

# **Digestive Enzymes**

3rd Edition

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## Enzyme Power

Of all the natural health compounds available, enzymes may be the most valuable. Simply defined, an enzyme is a protein found in plants and animals that helps cause or speed up natural processes. For all living creatures, including humans, enzymes are as critical to life as air and water. Enzymes make life itself possible—they are the reason why we have energy, why we can reproduce, why we can think and why we can grow and heal. Enzymes are the building blocks and the life force of all living things. In a world without enzymes, seeds wouldn't sprout, fruit wouldn't ripen, leaves wouldn't change color, living things wouldn't reproduce, and you, as a human being, would not exist.

## Types of Enzymes

Enzymes are involved in all body systems, including building body mass, detoxifying major organs and healing injured tissues. Enzymes allow the body to digest, absorb and convert food into energy. They also regulate thousands of other biochemical functions, including respiration, thought, growth, smell, taste, nerve stimulation, immunity, hormone regulation, cellular growth and the repair of organs, glands and tissues.

Enzymes are divided by their function. *Metabolic* enzymes work in the body to maintain proper functioning of the body's organs, tissues and blood level. They help detoxify the blood and act as catalysts in energy production but do not play a role in digestion. *Digestive* enzymes help the body convert foods into usable nutrients and deliver the nutrients to different areas of the body. Digestive enzymes are a critical component of proper digestion.

This book will focus on digestive enzymes and ways to maximize levels of digestive enzymes. The body can manufacture some digestive enzymes, but they are typically obtained from food. Digestive enzymes exist only in organic living matter. You cannot obtain enzymes from something that has no life, which means that you cannot get enzymes from minerals, synthetic chemicals or processed foods.

## How Digestion Works

To understand the importance of digestive enzymes, you first need to understand the digestive process. Digestion is the process of breaking the chemical bonds of nutrients found in food down into individual nutrients that the body can use to support its functions. Digestion includes both mechanical processes, such as chewing and grinding, and chemical processes, such as using enzymes to break down bonds within molecules. The body cannot function without digestion. And without digestive enzymes, digestion cannot properly occur.

Food is digested in the gastrointestinal (GI) tract, a 20-30 foot tube that runs from the

mouth to the anus. Digestion involves many of the body's organs, including the mouth, esophagus, stomach, small intestine and large intestine, as well as the pancreas and liver. The mouth, stomach, small intestine and pancreas contain glands that produce digestive enzymes to aid with digestion.

Digestion actually starts with the nose. Smelling food triggers a chemical reaction in the body. Have you ever driven by a restaurant while you were hungry and the smell alone made your stomach growl and your mouth salivate? Smelling food causes the brain to signal the body to begin to secrete digestive enzymes and also tells the pancreas and stomach to prepare to ingest food. Through your sense of smell, the body secretes specific enzymes in response to the particular food.

Stage two of the digestion process occurs in the mouth. Chewing food serves two important purposes. First, it breaks food down into smaller pieces. Second, while chewing, digestive enzymes found naturally in the food also begin the work of breaking down foods chemical bonds. Chewing allows food to mix with saliva, which contains digestive enzymes such as alpha-amylase (which breaks down carbohydrates or starches) and lingual lipase (which breaks down fat). In addition, tasting and chewing food triggers the stomach to begin producing hydrochloric acid (HCl). These are the primary reasons why food should be chewed thoroughly before swallowing.

After food is chewed, it is swallowed and travels to the esophagus. Swallowing is a voluntary muscle movement, but after the initial voluntary muscle movement, food moves through the GI tract with the help of involuntary muscle contractions called *peristalsis*. The esophagus connects the mouth with the stomach. In addition, the lower esophageal sphincter (LES), located at the bottom end of the esophagus, serves as a barrier between the stomach and the mouth. Except when swallowing, the LES is kept closed by the contraction of surrounding muscles. In some cases, however, the LES can malfunction, allowing the contents of the stomach to flow into the throat, causing acid reflux (also known as heartburn).

Stage three of digestion occurs after the food travels through the esophagus and drops into the upper portion of the stomach, sometimes called the enzyme stomach. The food stays in this portion of the stomach for 45 minutes to one hour, while natural enzymes from food or supplemental digestive enzymes continue breaking down carbohydrates, fats and proteins. Enzymes derived from raw food or digestive enzyme supplements may help break down as much as 75 percent of food in the enzyme stomach without the help of digestive enzymes secreted by the body. The stomach also produces digestive enzymes, including lipase and pepsin, which breaks down proteins. In addition, the stomach produces HCl, making the stomach an acidic environment that destroys bacteria and other toxins.

The food substance (now called *chyme*) is mixed with pancreatic juices that contain a variety of enzymes, including trypsin and chymotrypsin, which break down proteins, and

amylase. The chyme remains in the small intestine for about 2-6 hours while the body absorbs nutrients.

Finally, the nutrients that the body absorbs from the chyme travel to the liver, which filters toxins, stores certain vitamins and dispenses nutrients to the organs, tissues, nerves and glands where they are needed. The waste travels to the large intestine, or colon, where it remains for 6-72 hours until it is eliminated.

