## SYMPOSIUM: PROCEDURES AND METHODOLOGY FOR DETERMINING STANDARD ILEAL DIGESTIBILITY (SID) AMINO ACID DIGESTIBILITY AND ENERGY OF FEEDSTUFFS

**0749 Procedures and methodology for determining standard ileal digestibility (SID) amino acid digestibility of feedstuffs.** H. H. Stein*, *University of Illinois at Urbana-Champaign, Urbana.*

Since results of the first digestibility experiments with animals and humans were published more than 250 yr ago, it has been known that not all nutrients that are ingested by an animal are absorbed. The early work with AA digestibility was based on determining apparent total tract digestibility of AA in individual feed ingredients using rats or chickens as models. It was soon recognized that to avoid the contribution of microbial protein to AA output, AA digestibility is more correctly determined as ileal digestibility. The first procedure to collect digesta from the distal ileum, the reentrant ileal cannula, was described in 1962 and in 1974 the first description of the intestinal T-cannula was published. With this technique, it became possible to collect fluids from the distal ileum and by subtracting the ileal output of AA from the intake of AA it is possible to calculate the ileal digestibility of individual AA. In addition to dietary AA that enter the intestinal tract, there is also a contribution of endogenous AA that are secreted in the form of mucins, enzymes, bile acids, etc., and because of the contribution of endogenous AA to the ileal output, digestibility values that are calculated by subtracting the ileal output of AA from the intake are called apparent ileal digestibility (AID) values. The practical consequence of the endogenous contribution of AA is that values for AID that are measured in individual feed ingredients often are not additive in mixed diets. The endogenous AA may be divided into AA that are non-specific to the diets, also called basal endogenous AA, and AA that are secreted in response to the diet that is being fed. Basal endogenous AA and are not needed for calculation of digestibility values that characterize specific feed ingredients and may be determined after feeding a protein-free diet. By disregarding the basal endogenous losses in the calculation, values for standardized ileal digestibility (SID) are calculated. This concept was first proposed in 1995 and later publications documented that values for SID of AA are additive in mixed diets when fed to pigs. Because practical diet formulation relies on the assumption that values for AA digestibility in individual ingredients are additive in mixed diets, diets are most correctly formulated based on values for SID of AA.

**Key Words:** amino acids, ileal digestibility, pigs

**0750 Procedures and methodology for determining the net energy content of feedstuffs.** C. M. Nyachoti*, *University of Manitoba, Winnipeg, Canada.*

Feed is the single most expensive input in commercial pork production and a large portion of the cost associated with feed is related to supplying energy. Thus, there have been concerted efforts to develop methods and systems for evaluating the energy content of feed. In this regard, the net energy (NE) system, which takes into account the metabolic utilization of energy, has been proposed as a superior system for characterizing the energy value of feeds. Furthermore, the NE system allows for a more effective use of high fiber feedstuffs and may lead to reductions in feed cost. Various procedures and methods have been used to determine NE in feeds and feedstuffs, the most common ones being the comparative slaughter (CS) and indirect calorimetry (IC) methods. Each of these methods has its advantages and disadvantages. For instance, although the CS method is regarded as the gold method, it is labor-intensive and requires a large number of animals. The IC method requires fewer animals, takes a relatively short period of time and can be used for repeated measurement of energy balance, but it also requires sophisticated and often expensive equipment for the required gaseous exchange measurements. Nonetheless, the IC method is the most commonly used method for determining the NE content in swine feed and feedstuffs and require accurate estimation of energy lost as heat and the energy required for maintenance. These estimates, which are influenced by several factors including physiological status and activity level, have direct impact on the NE estimates obtained, and therefore it is critical that these are accurately determined. For routine estimation of NE content, however, prediction equations based on chemical composition measurements of feeds and feedstuffs have been suggested, although questions of acceptability for such equations still exists. In this presentation, the procedures and methods for estimation of NE in feeds and feedstuffs and considerations for design of experimental diet will be discussed. Results of recent studies comparing determined and predicted NE values will be highlighted.

**Key Words:** net energy, methodologies, feeds, feedstuffs, pigs

**0751 Procedures for determining digestible and metabolizable energy contents of feedstuffs.** O. Adeola*, *Department of Animal Sciences, Purdue University, West Lafayette, IN.*

A pig derives energy for cellular processes by oxidation of carbohydrates, amino acids, and fatty acids contained in feeds, and thus the resulting energy is equal to the sum of the energy produced from oxidation of these feed nutrients. The utilization of energy in a feed for pigs may be determined by total collection method in which pigs are fed test diet over a period of time and then feces and urine are collected for

subsequent chemical analysis. Depending on the collected energy-containing components (feces and urine), either apparent digestible (DE) or metabolizable energy (ME) can be determined. Total quantitative collection of feces and urine from pigs fed the diet or ingredient is achieved by placing pigs in metabolism cages with feed intake and feces and urine output commonly determined over a 5-d period that is preceded by an adaptation period of 5 to 10 d. Ensuring that the feces collected originate from the feed provided during the 5-d collection period requires a marker that is added to the feed at the beginning and end of the collection period to signal the start and end of feces collection, respectively. Urine collection during the period when feces are collected starts and ends at the time of marker addition to the feed at the beginning and end of the collection period. The difference between the gross energy (GE) in the feed and that in the feces is DE. Subtracting the GE in urine from the DE of the diet gives ME. For most pig feed, the ME is between 92 and 98% of the DE.

**Key Words:** digestible energy, feed, metabolizable energy, pig