Bio Ethics - Livestock and Poultry: The Ethics of Food Animal Production, Processing and Marketing

36 Introduction. R. D. Reynnells*, *USDA/CSREES/PAS*, *Washington, DC*.

Food animal production systems that supply food and fiber to society have been directly affected by societal demands from the beginning of history. This is true whether most people were directly engaged in food production, or for our current approximately 2 percent of the population. Societal expectations for food products and animal welfare have changed over these years. Today's ethical concerns of animal production and processing reflect our current understanding of the significance of animal sentience, our abundance of food, and the desires of some to control the actions of others without personal risk or responsibility versus using educational programs that create market demand to thus change the food animal system. Speakers for the first of two bioethics symposia discuss topics around the theme "The Ethics of Food Animal Production, Processing and Marketing". The first presentation covers the range of ethical arguments for and against animal use by humans (e.g., philosophy; maximizing genetic potential; realities of alternative systems; stewardship responsibilities of all size farmers). The changing social dynamics and related questions of ethics related to our food choices and marketing ethics are discussed by the second speaker. The current system was created in part by societal demand for cheap food, has altered the rural social structure, and is viewed by some as negatively impacting animal welfare. How should our society and food production system create a mutually beneficial relationship that includes concerns for animal welfare? Are there viable options to accommodate societal demands that do not create unfair burdens on farmers? The ethical aspects of controlling food animal production and processing include voluntary and involuntary options (e.g., certification programs; regulations), which the third speaker will discuss. An often-used argument against commercial animal production is harm to the environment (e.g., potential for surface and ground water contamination, ammonia, odor, worker safety, insect pests) and related societal costs, to be discussed in the final presentation. This is followed by a general discussion.

Key Words: Animal Welfare , Bioethics, Food Animals

37 The end of husbandry. B. E. Rollin*, *Colorado State University*, *Fort Collins*.

Civilization is ultimately based on agriculture, historically a contract with animals and the earth. We discuss the manner in which modern agriculture has cavalierly broken that contract. This violation ramifies in dire ethical and prudential consequences. The industrialization of agriculture has unintentionally but clearly undercut sustainability, animal welfare, and husbandry in ways we discuss in detail, and has also raised serious questions of environmental preservation, well-being of farmers and rural communities, and loss of what can be called ancestral local wisdom of the soil.

Key Words: Husbandry, Ethics, Sustainability

38 Ethical aspects of regulating production. J. C. Swanson*, *Kansas State University*, *Manhattan*.

Polls and surveys conducted within the United States show general agreement that there is public support for the protection of farm livestock and poultry. Concurrent with the growing public sentiment, is the recent adoption of socially responsible corporate policies by major food retailers relative to animal welfare. The animal welfare assurance and audit programs developed by the private sector are an attempt to assure consumers that best practice measures and independent oversight result in a reasonable quality of life for food producing animals. These programs represent voluntary self-regulation and arguably a market-based approach to secure the welfare of food producing animals. Animal advocacy organizations historically sought regulatory oversight of animal care practice. Legislative routes that require government promulgation and enforcement of animal care regulations represent an involuntary form of animal welfare assurance. There are ethical considerations concerning the employment of voluntary or involuntary regulation of the welfare of food producing animals. For example, impact on food price, viability of small to medium producers, food abundance and quality, taxpayer and government burden, and food security are prominent among the ethical considerations in deliberating involuntary regulated production. In either approach the public must be convinced that the welfare of food producing animals can be secured in a transparent and convincing manner.

Key Words: Livestock, Production, Regulation

39 Environmental aspects of ethical animal production. J. M. Siegford* and W. J. Powers, *Michigan State University*, *East Lansing*.