With many modern diets and eating habits, stages one, two and three of the digestive process rarely occur. Why? Because we don't take the time to prepare our food to allow us time to smell the food. We don't take the time to properly chew our food to allow amylase to predigest starches and sugars. And we eat enzyme-deficient foods that don't supply the enzymes necessary for stage three of the digestive process. The result is a variety of digestive disturbances.

## Medical Digestion Dilemma

Signs of digestive enzyme deficiency are all around us. Each comes with its own set of symptoms, including gas, bloating and acid reflux. Other indications of digestive problems may include headaches, chronic fatigue, stomachaches, diarrhea, constipation, yeast infections and a variety of nutritional deficiencies. In Japan, many alternative physicians are using digestive enzyme supplements for disorders such as food allergies and celiac disease. Could a lack of enzymes also be a cause of these and other debilitating diseases?

Because digestive diseases and symptoms are so common, many people think they are normal. But they're not normal- they're an indication that our bodies can no longer process the food that modern agriculture and food processors produce. These "dead" foods affect all of the digestive organs, particularly the stomach, intestines, colon, liver and pancreas. We know there is a problem out there: sales for a prescription acid reflux drug generated \$6.3 billion in 2010 and several brands are now being sold as over-the-counter drugs in pharmacies and supermarkets.

Could supplementing our diets with digestive enzymes or eating more raw food save our country billions of dollars in healthcare costs? Digestive disease is the most common reason for hospitalization-more than any other disease category. According to the National Digestive Disease Information Clearinghouse (NDDIC), Americans spend more than \$97.8 billion each year for treatments relate to digestive diseases, including surgical procedures. Digestive complaints are a major reason for missing work and school. Eating enzyme-less food compromises every aspect of the digestive process: digestion, absorption, assimilation and elimination. All of these processes are essential for good nutrition and a healthy body.

Autopsies have found that people who primarily eat cooked foods have dangerously enlarged and poorly functioning pancreases. Inadequate enzyme consumption places stress on the pancreas to produce digestive enzymes that would ideally be supplied by food. Gradually, the overworked pancreas and other digestive organs are not able to produce sufficient quantities of

enzymes. This can lead to digestive diseases and a toxic bowel condition.

According to Dr. Edward Howell (1898-1988), MD, a pioneer in the field of enzyme nutrition and author of the book *Enzyme Nutrition: The Food Enzyme Concept*, an enlarged pancreas is correlated to an increased incidence of chronic degenerative diseases and cancer. Howell also found that the pancreas of an adult human with a digestive disease was the same size as a healthy adult cow's pancreas, even though a cow has five times the individual's body mass. This, he said, is "proof that the body will continue to enlarge the pancreas so as to secrete more digestive enzymes, thus taxing the other organs of the body and causing death."

## Malabsorption Due to Enzyme Deficiency

Unfortunately, for many people, proper digestion is not reality. For evidence that problems with digestion are reaching epidemic proportions, look no further than recent statistics from the NDDIC. According to the NDDIC, in 2010:

- 60 to 70 million people were affected by a digestive disease
- 13.5 million people were hospitalized due to some type of digestive disease
- 20 percent of the population experienced heartburn each week (an indication of gastroesophageal reflux disease, or GERD)
- 15.3 million people had irritable bowel syndrome
- 20 million people experienced gallstones
- 236,000 people died due to a digestive disease (including pancreatic, gastric and colorectal cancers, liver disease, Crohn's disease, ulcerative colitis and GERD)

Such complaints indicate an underlying digestive problem. In addition, when such complaints happen frequently, they can result in damage to various organs. If supplied with the necessary nutrients, particularly digestive enzymes, many digestive problems can be alleviated. In addition to lacking enzymes, many typical diets also lack another essential element-fiber. Fiber acts as a bulking agent and speeds transit time of food in the digestive tract. These actions prevent metabolic waste from creating toxic byproducts. A major benefit of fiber is that it binds acids to bile and carries the bile, along with excess fats, out of the body. Fiber also helps to lower cholesterol, reduce the risk of heart disease, lower blood pressure, improve blood sugar levels and promote the growth of friendly intestinal flora. It promotes bowel regularity, aids digestion by giving the digestive enzymes more time to work and helps to keep the bowels clean.

Fiber cannot do its job effectively unless enzymes do theirs. Over time, hard-to-digest, high protein foods (such as cooked meat and other enzyme-deficient foods) exhaust the digestive organs until they can no longer function efficiently. This results in the accumulation of partially digested food in the bowel. Toxins produced from this buildup are reabsorbed into the bloodstream, creating auto-intoxication, or self-poisoning. This results in a dramatically weakened immune system and can lead to serious debilitating health problems including colon cancer, one of the most common forms of cancer in the United States. Eating more raw enzyme-

rich foods and/or taking supplemental digestive enzymes with and between meals can help eliminate the accumulation of toxic wastes.

