ADVANCED Naturals

PRODUCT MONOGRAPH

YeastZYME

Product composition
Medicinal Ingredients:
Each capsule contains:

Proprietary Blend	630 mg
Containing Plant enzyme blend:	
Protease (Aspergillus oryzae)	100000 HUT
Lipase (Rhizopus oryzae)	500 LU
Cellulase (Trichoderma reesei)	37500 CU
Glucoamylase (Aspergillus niger)	50 AG
Amylase (Aspergillus oryzae)	6000 DU
Lactase (Aspergillus oryzae)	250 ALU
Invertase (Saccharomyces cervesiae)	350 SU
Malt Diastase (Hordeum vulgare)	125 DP
Hemicellulase (Aspergillus niger)	15000 HCU
Lysozyme (Gallus domesticus)	7500 MCG

Non-medicinal ingredients: Hydroxypropyl Methylcellulose, water

Recommended dose: Adults: Take 3 capsules daily before bed at least 3 hours after meals.

Duration of use: For prolonged use please consult a health care practitioner.

Indication:
• Digestive aid.
• This product will aid in digestion.

Contraindications: Do not use if you have a peptic ulcer. Do not use if pregnant, breastfeeding or after recent surgery.

Warnings: Keep out of reach of children.
Consult a health care practitioner prior to use if you are taking blood thinners, or if constipation persists after one week of use.

Precautions: Not to be used by children.

Adverse Effects: Discontinue use if abdominal pain, nausea or vomiting occurs, unless otherwise directed by a health care practitioner.

Overdose: For management of suspected product overdose it is recommended to contact your physician.

Symptoms of Overdose: Has not been investigated nor any reports have been filed.

Supporting Research and Traditional Evidence

Protease (*Aspergillus oryzae*) (100000 HUT)
The function of the gastrointestinal tract is to secrete digestive enzymes to promote the breakdown of food stuffs and facilitate the absorption of nutrients in the upper digestive tract. One type of digestive enzyme, protease, facilitates the breakdown of proteins. There are 6 types of proteases, aspartic, cysteine, glutamic, metallo, serine, and threonine, all which contribute to protein catabolism (Shen and Chou, 2009). Following catabolism, absorption occurs in 3 locations: the intestinal lumen, the brush border and/or the cytoplasm of the mucosa cells. Approximately 50% of digested protein comes from diet (Ganong, 2009). Clinical evidence suggests that a combination enzyme therapy improved digestion and nutrient absorption in patients suffering from chronic pancreatitis. In a parallel-armed, randomized, placebo-controlled study, a supplement containing lipase, protease and amylase was administered with meals for 14 days. Only patients demonstrating pancreatic insufficiency, as determined by a fat excretion amount of less than 10 g/day, were included in the trial. Treatment with the enzyme mixture was associated with increased nutrient absorption when compared with placebo control (O'Keefe *et al.* 2001). Overall, scientific evidence suggests that proteases, as part of a combination enzyme supplement, may enhance digestion and nutrient absorption.

Lipase (*Rhizopus oryzae*) (500 LU)
In the digestive tract, lipase is essential for the breakdown and absorption of fatty acids and triglycerides. *In vivo* studies have been conducted to assess the effects of enzyme supplementation on nutrient absorption rates in broiler chickens. A combination enzyme supplement containing xylanase, amylase and protease was fed to the chickens daily for 3 weeks. Body weights and fecal nutrient levels were recorded weekly. The results indicate that enzymes as a dietary supplement improved nutrient absorption (Cowieson and Ravindran, 2008). Furthermore, clinical evidence suggests that lipase improves the digestive absorption rate in humans. In a double-blind, randomized, crossover pilot study, healthy participants were given 3 capsules containing pancrelipase, or sucrose as a control, and then fed a fatty meal. The researchers recorded the amount of gastrointestinal discomfort associated with the high fat meal, in the form of abdominal symptom scores and methane production. Treatment with digestive enzymes was associated with a significant reduction of abdominal symptoms which suggests that treatment with enzymes improved digestion and absorption of the fatty acids (Suarez *et al.* 1999). A second single-blind analysis was performed to evaluate the use of lipases to increase digestion and absorption of fatty acids. Patients suffering from pancreatic insufficiency were treated with a supplement of lipase, or placebo, and digestive parameters were assessed for an average of 54 weeks. The results of the study suggest that treatment with digestive enzymes, such as lipase, improves the absorption of fatty acids (Valerio et al. 1981). Scientific evidence has suggested lipase is effective in improving fat absorption.