Livestock and poultry producers face a number of challenges including pressure from the public to be good environmental stewards and adopt welfare-friendly practices. In both arenas, producers often implement practices beyond those required for regulatory compliance in order to meet consumer demands. However, environmental stewardship and animal welfare may have conflicting objectives. Examples include pasture-based dairy and beef cattle production where high fiber diets increase methane production and subsequent release to the atmosphere compared to grain feeding practices in confinement. Grazing systems contribute to nitrate leaching to groundwater in some areas of the world where grazing is the predominant land use. Surface water impacts are of issue when grazed animals have unrestricted access to streams. Similarly, hoop housing for sows, as an alternative to indoor gestation crates, increases the risk of nutrient leaching into soil and groundwater contamination if sites are not suitably prepared. Air emissions may also increase as a result of less opportunity to trap and treat emissions. Increasing cage space and providing greater surface area per mass of excreta in any production system can increase emissions from the excreta surface. Coupling welfare-friendly and organic production practices may require greater nutrient inputs in order to reach the same production endpoint, resulting in less efficient nutrient use and greater losses to the environment. Dual systems might additionally increase environmental contamination by pathogens. When swine were housed in huts, Salmonella cycled between swine and their environment; however, population numbers of pathogenic bacteria were not different between the indoor and outdoor systems evaluated. Alternatively, these dual purpose systems may reduce antibiotic and hormonal

contaminants. When considering ethical animal production practices, consideration needs to be given to the system impacts. In most situations, welfare-friendly production requires more land units per animal or per unit of product. Consideration of energy inputs into the system may be needed as energy use profoundly affects the ecological footprint left by an operation.

Key Words: Environment, Welfare, Organic

Breeding and Genetics - Livestock and Poultry: Poultry

40 Genetic variations in chicken aggressive behavior: the role of serotonergic system. R. L. Dennis*[1,2], Z. Q. Chen[3], and H. W. Cheng[1], [1]*Livestock Behavior Research Unit, USDA-ARS*, *West Lafayette, IN*, [2]*Purdue University*, *West Lafayette, IN*, [3]*Zheijiang University, School of Animal Science*, *Hangzhou, Zhejiang Province, China*.

Serotonin (5-HT) regulates aggressive behavior via binding to its receptors, such as 5HT-1A and -1B, in humans and rodents. This study was designed to test if 5-HT regulating aggressiveness has a heritable component in chickens. Chickens from two divergently selected lines KGB and MBB (low and high aggressiveness, respectively) and DXL (Dekalb XL, an aggressive out-group) were used in the study. Hens were paired within the same strain. At 24 wk of age, the subordinate of each pair received i.p. injection of either NAN-190 (1mg/kg, a 5HT-1A antagonist, NAN), GR-127935 (1mg/kg, a 5HT-1B antagonist, GR) or saline (control) for 5 days (n= 10 per strain). Frequency of aggressive behaviors were increased in the hens of DXL and MBB treated with NAN ($P<0.05$) and in the KGB hens treated with GR ($P<0.05$), respectively. GR treated KGB hens ($P<0.05$) and NAN treated MBB hens ($P<0.05$) also displayed an increased feather pecking (FP); but neither antagonist had an effect on FP of DXL hens ($P>0.05$). This may suggest the possibility of multiple mediating factors altering FP behaviors. Among the controls, MBB hens have higher epinephrine (EP) levels than KGB or DXL hens, indicative of the inferior stress coping ability of MBB hens. Treatment with GR significantly reduced EP levels in MBB hens ($P<0.05$), but not in DXL or KGB hens, suggesting a role of 5HT-1B in stress regulation in MBB hens. Hens of all strains treated with GR but not NAN exhibited reduced weight gain and increased plasma 5-HT concentrations compared to controls ($P<0.05$), suggesting a negative feedback system altering stress coping ability. The results provide evidence for different heritable serotonergic mediation of stress coping, aggression, and FP behaviors in chickens with high and low aggressive propensities. The data also indicates that, similar to humans and rodents, 5-HT-1A and -1B have different functions in the regulation of aggressive behaviors in chickens.

