



ENZYME RESEARCH GROUP

Enzymes: The Energy of Life

What are Enzymes?

Enzymes are energized protein molecules found in all living cells. They catalyze and regulate all biochemical reactions that occur within the human body. They are also instrumental in digestion. They break down proteins, fats, carbohydrates and fiber making it possible to benefit from the nutrients found in those foods while removing the toxins. Enzymes turn the food we eat into energy and unlock this energy for use in the body. Their presence and strength can be determined by improved blood and immune system functions.

There are three types of enzymes. Our bodies naturally produce two types, digestive and metabolic enzymes as they are needed, while food enzymes can only be consumed orally.

Metabolic Enzymes speed up the chemical reaction within the cells for detoxification and energy production. They enable us to see, hear, feel, move and think. Every organ, every tissue, and all one trillion cells in our body depend upon the reaction of metabolic enzymes and their energy factor. Metabolic enzymes are produced by every living cell. However, the liver, pancreas, gallbladder and other organs play a vital role in their production.

Digestive Enzymes are secreted along the digestive tract to break food down into nutrients and waste. This allows nutrients to be absorbed into the blood stream and waste to be discarded. Human digestive enzymes include ptyalin, pepsin, trypsin, lipase, protease and amylase. The body does not make cellulase, an enzyme necessary for proper digestion of fiber, so it must be introduced through the raw foods we eat.

Food Enzymes are introduced to the body through the raw foods we eat and through consumption of supplemental enzyme fortifiers. Raw foods naturally contain enzymes, providing a source of digestive enzymes when ingested. However, raw food manifests only enough enzymes to digest that particular food, not enough to have support systemically. The cooking and processing of food destroys all of its enzymes. Since most of the food we eat are cooked or processed in some way and since the raw

foods we do eat contain only enough enzymes to process that particular food, our bodies must produce the majority of the enzymes we require. For these reasons it is recommended that we supplement our diet with enzymes.

Enzymes Sold in Stores

Plant based Enzymes are the most popular enzymes found in natural food supplements. The four most common are Protease, Lipase, Amylase and Cellulase. They represent about 80% of the market. They are sources from aspergillus and grown in a laboratory setting on plants such as soy and barley. They are called plant based, microbial and fungal. Of all the choices, plant based enzymes are the most active or potent. This means they contain the highest active units and can break down more fat, protein and carbohydrates in the broadest pH range than any other source. Plant based enzymes are useful to develop and maintain a proper digestive system and to allow the body to produce more metabolic enzymes by reducing the need to produce digestive enzymes. They can also be used in varying formulas to treat certain ailments. The other types of enzymes mentioned next are better suited for specific treatment purposes rather than in enzyme maintenance programs.

Aspergillus enzymes have a strong record of safe use in the food industry and are considered food by the FDA. These enzymes can be taken with meals to aid in the digestion of all foods or between meals to feed and fortify the body as a whole. Plant based enzymes are not disposed of as if the body has no need for them, rather they exit only after there is no more left to do their work. Since they are food, which is natural to the body, and since they are the most potent, they are often preferred over other types. The following is a list of other typed of enzymes commonly sold in most health food stores.

Pancreatin is a substance from the pancreas of the hog or ox containing enzymes. Pancreatin contains proteolytic enzymes (enzymes that break down protein), amylase and lipase. This enzyme has been studied extensively for it's anti-inflammatory properties. Pancreatin has been used successfully in Germany for fortifying the pancreas in a molecular way. Since it is a glandular compound it provides the same type of support a thyroid complex an individual's thyroid. Dr. Roy Dittnan suggests that

pancreatic enzymes should not be taken during pregnancy or when using blood thinners.

Pepsin is a proteolytic enzyme usually prepared from the stomach of pigs and is the principle digestive component of gastric juice. It is usually given to those whose digestion is impaired. However pepsin is only activated at a temperature higher than normal body temperature.

Bromelain is a group of proteolytic and milk-clotting enzymes derived from the pineapple stem. A concentrate of this enzyme can be used as an anti-inflammatory agent, a meat tenderizer, and in the chill proofing of beer. Like pepsin, bromelain is only activated at a temperature higher than normal body temperature.

Papain is a proteolytic enzyme derived from the latex of papaya. This enzyme becomes active in an environment of 6.0-8.0 pH, and requires temperatures above normal human body temperature. For this reason Papain and Bromelain are often used to reduce inflammation since the temperature at points of inflammation are always higher than the rest of the body.

