



Enzymes for Animal Nutrition

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INTRODUCTION & OBJECTIVE

Modern animal feeds are predominantly composed of plant material, mainly cereals and vegetable proteins. Much of this cannot be fully digested and utilized, especially by monogastric animals. Enzymes increase digestibility of these modern animal feeds, which improve feed to gain ratios for ruminants and monogastric animals alike.



Enzymes can also benefit dogs and cats by improving the digestibility of pet foods. They provide more energy due to better utilization of nutrients and improve skin and coat condition.



Animal Feed Components to be broken down by feed enzymes can be divided into three main groups:

- Substrates for which monogastric animals synthesize suitable enzymes in their own digestive tract. All enzymes which are necessary for the breakdown of feed and subsequently its absorption, are formed by the monogastric animal but may not be available in sufficient amounts under certain conditions, such as in young animals or in animals under stress.
- Substrates for which enzymes are not produced by the animal and which also have a very low digestibility (i.e. cellulose). These poorly digestible fractions dilute the beneficial content of the feed. Some materials which are the main components of the plant cell wall exhibit a so-called "cage effect", there by entrapping other nutrients which would otherwise be highly digestible.
- Substrates for which enzymes are not produced by the animal which in addition have anti-nutritive effects (non-starch polysaccharides such as β -glucans, pentosans and phytate). Certain non-starch polysaccharides can increase the viscosity of the digest which hinders intestinal absorption of nutrients. In plant based feedstuff approximately 50-80 % of the phosphorus present is bound to phytate. Phosphate from the phytic acid can only be broken down by the enzyme phytase (which is virtually not produced by monogastric animals) and thus be made digestible for the animal. In addition to these substances, there are higher concentrations of specific indigestible oligosaccharides present, mainly in vegetable protein carriers.

The Non-Starch Polysaccharide concentrations of selected feedstuff are shown in g/kg dry matter in the Table below:

Ingredient	Crude Fiber	β -Glucans	Pentosans	Total NSP	Phytate phosphorus
Wheat	20-34	2-15	55-95	75-106	2.3-2.9
Rye	22-32	5-30	75-90	107-128	2.5
Triticale	30	2-20	54-69	74-103	*
Barley	42-93	15-107	57-70	135-175	2.2-2.9
Oats	80-123	30-66	55-69	120-296	2.1
Corn	19-30	1-2	40-43	55-117	2.1
Wheat bran	106-136	*	150-250	220-337	7.2-9.2
Soybean meal	34-99	*	30-45	180-227	4.4

