Wednesday, July 12, 2006

SYMPOSIA AND ORAL SESSIONS

ADSA Production Division, Dairy Reproductive Terminology Workshop

426 Reproductive terminology workshop. E. R. Jordan*[1], J. S. Stevenson[2], P. M. Fricke[3], and M. W. Overton[4], [1]*Texas A & M University*, *Dallas*, [2]*Kansas State University*, *Manhattan*, [3]*University of Wisconsin*, *Madison*, [4]*University of Georgia*, *Athens*.

Reproductive physiologists have developed a number of different synchronization programs and measures for reproductive analyses. Terminology, however, is not being applied consistently and uniformly in the scientific literature, textbooks, and popular press. Advances in reproductive biology of domestic species and adoption of the latest technical developments often are hindered by confusion and inconsistency regarding terminology, nomenclature, and specific definitions used to describe the protocols, treatments, or clinical conditions. During this workshop, a standardized set of terminology will be presented and discussed with the objective of developing a consensus, standardized reference to serve as a guideline for nomenclature use in manuscripts, textbooks, and popular press articles. Examples of the nomenclature to be discussed include: Ovsynch, Select Synch, Select Synch plus CIDR, Presynch, Presynch + Ovsynch, Co-Synch, CIDR Synch, CIDR + Co-Synch, Resynch with CIDR, Resynch at pregnancy diagnosis, % compliance, compliance rate, pregnancy rate, palpation pregnancy rate, AI-submission rate, conception %, conception rate, rate vs. risk, embryonic mortality, fetal mortality, abortion, retained fetal membranes, melengesterol acetate (MGA) + prostaglandins, MGA Select, MGA with natural service, 7-11 Synch, metritis, endometritis, pyometra, and daughter pregnancy rate (DPR). Standardizing reproductive physiology nomenclature, definitions, and descriptive terminology should facilitate comparisons across studies, and most importantly, provide dairy producers, veterinary practitioners, and scientists more precise measures of the utility of the observations when new reproductive technologies are reported and then applied in the field.

Key Words: Reproduction, Terminology, Nomenclature

ARPAS Symposium: Assessment and Management of Feedstuff Variation in Dairy Nutrition

427 How can dairy nutrition models deal with uncertainty? R. A. Kohn*, *University of Maryland*, *College Park*.

Diet formulation models for dairy cattle require estimates of feed composition provided as table values or from feed analysis. In addition to feed composition, models use predicted milk production and body weight for when the ration will be offered, and internal constants like digestibility coefficients for specific nutrients. Current models do not account for uncertainty of feed analysis, animal performance, or internal constants; they simply overestimate requirements by applying "safety" factors, or adjustments above estimated requirements to compensate for the risk of underfeeding. Optimal safety factors can be calculated by balancing the increased ration cost against the potential loss in milk income from the risk of underfeeding due to uncertainty. For the previous 5-yr average milk and feed prices, the optimal safety factor for diet CP was 35% of the SD in predicted requirements and supply. At half the cost of feed protein relative to milk, the optimal safety factor is 86% of the SD in feed CP supply. Multiple safety factors can be added as squared terms to account for uncertainty in feed analysis, animal production, intrinsic model uncertainty, and variation among animals. For example, if cows are fed 50% corn silage (9% CP; SD = 0.9%) and 50% grain mix (25% CP; SD = 1.0), the final ration is 17% CP with SD = 0.67 $\{\sqrt{(0.5^2 \times 0.9^2 + 0.5^2 \times 1.0^2)}\}$. Only considering variation from CP analysis would optimally target 17.2% CP in the diet $\{17 + 0.35 \times 0.67\}$. If uncertainty from other sources sums to an additional unit of CP as a fraction of feed DM, the total safety factor would be 0.42 $\{0.35 \times \sqrt{(1.0^2 + 0.67^2)}\}$ and the diet should target 17.4% CP. Common pitfalls in use of safety factors are 1) failure to understand that variance of ration composition is less than the variance for individual feeds, 2) failure to square safety factors before adding, and 3) using safety factors that are greater than optimal. These mistakes result in overfeeding of nutrients beyond the economic optimum. Explicitly understanding the sources of uncertainty in diet formulation and feeding would enable more accurate compensation for uncertainty.

Key Words: Ration formulation, Forage analysis

428 Quantifying assay variation in nutrient analysis of feedstuffs. D. R. Mertens*, *USDA-ARS, US Dairy Forage Research Center*, *Madison, WI*.