## **Pottenger's Cats**

Dr. Francis M. Pottenger Jr., MD, (1901-67) has received wide acclaim for a clinical study he conducted to determine the long-term effects of eating cooked foods. The study involved pairing cats (one male and one female in each pair) and tracking their health over the course of ten years, beginning in 1932. During the study, Pottenger fed two pairs of cats raw milk and meat and he fed another three pairs of cats pasteurized milk and cooked meat. By the second generation, the cats that ate raw food were, on average, stronger in muscle and bone mass, healthy and free of disease. They produced healthy kittens generation after generation.

By the end of the second generation, cats that ate cooked foods were weaker in bone structure, mentally slower and began to suffer from allergies, infections and other maladies, including kidney, heart, thyroid and gum diseases. Each succeeding generation of cats that ate cooked food showed progressively more illness and disease. Over 30 percent of the third generation of cats that ate cooked food were not even able to reproduce.

If we compare ourselves to the cats in Pottenger's study, we are now into the third and fourth generations of humans to eat predominantly cooked and processed foods. Our grandparents and great-grandparents began eating this way after World War I when canned foods became common and food processing to preserve shelf life became a financial necessity for mass production and distribution of food products.

Are you wondering what I'm wondering? If 30 percent of Pottenger's cats couldn't reproduce after three generations of eating cooked food, where will we be after a few more generations? Recent studies reveal that men's sperm counts have plummeted over the last 2-3 generations. No one yet knows if there's a direct correlation with diet, but this development is certainly a cause for concern.

Whether we are talking about cats, dogs or human beings, eating enzyme-deficient foods overburdens the body with the need to produce enzymes to help process foods in the diet. Several theories claim that the human body is only capable of producing a certain amount of enzymes. When this supply is gone, your body will stop functioning and you will die. Howell first suggested this theory in 1930, and now thousands of doctors are beginning to agree. Only by ingesting digestive enzymes can we stop the body from being depleted of the nutrients that are essential for a healthy life.

## **What Do Enzymes Do?**

Enzymes are the workforce of the body. I like to compare enzymes to a construction crew working within the body. This crew uses various raw materials, such as amino acids, fatty acids,

sugars and hormones, to build the entire infrastructure the body needs to perform efficiently. Enzymes also act as a demolition team that cleans up worn-out parts and destroys harmful materials that prevent health and growth. This process continues throughout our lives—as long as the necessary nutrients are available in abundance. Without the proper nutrients, enzymes can do nothing. For this reason, vitamin and mineral deficiencies can have a devastating effect on the body.

An interesting "catch-22" is that without digestive enzymes, the body does not benefit as it should from getting an adequate supply of vitamins and minerals. We must consume adequate amounts of all types of nutrients to maintain optimal health. Supplementing or eating just some of the necessary nutrients will serve little, if any, purpose—*especially if we lack abundant enzymes!*

## **Our Enzyme Bank**

Enzyme deficiency, or exhaustion of the body's enzyme production, leads to premature aging, disease and death. According to Howell, enzyme shortages are commonly seen in patients suffering from chronic illnesses, such as certain types of cancer, allergies, skin disorders, obesity and heart disease. Researchers have found that the root cause of most disease in humans and domesticated animals stem from nutritional deficiencies. Many researchers also suggest that virtually all disease may be traced to missing enzymes or malfunctioning enzyme reactions. Without enzymes, the body cannot function properly, nor can essential nutrients be delivered to the cells where they are needed.

Howell likens the body to an enzyme "bank." Through raw food intake, we can generally maintain a high number of enzymes in the body. Every time we eat raw, enzyme-rich food, it is like depositing funds into the bank. But eating processed, enzyme-deficient foods depletes the supply, and once all of the enzymes are "withdrawn," there are no loans on enzymes—only enzyme bankruptcy, which leads to the slow degenerative condition of disease.

Generally, low digestive enzyme levels are associated with older people and people suffering from chronic degenerative diseases. However, anyone can become enzyme deficient at any age if they make poor diet and lifestyle choices. Typically, a 20-year-old individual has twice the enzyme level of a 70-year-old person. However, research has shown that people can maintain high enzyme levels as they age by consuming a diet high in enzyme-rich foods, such as fermented food products, raw foods or digestive enzyme supplements.

## **How Are Enzymes Depleted?**

The most serious threat to the body's supply of digestive enzymes is eating only cooked and processed foods. Cooking or processing food at temperatures over 118 degrees Fahrenheit (56 degrees Celsius) completely destroys any enzymes found naturally in the food. This means

that foods found in a box, a bottle or a can are "dead" foods that cannot restore the body's supply of enzymes. Overcooking raw organic food also contributes to nutrient loss. Pasteurization, sterilization, radiation, preservation, freezing and microwaving either renders food enzymes inactive or alters their structure so much, they're useless to the body.

Fresh, unprocessed foods contain enzymes and coenzymes the body requires to function properly. Unfortunately, most people don't eat enough fresh, whole foods to compensate for the enzyme-deficient foods they eat. The ideal diet includes about 60 percent fresh, raw foods so the body can handle the other 40 percent of cooked and processed foods. If everyone followed a 60/40 ratio of raw to cooked food, degenerative diseases might disappear.

