



NUTRITIONAL ENZYMES

Answers to common
questions about enzymes from
the company founded by
Dr. Edward Howell.

.....In the 1920's, while working with Dr. Henry Lindlahr, Dr. Edward Howell observed that Lindlahr's fasting and raw diet therapy had a healing and health-potentiating effect by significantly decreasing the demand for digestive enzyme secretions by the body. As a result, the metabolic enzymes of the immune system were able to increase their detoxifying activity. Further research indicated to Howell that the enzymes present in raw food contribute to improved health by reducing the body's digestive burden. Recognizing that the typical diet consists of considerably more enzyme-deficient cooked food than enzyme-rich raw food, Dr. Howell founded National Enzyme Company in 1932 to develop nutritional enzyme supplements designed to replace the enzymes lost in the cooking and processing of food.

Coincidentally, also in 1932, Dr. Francis Pottenger began a ten year study that showed cats fed raw food diets maintained health and vigor whereas, cats consuming cooked diets exhibited evidence of degenerative disease. Pottenger's data supported Howell's theories that raw food contains a vital factor no longer present in cooked food...ENZYMES!

What are enzymes?

.....Enzymes are energized protein molecules necessary for life. They catalyze and regulate nearly all biochemical reactions that occur within the human body. There are three primary groups of enzymes: metabolic enzymes, digestive enzymes and food enzymes. Metabolic enzymes are those enzymes that catalyze various chemical reactions within the cells such as detoxification and energy production. Digestive enzymes are secreted along the gastrointestinal tract to break down food so the nutrients can be absorbed into the bloodstream. Human digestive enzymes include protease, amylase, lipase, pepsin, ptyalin and trypsin. Food enzymes are naturally present in all raw foods, providing an exogenous source of digestive enzymes when consumed. Raw foods contain protease, amylase, lipase and cellulase to aid in the breakdown of that foods protein, carbohydrates, fat and fiber, respectively. Dr. Howell observed a direct relationship between caloric content and food enzyme content stating "foods having a higher caloric content are richer in food enzymes."

How do food enzymes function in human digestion?

.....Naturally-occurring enzymes in raw food are activated by the moisture and heat introduced during mastication. Once active, these enzymes begin the process of pre-digestion as the food moves to the stomach. Pre-digestion continues in the fundus or upper portion of the stomach, sometimes as long as an hour before the food is mixed with gastric secretions and the enzymes are inactivated. Howell referred to this chronological compartmentalization as the "Food Enzyme Stomach". In the alkaline environment of the small intestine, the food enzymes return to their active state, contributing to the completion of the digestive process. When enzyme-deficient cooked food is consumed, the entire burden of digestion is placed upon the body's digestive system.

Can the importance of pre-digestion be substantiated?

.....Research shows that nearly all creatures including rodents, whales, canines and birds have distinct organs that allow the exogenous enzymes of food time to act, before initiating the body's own digestive process. For example, seeds and grains lie in a birds crop for eight to twelve hours, during which proteolytic and amylolytic enzymes in the seed begin hydrolyzing proteins and starch. The food enzyme stomach concept in humans is supported by research on the extended activity of salivary amylase. The amylolytic activity of ptyalin alone can digest as much as 45% of the starch in a meal, before gastric secretions inhibit its action. Further studies in the 1940's showed that as much as 60% starch, 30% protein and 10% fat were digested before pepsin was activated.

Do enzymes survive the acidity of the stomach?

.....Research in the 1930's clearly demonstrated that enzymes in both bananas and carrots are reactivated in the secretions of the intestine. More recently, a study in the 1980's demonstrated that enteric-coated pancreatic enzyme preparations were no more effective than non-coated forms, indicating survival of the enzymes through the low pH of the stomach. Indeed, many studies support the gastric survival of enzymes and consequent intestinal absorption of intact active enzymes.

Is there evidence that food enzymes are beneficial to health?