Chymotrypsin is a proteolytic enzyme taken from the pancreas of ox and pigs. This enzyme requires a pH level of 8.0 to become active.

Trypsin is a proteolytic enzyme formed in the intestine and can be taken from the intestine or pancreas of an animal. Trypsin breaks down arginine or lysine and works only in an alkaline setting. Today, it is often coated so that it can make it to the 8.0 pH occurring in the small intestine. It is commonly used to fortify the pancreas and the small intestine.

Enzyme Measurements and Labeling

When comparing enzyme products it is important to note if there are no fillers on the label. Fillers can be many things including leftover fibers or cellulose. Looking at the label of a high quality enzyme product, you will find measurement units you may not be familiar with. These are from the Food Chemical Codex (FCC). The FCC is published by the National Academy Press and is the accepted standard of the U.S. Food and Drug Administration. The system for determining enzyme **potency** used by the American food industry is derived from the FCC. This is the **ONLY** National Standard for evaluation of plant enzymes. This system establishes activity

levels and potency for enzymes. The following are the most common enzymes used and their FCC abbreviation.

- ❑ Alpha-Galactosidase-GALU (Galactosidase Units)
- ❑ Amylase-DU (Dextrinizing Units)
- ❑ Bromelain-GDU (Gelatin Digesting Units)
- ❑ Catalase-Baker Units (named after the author)
- ❑ Cellulase-CU (Cellulase Units)
- ❑ Glucoamylase-AG (Amyloglucosidase Units)
- ❑ Hemicellulase-HCU (Hemicellulase Units)
- ❑ Invertase-INVU (Invertase Activity Units)
- ❑ Lactase-LacU (Lactase Units)
- ❑ Maltase-DP (Degrees of Diastatic Power)
- ❑ Nattokinase-FU (Fibrinolytic Units)
- ❑ Pectinase-AJDU (Apple Juice Pectinizing Units)
- ❑ Phytase-PU (Phytase Units)
- ❑ Protease-HUT (Hemoglobin Unit Tyrosine base)
- ❑ Xylanase-XU (Xylanase Units)

Enzyme Benefits

Enhance Blood

Is it possible that an enzyme can clean up or purify the blood? When you look at it from the simplest perspective it makes sense. It is a known fact that fungal forms, parasites and bacteria are made up of protein, and the shell that protects a virus in our bodies is in fact a protein coating. The enzyme protease breaks down proteins and since the invaders of our blood systems are protein, it would make sense that ingesting protease on an empty stomach would help purify the blood of protein invaders. An empty stomach is suggested since the protease would not have to be held in the digestive system to digest food protein.

Enzymes in general deliver nutrients, carry away toxic wastes, digest food, purify the blood, deliver hormones by feeding and fortifying the endocrine system, balance cholesterol and triglyceride levels, feed the brain and cause no harm to the body. All of these factors contribute to the strengthening of the immune system.

Break Down Fats

Lipase breaks down (digests) fat. When added to your meal as a supplement it is able to do this in the digestive tract. This takes stress off the

gall bladder, liver and pancreas. When taken between meals, they can be of great support systemically and in some cases stored in the liver for later use.

Shed Excess Weight

Many overweight people have a metabolism imbalance or will soon create one. The endocrine system is our metabolism. Once we are able to fortify the endocrine system, get the bowels working regularly, and digest our food rather than turning it into fat, we have a successful combination for losing weight. This process is not instantaneous, because we have to lose fat instead of weight. A person has to lose a great deal of fat to equal one pound of weight. It takes longer, but is healthier and lasts longer. Best of all, it does no harm.

Enhance Mental Capacity

Your body uses glucose called from the liver to feed and fortify the hypothalamus. The hypothalamus directs our endocrine system and is responsible for, among other things, balancing emotions. This long lasting glucose is made from the protein stored in the liver. All plant enzymes come from protein foods, thus they help fortify the liver for this function. Red blood cells carry oxygen and nutrients to the glands, muscles, and all the organs of the body, including the brain. Nutrients however, can only be delivered throughout the body by means of the enzyme delivery system. When this is not accomplished, you become fatigued and are less able to think clearly.

