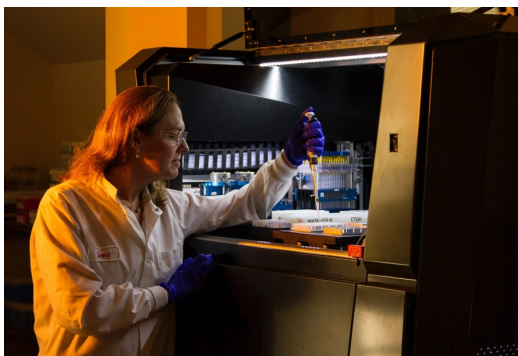
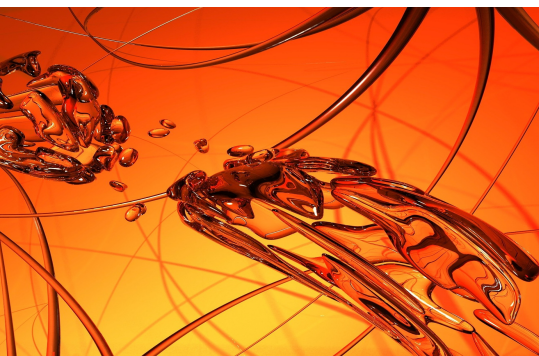


# EUROZYME MULTI



## MULTI-ENZYME FOR LIVESTOCK AND POULTRY

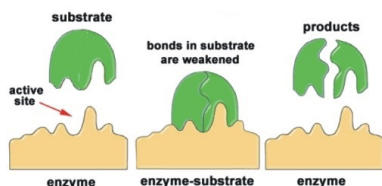


Hydrolyze NSPs, Protein and other Substrates in Animal Diets

# Eurozyme Multi

## The Need for Multi-enzyme Blends

All animals use enzymes to digest feed. These are either produced by the animal itself, or by the microbes naturally present in the gut. However, the animal's digestive process is not 100% efficient. Pigs and poultry cannot digest 15–25% of the feed they eat, because the feed ingredients contain indigestible anti-nutritional factors that interfere with the digestive process and/or the animal lacks specific enzymes that break down certain components in the feed.



### Xylanase

Xylanases (endo-1,4- $\beta$ -xylanase) cleave the xylan backbone randomly, resulting in non-substituted or branched xylooligosaccharides. It is an enzyme which degrades the linear polysaccharide beta-1,4-xylan into xylose, thus breaking down hemicellulose, one of the major components of plant cell walls. With regard to feed application, only a partial hydrolysis of xylan is needed for viscosity reduction and thus xylanase addition to feed is already highly effective.

### $\beta$ -Mannanase

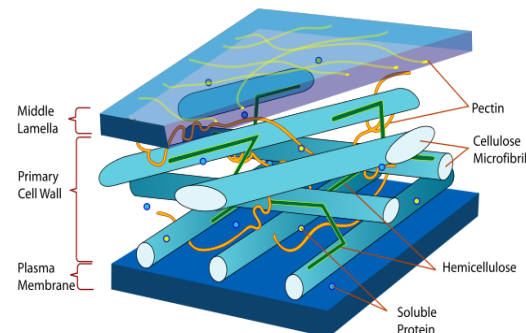
$\beta$ -Mannanase ( $\beta$ -mannosidase) is an enzyme with system name beta-D-mannoside manno-hydrolase. This enzyme catalyzes the hydrolysis of the terminal, non-reducing beta-D-mannose residues in beta-D-mannosides. Mannanase hydrolyses mannan which is an abundant hemicellulose, and the application of mannanase for catalyzing the random hydrolysis of beta-D-1,4 mannopyranoside linkages in beta-1,4 mannans.

### Arabinosidase

Alpha-L-arabinosidase is an enzyme that catalyzes the hydrolysis of terminal non-reducing a-L-arabinofuranoside residues in a-L-arabinosides. The enzyme acts on a-L-arabinofuranosides, a-L-arabinans containing (1,3) - and/or (1,5) linkages, arabinoxylans and arabinogalactans.

