SYMPOSIA AND ORAL SESSIONS

Alpharma Beef Cattle Nutrition Symposium

9 What routine analytical measurements best predict available energy content of feeds and co-products? F. N. Owens*, *Pioneer Hi-Bred International*, *Johnston, IA*.

Net energy for gain and lactation available from feeds traditionally has been predicted from an index of feed energy digestibility (e.g., TDN). At least 15 different equations are available to calculate TDN from nutrient content of a feed or a diet ranging in complexity from two assays (DM plus either ADF, NDF, or crude fiber) to 11 determinations (feed class, DM, ash, CP, ether extract, NDF, NDFn, ADF, ADFn, lignin, PAF). To test the validity of various prediction equations, energy availability (TDN or DE) must be measured independently from nutrient composition, not calculated from feed analysis as used in the Dairy NRC (2001). TDN and nutrient composition for individual feedstuffs (1,087 from Morrison′s Feeds and Feeding, 1961; 248 from Dairy NRC 1989; 71 from Beef NRC, 1996) were compiled; relationships between TDN estimates and nutrient concentration of feeds within and across data sets and feed classes were assessed by correlation and regression. Incomplete nutrient analysis limited the testing precision. However, based on stepwise regression, feed DM content was the primary factor responsible for differences among feeds in TDN content as a fraction of wet matter as might be expected. True digestibility of protein, fat, and NFE, estimated as the slope of digested amounts against feed concentrations across more than 500 feeds with digestibility values reported in Morrison′s tables, averaged 90 ± 1%, 93 ± 1%, and 107 ± 2%, respectively. Consequently, TDN on a DM basis was predicted most closely by deducting some multiple of fiber (crude fiber or ADF and, for wet forages, NDF) from a constant value both overall and within all feed classes (concentrates, dry forages, wet forages). This supports the concept of predicting TDN from fiber content. The second factor of importance was either ether extract (increasing TDN by 1.5 units for each 1% additional fat) or ash (decreasing TDN by 0.8 units for each 1% added ash), with ether extract content having a greater range and thereby being more important for predicting TDN for concentrates than forages.

Key Words: energy, digestibility, TDN

10 Interesting but minor ingredients available for use in feedlot formulations. R. A. Zinn*, J. Salinas, and P. Garces, *University of California*, *Davis*.

Recent changes in grain pricing structure in combination with generalized economic uncertainty have introduced portentous risks to grain contracting, prompting renewed interest in alternative energy sources for feedlot cattle. In this presentation we will discuss several of the “minor” high-energy feed ingredients including: bakery waste, confectionery waste (candy product), corn bran, cull beans, dehydrated sugar beets, malt sprouts, pelletized grain screenings, rice bran, and rice polishings. Their feeding value will be assessed in terms of nutrient composition, comparative net energy value, acceptability (palatability), handling and processing limitations, formulation constraints, and availability.

Key Words: grain, feedlot

11 Changes and evolution of corn based co-products for beef cattle. L. Berger* and V. Singh, *University of Illinois*, *Urbana*.

The number and nutrient composition of corn based co-products will expand as ethanol producers seek to optimize the efficiency of ethanol production and the value of the co-products. Several innovative technologies have been developed to fractionate corn and/or distiller dried grains with solubles (DDGS) for recovering additional co-products and improving nutritional composition of DDGS. Two (wet and dry) corn fractionation technologies have been developed to remove the germ, pericarp fiber and/or endosperm fiber before fermentation, resulting in a significant reduction in the amount of DDGS produced and a corresponding increase in its protein content. Other fractionation technologies include removal of oil (by centrifugation) after fermentation but prior to DDGS production or removal of oil (by solvent extraction) from DDGS. Technology to recover pericarp fiber (by sieving and aspiration) after DDGS production has also been developed. Germ, pericarp fiber, endosperm fiber, or oil can be used as feedstocks for producing other marketable co-products or can be used as ingredients in animal diets. One new corn co-product available to the beef industry will be bran cake. This product results from combining corn bran (pericarp fiber) and distillers solubles produced from a dry fractionation process. The bran cake contains less protein, slightly less fat, and similar fiber levels compared to traditional DDGS. When bran cake replaced corn up to 45% of a finishing diet, gains and feed efficiency were improved. In high-forage diets the corn bran had 85% the energy value of DDGS. How rapidly these technologies are adopted will be driven by the economics advantages achieved over the traditional dry and wet milling processes. Large quantities of DDGS and corn gluten feed will be available for the foreseeable future. Research at the University of Illinois has shown that combining these co-products with soybean hulls can be used to replace rolled-corn in finishing diets without a reduction in gain, feed efficiency, or carcass merit. Traditional methods of evaluating diets markedly underestimate the energy value of this mixture.

