

We care for the little ones

A Nutrient-Driven Approach to Feed Formulation for Monogastric Animals

In feed formulation, traditional parameters such as crude protein levels and familiar ingredient names continue to dominate decision-making. Ingredients like soybean meal, fish meal, blood plasma, or newer alternatives such as insect meal often carry reputations shaped by marketing, tradition, or sustainability narratives. Animals, however, are indifferent to such labels. The gastrointestinal tract does not respond to ingredient names or crude protein percentages, but to nutrients—their balance, digestibility, and bioavailability.



For monogastric animals such as pigs and poultry, this distinction is critical. These animals do not require crude protein as such; they require digestible amino acids in precise ratios. Consequently, the true nutritional value of a protein source is defined by its amino acid profile and by the extent to which those amino acids are digested and absorbed in the small intestine.

Crude Protein: a Misleading Nutrient

Historically, piglet diets were formulated with high crude protein levels to meet requirements for limiting amino acids such as lysine and methionine. As a result, pre-starter diets often contained 20–23% crude protein, while starter diets contained 18–20%. This strategy was inherently imprecise. Increasing total protein without regard to amino acid balance inevitably leads to an oversupply of non-limiting amino acids.

Such oversupply has well-documented drawbacks. Excess amino acids are inefficiently utilized and increase the risk of digestive disturbances, particularly post-weaning diarrhea. Modern feeding strategies therefore have reduced-protein diets formulated on digestible amino acid levels, in line with the principles of precision nutrition, improved gut health, and reduced antibiotic use.

Digestibility Determines Nutritional Value

Beyond amino acid composition, digestibility is a decisive factor in protein evaluation. Only amino acids that are digested and absorbed in the small intestine contribute to protein synthesis and growth. Undigested protein reaching the large intestine serves as a substrate for undesirable bacteria such as Clostridia, Escherichia coli, and Salmonella. This microbial activity increases toxin production, compromises gut integrity, and elevates the incidence of diarrhea.

High digestibility minimizes the flow of undigested protein to the hindgut, thereby improving gut health, animal performance, and feed efficiency. This is especially important for weaned piglets, whose digestive systems are still developing and whose tolerance for poorly digestible protein sources is limited.

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Ileal Amino Acid Digestibility

Accurate assessment of protein sources requires reliable digestibility measurements. Research led by Professor Hans Stein at the University of Illinois has demonstrated that in vivo methods are essential for determining amino acid digestibility. While in vitro systems can provide useful estimates for energy or fibre, they lack sufficient accuracy for amino acids.

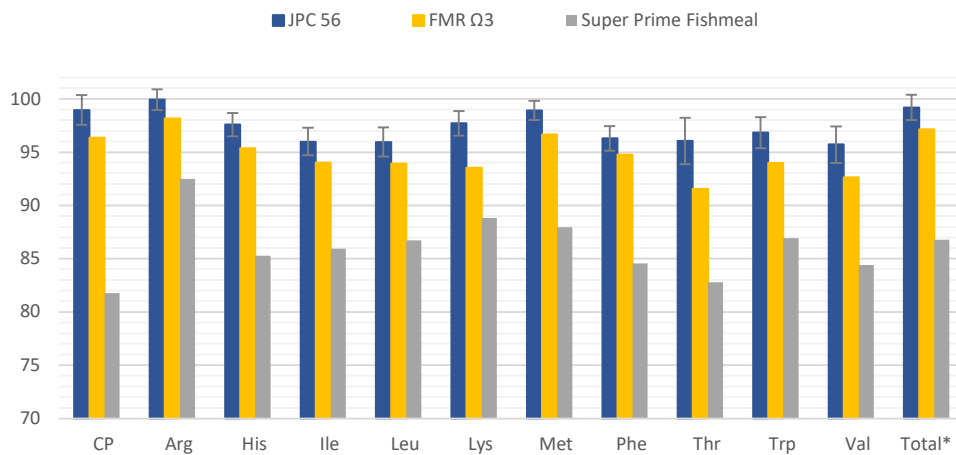
For this reason, digestibility is measured at the end of the small intestine (the ileum), before microbial fermentation in the large intestine occurs. Using piglets fitted with ileal cannulas, amino acid concentrations in the diet and in ileal digesta are analysed to determine standardized ileal digestibility (SID).

