasound can be used as a tool for selecting individuals with well formed, normal, follicular hierarchies or, in males, testis development. The potential for application in domestic or threatened bird species is tremendous and merits further evaluation.

Key Words: ultrasound, poultry, reproduction

Bioethics in Animal Science

735 Applied ethics and animal science. W.R. Stricklin*¹ and Lars Viking*², ¹*University of Maryland*, ²*Center for Applied Ethics, Linköping University, Linköping, Sweden.*

Animal agriculture is currently confronting many issues that range across a wide spectrum of public opinion. Environmental issues, animal treatment, gene manipulation, food safety, declining farm numbers, changes in rural society, and farm and food worker labor issues are but a few areas where there are valid differences of opinion relative to ethical questions involving animal agriculture. The response to these issues by animal scientists of course varies among individuals. However, we suggest that a somewhat common view by scientists is of the following type, "I only deal with facts. Science tells me everything I need to know. Philosophy is simply words related to opinion where one can not collect data and establish facts." We contend that values are an unavoidable part of all human decision-making, including for instance choices of research focus in science. We further contend that the methods for moral reasoning used by applied ethicists have many similarities to the scientific process. While we acknowledge that not everyone using this process will always reach the same conclusion, we contend that this is also true for the scientific method. Ultimately, if animal scientists are to serve the needs of animal agriculture as they contend is their mission, then they have an obligation to address the issues that are confronting animal agriculture. The challenge then becomes a matter of seeking methods for beginning the establishment of consensus in a pluralistic society. We will argue that the tools used by applied ethicists can be useful in the pursuit of this consensus. Not necessarily each animal scientist should take on this endeavor, but we propose that it should be a supported activity of at least some. These individuals must expand their knowledge base to include some familiarity of philosophy and arm themselves with additional academic tools other than those of science. Specifically, to increase their effectiveness, they must become somewhat conversant in

the methodology of moral philosophy and then work toward the development of collaborative efforts with applied ethicists. And finally, the leadership of the discipline of animal science should work toward facilitating the dissemination of knowledge regarding applied ethics and the process of consensus building.

Key Words: Applied ethics, Animal agriculture, Bioethics

736 Postmodernism for animal scientists. K.K. Schillo*¹ and P.B. Thompson*², ¹*University of Kentucky, Lexington, KY*, ²*Purdue University, West Lafayette, IN.*

Our goal is to explore whether postmodernism, a popular perspective within the humanities and social sciences, is relevant to animal science in the context of addressing contentious policy issues. As a social institution in Western culture, the animal science profession favors a modern ideological perspective. This view, which emerged in the 16th century and developed into the 19th century, is characterized by several pivotal assumptions: 1) humans are essentially rational individuals; 2) science is the paradigm of rationality and is therefore the most legitimate source of knowledge; 3) change brought about by science-based technology is inherently progressive. During the last century, there has been growing criticism of modernism. For example, a number of groups question the claim that science is an objective practice and view technology in terms of creating unnecessary risks rather than serving a social good. Such criticisms have been attributed to postmodernism. In general, postmodern theorists emphasize the role of language as a means to explain reality, and argue that because language is both historically and culturally relative, no one account of reality can be purely objective. In this sense, postmodernism has often been characterized as "anti-scientific." Some varieties of postmodernism embrace a nihilistic perspective and

portray scientific knowledge as nothing more than personal preferences that don't matter. However, other varieties view science as a value-laden social practice, but recognize that scientific methods can provide useful ways for coping with nature; especially when they take into account multiple perspectives. It is this latter view that offers insight into how the animal science profession can address policy issues in morally responsible ways. Currently, the animal science community advocates the modern view that public policy should be based only on sound sci-

ence. This view conceives the animal science community as one that is segregated from and holds authority over a greater human community. A perspective which seems more compatible with addressing the diverse interests of a greater community is one which views animal scientists as part of such a community, and who provide only some of the perspectives that should be considered when addressing policy issues.

Key Words: Ethics, Policy, Philosophy of Science

Mechanisms of Hormonal Signal Transduction

737 Progesterone regulates reproductive function through two functionally distinct receptor isoforms. OM Conneely*¹, B Mulac-Jericevic¹, and F DeMayo¹, ¹*Baylor College of Medicine.*

Progesterone regulates reproductive function by interaction with two intracellular receptors, PR-A and PR-B, that arise from a single gene. To establish the selective physiological roles of PR isoforms in vivo, we have selectively ablated PR-A (PRAKO) or PR-B (PRBKO) expression in mice. Ablation of PR-A results in severe abnormalities in ovarian and uterine function but does not affect responses of the mammary gland or thymus to progesterone. Analysis of uterine function of PRAKO mice reveals an unexpected progesterone-dependent proliferative activity of PR-B in the epithelium and provides evidence that the tissue specific functions of this isoform are due to specificity of target gene transactivation rather than differences in spatiotemporal expression relative to PR A. Contrary to PRAKO mice, PRBKO mice are fertile and have successful pregnancies that result in normal litter sizes. Histological studies of uteri isolated from PRBKO mice revealed normal sensitivity to estrogen and progesterone. Specifically, progesterone acting through PR-A alone antagonizes estrogen-induced proliferation of the uterine epithelium in PRBKO mice. Progesterone receptors are critical for mammary gland development and morphogenesis. We have analyzed mammary glands response to estrogen and progesterone in PRBKO animals ovariectomized at 6 or 10 weeks of age. Whole mounts analysis of mammary glands obtained from ovariectomized 6 week old PRBKO mice treated with estrogen and progesterone for 3 weeks showed significantly reduced side branching when compared to wild type and PRAKO mice. Interestingly this phenotype is reverted in 10 week old PRBKO mice treated under identical hormonal regime. These results further demonstrate tissue specific functions of progesterone receptor isoforms.