Improved Aging Skin

An adequate supply of enzymes are absolutely essential for keeping your skin young looking and healthy. According to researchers, Amber Ackerson and Anthony Cichoke in Portland Oregon, enzymes fight the aging process by increasing blood supply to the skin, bringing with it life-giving nutrients and carrying away waste products that can make your skin look unhealthy and dull.

Your "Enzyme Potential"

Dr. Edward Howell began researching what he called "Enzyme Potential" in the 1940's. Since then there has been a great deal of support for this concept.

We all make Digestive and Metabolic enzymes as needed, and it is a proven fact that as we age we make less with each passing year. This ability to make only a limited number of enzymes has been called our enzyme potential. An individual's potential is dependent on their DNA or what they inherit from their parents. Some people have a great potential. This is exhibited by the quality of their health despite their lifestyle choices. They can essentially eat whatever they want, drink whatever they want, rarely exercise, have high-pressure jobs etc. Despite this, they live long, happy, healthy lives with little illness.

On the opposite side of the spectrum there are people that are essentially born sick. These people have to be careful about every aspect of their lives. To deviate will only bring grief. The difference between these two types of individuals is their enzyme potential. Most of us fall somewhere in the middle of these two groups.

There are three ways to preserve this potential. They are all based on reducing the amount of energy that we spend on digestion. By some estimates, we spend up to 80% of all of the energy we have at our disposal digesting our food. This makes sense since most people require 3 to 10 days to break down, assimilate and excrete the waste of any given meal. Thus our body is in a constant state of digestion. To preserve our potential we need to reduce this amount. One of the easiest ways to do this is to limit the number of digestive enzymes that our body needs to break these meals down. By making less digestive enzymes we will ultimately make more metabolic enzymes in our lifetime. The second choice is to reduce the number of calories we consume. Dr. Roy Walford from UCLA pioneered this concept. By eating less, we are ultimately preserving vital energy (making less digestive enzymes) and again, extending our potential. The third is perhaps the most obvious. Take a high quality digestive enzyme supplement with every meal. The choice is yours!

Enzyme Deficiencies

Have you ever asked yourself, 'How is it possible that I am sick even though I eat organic foods and am careful with my diet?' The answer most likely revolves around an ENZYME DEFICIENCY. An enzyme deficiency can manifest itself as a variety of conditions. Presented here is a brief look at causes and symptoms.

Protease Deficiency:

Protease digests protein. The benefit of proteolytic enzymes has been studied for decades in the United States, Germany and Japan primarily. Research has focused on immune support, inflammation and cancer.

Since everything that makes us sick is either a protein or is protected by protein, the immune system is constantly in need of protease. Bacteria, parasites and fungal forms are all protein. Viruses and cancer cells are all protected by protein. Protease has the ability to digest this unwanted debris in the blood. Therefore, protease deficient people are immune compromised, making them susceptible to bacteria, yeast and viral infections and a general decrease in immunity.

Amylase Deficiency:

Amylase digests carbohydrates (converts them into sugars) along with dead white blood cells. When you are low in amylase you are a candidate for blood sugar imbalances, Hypoglycemia, Type II Diabetes, carbohydrate cravings and allergies. Amylase is also involved in anti-inflammatory reactions such as those caused by the release of histamine and similar substances. Asthma and emphysema may also be exacerbated by an amylase deficiency.

Lipase Deficiency:

Since lipase digests fat, fat-soluble vitamins and balances fatty acids, lipase deficient people can be expected to have a tendency towards high cholesterol, high triglycerides and difficulty losing weight. The future outcome of these tendencies is heart disease, which kills more Americans than any other disease. Lipase deficient people also have decreased cell permeability, meaning nutrients cannot get in and waste cannot get out. The condition or labyrinthis, also called Meniere's Disease (dizziness aggravated by movement such as walking or driving), can also result from lipase deficiency.

Cellulase Deficiency:

Cellulase breaks down the fiber in our diet. Because our body does not produce cellulase, this food enzyme is essential. The good bacteria in our intestinal tract has the ability to manufacture cellulase when it is in balance. We can also get it through the raw foods that we eat.

The symptoms of cellulase deficiency can be best described as malabsorption syndrome (impaired absorption nutrients, vitamins, or minerals from the diet by the lining of the small intestine). Malabsorption has many symptoms including lower abdominal gas, pain, bloating and

problems associated with the jejunum and pancreas. The consumption of fiber enriched nutritional drinks, which are full of cellulose, can exacerbate these problems.