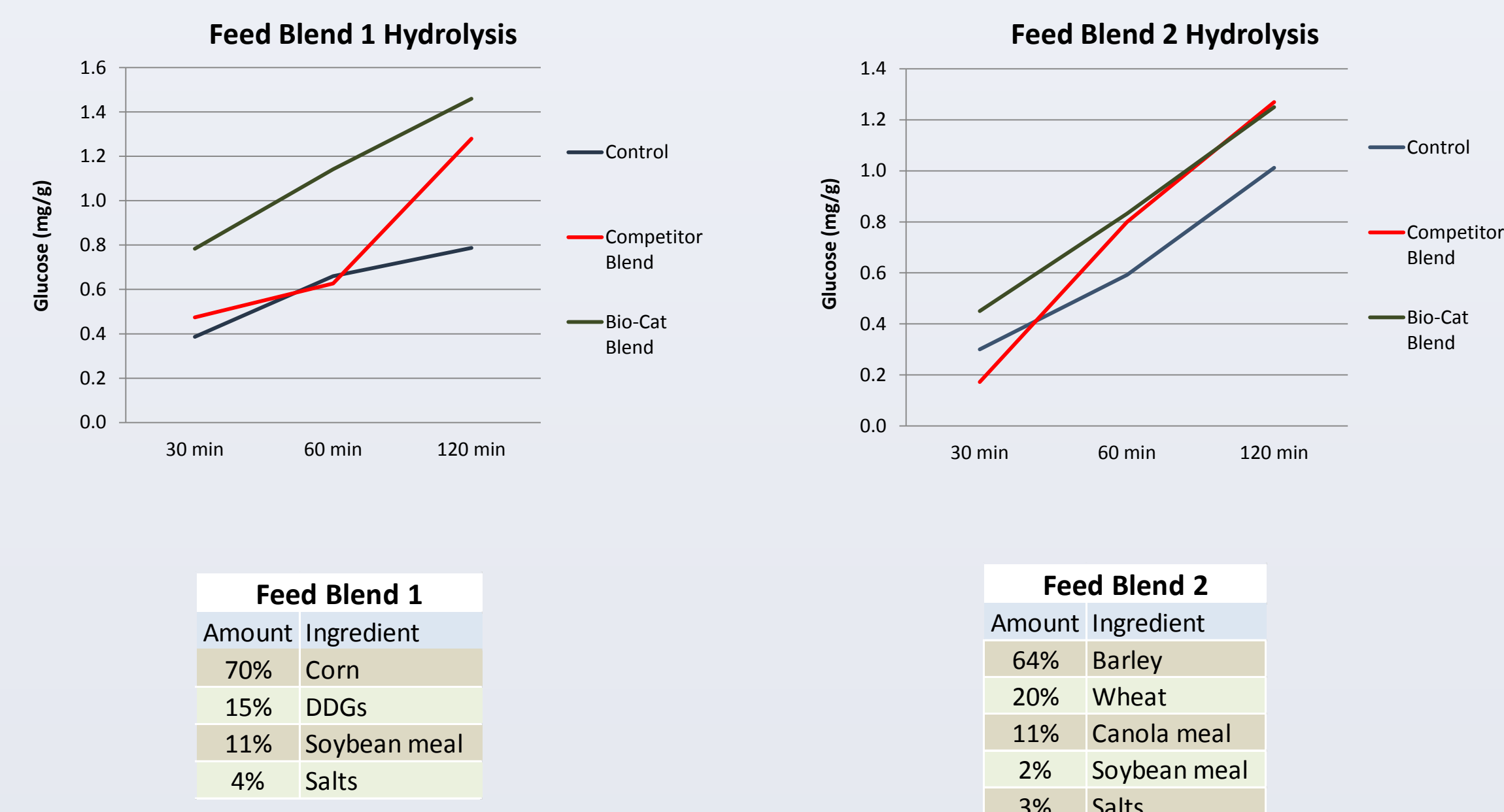
* No Data Available

METHODS & RESULTS

Livestock Feed Hydrolysis Work

Lab Scale Hydrolyses were performed in order to compare a Bio-Cat Enzyme Blend to a Competitor Enzyme Blend on two different feed blends at pH 4 and 37°C. Hydrolysis was assessed by release of Glucose.

Samples were run for Glucose by HPLC. This method uses a SUPELCOGEL C-610H, 30cm x 7.8mm column kept at 30°C and a flow rate of 0.5 mL/min of 0.1% Phosphoric Acid. The method is run on an Agilent 1100 Series HPLC system with refractive index detection. Standards and Samples were prepared in water.