Protein Concentrates as Reliable Ingredients

Joosten Protein Concentrate 56 (JPC 56) and Fishmeal Replacer Omega 3 (FMR Ω3) are high-quality, plant-based protein concentrates developed by Joosten specifically for young animal nutrition. These ingredients emphasize feed safety, support gut health, and exhibit excellent digestibility. Numerous in vitro studies have demonstrated minimum protein digestibility levels of 95%, and in vivo research has confirmed these findings.

In vivo trials conducted at the University of Illinois showed excellent digestibility of both crude protein and amino acids. Standardized ileal digestibility of crude protein and indispensable amino acids was significantly higher for JPC 56 and FMR Ω3 compared with Super Prime fish meal ($P < 0.001$).

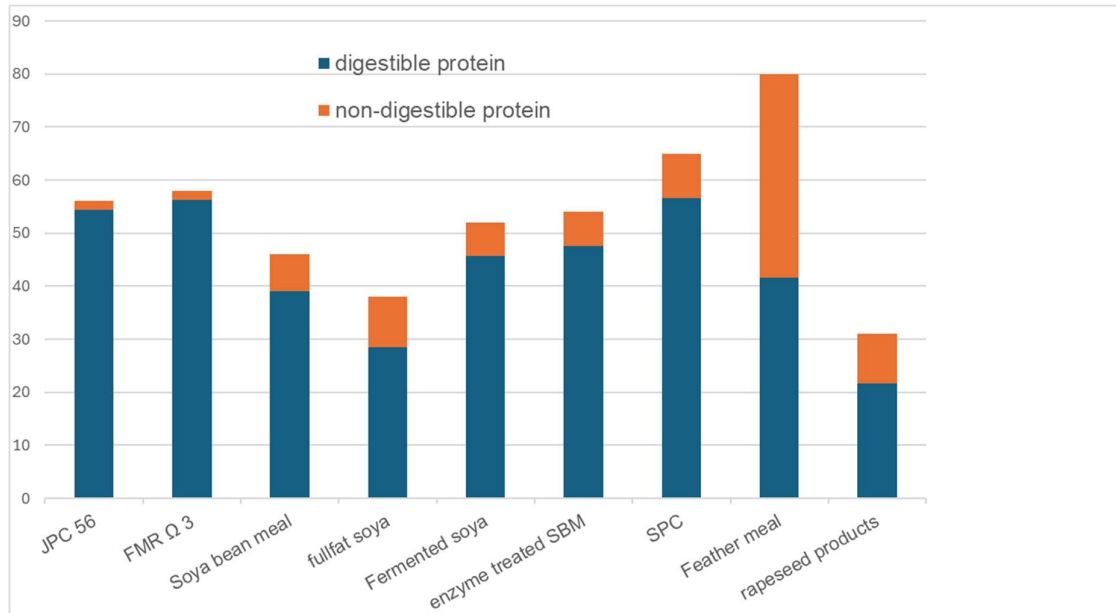
Fig. 1. Standardized ileal digestibility of CP and indispensable amino acids (AA) in JPC 56, FMR Ω3 and Super Prime Fish meal. All graph values are significant with Super prime fishmeal ($P < 0.001$). *SID of all 17 (in)dispensable amino acids in total.



Similarly, SID values for indispensable amino acids exceeded those reported for fish meal and were higher than values published for other plant-based protein sources such as enzyme-treated soybean meal, soy protein concentrate, extruded soybean meal, or fermented protein products. These results clearly demonstrate that high digestibility and optimal amino acid availability are not exclusive to animal-derived proteins.

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Fig. 2. Crude protein level of several protein sources commonly used in animal nutrition divided by digestible and non-digestible part. A high digestibility is desired to lower diarrhea incidence



An additional benefit of high digestibility is reduced nitrogen excretion, offering both environmental and economic advantages.

Nutrient-Driven Feed Formulation Is Essential

Effective feed formulation requires a fundamental shift in perspective. The critical question is no longer *which ingredient should be used?* but rather *which nutrients are required, and which ingredients deliver them most consistently and efficiently?* A nutrient-driven approach reduces formulation risk, increases flexibility in volatile raw material markets, and supports healthier animals with improved performance.

Products such as FMR Omega 3 and JPC 56 are safe, stable ingredients with predictable nutrient values, enabling precise, nutrient-driven feed formulation for pigs and poultry.