Key Words: Serotonin, Aggression, Hen

41 Association between SNPs and mortality in commercial broilers: a machine learning approach. N. Long*[1], D. Gianola[1], K. A. Weigel[1], G. J. M. Rosa[1], and S. Avendaño[2], [1]*University of Wisconsin*, *Madison*, [2]*Aviagen Ltd.*, *Newbridge, Scotland*.

Genome-wide association studies using single nucleotide polymorphisms (SNPs) can identify genetic variants related to complex traits. An objective is to find sets of relevant SNPs, and to combine them in a model that predicts phenotypes of individuals or groups. Typically, there are thousands of SNPs genotyped, but the number of phenotypes is smaller. An efficient method of selecting influential SNP markers is required; subsequently, more elaborate statistical modeling work can be conducted. A 2-step feature selection method for binary traits was developed, which consisted of filtering (using information gain), and wrapping (using naïve Bayesian classification). The filter reduces the large number of SNPs to a much smaller size, to facilitate the wrapper step. Also, an approach based on discretization for dealing with continuous phenotypic values in a classification framework was developed, to enable feature selection. The methods were applied to chick mortality rates on progeny from 201 sires in a commercial broiler, with the goal of identifying SNPs (over 5000) related to progeny mortality. To mimic a case-control study, sires were clustered into two groups, low and high, according to two arbitrarily chosen mortality cut points. By varying these thresholds, 11 different "case-control" samples were formed, and the 2-step feature selection procedure was applied to each. To compare the 11 sets of chosen SNPs, an ANOVA was carried out, and p-value of overall model fit and the predicted residual sum of squares (PRESS) were used as end-points. The 2-step method improved greatly the naïve Bayesian classification accuracy over the case without feature selection (from around 50% to above 90% without and with feature selection in each case-control sample). There was consistency over the 11 case-control samples between the patterns of selected SNPs and the mutual information. The best case-control group (63 sires over or below the thresholds) had a small p-value (< 0.0001) and a relatively small PRESS value (0.59). The 17 SNPs selected using this group accounted for 36% of the variation in mortality rates across all sire groups.

Key Words: SNP-mortality Association, Machine Learning

42 Non-major histocompatibility complex effects on the outcome of Rous sarcoma virus in Arkansas Progressor and Regressor chicken lines. M. Spanakos*[1], S. M. Sullivan[1], L. K. Stamps[1], R. Kopulos[2], J. Thompson[1], G. F. Erf[1], and N. B. Anthony[1], [1]*University of Arkansas*, *Fayetteville*, [2]*Northern Illinois University*, *DeKalb, IL*.

The *B* complex, or the major histocompatibility complex (MHC) in chickens, has a direct effect on the development of Rous sarcoma virus (RSV)-induced tumors. Certain erythrocyte (*Ea*) alloantigen systems have also been shown to influence the regression of RSV-induced tumors. The objective of this study was to determine the effects of the *Ea-A* and *Ea-I* systems on the development of RSV-induced tumors within and between the Arkansas Progressor (AP) and Regressor (AR) chicken lines. The interactions between the *Ea-A* and *Ea-I* loci and the *B* complex were also examined. The AP line (B^{13}) has two segregating alleles at the *Ea-A* (A^4 and A^5) and *Ea-I* (I^2 and I^8) loci, while the AR line (B^{13} and B^{221}) is fixed at the *A* locus (A^4). Tumors were scored three times a week for a 10-week period. Pattern of response to the tumor was evaluated using tumor score (TS), tumor profile index (TPI), and mortality. Birds with the AP B^{13}, AR B^{13}, and AP B^{13}/AR B^{13} backgrounds and I^2I^8 haplotype had higher TS, TPI and mortality compared to those with the homozygous *Ea-I* combinations. A similar effect was seen with the *Ea-A* heterozygotes as compared to homozygotes in the AP B^{13}, and AP B^{13}/AR B^{13} backgrounds. Tumor