

requirements for the Office of Management and Budget (OMB) for the Program Assessment Rating Tool (PART) and Research and Development Investment Criteria. To meet these internal and external needs, CSREES developed a self-assessment and peer review process known as the Portfolio Review Expert Process (PREP). This session

will review the relationships among the PREP, PART, and BPI. It will also describe the ways that government performance information is presented by OMB to the public.

**Key Words:** Budget, Plans of work, Performance

## Nonruminant Nutrition: Lessons and Logistics of Application of Digestible Amino Acids in Diet Formulation

**476 Amino acid digestibility measurements of feedstuffs – Lessons from poultry studies.** V. Ravindran\*<sup>1</sup> and W. L. Bryden<sup>2</sup>, <sup>1</sup>Massey University, Palmerston North, New Zealand, <sup>2</sup>University of Queensland, Gatton, Australia.

It is now accepted that the analysis of ileal contents rather than of excreta is a more reliable method for assessing amino acid (AA) digestibility of feedstuffs for poultry. However, a major problem faced by the users of currently available digestibility databases is the confusion that exists about various terminologies used to describe AA digestibility, highlighting the need in the industry to agree on a standard methodology to measure and describe AA digestibility estimates. Lessons learnt from ileal digestibility assays, which were developed in our Laboratory for a large-scale survey of poultry feedstuffs, will be discussed and a standard methodology for poultry digestibility assays will be presented. The relative merits of apparent and true digestible AA systems, however, will continue to be a subject of debate among nutritionists. The measurement of true digestibility includes a correction for endogenous AA secretions determined in the same digestibility assay. The concept of standardized digestibility system that overcomes the limitations of apparent and true digestible AA systems will be discussed. This system is comparable to true digestibility system, with the only difference being that it involves a correction for basal endogenous losses that need not be determined in the same digestibility assay. The basal endogenous AA loss is defined as the minimal loss of endogenous AA which occurs irrespective of feed ingredient or dietary composition and could be measured by feeding of low levels of highly digestible proteins (e.g. casein, wheat gluten) or the regression method. However, only limited published data is available on the endogenous amino acid losses at the distal ileum of poultry. Since the transformation to standardized digestibility values will require reliable estimates of basal endogenous amino acid losses at the ileal level, further research on this subject is warranted. Some key areas for future research will be highlighted.

**Key Words:** Amino Acid Digestibility, Endogenous Losses, Poultry

**477 Methodology for endogenous flow estimates for standardization of digestible amino acids.** S. A. Adedokun\*<sup>1</sup>, O. Adeola<sup>1</sup>, C. M. Parsons<sup>2</sup>, M. S. Lilburn<sup>3</sup>, and T. J. Applegate<sup>1</sup>, <sup>1</sup>Purdue University, West Lafayette, IN, <sup>2</sup>University of Illinois, Urbana/Champaign, <sup>3</sup>The Ohio State University, OARDC Wooster.

The importance of formulating poultry diets on a digestible amino acid basis cannot be over emphasized based on the need to reduce safety margins associated with diet formulation, especially when diets are

formulated on a total amino acid basis. In addition to the undigested and unabsorbed amino acids of dietary origin, amino acids of endogenous origin which can either be basal or diet specific are also found in ileal digesta. Hence there is the need to standardize apparent digestibility coefficients. The improvement in techniques used in amino acid analysis as well as a shift from excreta sampling to ileal digesta has resulted in more accurate amino acid digestibility coefficients. Despite this, however, it is important to determine the relative amino acids in the digesta that are of endogenous origin. Although the need for standardization and the associated advantages of standardized values is still subject to debate it is however, important to evaluate how values from various methodologies compare. Several methods have been used for standardizing digestibility coefficients. A number of methods have been used to estimate ileal endogenous amino acid (IEAA) flow. These include the classical methods comprising of the regression method, the use of nitrogen-free diet (NFD), and fasted roosters. The criticisms with the last two methods are that the animal is not in a physiological state and the IEAA flow is underestimated. Other methods include feeding of completely digestible protein (CDP), peptide alimentation ultrafiltration techniques (enzymically hydrolyzed casein), the use of isotope markers, and the homoarginine technique. Different methods have resulted in different endogenous flow estimates with NFD method having the lowest values when compared with flows from the regression and CDP methods. In addition to the influence of methods on IEAA flows, the influence of age on flow is also important. For example, IEAA flow has been shown to decrease by about 50% between d 5 and d 15 in broiler chicks.