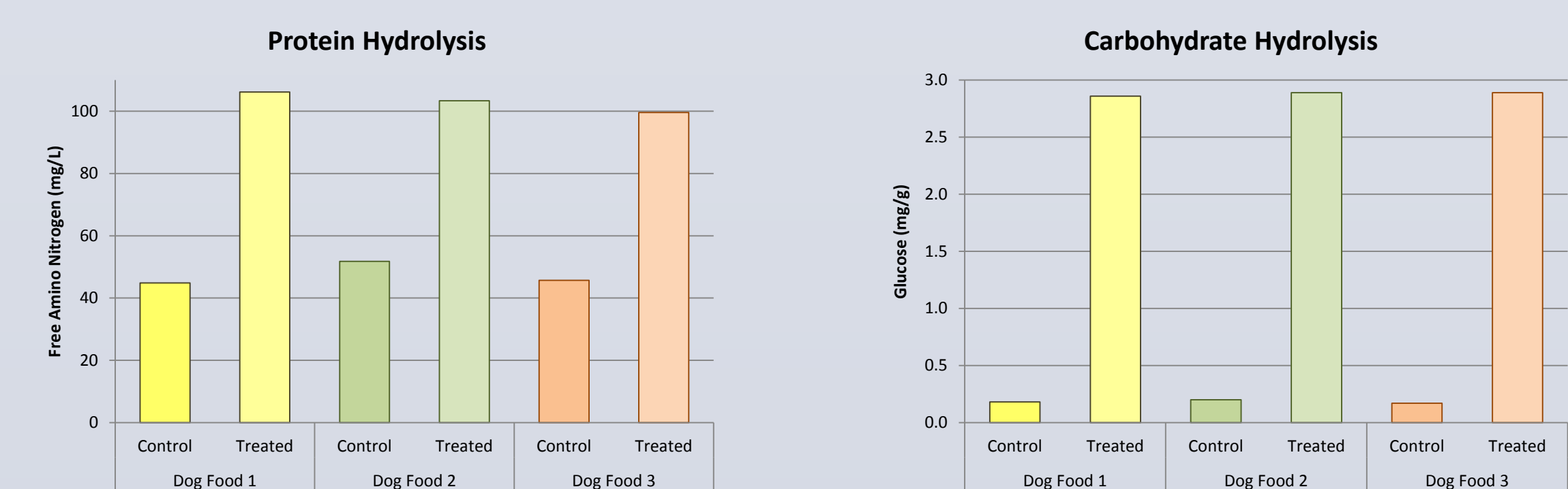
Dog Food Hydrolysis Work

In order to demonstrate the benefits of enzymes for dog nutrition, three inexpensive dog foods and three middle to high quality dog foods were hydrolyzed at pH 4 and 37°C using an enzyme blend containing protease, lipase, cellulase, amylase and alpha-galactosidase.

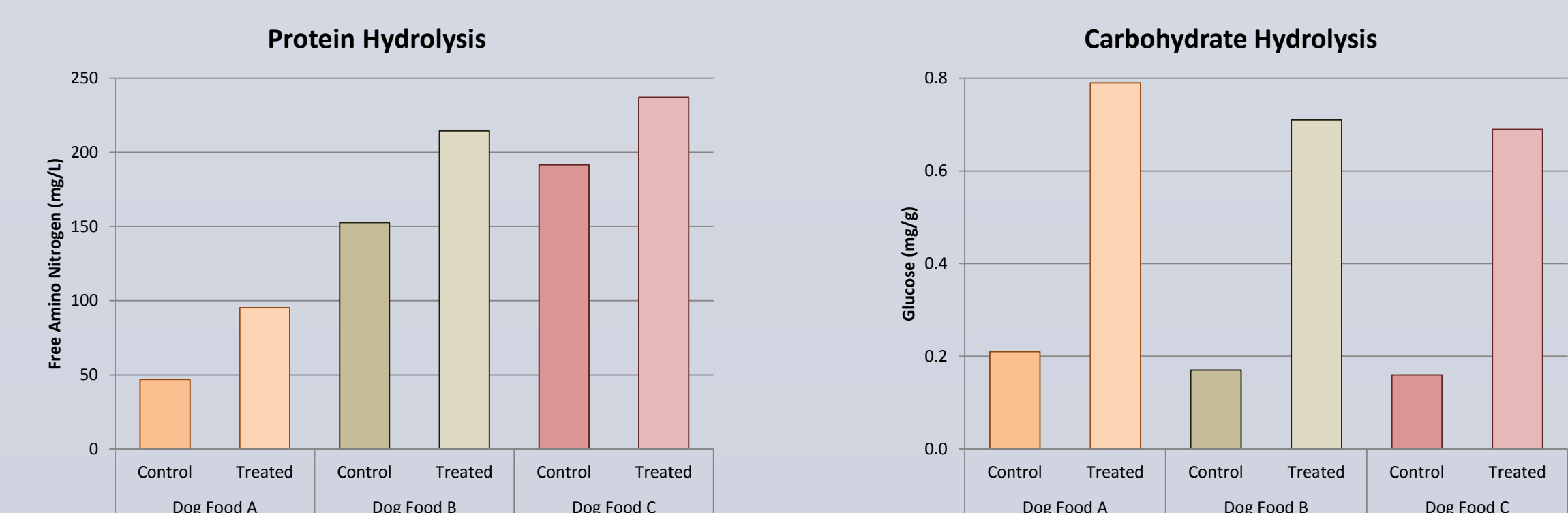
For Protein hydrolysis, samples were measured for Free Amino Nitrogen using the NOPA method. The amino nitrogen groups of free amino acids in the sample react with N-acetyl-L-cysteine and o-phthalaldehyde to form isoindole derivatives. The amount of isoindole derivative formed in the reaction is stoichiometric with the amount of free amino nitrogen. It is the isoindole derivative that is measured by the increase in absorbance at 335nm.