Key Words: corn co-products, beef cattle

12 Utilization and application of wet co-products. M. L. Nelson*, *Washington State University*, *Pullman*.

Wet co-products fed to beef cattle include processing co-products of the fruit, vegetable, juice, and beer industries. Considerations for their utilization in beef cattle diets include quantity available, feeding value, quality of animal products produced, economics (e.g., transportation of water), storage and preservation, consumer perception and nuisance concerns, contaminants and interactions with other diet ingredients. Potato (*Solanum tuberosum*) co-products from processing for frozen products may be quantitatively most important because the 10 million m tons of potatoes (fresh weight) processed in the United States and Canada in 2007 resulted in an estimated 3.5 million m tons (as is basis) of co-product. Chemical composition and feeding value of potato co-products depends on the type. The names of co-products vary among potato processors and some processors combine the types into one product commonly called slurry. The four main types are:

1) potato peels; 2) screen solids (small potatoes and pieces); 3) fried product (fries, hash browns, batter, crumbles; and 4) material from the water recovery systems (oxidation ditch, belt solids, filter cake). The co-products, except the fried products, ensile rapidly, reaching pH 5 in 7 d or less. Dry matter content varies from 10 to 30% and varies (DM basis) in CP (5 to 27%), starch (3 to 56%), NDF (4 to 41%), and ether extract (3 to 37%) content among types of potato co-product. Type of co-product and frying greatly affect the energy value (0.6 to 1.6 Mcal NEg/kg DM). Composition, quality and shelf-life of meat were not affected by potato co-product feeding in contrast to perceptions of some purveyors and chefs. Potato co-products are important energy sources in beef cattle diets, which, in turn, solve a potentially massive disposal problem for the food processing industry.

Key Words: beef cattle, potato co-products

13 Applying technology with newer feed ingredients – Do the old paradigms apply? M. L. Galyean* and N. DiLorenzo, *Texas Tech University*, *Lubbock*.

Use of co-products like corn and sorghum distillers grain (DG) and corn gluten feed (CGF) in beef cattle finishing diets has increased significantly in recent years, but research to evaluate the efficacy of traditional feeding practices and feed additives when co-products are fed has not kept pace. Grain processing methods that increase starch availability seem equally effective in traditional diets and diets with wet CGF; however, in wet DG diets, some studies have shown decreased efficacy of grain processing, whereas others have shown no evidence of an interaction. Limited data are available on the physical and nutritional value of the fiber in wet DG and CGF; however, CGF at levels ≥ 25% of the dietary DM seems to have some degree of “roughage value,” whereas fiber in wet DG has less potential to replace traditional roughage sources. There is little evidence that efficacy of ionophores and antibiotics is changed with diets based on wet CGF or that they interact with addition of wet DG to finishing diets. In vitro data from our laboratory suggest no loss of monensin efficacy in substrates with 15% (DM basis) corn DG in terms of changes in VFA and gas production. Moreover, efficacy of ionophores was not affected in our data by diet substrates with increasing concentrations of S, and in vitro H_2S production in substrates containing wet DG seems predictable from substrate S concentrations. Nonetheless, limited in vivo data suggest lower acetate:propionate ratios with diets high in wet DG, which might affect ionophore efficacy. Likewise, in vivo results suggest that feeding wet DG might decrease ruminal pH; thus, to maximize DMI and minimize digestive upsets, optimal concentrations of roughage need to be evaluated in diets containing wet DG. The effects of yeast products and live microbial cultures in diets with co-product feeds have generally not been determined. Because of the high fiber concentration in CGF and DG, effects of exogenous enzyme preparations on ruminal fermentation and fiber digestion of diets containing these coproducts should be evaluated.