Hundreds of other factors can cause enzyme depletion in the digestive tract and foods. For instance, because of chemical poisoning, pollution and soil exhaustion, the Earth can no longer provide clean air to breathe, pure water to drink or nutrient-rich foods to eat. The misuse and demineralization of soils have escalated to such a degree that if nothing is done, all our food will contain nothing but empty calories. This is why many food manufacturers add synthetic vitamins and minerals to breakfast cereal, breads and other grain products. Remember, without vitamins and minerals, enzymes are useless.

Other factors such as stress, overly strenuous exercise, pregnancy, frequent colds, exposure to extreme temperatures and high fevers all require tremendous amounts of enzymes and can contribute to enzyme deficiency.

## **Maximizing Your Enzyme Levels**

The body's immunity, vitality and longevity depend on keeping high levels of enzymes. Many factors can help maximize enzymes levels. Genetics-including the health of your parents before and after conception-play a large role in healthy enzyme levels. However, many other factors related to your own eating habits and lifestyle also play a role. By supplying the body with digestive enzymes from food or digestive enzyme supplements, you can maintain healthy enzyme activity-and good digestive health-into old age.

Fortunately, digestive enzyme dietary supplements are available. Medical research shows that digestive enzyme supplements are helpful during the digestive process, similar to digestive enzymes found in foods. By supporting proper digestion, digestive enzymes also boost immunity, helping to fight illnesses and slow the effects of aging, just as a diet composed of 60 percent raw food does.

You might be wondering: if the body already produces digestive enzymes, why do we need digestive enzymes from food or supplements? The body continually needs raw materials to produce energy. If the body is continually overburdened by needing to manufacture energy using only the raw materials it produces on its own, it will begin to break down and wear out. By ingesting digestive enzymes, you restore the body's raw material supply, like bringing on a



temporary construction crew, thus allowing the body's main crew to rest. If your main crew does not rest, the stage is set for accelerated aging and disease regardless of your current age.

Scientists can keep cells alive and healthy in the laboratory indefinitely. The body has the same potential for longevity as laboratory cells. So why are so many people getting sick and dying early? The answer is simple: we eat "dead" food—food that has been processed beyond the body's ability to recognize it as a nutrient. We also add enzyme inhibitors (preservatives) to food that sap the body's supply of enzymes. Americans live in a country of abundance, yet astonishingly, many Americans are enzyme deficient and face "nutritional bankruptcy."

## **Your Blood Speaks!**

Live blood cell morphology is the science behind the observation of the size and shape or pattern of live, unstained red blood cells in the body. This informative science can help identify many nutritional deficiencies before they become diagnosable diseases. I began teaching live cell morphology in 1995 and have found it to be a very effective tool in the prevention of disease. Some allopathic physicians question its usefulness because their training emphasizes diagnosing a disease and live blood cell morphology does not do that. However, live blood cell morphology is a very useful tool that can be used by both allopathic and homeopathic physicians as a means of pre-screening individuals to determine whether further tests are necessary.

By examining a patient's blood through a microscope, a healthcare practitioner can see excess proteins, fats and sugars in the bloodstream. Such excesses can lead to many health problems. Excess protein creates uric acid and contributes to the deterioration of muscle and joints. Excess fats such as triglycerides can clog major arteries and lead to heart attacks and strokes. And excess sugars can contribute to developing diabetes.

Some digestive enzymes can act as scavengers to eliminate excess food residues within the bloodstream. When we consume foods that are extremely high in proteins, fats and sugars, yet lack the live enzymes necessary to process the nutrients, the immune system can become overworked because it's forced to "clean up" after our meals. This process can lead to many degenerative diseases, including allergies, rheumatoid arthritis and cancer, among others. Simple numbers from a CBC or lipid profile, which are the standard tests an allopathic physician performs, do not always reveal the extent of the body's capability to process excess fats, proteins and sugars. Only a live cell morphology screening can do that.

During illness and infection, white blood cells increase to fight off pathogens. When you overeat cooked foods, the body reacts in the same way. Within 30 minutes of eating cooked foods, white blood cell count increases dramatically. The immune system may be unnecessarily called into action virtually every time we eat.

A microscope used for live blood cell analysis is an excellent tool to demonstrate how excess nutrients in the bloodstream can negatively affect health. A typical research-grade

microscope can magnify a tiny drop of blood 1000 times. By projecting that image to a TV monitor or screen you can see a red blood cell that is 20,000 times its normal size. This can provide an accurate "real-time" picture of your blood cells.

Under a microscope, we can see what happens to red blood cells when proteins are not properly assimilated or digested. Inadequate protein digestion can cause the red blood cells to stick together, which results in a lack of surface area and creates low oxygen content and nutrient delivery. This condition can lead to chronic fatigue, migraine headaches, stiff muscles and poor circulation. The effects of long-term protein consumption can also manifest as digestive problems such as the formation of uric acid crystals, which can eventually lead to arthritis and gout. Using a microscope we can also see chylous (undigested fats) and plaque, which can lead to arteriosclerosis. It takes a concentrated effort on the part of the white blood cells to eliminate these nutrients in cooked foods, while still protecting the body from other toxic invaders. Failing to regularly consume and properly digest raw foods can lead to many health problems.

