Improving Animal Nutrition with Enzymes

ENZYME OVERVIEW

Found in all living cells, enzymes catalyze chemical processes that convert nutrients into energy and new tissue. In the case of animal nutrition, they do this by binding to specific substrates in the animal feed and breaking them down into smaller components. Each type of enzyme is highly efficient in its activity on specific substrates, requiring only a small dosage to produce the desired effect.

Enzymes perform optimally in certain pH conditions and temperature ranges. The animal's digestive system, feed processing conditions and diet formulation must be taken into consideration in selecting the best enzyme or mix of enzymes for the desired nutritional outcome.

Enzymes that are produced within the animal are referred to as endogenous and enzymes that are added to animal feed are referred to as exogenous. Exogenous enzymes created for use as animal feed additives are produced by microbial fermentation of substances found in plants, animals or microorganisms. As a result, exogenous enzymes have low toxicity, making them safe for animals and people and less harmful to the environment then chemically derived feed additives.

WHY USE ENZYMES?

NUTRITIONAL BENEFITS

- To break down anti-nutritional factors present in feed ingredients
- To increase availability of energy, proteins and minerals that are contained within fiber-rich cell walls or bound up in a form that the animal is unable to digest
- To break down specific chemical bonds in raw materials not usually digested by the animal's endogenous enzymes
- To supplement relatively low levels of enzyme production in young animals

ECONOMIC BENEFITS

- To manage constantly changing costs of animal feed ingredients by optimizing the release of energy sources to the animal
- To minimize the effects of variability in feed ingredients on the animal's ability to obtain nutrients
- To improve animal growth and meat yield without the use of antibiotics
- To reduce the volume of animal waste, including nitrogen, ammonia and phosphorus, released into the environment

COMMERCIAL PRODUCTION OF ENZYMES

While thousands of enzymes have been identified and several hundred are available commercially, only a fraction of these are produced on an industrial scale. Since the early 1980's, scientists have been using biotechnology to increase the production efficiency, quantity and quality of enzymes.

The research, development and testing of enzymes is a rigorous process that requires considerable time and financial investment. It involves the identification and selection of a naturally occurring substance that can be efficiently expressed by a microbial process and maintain the required enzyme profile and activity. Once the enzyme is selected, multiple animal feeding trials are conducted to confirm the enzyme's performance in animals.

The final selected strain is propagated in liquid broth to produce a large quantity of inoculum which is fermented in tanks. Enzyme manufacturers adjust the temperature, nutrients, and air supply to ensure optimal development. When the process is complete, the mixture of enzymes, nutrients, and microbes is strained though a series of filters to remove impurities and extract the enzymes.

ENZYMES USED IN POULTRY FARMING

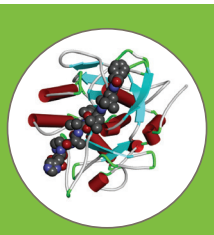
PHYTASES break down phytate, a substrate that contains phosphorus,an important nutrient that is essential for growth, cell maintenance, and tissue repair. Corn, which is a major component of the typical poultry diet, contains significant amounts of phytate. Adding phytase to poultry feed allows the animal to utilize more of the phosphorus within the feed. There is also an important environmental advantage to maximizing the amount of phosphorus that an animal can absorb. Once excreted, undigested phosphorus seeps into the ground and ultimately makes its way to rivers, lakes, and the ocean. Given sufficient light, the excess nutrients promote the growth of algae and other aquatic plants. This produces huge algae blooms that deplete the water of oxygen and damage aquatic life. Laws that limit phosphorus pollution have contributed to the increased use of phytase over the years.

CARBOHYDRASES break down fiber to improve the digestibility of carbohydrates in feed, thus increasing the amount of nutrients an animal can use for energy and growth. The primary types of carbohydrases used in animal nutrition include xylanase, which breaks down xylans, glucanase which digests glucans, and mannanase which digests mannans. Although chickens naturally produce enzymes that aid in the digestion of carbohydrates, they do not produce all the enzymes needed to completely break down the fiber within feed.

PROTEASES break down complex proteins into shorter proteins, called peptides, and amino acids, which are the building blocks of protein. They are also capable of breaking apart proteins that bind starch within feed ingredients, thus making more of the energy found in starch available to the animal.

phytase

xylanase



protease

BRI™

4222 Emperor Blvd, Suite 460 | Durham, NC USA 27703 | +1-919-993-3389 | sales@briworldwide.com | www.BRIworldwide.com