Key Words: coproduct feeds, high-concentrate diet, ionophores

Animal Health: Mastitis, Lameness, and Stress

14 Validation of a novel in-line milk analysis system designed to measure SCC and milk components. H. Karp* and C. S. Petersson-Wolfe, *Virginia Polytechnic and State Insitute*, *Blacksburg*.

The objective of the current study was to evaluate the accuracy of a novel in-line milk testing system for Holstein, Jersey and crossbred populations. The AfiLab system, developed and manufactured by the AfiMilk Corporation (Israel), measured milk components including fat percent, protein percent, lactose percent, milk urea nitrogen (MUN), presence of blood and SCC. Values were collected for each cow at each milking and data were stored using the AfiFarm software program, similar to conventional conductivity measures. The AfiLab system was designed and tested using a purebred Holstein population. However, validation was required for the Jersey and crossbred populations due to the distinct differences in milk components. Composite milk samples were collected daily from Holstein, Jersey and crossbred lactating cows at the Virginia Tech Dairy Center for an 8-wk period using DHI sampling bottles. All samples were preserved with bronopol and stored (4° C) until analysis. Milk analyses were conducted at the DHI Laboratory (Blacksburg, VA) and components measured included fat, protein and lactose percent, as well as, SCC and MUN. Results from the AfiLab system were compared to that from the DHI Laboratory (gold standard). Preliminary data analysis suggested a high level of correlation between the DHI and AfiLab results for both the Holstein and crossbred population. However, a lower correlation was found for the Jersey breed. These results were reported to the AfiMilk Corporation and an adjustment in the algorithms used to calculate the milk components was performed. Following the adjustment, accurate data was achieved for the Jersey breed. The dataset will be complete within 2 wk and a final analysis will be conducted to determine actual correlation values for the 3 breed populations examined. The use of daily milk component data may prove to be an effective way of identifying disease prior to clinical onset of signs.

Key Words: AfiLab, milk components, DHI laboratory

15 Reproduction and milk loss following clinical mastitis compared among J5 vaccinates and controls. D. J. Wilson*, *Utah State University*, *Logan*.

Milk loss and reproduction following clinical mastitis (CM) were compared among J5 vaccinates and controls on 3 commercial dairy farms. Contagious mastitis was well controlled and milk production was approximately 11,350 kg/cow/305 d. Cows were randomly assigned as vaccinates or controls. The vaccine was administered subcutaneously in the supramammary region at dryoff, and again 21-28 d before calving due date. At onset of CM, milk samples were aseptically collected for bacterial culture. Among 306 controls and 251 vaccinates, there were 221 new cases of CM affecting 120 cows. 90% (159/176) of milk isolates were environmental pathogens. Factors significantly associated (general linear model) with change in daily milk production following CM were J5 vaccination, DIM at onset of CM, and herd effect as well as each 2-way interaction between the 3 factors. The adjusted daily milk for 21 d following CM (all agents) was 7.6 kg higher among J5 vaccinates than controls; this protective effect of vaccination waned with increasing DIM at onset of CM. A mixed linear model with AR(1) correlation structure estimated the daily milk production of any cow (whether or not she had CM) on a given DIM. Cows with CM caused by Strep spp., S. aureus, E. coli, and Klebsiella all lost significant daily milk production for the entire lactation relative to non-mastitic cows. Another mixed linear model evaluated only coliform CM cases within