## **Therapeutic Applications of Enzymes**

Using digestive enzyme supplements, coupled with an increased consumption of raw foods, can:

- boost tissue repair
- increase energy
- enhance immune function
- detoxify the tissue
- slow aging
- promote weight loss
- inhibit inflammation rejuvenate circulation
- fight cancer
- enhance vitamin and mineral absorption
- fight autoimmune disease and viral infections
- reduce muscle aches

## **Does a Lack of Enzymes Contribute to Obesity?**

According to the Centers for Disease Control (CDC), nearly 70 percent of Americans are overweight. I travel abroad extensively and all I have to do is fly back to the United States and look around to realize the difference in the average size of the average American versus the average European or Asian. It reminds me of the paintings of corpulent Romans reclining on their plush sofas, oblivious to the fact that lean, fit Germanic tribes were about to invade their borders to the north. So, too, will disease and other degenerative conditions invade America's lifestyle of excess if we don't take action. The average American's diet today consists of too many processed and cooked foods that are high in empty calories, processed sugars and trans fats. Our typical diet is also low in fiber and essential enzymes. Excess body fat, caused by

empty calorie intake, is associated with innumerable diseases. Additionally, virtually all health studies agree that excess body fat can significantly shorten life span.

Many Americans believe that fat from food is bad for you, but fat from plants and animals is one of the best sources of energy available-as long as it is in its original, unprocessed form. For example, in the not-so-distant past, the Eskimo diet consisted mainly of uncooked animal protein and whale blubber. Generations of Eskimos lived on this diet without suffering from nutritional deficiencies or heart disease. In contrast, they were extremely robust and healthy and not affected with degenerative diseases such as high blood pressure, high cholesterol, heart disease, kidney stones or other ailments that afflict modern Americans. The Maasai tribes in Kenya and Tanzania in Africa are much the same way. For generations, they sustained themselves on a diet consisting of beef fat and milk in its raw form. Again, after hundreds of autopsies, researchers found no heart disease or clogged arteries.

So what is the cause of obesity and heart disease? Take a look at modern day descendants of Eskimos and Maasai who now live on reservations and eat Western diets. Most Eskimos and the people of the Maasai who have adopted the Western habit of eating cooked and processed food have now inherited the degenerative diseases associated with an enzyme-deficient diet. It is the enzymes in the unprocessed foods that kept them healthy for generations, and it is the enzyme-less diets that are now causing them to inherit human-made diseases. As one of my mentors, Dr. Bernard Jensen, used to say, "Live food will keep you alive and dead food will make you dead."

## **Enzymes and Weight Loss**

One of the primary keys to weight loss may simply be the action of digestive enzymes. In a landmark 1966 study, Dr. David Galton at Tufts University School of Medicine in Boston, Massachusetts, tested people weighing 230-240 pounds. He found that virtually all of them were lacking the digestive enzyme lipase in their fatty tissues. Lipase, which is found abundantly in raw foods, is a fat-splitting enzyme that aids the body in digestion, the storage and distribution of fat and the burning of fat for energy. Lipase activity breaks down and dissolves fat throughout the body. Without lipase, fat stagnates and accumulates in the organs, arteries and capillaries.

A good example of the importance of lipase activity lies in an interesting experiment with pigs. Veterinarians fed one group of pigs only enzyme-rich raw potatoes and another group enzyme-deficient cooked potatoes. The pigs that ate the raw potatoes did not get fat. However, the pigs eating cooked potatoes gained weight rapidly. Likewise in humans, the regular use of supplemental digestive enzymes that include lipase with meals often results in shedding excess pounds.

## Overweight and Sick Children

Before the advent of processed foods, junk foods and fast foods, overweight children were a rarity. That is no longer the case. According to 2008 statistics, a minimum of 20 percent of children ages 6-11 years old are considered obese— an increase from 6.5 percent in 1978.

Not only are many children overweight or obese, but doctors are now treating children for juvenile arthritis, type 2 diabetes and other degenerative diseases that just a few years ago were usually found only in people older than 50. This disturbing trend is directly related to diets that are high in fats and sugars and low in fiber, enzymes, vitamins and minerals.

According to statistics from the National Health and Nutrition Examination Survey (NHANES) conducted by the CDC, many children do not consume sufficient fruits and vegetables. According to NHANES, 45 percent of children ages 6-11 years old eat no fruit on a typical day, and 20 percent eat less than one serving of vegetables. On average, children eat 3.5 servings of vegetables daily, far below the recommended seven daily servings. Statistics do not reveal what percentage of fruits and vegetables are consumed in raw form, but given the prevalence of deficiencies, children could likely benefit from digestive enzyme and other nutritional supplements. It is hard to believe that simply eating more raw food or taking an enzyme supplement with each meal could solve obesity, but studies indicate that is possible.

