**Questions**

1. Charger Zyme is a brand name for an enzyme used in swine feed. Based on your research of enzymes, discuss why it is common for an animal nutritionist to include an enzyme in animal feed. (Use the word catalyst in your explanation.)

Catalysts are necessary in many chemical reactions to reduce the activation energy for the reaction and thereby make the chemical reaction occur. Enzymes are examples of catalysts in the digestion process.

Enzymes are proteins or protein-based molecules that increase nutrient utilization in feed. They have two key roles—they break down a larger molecule into one or more smaller molecules or they combine smaller molecules into a large molecule. Either way, enzymes help convert a less digestible component of feed (e.g. fiber) into a more usable form for the animals to utilize for growth, egg production, etc.

Enzyme supplementation in animal feed shows numerous benefits. One major plus includes improved gut health by making nutrients more available to the animal and less available as a nutrient source for “bad” bacteria. By making nutrients more available, enzymes are able to reduce feed costs, improve feed conversion, and improve the consistency in the diet. Finally, since nutrients are more available for the animal to use, less quantities of nutrients are excreted in waste. This makes livestock production more beneficial to the environment through enzyme supplemented diets.

2. Lysine monohydrochloride, L-Threonine and Methionine-DL are specific amino acids used in swine feed. What is the purpose of amino acids?

The major roles of amino acids are in the production of muscle protein, digestive enzymes, haemoglobin in the blood, gamma globulins (antibodies), milk protein and in hormone metabolism. Since the proteins used in pig diets are of variable quality, some of the essential amino acids may be deficient. These are called the limiting ones and in most cases lysine is the most likely, followed by methionine, and both are often added to diets routinely.

If the diet is deficient in one or more of these essential amino acids then protein synthesis will only continue to the level associated with the first limiting amino acid. The amounts of each amino acid required in the diet are expressed as a percentage of the total lysine requirement.

3. Terminal Base contains salt and essential vitamins and minerals (notably calcium and phosphorus). What are the primary purposes of calcium and phosphorus in an animal’s diet?

Calcium and phosphorus are important in skeletal structure development, but their presence in soft tissues is also vitally important. Both aid in blood clotting, muscle contraction, and energy metabolism. About 99 percent of the calcium and 80 percent of the phosphorus in the body are found in the skeleton and teeth. Therefore, deficiency of calcium and phosphorus will result in impaired bone mineralization, reduced bone strength, and poor growth.

Young pigs with a deficiency of calcium and phosphorus will have clinical sings of rickets. Mature pigs eating a deficient diet will remove calcium and phosphorus from the bone (osteoporosis), decreasing bone strength. This can result in a condition called "Downer Sows" and can be prevented by proper diet formulation.