### Cellulase

Is an enzyme that catalyzes the hydrolysis of cellulose. Cellulose is an important structural component of the primary cell wall of plants. The enzyme breaks down cellulose to beta-glucose. Aside from ruminants, most animals do not produce cellulase in their bodies and can only partially break down cellulose through fermentation – limiting their ability to use energy if fibrous plant material. Enzymes that hydrolyze hemicellulose are usually referred to as hemicellulase and are usually classified under cellulase in general.



### Feruloyl esterase

Feruloyl esterase (aka Ferulic acid esterase) forms a part of the enzyme complex that acts collectively and synergistically to completely hydrolyze xylan to its monomers. It's synergistic interactions with xylanase and arabinosidase (an accessory enzyme) results to hydrolysis of xylan's sequence-structure.

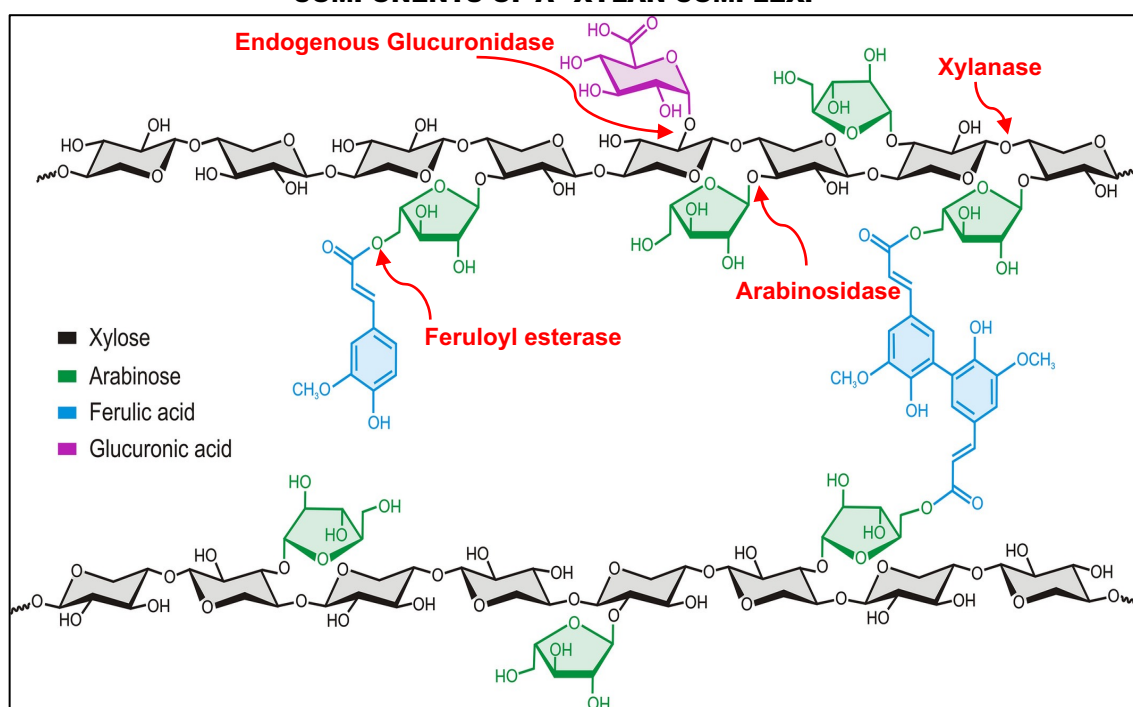
### Glucanase

Glucanase are enzymes that break down a glucan, a polysaccharide made of several glucose sub-units. As they perform hydrolysis of the glucosidic bond, they are hydrolases. A glucan molecule is a polysaccharide of D-glucose monomers, linked by glycosidic bonds. Glucans extracted from grains tend to be both soluble and insoluble.

### Pectinase

Pectinases are a group of enzymes that breaks down pectin, a polysaccharide found in plant cell walls, through hydrolysis, trans-elimination and de-esterification reactions. Pectin enzymes added to animal feed preparations can lead to significantly higher nutritional value from the feed. It increases bio-accessibility and improves digestion and nutrition in the animals.