## Sugar and Enzymes

What about sugar? Unprocessed, raw sugar contains enzymes, chromium and B-complex vitamins and is easily digested and assimilated. On the other hand, the white, processed sugar most of us are familiar with contains no enzymes, no B-complex vitamins and no chromium. In order for the body to metabolize processed sugar, the missing enzymes, vitamins and chromium must be "borrowed" from the body's own tissue stores.

Eating large quantities of white sugar not only depletes the body's enzymes, but also leads to B-vitamin and chromium deficiencies. Chromium is an essential mineral that the body needs to support efficient function of insulin, which regulates the metabolism of proteins, carbohydrates and fats. Studies show a relationship between obesity, diabetes and chromium deficiencies. B-vitamins are coenzymes that are essential to the metabolism of all cells. Deficiencies of such nutrients increase the risk of obesity and diabetes.

## Osteoporosis and Enzymes

Calcium is a mineral found abundantly in many plants and raw dairy foods. However, without digestive enzymes naturally found in the foods, the body cannot fully assimilate the calcium they contain. I am convinced that digestive enzyme supplements are the answer to proper calcium assimilation from the foods we eat and the supplements we take. Certain types of

calcium act as cofactors for enzyme activation of protease, the enzyme that breaks down and digests proteins, like those found in meat and dairy products.

Isn't it interesting that nature knew we needed calcium in milk and put the right enzyme in the milk to help us digest it? And what did we do? We pasteurize (heat) the milk to kill bacteria, which also kills the enzyme. This prevents the body from digesting the milk properly, which also prevents the body from absorbing the calcium that we need from the milk in the first place.

People diagnosed with osteoporosis are generally instructed to take calcium and vitamin D supplements. Yet often, in a few months or years, they find that not only has the disorder progressed, but they now have buildups of calcium in their joints, including bone spurs or blocked arteries due to calcium deposits. Calcium is vital to transmitting nerve impulses, heart function and muscle contraction in addition to bone health. If the body cannot properly assimilate calcium from the food we consume, it will begin to pull calcium from the bones and muscles to perform its functions. This results in weak, brittle bones and muscular fatigue and cramping.

## Candidiasis and Allergy Relief with Enzymes

Candidiasis is an overgrowth of the common yeast *Candida albicans*, which lives in the intestinal tract. The condition typically affects the endocrine and nervous systems and can have a devastating effect on the immune system. By some estimates, at least 50 percent of the population may be affected by yeast overgrowth, which can lead to allergies of various types, chronic fatigue and many outward symptoms such as athlete's foot, jock itch, vaginal and anal yeast infections and other skin irritations. Yeast overgrowth can be triggered by several factors. For example, taking antibiotics regularly can kill the "good" bacteria found in the colon that keep the yeast at bay, thus allowing the yeast to proliferate. Another contributor is frequent consumption of processed carbohydrates and simple sugars. Yeast spores feed off of these sugars, thus inducing their proliferation.

The cause of Candida overgrowth is a lack of enzymes. When the body has sufficient digestive enzymes, the enzymes convert all sugars into glucose, the only sugar your body can use. If the body lacks digestive enzymes, the sugars found in foods (lactose, sucrose, fructose and maltose) remain in their crystalline state. These sugars then ferment and feed existing yeast and fungal forms, causing them to grow faster than the immune system can control them. This leads to fungal or yeast infections.

If improperly digested sugars are the cause of *Candida* overgrowth, then a simple way to prevent *Candida* overgrowths is to consume more raw food or digestive enzyme supplements. Such changes are so effective that many with *Candida* find relief in a matter of days after taking supplemental digestive enzymes. In Japan, many enzyme supplements are prescribed for

allergies and *Candida*.

Candidiasis and associated allergies affect millions of people. Allergens and antigens such as viruses, bacteria, fungi and yeast are most often proteins. They can enter the body via the digestive tract or they may be breathed into the body via the lungs. The body needs tremendous quantities of protease to digest and eliminate these toxic invaders, not only in the digestive tract but in the bloodstream as well. Taking certain types of supplemental digestive enzymes containing protease can eliminate most antigens, including yeast. Such digestive enzymes can be taken both with food and between meals to digest excess matter in the bloodstream such as protein, fat and sugars.

## Celiac Disease and Enzymes

Celiac disease begins when the body no longer can digest the gluten found in wheat and other grains. As previously discussed, when food residues are not properly digested, the immune system automatically overreacts. In an individual with celiac disease, undigested gluten coats the intestinal lining, damaging the *villi*, tiny projections that line the intestinal wall that allow nutrients to pass into the bloodstream. The immune system responds to this coating, further damaging the villi. Soon, very few nutrients can be absorbed and the celiac suffer begins to show signs of malnutrition.

Some researchers suggest that celiac disease is caused by an enzyme deficiency. Digesting gluten requires a specialized type of protease. Research currently underway at Stanford University in Palo Alto, California, is examining gluten-specific protease enzymes that may break down gluten into fragments small enough that they do not cause a negative reaction. Similar research is also underway at Leiden University Medical Center in the Netherlands. While research is still preliminary, specialized digestive enzymes may eventually help provide a way to help manage celiac disease without following a gluten-free diet.