Analytical results from different laboratories have greater variation than those from a single laboratory, and this variation differs by nutrient. Objectives of this presentation are to describe methods for quantifying the analytical reproducibility among and repeatability within laboratories, estimate the expected variation for nutrient assays, and discuss sources of assay variation. Only carefully designed and replicated collaborative studies or proficiency testing programs can measure variation in nutrient assays. The National Forage Testing Association (NFTA) has developed a proficiency testing program that partitions variation in nutrient analysis into two components: accuracy and precision. This program and its statistical methodology will be described. Although they are often used interchangeably, accuracy and precision measure two independent sources of variation. Accuracy is related to the closeness of the result to the known or consensus reference value. The NFTA determines consensus values as the censored averages of only laboratories using the reference method. Precision is related to the consistency of results among repeated assays. Precision is related mostly to random variation and accuracy is related primarily to systematic error or bias. Much of the random variation associated with precision is related to differences in test samples from heterogeneous materials. Most systematic bias is related to differences in methodology among laboratories and technicians, although some systematic true error is associated with mistakes in calculation or corrections using inaccurate DM determination. Although consistency in analyses (precision) is desired by feed producers, accuracy is required by feed users because the animal provides an independent and ultimate evaluation of nutrient content and utilization. Variation in nutrient analysis is real and controllable, but not completely avoidable. For accurate determination of mean values for tables of feed composition, assays should be replicated across both test samples and analytical laboratories to verify consensus among results.

Key Words: Nutrient analysis, Feed composition

429 Impact of variation in diet nutrient inputs on model output predictions. J. G. Fadel, H. A. Johnson, and P. H. Robinson*, *University of California*, *Davis*.

Objectives were to assess impacts of variation in diet nutrient inputs on model output predictions and determine if nutrient variation is important to predicted outputs of dairy cows. Models used were Molly and CPM, and their default diets were used for evaluation with each model. Diet nutrient inputs varied were sugars, starch, soluble protein (SP), neutral detergent fiber (NDF), acid detergent fiber (ADF), lignin, ether extract (EE), lysine (Lys) and methionine (Met). Nutrients were varied individually, both plus and minus 10% from model default values. Default diets were then switched between the models and the nutrient inputs varied as before. Outputs used to assess impacts of variation in diet nutrient inputs on model predictions were fecal nitrogen (N), urinary N, plasma urea N, metabolizable energy (ME) balance, ME requirement, body weight change, microbial dry matter, milk, milk fat and milk protein creating a total of 90 combinations of nutrient inputs and model predicted outputs. An ANOVA was completed on the percent differences from model default predicted outputs with both +10% and -10% changes in nutrient inputs. The statistical model included diet and model as main effects, as well as the interaction. In 23 of 90 input/output combinations there were no statistical significances. In 66 of 67 significant ($P < 0.01$) combinations, model or the interaction was significant indicating the impact of nutrient variation on predicted outputs was largely model dependent. In only one combination was diet alone significant, indicating that models were affected by nutrient variation differently and predicted outputs differently. Effects are substantial, as starch and ADF affected 10 of 10 predicted outputs, sugars affected 9, SP and Met affected 8 and NDF and Lys affected 7. In contrast, lignin and EE only affected 4. All outputs were sensitive to 5 or more of the 9 inputs, except milk protein (only sensitive to 3). Results may differ with other diets. Overall, models were least sensitive to changes in lignin and EE, and milk protein was the least sensitive output to changes in nutrient inputs.

Key Words: Diet nutrient variation, Predicted output, Cow models

430 Managing feedstuff variation in nutritional practice. N. R. St-Pierre*[1] and W. P. Weiss[2], [1]*The Ohio State University*, *Columbus*, [2]*Ohio State University*, *Wooster*.

Variation in feedstuff composition can lead to reduced performance by animals. Our objective is to review practical ways to reduce the variation in nutritional characteristics of diets. There are two types of variations: 1) abrupt changes in composition as when receiving a new batch of a commodity, and 2) random variation because feed particles are not nutritionally uniform. The control of variation in diet composition must be initiated before diet formulation. This requires periodical chemical analyses of feedstuffs. What should be analysed, at what frequency, and when the diet should be modified has been studied as a renewal reward process. Results showed that the optimal sampling pattern varies across feeds, nutrients, and herd size. Important practices include 1) maintaining separate inventories of feeds with different nutritional characteristics, 2) sourcing commodities from a single source, and 3) purchasing commercial feeds from a manufacturer with an effective quality control program. Variation in diet composition can be greatly affected by formulation. With simple nutrients, i.e., those that can be expressed as a proportion of DM and that do not interact with other nutrients (e.g., CP), the contribution of an ingredient to diet variance changes with the square of its inclusion rate. For complex or composite nutrients (e.g., RUP), diet variance is a complex function of multiple variances and covariances. Approximation formulas exist but are generally very inaccurate. Monte Carlo simulation methods have been used successfully in these instances. Unresolved issues exist related to the identification of response functions to nutrient variation as well as obtaining reasonable estimates of variances and covariances for each feedstuff. In general, increasing the number of ingredients in the diet, and increasing the use of ingredients with low variability lead to less variable diets. Post-formulation, one must ensure that the amounts actually fed (mixed) are close to the theoretical ones. Sorting of diet components must also be minimized.

Key Words: Feedstuff variation, Nutrient variance, Diet formulation