A cellulase deficiency can also lead to fungal overgrowth such as Candida. The cell wall of Candida contains chitin, which is very similar to cellulose (fiber). This can often make it difficult to remove once an overgrowth develops. Cellulase taken orally can often assist in bringing the Candida overgrowth back into balance.

Sucrase, Lactase and Maltase Deficiency:

People who have malabsorption syndrome and cellulase deficiency also have a tendency towards sugar (sucrose, lactose and maltose) and/or gluten intolerance. Sucrose, lactose and maltose are three common sugars, which some people cannot tolerate. They are broken down and absorbed into the system by three enzymes: sucrase, lactase and maltase.

Sucrase deficient cannot split the sucrose disaccharide into twin partners, two units of glucose. Glucose is a primary brain food so expect mental and emotional problems in people who are sucrase deficient. Symptoms include depression, moodiness, panic attacks, manic and schizophrenic behavior and mood swings.

Lactase deficient people also have classic symptoms, which include abdominal cramps and diarrhea. Other allergic symptoms including asthma have been witnessed from the ingestion of lactose containing products.

Maltase deficient people are generally sensitive to environmental conditions.

Intolerance to Sucrose, lactose or maltose may be worsened by a deficiency in sucrase, lactase or maltase.

Combination Deficiency is when an individual has more than one of the above deficiencies. The person will most often have the most severe digestive issues. Crohn's Disease, Colitis, and Irritable Bowl Syndrome are quite common.

Gluten grains can be a real problem for example. These grains include wheat, oats, rye and barley. Not everyone has to avoid all four grains; however, sometimes it is a must. Gluten intolerance is associated with Celiac Disease and Malabsorption Syndrome. It is also associated with Crohn's Disease. Gluten is actually a protein that exists in these high carbohydrate grains. The best way to address this is to usually a high potency protease and amylase combination.

The insidious thing about gluten intolerance is that it creates sugar intolerance because when gluten intolerant people eat gluten-containing foods; the brush border cells of the jejunum are injured and thus unable to secrete the disaccharides (sucrase, lactase and maltase) leading to sugar intolerance. The problems discussed here are just the tip of the iceberg. More discoveries continue to emerge as research with food enzymes continues.

Syndromes Common To Enzyme Deficiency

Amylase Deficiency

- ❑ Breaking out of the skin –rash.
- ❑ Hypoglycemia
- ❑ Depression
- ❑ Allergies
- ❑ PMS
- ❑ Hot Flashes
- ❑ Fatigue
- ❑ Cold Hands and Feet
- ❑ Neck and Shoulder Aches
- ❑ Sprue
- ❑ Inflammation

Protease Deficiency

- ❑ Back Weakness
- ❑ Fungal Forms
- ❑ Constipation
- ❑ High Blood Pressure
- ❑ Insomnia
- ❑ Hearing Problems
- ❑ Parasites
- ❑ Gum Disorders

- ❑ Gingivitis

Lipase Deficiency

- ❑ Aching Feet
- ❑ Arthritis
- ❑ Bladder Problems
- ❑ Cystitis
- ❑ Acne
- ❑ Gall Bladder Stress
- ❑ Gallstones
- ❑ Hay Fever
- ❑ Prostate Problems
- ❑ Psoriasis

Combination Deficiency

- ❑ Chronic Allergies
- ❑ Common Colds
- ❑ Diverticulitis
- ❑ Irritable Bowel Syndrome
- ❑ Chronic Fatigue
- ❑ Sinus Infection
- ❑ Immune Depressed Condition

Therapeutic Uses Of Enzymes

If enzymes truly are catalysts, which participate, in virtually every bodily process, and if a shortage can cause a variety of illness, then why are they not widely used as a treatment? It is certainly true that they are not widely used here in the Americas, but what about other countries? In Europe enzyme therapy is routinely used to treat a variety of illnesses.

As you become familiar and comfortable working with enzymes they will serve you as no other supplementation program. The one thing we must be able to do is digest, assimilate utilize, eliminate and create healthy cells to live. The body requires enzymes to do all this work. If it is true the body uses 80% of its energy just to digest food, there can be no limit to the benefit of plant-based enzymes in this process.