## Summary of Enzyme Use

The following is a summarized list of conditions and disorders that may respond to digestive enzyme therapy:

- allergies
- cataracts
- celiac disease
- chronic hepatitis
- chronic venous insufficiency
- crohn's disease
- colitis
- constipation
- cystic fibrosis

- diabetes (type 1)
- diarrhea
- energy loss
- excess or lack of HCl
- fibrocystic disease
- food intolerances
- gout
- indigestion
- inflammatory joint disease
- inflammatory venous diseases
- intestinal toxemia
- irritable bowel syndrome
- irritable thyroiditis
- lactose intolerance
- lupus
- myasthenia gravis
- nutrient malabsorption
- obesity
- pancreatic insufficiency
- premature aging
- phlebitis
- sinusitis
- tooth decay

## Can Food Alone Help?

In today's society, a diet of live organic foods is difficult to sustain. Even if we are able to accomplish it, such a diet may not meet all of our nutritional needs. Why? Because decades of intense cultivation has led to devitalized or nutrient-depleted soil. Devitalized soil produces devitalized food. In addition, the foods we consume are rarely fresh from a garden-and enzyme depletion begins as soon as crops are harvested.

Many fruits and vegetables come from foreign countries and are picked when they were unripe. Fruits and vegetables contain fewer enzymes when they are not allowed to vine ripen. Another downside to importing food is the process of irradiating food to kill any unwanted bacteria or organisms coming from foreign countries. Although this process may keep us from getting sick from bacteria, it also kills the enzymes, thus leading to degenerative diseases. Another factor is adding preservatives to food. While preservatives help keep food fresh, they also destroy enzymes.

## What Can You Do?

Consume as many locally and organically grown raw or freshly juiced fruits and

vegetables as possible. Include digestive enzyme supplements with each meal. (See page 28 for specific types of digestive enzymes). I also suggest including sprouted "superfoods," such as alfalfa or soybeans, and green superfoods such as blue-green algae, hydrilla, green barley, chlorella or spirulina. Superfoods are available in supplement form and contain high quality predigested proteins, vitamins, antioxidants, minerals and enzymes.

Since trace minerals are necessary to activate certain enzymes, I also suggest including a full-spectrum mineral supplement to make up for any mineral shortages in the foods you eat. Digestive enzyme supplements taken with raw or cooked meals can assure optimum digestion and assimilation from the nutrients in foods we eat. This will relieve stress on the pancreas and allow the body to focus on producing metabolic enzymes so they can perform their vital functions throughout the body.

## **Good Water is Also Essential**

The body needs a certain amount of pure, filtered water each day. Eat foods that contain a high water content as well as drinking plenty of water. The amount of water your body needs depends on your environment and your body size. A good average calculation would be to divide your body weight by half and then convert the amount to ounces. the result is the amount you need daily.

Cells, the GI tract and the bloodstream also need water to catalyze various enzymatic reactions. Water also transports oxygen to the body's cells, helps the body carry and absorb nutrients and helps hydrate the GI tract to flush toxins and waste. It lubricates the joints, keeps skin moist, prevents organs from "sticking together" and maintains proper fluid balance inside and outside your cells. Provide your body with the purest water available. Don't drink or cook with water that has been treated with chlorine, a chemical disinfectant that kills harmful bacteria. When ingested, chlorine also kills beneficial bacteria in the stomach and colon.

Most people think that as long as they are drinking liquid, they are meeting their body's fluid requirements. This is not true. Soft drinks, juices and other beverages are typically loaded with simple sugars that the body must use digestive enzymes to process. According to Beverage Digest, in 2009, Americans spent \$115 billion on soft drinks, juice, teas and energy drinks-none of which can substitute for the body's need for pure water.

## **Digestive Enzyme Supplements**

Digestive enzyme supplements are available in several varieties. To choose a digestive enzyme that is right for you, consider your needs and what you will be using the supplement to accomplish. Do you have trouble digesting proteins? Or carbohydrates? Or fats? Are you a vegetarian? Do you have low stomach acid? Do you have food intolerances to milk or beans?

In my opinion, the best sources of supplemental digestive enzymes are derived from two



species of fungi: *Aspergillus oryzae* and *Aspergillus niger*. Such enzymes can work in all stages of digestion as well as all ranges of pH levels of food. Digestive enzymes derived from *Aspergillus* come in powders or capsules that can be taken orally or sprinkled on food. They are not degraded by stomach acid, while certain enzymes derived from porcine or bovine pancreas, such as pancreatin, need to be enteric-coated in order to pass through stomach acid. I usually suggest that anyone who eats cooked food on a regular basis consider supplementing their diets with digestive enzymes.

When searching for an enzyme supplement, remember that different digestive enzymes have very specific functions and many come from different sources.