**Key Words:** Amino Acid, Endogenous Flow, Poultry

**478 Ileal digestibility of amino acids: Lessons from pig studies.** O. Adeola\*, Purdue University, West Lafayette, IN.

It is recognized that only a part of the dietary amino acid supply is digested, absorbed, and utilized by animals. Ileal amino acid digestibility is considered the best measure of the amino acid value of feed ingredients. Formulation of broiler chicken diets on a digestible amino acid basis should greatly reduce feed cost and nitrogen emissions from broiler operations, decrease safety margins, and increase the accuracy of predicting performance and the uniformity of product after processing. An important component is accurate datasets on ileal digestibility of amino acids in feed ingredients. Generating the datasets on ileal amino acid digestibility values require quantifying the disappearance of ingested amino acids from the gastrointestinal tract immediately anterior to the ileocecal junction. Ileal amino acid digestibility values may be expressed as apparent ileal digestibility, which is the proportion of amino acid ingested that is not accounted

for in the total ileal outflow of amino acids and emphasizes that the outflow contains amino acids of both dietary and endogenous origins. Total ileal outflow of amino acids therefore consists of unabsorbed dietary amino acids and those of endogenous origin secreted into the gastrointestinal tract that were not absorbed prior to exit from the ileum into the ceca. Ileal outflow of amino acids of endogenous origin consists of basal outflow that is not dependent on feed ingredient composition and specific outflow, which is ingredient composition dependent. Thus, ileal digestibility values may be also expressed as standardized ileal digestibility or true ileal digestibility, which reflect the correction of the apparent ileal digestibility for basal or specific ileal outflow of amino acids, respectively. There is evidence from swine literature that standardized ileal amino acid digestibility values are more likely to be additive in mixtures of feed ingredients and research is needed for a variety of feed ingredients to confirm that this also holds in broiler chickens.

**Key Words:** Amino Acids, Digestibility, Ileal Flow

**479 Digestible amino acid formulation of poultry feeds; practical considerations.** D. J. Burnham\*, *Aviagen, Inc, Huntsville, AL.*

Poultry Feed Formulation has evolved from an Art more toward a Science over the past forty years. Sound nutrition research and computing technology has developed alongside analytical techniques to allow us to refine our formulation techniques. Digestible amino

acid formulation is part of the science. Unfortunately, there is still a lot of Art since as an industry we are not yet fully utilizing the all of the Science that is available to us today. The United States Poultry Industry has up until recently been extremely fortunate with an abundant supply of high quality inexpensive ingredients. So, the pressure to make full use of the science has not been there. This does not however mean that this is the best or most profitable approach. There are a number of feed ingredients that have very variable digestibilities; these include, meat and bone meal, poultry by product meal, feather meal, distillers grains and solubles and others. Any ingredient that undergoes processing, primarily heat treatment, stands the risk of being damaged. Formulating on a total basis ignores these effects, and will vastly over value a poor ingredient or undervalue a well processed ingredient. Ingredient buyers are charged with buying ingredients at the lowest price, not the best value. In addition, the most limiting amino acids are now commercially available in synthetic form, these are 100% digestible. Evaluating their value when formulating on a total basis undervalues the value by at least 10%, as the assumption is that all other ingredients are 100% digestible. The most common reason given for not formulating on a digestible basis is that we do not have accurate digestibility values. The truth is that the values may be a few points out, but using an 85% digestibility coefficient when it is actually 87%, is a lot more accurate than assuming it is 100%. Indications are that the status quo is changing as bio-fuels compete for the same resources. The products we may have to use vary in digestibility more than current ingredients and we need to make sure we understand how to use them to optimize performance and maximize profitability of our operations.

