Completed Research

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Project #F033: "Evaluation of Animal Protein Meals on Nutritional Quality and Microbial Profile of the Gastrointestinal Tract"

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Amino acid (AA) digestibility and phosphorus availability values for animal protein meals are both varied and limited, resulting in formulation of broiler diets based on "best estimates." Objectives of this research were: 1) characterize mineral content, proximate components, and fat quality measurements of 30 APM and correlate pepsin digestible nitrogen and Novel Digestible Enzyme Assay - Poultry Complete (PC IDEA) values with standardized ileal amino acid digestibility (SIAAD) digestibility of 20 APM samples, 2) evaluate the effects of 6 APM samples differing in AA digestibility and CP content on microbial profile of the gastrointestinal tract during a 28 d assay, and 3) determine phosphorus bioavailability of 10 APM samples differing in ash content.

Pepsin digestibility and PC IDEA were significantly correlated with SIAAD for each AA for all 20 APM sources. The SIAAD of Lys and Met was predicted as % Lys SIAAD = [-9.65 + (0.38 × % PC IDEA predicted Lys digestibility) + (0.69 × % pepsin digestibility) and % Met SIAAD = [-35.95 + (0.62 × % PC IDEA predicted Met digestibility) + (0.75 × % pepsin digestibility). The prediction equation for Thr was: % Thr SIAAD = [-77.55 + (0.39 × % PC IDEA predicted Thr digestibility) + (1.37 × % pepsin digestibility)].

Dendrogram, principal component analysis and multi-dimensional scaling differences indicated that the effect of age was more pronounced than APM source on the intestinal communities of the small intestine. The age differences were apparent at 7 and 14 d of age, and the age effect was less pronounced by d 28. Dendrogram analysis indicated that APM source influenced the microbiota of the small intestine (7 and 14 d of age) and ceca (7, 14, and 28 d of age). However, principal component analysis and multi-dimensional scaling demonstrated little effect of diet and indicated age-related effects on microbial communities.

Phosphorus content of the animal protein meals were highly available compared with monosodium phosphate. No differences were observed for shear strength, ash, and relative bioavailability among the 10 animal protein meals. These data suggest that phosphorus in animal protein meals is readily available to poultry.

Data indicated a significant relationship of PC IDEA and pepsin digestibility with SIAAD for APM diverse in nutrient composition and AA quality. It appears that intestinal microbial communities can be affected by APM in the young chick when the gastrointestinal tract is immature. Animal protein meals are a good source of phosphorus for broilers, and ash content of APM does not appear to influence relative bioavailability.

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