For Carbohydrate hydrolysis, samples were run for Glucose by HPLC. This method uses a SUPELCOGEL C-610H, 30cm x 7.8mm column kept at 30°C and a flow rate of 0.5 mL/min of 0.1% Phosphoric Acid. The method is run on an Agilent 1100 Series HPLC system with refractive index detection. Standards and Samples were prepared in water.

Dog Foods 1-3 are inexpensive foods with the primary ingredients listed as Corn, Wheat and Soybean Meal.



Dog Foods A-C are middle to high quality foods with Meat and bone meal, Lamb meal and Chicken by product meal listed as the first or second ingredient.



CONCLUSIONS & BIO-CAT PRODUCTS

Enzymes in the laboratory and in the field have proven to be successful tools which allow feed producers to extend the range of raw materials used in feed and to improve the efficiency of existing feeds.

The benefits of feed enzymes include:

- Reduced feed costs by the use of cheaper raw materials as well as by the ability to decrease the amount needed to achieve the same digestibility as seen with more expensive materials.
- Improved efficiency by breakdown of anti-nutrients allowing the animal to digest its feed more efficiently, leading to faster growth, and greater efficiency in the production of animal products such as meat and eggs.
- Better environment by reduction of the volume of manure produced and by lowering phosphorus and nitrogen excretion.
- Improved consistency by reduction of the nutritional variation in feed ingredients, resulting in more consistent feed for more uniform animal growth and production of animal products.
- Better health by improving nutrient digestibility which decreases the potential growth of more pathogenic bacteria that may be present in the digestive tract from proliferating.

BIO-CAT Animal Feed Enzyme Blends

- BIO-GEST™** is an enzyme dog food supplement formulated to help dogs reach and maintain optimum condition and peak performance.
- BIO-SWINE™** is an enzyme additive designed to increase the weight gain of pigs and reduce the incidence of disease. This enzyme blend also enables weaned piglets to switch from sow's milk to a weaned diet at an earlier age.
- CALFZYME PLUS™** is a mixture of various enzymes which is formulated to aid the calf by digesting the ingredients found in milk replacers. Although milk replacers are balanced to give enough nutrients to the young animal, the calf's digestive system does not easily adapt to the milk replacer and consequently the animal does not utilize the replacer to its maximum potential.
- POULTRYASE PLUS™** is an enzyme mixture designed to take into consideration the types of substrate contained in poultry feed.
- RUMINASE™** is an enzyme product designed to stimulate milk production in dairy cattle. This product assists the symbiotic micro flora normally present in the rumen which provides greater feed efficiency.
- EQUIGEST™** is a unique nutritional digestive aid specifically formulated to supplement and assist the normal enzyme action in the digestive tract of horses. This digestive aid is ideally suited to address issues a horse may encounter with changes in their diet or environment.

EQUIGEST™
A Healthy Habit
for Your Horse

EQUIGEST™ is a natural enzyme digestive aid, uniquely formulated to supplement and assist the normal enzyme activity in your horse's digestive tract.

EQUIGEST™ helps your horse reach and maintain optimum condition.

Daily use of EQUIGEST™ can:

- Improve digestive efficiency
- Increase and maintain vitality
- Improve skin, coat and hooves
- Promote healthy weight gain

BIO-CAT
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Find EQUIGEST™ in the Dover catalog under "Supplements"