

# 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 100 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 the 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 any support systemically. The cooking and processing of food destroys all of its enzymes. Since most of the foods 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 digestive 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 sourced 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 con-

### *In This Issue...*

What are enzymes?.....	1	Syndromes common to	
Enzyme Measurements and Labeling.....	2	enzyme deficiency.....	6
Enzyme Benefits.....	3	Therapeutic uses of enzymes.....	6
Shed excess weight.....	3	Plant based enzymes vs.	
Enhance mental capacity.....	3	Animal enzymes.....	8
Improve aging skin.....	3	References.....	8
Your enzyme potential.....	4		
Enzyme deficiencies.....	4		

tain 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 activity 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 types 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 its 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 provides an individual's thyroid. Dr. Roy Dittinan 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 of protein 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 required 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 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 abbreviations

Alpha-Galactosidase-GALU (Galactosidase units)  
Amylase-DU (Dextrinizing Units)  
Bromelain - GDU (Gelatin Digesting Units) or FCCPU  
Catalase - Baker Units (Named after the Author)  
Cellulase - CU (Cellulase unit)  
Glucoamylase - AG (Amyloglucosidase Units)  
Hemicellulase - HCU (Hemicellulase Units)  
Invertase - INVU (Invertase Activity unit)  
Lactase - LacU (Lactase unit)  
Lipase - FCCFIP (Federation Internationale Pharmaceutique)  
Maltase - DP (Degrees of Diastatic Power)  
Nattokinase - FU (Fibrinolytic Units)  
Pectinase - AJDU (Apple Juice Depectinizing 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 system 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. (see pg. 7 "Protease")

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 gallbladder, 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. (see pg. 7 "Lipase")

### **Shed Excess Weight**

Many overweight people have 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 it is more healthy 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.

### **Improve 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 dull and unhealthy.

## ***YOUR “ENZYME POTENTIAL”***

Dr. Edward Howell began researching what he called the “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 dependant 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 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. We should be conscientious about the choices we make. If we fail to be, eventually it will catch up to us and we will pay for it with immune compromise, fatigue, brain-fog and sickness.

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. Keep in mind it is these metabolic enzymes that are the catalysts to every biochemical reaction in our bodies. These are the energy of life.

The first option is to eat more raw food. Within all raw foods there are food enzymes. These enzymes become digestive enzymes when we eat these foods. By eating foods that have not been cooked, processed, irradiated or heated above 118 degrees, we are extending our potential. (All of the above mentioned processes denature enzymes and the raw food does not have the same affect on the digestive system.)

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 choice 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 very 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 protein or is protected by protein, the immune system is in constant need of protease. Bacteria, parasites, and fungal forms are all protein. Viruses and cancer cells are protected by protein. Protease has the ability to digest these unwanted debris in the blood. Therefore, protease deficient people are immune compromised, making them susceptible to bacterial, viral and yeast infections and a general decrease in immunity.

#### **Amylase Deficiency:**

Amylase digests carbohydrates (converts them to 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 the waste cannot get out. The condition of vertigo or labyrinthitis, 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 we eat.

The symptoms of cellulase deficiency can best be described as malabsorption syndrome (impaired absorption of 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 & Maltase Deficiency:**

People who have malabsorption syndrome and cellulase deficiency also have a tendency towards sugar (sucrose, lactose, & 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 people 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 severe 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.

An 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 Bowel 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 exist in these high carbohydrate grains. The best way to address this is usually a high potency protease and amylase enzyme combination.

The insidious thing about gluten intolerance is that it creates a 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 disaccharidases (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  
Mood swings  
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  
Urinary weakness  
Constipation  
Diarrhea  
Heart problems

### **Combination Deficiency**

Chronic allergies  
Common colds  
Diverticulitis  
Irritable Bowel Syndrome  
Chronic fatigue  
Sinus infection  
Immune depressed conditions

## ***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

illnesses, 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 all 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 protease's are able to dissolve almost all proteins as long as they are not components of living cells. Normal living cells are protected against 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 observations (manuscript in preparation) have noted that upon high intake of oral protease, heavy metal concentrations 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 proteins 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 flaxseed and cold-water fish were found to be essential for human health by physiologists in the 1930s. 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 80% 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 a 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 those with heart disease weren't absorbing their fats (Am J Cardiology 5: 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 8: 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 makeup. 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) verses plant enzymes, the following may be helpful.

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

Pancreatic enzymes tend to claim high unit amounts, such as 31,500 units of protease. However, this amount, or unit measurement, does not indicate the actual enzyme activity level. 31,500 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 formulations. 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.

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