NC Digestive Enzymes Blend

Minimum Recommended Dosage: 500mg per serving
Serving suggestion: 5 mins before meal or right after meal.

Ingredients List

NEC Custom Blend	500 mg
Amylase	15000 DU
Glucoamylase	20 AGU
Lipase	800 FIP
Pectinase	20 endo-PGU
Cellulase	1000 CU
Protease 4.5	10000 HUT
Bromelain	300000 FCCPU
Alpha-galactosidase	140 GalU
Hemicellulase	1000 HCU
Beta-glucanase	25 BGU
Phytase	10 FTU
Xylanase	875 XU
Invertase	400 SU

This formulation was designed specifically to support digestion in people who obtain many of their nutrients through vegetarian sources. It contains a proprietary blend of proteolytic, lipolytic, and carbohydrolytic enzymes specifically designed to aid the digestion of these meals. Whole plant foods can create a unique problem for the human digestive system. This is because many of the structural components of plant cells are poorly digested by human enzymes or require digestive enzymes that humans do not produce. Due to this, the supplementation of select carbohydrases, proteases and lipases may be needed to digest these structures and release the trapped nutrients and bioactive ingredients found in whole plant foods. The cell walls of plants are composed of non-starch polysaccharides (NSPs) which are organized in complex matrices that can trap macronutrients, micronutrients, and bioactive compounds. These NSP matrices account for the fibrous nature of plant foods and are composed of cellulose, hemicellulose, xylans, pectins, and phytates along with miscellaneous other NSPs. Because humans lack the enzymes required to digest these NSP matrices, the essential micronutrients, macronutrients, and bioactive compounds found in plant based foods tend to be poorly absorbed and utilized by the average individual. Numerous studies have shown that the dietary addition of enzymes capable of digesting NSPs can increase the availability of essential plant nutrients.

Enzymes – A Historical Perspective

While the recognized use of enzymes as dietary supplements and therapeutic agents has only developed within the last century, humans have been benefiting from their presence in food since the dawn of mankind. Consumption of raw foods and traditional food processing practices, including aging of food and fermenting food, take advantage of dietary sources of enzymes. However, many modern food processing practices actually deplete our food's supply of enzymes. Uniquely modern ailments that have developed since the onset of modern food processing techniques have lead to research into the benefits of dietary enzymes.

All raw food contains the enzymes needed to eventually "digest" itself through decay. The native enzymes found in raw foods actually act synergistically with human endogenous enzymes to help digest our foods, reducing the enzymatic burden of digestion on the body. Early human diets were rich in raw food sources allowing early man to benefit from this synergism. As civilization advanced, cooking and processing of foods became more prevalent. Though humans did not understand the basic mechanisms of enzymatic predigestion in raw foods, they started taking advantage of this fact early on, by allowing foods to age. During the aging process of foods, native enzymes begin the digestive process, making foods more tender, flavorful, and nutritious. A natural adjunct to the aging process was fermentation of foods. The act of fermentation subjects the food to the enzymatic actions of microbes, essentially predigesting the food. For centuries, foods have been fermented with bacteria and fungi to produce nutritious and tasty foods, such as tofu, cheeses, tempe, yogurt, and alcoholic beverages.

In the late Nineteenth Century, large scale canning and heat processing techniques rapidly replaced traditional food preparation/preservation techniques in the Western world. The temperatures used in large scale food processing are specifically designed to destroy enzymatic activity and delay the predigestion (decay) of foods. As a result, processed foods completely lack native enzyme activity, which some feel places the burden of digestion completely on the human body. Some researchers have theorized that the added digestive burden may lead to a variety of diseases and disorders, though this theory has yet to be proven conclusively.

In recent decades, the biological effects of modern food processing have been compounded by a modern lifestyle. Our modern fast paced high stress lifestyles tend to lead to improper digestion. Stress and anxiety trigger hormone releases that interfere with smooth muscle contraction and enzyme secretion, leading to indigestion. This is further compounded by the tendency to eat on the run and to overeat. Because hurried eating results in partially chewed foods being dumped into the digestive tract, the tendency to eat on the run results in food not being properly mixed with salivary enzymes and to be in such large pieces that digestive enzymes can not adequately act on the food. Overeating causes more nutrients to be consumed than what the average human digestive system can handle. These issues can combine to overwhelm the body’s ability to completely digest consumed meals, which can lead to digestive discomfort, constipation, and suboptimal nutrient uptake.

Age Related Digestive Insufficiency
A person's ability to properly digest and absorb their food decreases with age. This reduction in digestive capacity is likely related to the fact that pancreatic digestive enzyme production decreases linearly after the second decade of age, at a rate of nearly 10% per decade. As a result, the ability to digest/absorb fats and proteins can become greatly impaired. This impairment can lead to a host of gastrointestinal symptoms and health consequences, including anorexia, abdominal discomfort, flatulence, constipation, reflux disorders, ulcers and diarrhea. Some studies tested the effectiveness of oral enzyme supplementation on the above stated symptoms. In these studies, the gastrointestinal symptoms of study participants improved significantly. While these conditions are in themselves a concern for seniors, malnutrition caused by such enzyme deficiencies can significantly reduce the quality and quantity of life in the aging population. Protein utilization of the elderly is of particular concern, because such deficiency can lead to reductions in immunity and muscle atrophy. Enzyme supplementation significantly improves protein utilization among the elderly. These ingredients and their specific functions are outlined below.