.....It has long been known that wild animals and primitive tribes seldom suffer from degenerative disease. Research as early as the 1920's clearly demonstrated that a captive animal health declined, exhibiting a wide array of pathological conditions when their native raw foods were replaced with a cooked food diet. Similarly, primitive isolated Eskimos consume a diet consisting of primarily raw fish and whale blubber. Yet, despite consuming such large amounts of fat, these Eskimos have almost no incidence of atherosclerosis or other fat-dependent pathologies. However when a cooked diet was adopted by Eskimo tribes, disease soon followed. Clearly, humans and other mammals suffer when food enzymes are lost in cooking and processing.

Why are food enzymes missing in cooked and processed foods?

.....Modern food processing techniques and all types of cooking destroy nearly 100% of the enzymes naturally occurring in food. Enzymes are completely denatured when exposed to temperatures over 118°F for any length of time. The modern diet consisting of cooked and processed food is essentially devoid of food enzymes.

What happens when food is not properly digested?

.....Over a century ago, Virchow described "digestive leukocytosis" in which the white blood cell count increases after a meal. Further research by Kouchakoff identified

"Foods having a higher caloric content are richer in food enzymes."

cooked and processed foods as the causative factor. Kouchakoff observed that raw food induced no change in WBC counts while cooked foods, particularly cooked meat, caused rapid increases in serum leukocyte levels. When incompletely digested food molecules are absorbed, the body identifies this particulate matter as foreign antigens and forms circulating immune complexes. The immune system then mobilizes macrophage leukocytes to digest the food. When food enzymes are present to pre-digest the food, digestive leukocytosis does not occur which allows the immune system to focus on disease prevention rather than digestion.

Are there physiological effects from consuming an enzyme-free diet?

.....According to Dr. Howell, "cooked, enzyme-free diets contribute to a pathological over-enlargement of the pituitary gland [which in turn] regulates the other glands." Likewise, the human pancreas is grossly hypertrophied in relation to all other members of the animal kingdom. Howell concluded that the massive size of the human pancreas is the result of a pathological adaptation to a cooked food diet.

Research conducted at the University of Minnesota showed significant changes in the organ weights of rats fed heat-treated food. Both the pancreas and submaxillary glands increased in weight by 20 to 30 percent. Research by Grossman further substantiates the adaptive role that diet plays in pancreatic secretion.

Does the addition of raw food to the diet guarantee enough enzymes?

.....Raw food provides enough enzymes to digest that particular food only. There are no extra enzymes in raw food to digest cooked or processed food. Although a totally raw diet may appear to be the best solution, it is generally not practical and, in many cases, not medically advisable. Due to the risk of bacterial contamination, many foods should not be eaten raw including meats, poultry, eggs and beans. Many people find the fiber content in large quantities of raw foods difficult to digest. Given the fact that most people will choose cooked food over raw food, nutritional enzyme supplements should be taken to assure an adequate enzyme supply.

What are Enzymes?

.....NEC Enzymes are purified high potency enzymes, extracted and concentrated from specially cultivated plant sources, intended for use as a replacement for enzymes lost in the cooking and processing of food. Under conditions found in the human digestive tract, these protease, amylase, lactase, sucrase, maltase, lipase and cellulase enzymes can efficiently break down protein, carbohydrates, fat and fiber thus improving the nutritional value of the food. The NEC process provides enzyme activity combinations which are precisely balanced to optimize the body's utilization of food nutrients.

How do Enzymes compare to other enzymes?

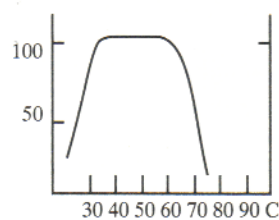
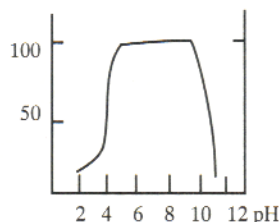
.....NEC Enzymes break down protein, carbohydrates, fat and fiber, whereas pepsin, trypsin, bromelain and papain digest protein only and pancreatic enzymes digest only three of the four food components.