**Key Words:** Digestible, Amino Acids, Poultry

## Nonruminant Nutrition: Poultry Nutrition - Enzymes, Feeds, Feed Ingredients, and Manufacturing

**480 Influence of prepress solvent extracted cottonseed meal supplemented with exogenous enzyme and digestible lysine on performance, digestibility, carcass and immunity responses of broilers chickens.** T. Mushtaq<sup>1</sup>, M. Sarwar<sup>1</sup>, G. Ahmad<sup>1,2</sup>, M. A. Mirza<sup>1</sup>, and U. Noreen<sup>1</sup>, <sup>1</sup>*University of Agriculture, Faisalabad, Pakistan*, <sup>2</sup>*Shamim Feed Industries, Bahawalpur, Pakistan*.

The response of broiler chickens to 2 levels of endo-1,4- $\beta$  xylanase (EC 3.2.1.8) and endo-1,3- $\beta$  glucanase (EC 3.2.1.6) combination (with and without), 3 levels of digestible lysine (0.8, 0.9 and 1.0% with the applicability of ideal protein concept) and 2 levels of cottonseed meal (CSM; 20 and 30%) were evaluated in  $2 \times 3 \times 2$  factorial arrangement. A total of 2448 male Hubbard broiler chicks were fed on the practical vegetable based mash diets having 2750 kcal ME/kg and 18.50% CP from 1 to 42 d of age. The supplemental enzyme had minimum 1,100 units of endo-1,4- $\beta$  xylanase and 100 units of endo-1,3- $\beta$  glucanase kg-1 of finished diet. The addition of CSM at 30% resulted in increased arginine to lysine ratio. The CSM at 30% depressed BW gain and mortality during 1 to 21 d and BW gain and feed:gain during 1 to 42 d. A depression in dressing and breast percentages were also observed by the addition of 30% CSM. The digestible lysine at 1.0% depressed the BW gain and lowered the mortality during 1 to 21 d whereas the BW gain and feed:gain were unaffected among the three digestible lysine levels. The antibody titers against Newcastle and infectious bursal disease viruses were improved with the increasing levels of digestible lysine. The enzyme supplementation improved the AME and

digestibility coefficient of nitrogen when it was used with 30% CSM. No effect of enzyme, lysine, CSM or their interactions was observed on serum iron, gizzard and liver weights or abdominal fat percent. In conclusion, the enzyme supplementation failed to show any improvement in performance in CSM based diets and increasing digestible lysine in such diets did not improve the growth performance and carcass characteristics probable due to high arginine contents.

**Key Words:** Cottonseed Meal, Enzyme, Digestible Lysine

**481 Growth, carcass nutrients accretion and nutrient retention of broiler chicks receiving phytate- or polysaccharides-degrading enzymes.** O. A. Olukosi<sup>1</sup>, A. Cowieson<sup>2</sup>, and O. Adeola<sup>1</sup>, <sup>1</sup>*Purdue University, West Lafayette,* <sup>2</sup>*Danisco Animal Nutrition, Marlborough, Wiltshire, UK.*

Broiler chicks were used to determine efficacy of a cocktail of xylanase, amylase and protease (XAP) or phytase for enhancing growth, carcass nutrient accretion and total tract nutrient retention. Carcass nutrient accretion from 0 to 21 d post hatch was determined using comparative slaughter technique. Thirty chickens were used as initial slaughter group. Four hundred and fifty chickens were allocated to 5 treatments in a randomized complete block design; each treatment had 6 replicate cages with 5 birds per replicate cage. The treatments were: (1) positive