Protease:

It is known that proteases are able to dissolve almost all proteins as long as they are not components of living cells. Normal living cells are protected against the lysis by the inhibitor mechanism. Parasites, fungal forms and bacteria are protein. Viruses are cell parasites consisting of nucleic acids covered by a protein film. Enzymes can break down undigested protein, cellular debris, and toxins in the blood, sparing the immune system this task. The immune system can then concentrate its full action on the bacterial, viral or parasitic invasion.

Protease is a polymorphic enzyme. The enzyme action it produces can adapt to meet the current digestive or metabolic needs of the body. It should be noted that protease when taken on an empty stomach is readily taken up into the mucosa cells of the intestine and passed into the blood circulation. Clinical observation (manuscript in preparation) have noted that upon high intake of oral protease, heavy metal concentration have been significantly decreased in the blood.

Lipase

Fats are the most difficult component of the diet to digest. Fatty foods cause more indigestion than protein or starches. Most Americans have crossed wires when it comes to fats. Because of bulging waistlines, most Americans battle between fat-phobia and fat craving. The human body is programmed to crave fats. Without essential fats and fatty nutrients animals and humans cease to thrive. Omega-3 and Omega-6 fats from flaxseeds and cold-water fish were found to be essential for human health by physiologists in the 1930's. Fat-soluble nutrients such as beta carotene, lutein, and vitamins A, D, E and K fulfill important functions in health maintenance. So fat isn't all bad.

The American diet is intentionally laden with saturated fats and hardened hydrogenated fats, leaving about 0% of the population deficient in the essential fats required for the maintenance of the human nervous system, the production of hormones and the control of inflammation.

Foods actually taste better when they contain fats. A famous fast-food quarter-pound hamburger actually has saturated fat content equivalent to 16 pats of butter! The fast-food engineers really know how to stimulate our taste buds.

It is worth noting here that weight loss is a common finding among individuals with chronic heart failure. It is evident that malabsorption of

fats is related to heart failure. In one study, subjects with heart disease had 10 times more fat in their stool than heart-healthy individuals. This means that those with heart disease weren't absorbing their fats (AM J Cardiology 67: 295, 1960). Yet heart patients are typically placed on low-fat diets! These individuals were leaner, but not healthier.

For these same reasons, fat-blockers such as Olean and Elestra are undesirable. They keep fat from being absorbed, but they also keep fatty nutrients from being available. Under-nutrition occurs in about half of the patients with chronic heart failure. Fats are a major source of fuel for the heart muscle. The use of lipase has been suggested to improve fat absorption. (AM J Cardiology 88: 43, 1963).

It was not until 1997 that researchers found that lipase also can help to control LDL cholesterol and is helpful in stubborn cases of high triglycerides. (Lipids 32: 1147, 1997).

Low levels of lipase have been found among adults who have benign fatty tumors surrounding their eyelids, an unsightly condition called xanthelasma. Adults with this condition often hide these fatty growths with make-up. While lipase is untried in these cases, a course of daily lipase with meals may prove to be a remedy.

Plant Based Enzymes vs. Animal Enzymes

Enzymes are the energy of life. All supplemental enzymes, with very rare exception can be beneficial to one degree or another. If you must choose one, which would it be? When considering the benefits of animal (or glandular, usually represented by USP) vs. plant enzymes, the following may be helpful.

Animal enzymes, or pancreatic enzymes, are from the pancreas of a slaughterhouse animal. Ask yourself "What was the condition of this animal and its organs before it was slaughtered". How does anyone know?

Pancreatic enzymes tend to claim high unit amounts, such as 31500 units of protease. However, this amount, or unit measurement, does not indicate the actual enzyme activity level. 31500 units of protease will yield a level of only 356 units of digestive activity. Compare this to hundreds of thousands of actual protease activity in our plant based enzymes. Enzyme effectiveness depends on activity not weight. Remember to compare "apples to apples".

Don't forget about the importance of the pH balance. Pancreatin requires an 8.0 pH to be of use in the system. The human body reaches this 8.0 pH in the small intestine after major digestion has already taken place. Plant enzymes have the capability to work between 3 and 9 pH. They are blended as neutral, alkaline and acidic to cover all concerns in our formulation. This means they work throughout the entire digestive tract and in the blood. For instance, one English study showed a small dose of acid-stable lipase from a plant source was more effective than a dosage 25 times larger of conventional pancreatin in the treatment of malabsorption and malnutrition due to pancreatic enzyme deficiency.