.....NEC Enzymes are most active in a temperature range approximating human body temperature. Papain and bromelain, on the other hand, were developed for such industrial uses as tanning leather and tenderizing meat so they work best at temperatures considerably higher than body temperature. Although supplemental animal enzymes, such as pepsin and pancreatin, are active at body temperature, they do not relieve the body's digestive burden as they are activated only after the body has secreted digestive enzymes. NEC Enzymes, however, begin working in the upper stomach thus decreasing the digestive enzyme secretion needed to complete digestion.

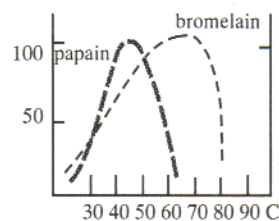
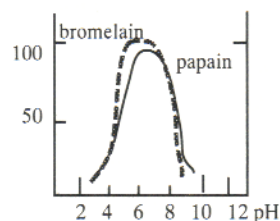
.....NEC Enzymes are active from pH 3.0 to 9.0. Therefore, they can function throughout the entire digestive tract, whereas pepsin and trypsin only work in the acidic pH of the stomach and pancreatic enzymes in the alkaline pH of the small intestines. Although the environment of the stomach can drop to pH 1.8, research indicates that a pH 4.0 to 5.0 is present within the food bolus in the stomach which is the optimum pH for NEC Enzyme activity.

The graphs below demonstrate the superiority of NEC Protease compared to other proteases.

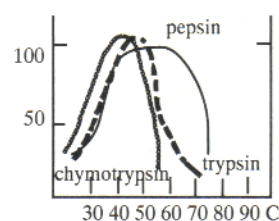
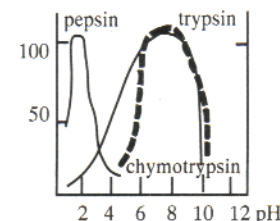
pH Activity Curves Temperature Activity Curves



Protease - a complete mixture of acid, alkaline and neutral proteases.



PLANT PROTEASES



ANIMAL PROTEASES

What is the biological source of Enzymes?

..... NEC Enzymes are derived from microbiological sources among which *Aspergillus* species are foremost. Long used in Asia and the western Pacific area to produce soy and fish condiments, *Aspergillus* enzymes have a strong record of safe use in the food industry. Dr. Howell developed a special fermentation process for producing enzymes to replace those lost in the cooking and processing of food. Unlike many of the commercially available enzymes which are designed for use in making products such as beer, bread and cheese.

Can Enzymes invoke an allergic response?

..... NEC Enzymes are extracted from nonpathogenic *Aspergillus* species and are essentially free of mycelium contamination. However, since enzymes themselves are proteinaceous compounds, an allergic reaction is possible. Some individuals, particularly those sensitive to molds and penicillin, may experience nausea or gastric upset. If gastrointestinal sensitivity occurs, the use of NEC enzyme-containing products should be discontinued.

How is the potency of Enzymes measured?

..... Enzyme activity is the acceptable way to declare enzyme potency. Weight measurements (mg) are not appropriate and can be misleading as there is not necessarily a direct relationship between weight and units of activity. The enzyme activity of NEC Enzymes is measured and expressed in Food Chemical Codex (FCC) Units, the national standard for plant enzymes sanctioned by the FDA. The FCC designation is similar in function to the USP designation for pancreatic enzymes. Not all manufacturers of plant enzymes use FCC units and are not required to do so by law. However, those who continue to express enzyme activity in units other than the industry standard are perpetuating the confusion concerning enzyme potencies and preventing the consumer from making an informed choice through comparison of enzyme products.

NEC Enzymes are expressed in the following FCC Units:

Protease	HUT	(Hemoglobin Unit - Tyrosine basis)
Amylase	DU	(alpha-Amylase Dextrinizing Units)
Lipase	LU	(Lipase Unit)
Cellulase	CU	(Cellulase Unit)
Sucrase	IAU	(Invertase Activity Unit)
Lactase	LacU	(Lactase Unit)
Maltase	DP^o	(degrees Diastatic Power)

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