Proteolytic Enzymes
Protease 4.5 is a mixture of acid, neutral, and alkaline proteases that demonstrate both exo-peptidase and endo-peptidase activity with high substrate specificity. Protease 4.5 has an effective pH range of 2.75 to 6.25. For this reason, protease 4.5 works synergistically with endogenous enzymes to provide protein digestion in the stomach and superior duodenal region of the small intestine.

Bromelain contains several proteolytic enzymes, which differ in their specificity and optimum environments. Bromelain has an effective pH range of 4.0 to 9.0 and works synergistically with endogenous enzymes to provide protein digestion throughout the entire digestive tract.

The proteolytic enzymes in this formula are used to help digest protein to produce amino acids, which are important building blocks in the human body. The amino acids are used to build muscles, metabolic enzymes, neurotransmitters, and many other essential biochemicals. Proteolytic enzyme supplementation can be essential to maintaining lean muscle tissue while on any type of diet, and allows you to get the maximum nutrition from the protein consumed in a typical diet.

Lipolytic Enzyme
Lipase catalyzes the hydrolysis of triglycerides of simple fatty acid esters, yielding mono- and diglycerides, glycerol and free fatty acids. It has broad substrate specificity on the fats and oils of vegetable and animal origins. Lipase works synergistically with endogenous enzymes to help digest fatty foods.

Supplementing with Lipase can help the body to properly digest the excessive fat being eaten in today's typical high fat, high carbohydrate diet. Considerable digestive distress and even malabsorption of nutrients such as vitamins A and E can result from improper fat digestion.

Carbohyrdolytic Enzymes

Amylase will randomly hydrolyze the interior alpha-1,4-glucosidic bonds of starch to release simple sugars for digestion. This enzyme works synergistically with endogenous human amylase to digest starchy foods.

Glucoamylase will hydrolyze terminal 1,4-linked alpha-D-glucose residues successively from nonreducing ends of amylose chains to release free glucose. This enzyme also possesses the ability to hydrolyze alpha-1,6-glucosidic linkages in isomaltose and dextrins. This enzyme works synergistically with endogenous human amylase and supplemental amylase to potentiate the complete digestion of carbohydrate rich foods.

alpha-galactosidase is characterized by its ability to hydrolyze the alpha-1-6 linkages in melibiose, raffinose, and stachyose. These are indigestible sugars containing alpha-galactosyl groups, and commonly occur in vegetables, especially in members of the legume and cruciferous families.

Invertase is characterized by its ability to catalyze the inversion of sucrose solution. This enzyme catalyzes the hydrolysis of sucrose into its component parts D-fructose and D-glucose. This action helps in the digestion of refined sugars that are common in modern diets.

Cellulase hydrolyzes the beta-D-1,4-glucosidic bonds of cellulose (an indigestible structural carbohydrate of plant cell walls), its oligomers and derivatives. This enzyme is a complex composed of three distinct enzymes to convert cellulose to glucose. Since humans lack the endogenous enzymes required to digest cellulose, the supplementation of cellulase provides humans with an additional source of nutrition and reduces the bulking effect of fibrous foods.

Pectinase is a mixture of pectin methylesterase, which demethylates pectin (an indigestible structural carbohydrate of plant cell walls), and polygalacturonase which hydrolyzes b-D-1, 4-galacturonide. Since humans lack endogenous pectinase, the supplementation of pectinase provides humans with an additional source of nutrition and reduces the bulking effect of fibrous foods.

Hemicellulase is a mixture of enzymes including polygalacturonate hydrolase, arabinosidase, mannosidase, mannanase, and xylanase. Mannose, arabinose, and xylans are indigestible components of plant fibers. Since humans lack the endogenous enzymes required to digest these components, the supplementation of hemicellulase provides humans with an additional source of nutrition and reduces the bulking effect of fibrous foods.

Beta-glucanase acts to hydrolyze beta-glucans, which are plant polysaccharides which are common in many vegetables, grains and herbal ingredients. Beta-glucans can act as anti-nutritive factors. Betaglucanase may be a useful supplement for digestive support and general nutritional support.

Xylanase catalyzes the hydrolysis of 1,4b-D-xylosidic linkages in xylans (indigestible structural carbohydrates in plant cell walls) to produce D-xylose. Since humans lack endogenous xylanase, the supplementation of xylanase provides humans with an additional source of nutrition and reduces the bulking effect of fibrous foods.

Phytase catalyzes the hydrolysis of phytic acid into its component parts, releasing inositol and orthophosphate. Phytic acid is known as an antinutrient because it tends to bind important minerals. Since humans lack endogenous phytase, the supplementation of phytase releases important mineral nutrients that would otherwise be lost.

This combination of carbohydrases is designed as a comprehensive approach to carbohydrate digestion, which allows for a more complete digestion of the carbohydrates consumed. This enables a person to properly digest and receive the maximum amount of nutrients available from their carbohydrate intake.