Cellulase (*Trichoderma reesei*) (37500 CU)
Cellulase is a plant-derived enzyme involved in the catabolism of cellulose. Cellulose is a key component in plant physiology. The fibrous compound gives structural stability to plant cellular walls. Consequently, cellulase is endogenous to plant cells only. Ingestion of cellulose results in increased gastric motility since there is no natural mechanism for the digestion of fibre within the human digestive tract (Campbell, 1996). Supplementation with dietary cellulase would promote the digestion of foods high in cellulose yielding glucose monomers upon complete breakdown of the polymer. Glucose, in its monomeric form, readily undergoes absorption into the gastric mucosal cell. Subsequently, the simple sugar can diffuse through the cytoplasm be transported across the baso-lateral membrane into the blood stream (Ganong, 2009). Therefore, supplementation with a daily supplement of cellulase may help to increase digestion of usually indigestible foods, such as cellulase, and facilitate glucose absorption.

Glucoamylase (*Aspergillus niger*) (50 AG)
Glucoamylase is also known as γ-amylase and is present in the brush border of the human gastric mucosa. Physiologically, this enzyme is important for the digestion of glucose chains of intermediate lengths (Lee *et al.* 2004). Structurally, starches are branched or unbranched glucose polymers and digestion of these starches yields glucose monomers. A clinical trial was conducted to assess glucoamylase activity in 214 children. Initially, small bowel biopsies were taken and enzyme activities were measured. Severe inflammation of the gastric mucosa was associated with a glucoamylase deficiency (Lee *et al.* 2004). Furthermore, a decrease in amylase activity would result in a decrease in starch degradation and consequently, glucose absorption. A similar multi-centred study was performed in 511 children suffering from chronic diarrhea. Biopsies and stool samples were collected from the subjects and analyzed for glucoamylase activity. The results suggest that low levels of glucoamylase were associated with severe small intestinal mucosal injury in 9 children. Overall, the study suggests that chronic diarrhea was associated with glucoamylase deficiency (Lebenthal *et al.* 1993). Furthermore, this evidence suggests that daily supplementation with glucoamylase may increase the digestion of glucose-containing starches potentially increasing nutrient absorption.

Amylase (*Aspergillus oryzae*) (6000 DU)
Amylase is an enzyme which facilitates the breakdown of complex carbohydrates into maltose and maltriose (Whitcomb and Lowe, 2007; Ganong, 2009). There are various forms of amylase, including α-amylase, β-amylase and γ-amylase. α-amylase is present in the saliva as the first mechanism of carbohydrate catabolism. α-amylase can also be secreted by other organs, such as the pancreas (Whitcomb and Lowe, 2007). A small-scale study by Layer *et al.* (1986) used an amylase inhibitor to assess the effects of digestive enzyme inhibition on gastric motility. Fasting participants were given 50 g of rice starch with either an α-amylase inhibitor or placebo. The results suggest that amylase inhibition reduced starch digestion and consequently nutrient absorption in the small intestine. Furthermore, in a randomized, placebo-controlled study, a supplement containing lipase, protease and amylase was administered with meals for 14 days. Only patients demonstrating pancreatic insufficiency, as determined by a fat excretion amount of less than 10 g/day, were included in the trial. The results of the study suggest that treatment with the enzyme mixture was associated with increased nutrient absorption when compared with placebo control (O'Keefe *et al.* 2001). Clinical evidence suggests that amylase aids digestion by degrading starch which may potentially facilitate nutrient absorption within the intestine.

Lactase (*Aspergillus oryzae*) (250 ALU)
Lactase, a β-galactosidase, is responsible for the hydrolysis of lactose into its monomers, galactose and glucose (Ganong, 2009). Lactase is present in the brush border of the upper intestine and indirectly plays a role in the absorption of simple sugars. Inactivity of the enzyme is common in

society, a condition generally known as lactose intolerance (as reviewed by Lomer *et al.* 2007). Associated with lactose intolerance is gastrointestinal discomfort which occurs when lactose is not degraded in the intestine. Typical side effects include abdominal pain, bloating, flatus, diarrhea, nausea and vomiting (Lomer *et al.* 2007). Since lactase is an enzyme involved in the digestion of milk sugar, supplementation with the enzyme may increase the digestion of lactose which could potentially increase nutrient absorption in the intestine.

Invertase (*Saccharomyces cervesiae*) (350 SU)
Physiologically, invertase (also known as sucrase) is found in the brush border of the small intestine and facilitates the breakdown of sucrose into glucose and fructose (Ganong, 2009). Sucrose is commonly known as table sugar and is ingested in our daily diets in desserts and sweets. In the intestinal lumen, both glucose and fructose can be transported across the apical cell membrane. Fructose readily passes across the cellular plasma membrane, whereas glucose typically undergoes active diffusion to be absorbed (Gray, 1971). Increased digestion of the sugar would result in increased nutrient absorption within the small intestine. In a double-blind placebo-controlled clinical trial, a yeast-derived sucrase enzyme was administrated to patients suffering from sucrase-isomaltase deficiency and the prevalence of digestive disturbances was evaluated. Patients received enzyme replacement therapy at various doses in addition to ingesting sucrose in their daily diets. The findings of the study suggest that supplementation with yeast-derived sucrase replacement therapy improved sucrose digestion as indicated by the reduction of gastrointestinal disturbances (Treem *et al.* 1993). Clinical evidence suggests that daily supplementation with sucrase may help digestion and potentially contribute to the increased absorption of glucose and fructose within the intestine.