## COMPONENTS OF A "XYLAN COMPLEX."



Xylanase, Arabinosidase, Feruloyl Esterase and endogenous Glucuronidase breaking down XYLAN COMPLEX.

## Protease

Protease is an enzyme that catalyzes the breakdown of protein into smaller polypeptides or individual amino acids. It is involved in a many physiological reactions in side the body ranging from simple digestion of food proteins, blood-clotting cascade and the complement system. Proteases can either break specific peptide bonds (limited proteolysis), depending on the amino acid sequence of a protein, or break down a complete peptide to amino acids (unlimited proteolysis).

## Amylase

Amylase is an enzyme that catalyzes the hydrolysis of starch into sugars. It is produced by the salivary glands and pancreas of animals to hydrolyze dietary starch into disaccharides and trisaccharides which are converted by other enzymes to glucose. Alpha-amylase is a calcium metalloenzyme that acts at random locations along the starch chain.

Alpha amylase can act anywhere in the substrate and is faster acting than  $\beta$ -amylase. It breaks down long-chain saccharides yielding either malto-triose or maltose from amylose, or maltose, glucose and limit dextrin from amylopectin.

Cereal	Xylan	$\beta$ -Mannan	Cellulose	$\beta$ -Glucan	Pectin
Corn	4.40%	0.60%	1.80%	0.10%	0.10%
Soybean Meal	6.00%	2.00%	10.30%	1.40%	9.50%
Wheat	8.00%	0.70%	2.60%	0.70%	0.20%

Percentage of NSPs in some Major Macro-Ingredients

## Standard Matrix Values

NUTRIENT	PIGS (500 g/ton)	LAYERS (400g/ton)	BROILERS/DUCKS (500 g/ton)
ME (kcal/kg)	90 $\downarrow$	90 $\downarrow$	95 $\downarrow$
Crude Protein %	0.35 $\downarrow$	0.30 $\downarrow$	0.35 $\downarrow$
Lysine %	0.018 $\downarrow$	0.018 $\downarrow$	0.018 $\downarrow$
Methionine %	0.010 $\downarrow$	0.010 $\downarrow$	0.011 $\downarrow$
Cysteine %	0.011 $\downarrow$	0.010 $\downarrow$	0.011 $\downarrow$
Threonine %	0.018 $\downarrow$	0.018 $\downarrow$	0.018 $\downarrow$
Tryptophan %	0.008 $\downarrow$	0.008 $\downarrow$	0.008 $\downarrow$
Isoleucine %	0.012 $\downarrow$	0.012 $\downarrow$	0.013 $\downarrow$
Arginine %	0.022 $\downarrow$	0.020 $\downarrow$	0.022 $\downarrow$
Valine %	0.020 $\downarrow$	0.020 $\downarrow$	0.022 $\downarrow$

## Prebiotics

(by-products of NSP break down by Eurozyme Multi)

The break down of xylan yields Xycloooligosaccharides such as Xylobiose and Xylotriose. They are potent prebiotics which selectively enhance the multiplication and growth of beneficial bacteria such as Lactobacillus and Bifidobacterium in the host animals. These beneficial bacteria out-compete and suppressed the proliferation of Gram-negative bacteria such as E. coli and Salmonella.

Increase in number of beneficial bacteria leads to increase in production of lactic acid and synthesis of amino-acids and vitamins which improves productivity in animals such as better: ADG, FCR, laying performance, growth performance and increase resistance to GIT infections in livestock and poultry.



## Residual Activity after Pelleting



Note: Conditioning temperature 75-85°C, conditioning time 15-30s  
Steam pressure 0.24-0.40MPa, Compression Ratio 1:8.

## Components of Eurozyme Multi per kg

endo-1,4- $\beta$ -xylanase	25,000,000 units
$\beta$ -D-1,4-mannanase	2,500,000 units
cellulase	750,000 units
$\beta$ -glucanase	3,000,000 units
$\alpha$ -amylase	250,000 units
alkaline protease	15,000,000 units
$\alpha$ -L-arabinosidase	500,000 units
feruloyls esterase	100,000 units
pectinase	500,000 units
Dosage Broilers, Ducks and Pigs .....	250-500 grams per ton
Dosage Layers .....	200-400 grams per ton