Key Words: progesterone receptor isoforms, female reproduction

738 Role of Neurotrophic Factors in Ovarian Development. S.R. Ojeda*, G.A. Dissen, C. Romero, and A. Paredes, *Oregon Regional Primate Research Center/Oregon Health Sciences University, Beaverton, OR.*

The neurotrophins nerve growth factor (NGF), neurotrophin-4/5 (NT-4/5), and brain derived neurotrophic factor (BDNF), and their high-affinity tyrosine kinase membrane-anchored receptors (trkA for NGF and trkB for NT-4/5 and BDNF) are expressed in the mammalian ovary before the initiation of follicular assembly. Mice carrying a null mutation of the NGF gene had a reduced number of primary follicles and a normal population of primordial follicles, suggesting that NGF is not required for follicular formation, but is necessary for the initiation of follicular growth. The fewer primary follicles seen in NGF KO mice appear to result from a deficiency in somatic ovarian cell proliferation. After formation of primary follicles, NGF facilitates early follicle growth by inducing the synthesis of biologically active FSH receptors. Concomitant

deletion of the NT-4 and BDNF genes, or deletion of the gene encoding their trkB receptor, resulted in reduced granulosa cell proliferation and decreased formation of secondary follicles at the onset of follicular growth. Thus, activation of trkA receptors during early follicle development appears to sustain the conversion of primordial into primary follicles, whereas activation of trkB receptors facilitates the acquisition of additional layers of granulosa cells by the primary follicles. Thecal cells of antral follicles continue to express NGF and respond to the neurotrophin with proliferation and prostaglandin release. While an increase in thecal trkA expression occurs at the time of the preovulatory surge of gonadotropins, blockade of trkA receptors inhibits ovulation, suggesting a role for NGF in ovulatory rupture. Thus, neurotrophins contribute to regulating two key phases of ovarian development: the initiation of follicular growth, and follicular rupture at ovulation. Together, these results identify a novel function for the neurotrophins in the development of a nonneural organ, and demonstrate that they act in the ovary to facilitate the proliferation and differentiation of specific cellular subsets involved in follicular growth. (Supported by NIH grants HD-24870, RR-00163 and U54-HD18185)

Key Words: Ovarian Development, Neurotrophic Factors, Follicular Growth

739 Growth hormone signaling to the nucleus. Jessica Schwartz* and Graciela Pivien-Pilipuk, *Dept. Physiology, University of Michigan.*

Effective use of growth hormone (GH) depends on understanding its mechanism of action. The diverse actions of GH are mediated by multiple signaling mechanisms. When GH binds, the GH receptor associates with the tyrosine kinase JAK2, initiating multiple signaling events. Analysis of GH-regulated gene expression indicates that multiple signaling cascades triggered by GH regulate the function of multiple transcription factors. The proto-oncogene c-fos is a target for several GH-initiated signaling pathways. One pathway, mediated by GH-promoted tyrosine phosphorylation of Signal Transducers and Activators of Transcription (STATs), regulates the *Sis-Inducible Element*. Transcriptional activation mediated by the Serum Response Element in response to GH depends on the phosphorylation and activation of the transcription factor Elk-1 by MAP kinases. The dephosphorylation of the transcription factor C/EBP beta promoted by GH appears to reflect inhibition of Glycogen Synthase Kinase 3 (GSK3) via GH-stimulated PI-3 kinase/Akt, leading to changes in the binding and function of C/EBP beta. It is likely that signaling networks involving multiple pathways initiated by GH-GH receptor-JAK2 interactions contribute to the coordinated regulation of gene expression in response to GH. Such changes in gene expression underlie the physiological actions of GH.

Key Words: Gene expression, GH signal transduction, Transcription factors

Profitable Meat Goat Production: The Interaction of Genotype and Management

740 Rheological characteristics of uncooked goat meat. Eric Risch* and Jackson M. Dzakuma, *Prairie View A&M University, Prairie View, TX. USA.*

After weaning, 48 kids of Spanish (SP) and Tennessee Stiff-Legged (TS) breeds were individually penned and fed an 18% CP and 65% TDN ration for six months during which time their weights were taken on a bi-weekly basis. These breeds represent goats with small (TS) and intermediate (SP) mature sizes. They were slaughtered at six months of age. Four replicates of rectangular slabs (approximately 2.54 cm x 2.54

cm x 1.77 cm) of samples were taken from the fore-quarter, hind-quarter and breast regions of the carcasses. An Instron Universal Testing Machine (Model 4201) was used to apply 80 % compression deformation at a strain rate of 2.54 cm/min to each sample in the axial direction. The strength or ultimate stress (as determined by the ultimate load applied to the sample till failure), the elastic modulus (as determined by the ratio of ultimate stress over strain) and the toughness of the sample (derived from the area under the force-deformation curve and giving an indication of the energy required to propagate failure) were determined