Malt Diastase (*Hordeum vulgare*) (125 DP)
Complex carbohydrates, such as starches are not readily absorbed in their parent structure. They require digestive enzymes to provide nutritional value following ingestion. Physiologically, diastase is important for digestion of starches in the upper intestinal lumen (Ganong, 2009). Currently, the term diastase means an enzyme mixture consisting of α-amylase, β-amylase and/or γ-amylase which function as hydrolases to mediate the breakdown of starches (Gibbons, 1979). Classically, diastase was isolated from barley and considered to be one of the first discovered enzymes, and a first step towards the development of modern enzyme kinetics (Schultz, 1994). The breakdown of starch yields disaccharides or trisaccharides which may be transported into the intestinal mucosa cells and across the baso-lateral membrane to be absorbed into the bloodstream. In the human digestive tract, there are various enzymes which work in harmony to catabolise macromolecules and facilitate the absorption of nutrients (Ganong, 2009). Diastase one of these enzyme which when taken as a daily supplement may aid digestion to enhance nutrient absorption.

Hemicellulase (*Aspergillus niger*) (15000 HCU)
Hemicellulose is a polymer present in the cell wall of plants and is present in many of the plant materials used for human consumption. Unfortunately, the human digestive system does not synthesize cellulases. Hemicellulase is a type of cellulase which catalyzes the breakdown of hemicellulose. Supplementation with cellulase would allow for the digestion of foods high in cellulose, a type of fibre which when ingested, promotes a laxative effect by increasing gastric motility in the colon (Campbell, 1996). Animal studies have been conducted to assess the effects on combination enzyme treatment on nutrient absorption in chickens. Chickens were supplemented with 0.33, 2, and 2 IU of cellulase, hemicellulase and pectinase, respectively. Results indicate that supplementation with combination enzyme treatment increased both digestion and nutrient absorption (Tahir *et al.* 2008). Moveover, the breakdown of fibres improves their ability to be absorbed into by the body such that daily supplementation with cellulose may help with digestion of foods high in fibre potentially increasing the absorption of nutrients.

Lysozyme (Gallus domesticus) (7500 MCG)
Lysozyme is a digestive enzyme involved in the process of cleaving N-acetylmuramic acid -N-acetylglucosamine linkages found in bacterial peptidoglycan (Jolles and Jolles, 1984; Phillips, 1966). Peptidoglycan is a major component of the bacterial cell wall in gram-positive bacteria. Various gram-positive bacterial types, such as Clostridium botulinim, C. difficile and Listeria monocytogenes, have been implicated in gastrointestinal disturbances (CDC, 2010). Scientific evidence has suggested that irritable bowel syndrome is associated with imbalances in the gut microflora (Subramanian *et al.* 2006). Studies have assessed the effects of gram-positive bacteria in irritable bowel syndrome. A recent review by Mhyre *et al.* (2006) discussed the role of peptidoglycan in Chron's disease and recent evidence suggests that infection with C. difficile is linked to colitis (Butala and Divina, 2010). Moveover, peptidoglycan is an essential component to the bacterial cell wall due to its involvement in the regulation of cell size and stability (Koch, 2003). Without intact peptidoglycan, the gram-positive bacteria would be more susceptible to the osmotic and immune threats present in the human gastrointestinal tract. Therefore, supplementation with an enzyme mixture containing the peptidoglycan-degrading lysozyme would act as a defence against harmful bacterial species and promote gastrointestinal health.

Ingredient Summary:

Protease (Aspergillus oryzae) (100000 HUT)
- Helps with the digestion of proteins

Lipase (Rhizopus oryzae) (500 LU)
- Helps with the digestion of fats

Cellulase (Trichoderma reesei) (37500 CU)
- Helps with the digestion of fibre

Glucoamylase (Aspergillus niger) (50 AG)
- Helps with the digestion of starch

Amylase (Aspergillus oryzae) (6000 DU)
- Helps with the digestion of starch

Lactase (Aspergillus oryzae) (250 ALU)
- Helps with the digestion of lactose

Invertase (Saccharomyces cervesiae) (350 SU)
- Helps with the digestion of table sugar

Malt Diastase (Hordeum vulgare) (125 DP)
- Helps with the digestion of starch

Hemicellulase (Aspergillus niger) (15000 HCU)
- Helps with the digestion of fibre

Lysozyme (Gallus domesticus) (7500 MCG)
- Helps with the degradation of bacterial peptidoglycan and may contribute to gastrointestinal health

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