- protease, papain and bromelain digest proteins into amino acids
- amylase digests complex carbohydrates into simple sugars
- maltase digests maltose into glucose
- lactase digests milk sugars into simple sugars
- lipase digests lipids or fats into fatty acids and glycerol's
- cellulase digests fibers into simple sugars
- alpha-d-galactosidase helps digest bean sugars and oligosaccharides
- pancreatin (from porcine pancreas) is a combination protease, amylase and lipase that helps digest proteins, carbohydrates and fats

Choose an enzyme supplement that contains a variety of different enzymes so you will not have to take several different capsules to digest all the nutrients contained in one meal.

Additionally, when searching for a digestive enzyme supplement, be sure that your enzymes are measured in the latest measuring standards set by the Food and Chemical Codex (FCC), which are the measurements accepted by the U.S. Food and Drug Administration (FDA). Avoid supplements that are measured in milligrams. The efficacy of enzymes is measured by strength, activity and potency, not by weight. Enzymes are catalysts, similar to electricity.

Each enzyme has its own activity measurement, which is established by the FCC. The units of measure for some of the most common digestive enzyme supplements are as follows:

- protease: HUT (hemoglobin unit tyrosine base)
- amylase: DU (alpha-amylase dextrinizing units)
- maltase: DP (degrees diastolic power)
- lactase: LacU (lactase unit)
- lipase: LU (lipase unit) or FIP (Federation Internationale Pharmaceutique)
- cellulase: CU (cellulase unit)

## Ingredients Commonly Found In Natural Digestive Enzymes

A complete digestive enzyme supplement needs to include a variety of enzymes and other possible compounds to address all facets of digestion for the three main food groups, proteins, carbohydrates and fats. Ingredients that are commonly found in enzyme supplements and digestive aids include:

**Amylase:** Derived from *Aspergillus oryzae*, amylase works to break down starch and glycogen (sugar).

**Bromelain:** Derived from the stem of the pineapple plant, this enzyme contains sulfur proteinase, which helps to breakdown proteins.

**Cellulase:** An enzyme fermented from *Aspergillus* that breaks down fibrous foods.

**Chymotrypsin:** An animal-source enzyme (usually from porcine pancreas) that breaks down protein components in the stomach.

**Hydrochloric acid:** Hydrochloric acid (HCl) is often added to digestive enzyme supplements to boost digestion and enhance the action of enzymatic compounds in the stomach. *Only supplement HCl if you have been tested and found to have low HCl levels.*

**Lactase:** Extracted from yeast and fungal sources, this enzyme breaks down lactose, a sugar found in milk products.

**Lipase:** Extracted from *Aspergillus oryzae*, this enzyme breaks down fats into their basic components, fatty acids and glycerol.

**Ox bile:** Improves fat digestion, combats constipation by stimulating bile flow and improves gallbladder function.

**Pancreatin:** A collection of enzymes that contains protease, lipase and amylase that is secreted by the pancreas. Pancreatin from bovine or porcine sources is available in supplement form.

**Papain:** Extracted from the papaya fruit, this enzyme digests protein into amino acids.

**Pepsin:** The natural enzyme that breaks down proteins in the stomach. The function of pepsin depends on the availability of HCl.

**Protease:** Protease, also known as proteinases and proteolytic enzymes, are secreted by the pancreas and form a large group of enzymes involved in breaking down proteins into amino acids. They are involved as metabolic enzymes throughout the body, in the blood and the digestive tract. In the digestive tract, they include pepsin, trypsin and chymotrypsin.

**Trypsin:** An enzyme from animal sources that breaks down protein into peptides and amino acids. Usually works with pepsin and chymotrypsin.

**Alpha galactosidase:** derived from *A. niger*, is an enzyme found in Beano®, an enzyme dietary supplement that helps reduce gas and bloating caused by incomplete digestion of legumes (such as beans) and the cabbage family.

## How to Use Enzymes

The most effective digestive enzyme supplements incorporate a variety of enzymes such as lipase, amylase and protease. Enzyme supplements can be purchased in capsule, tablet, granule, powder or chewing gum form and should be kept cool. They can be taken sublingually, orally or even applied topically. While digestive enzymes can be taken between meals and before bedtime, they are usually taken approximately 30 minutes before eating a meal. They can also be taken during meals, but taking digestive enzyme supplements prior to a meal places less stress on the pancreas. Taking digestive enzymes can make all the difference when it comes to making the most of the food you eat. Carry enzymes around in your pocket or purse and get used to using them.

Ideally, digestive enzyme supplements replenish enzymes in the foods we consume and make it possible to fully metabolize macronutrients without taxing the pancreas. Typically, dosages should be high at first and then adjusted to lower levels as the body becomes less enzyme depleted. *Note: If you experience a feeling of fullness, a softening of the stool or gas while taking digestive enzymes, reduce your dosage.*

## The Power of the Enzyme

Numerous studies show that people can improve a myriad of medical conditions—such as circulatory and blood pressure problems, arteriosclerosis, diabetes, skin afflictions and arthritis—by taking supplemental digestive enzymes. Studies also show that enzyme supplements help with faster recovery time from sports related injuries. Drs. Lopez, Miehle and Williams supported the healing properties of enzyme supplementation in their outstanding book *Enzymes: The Foundation of Life*, published in 1994. Unfortunately, the book is out of print, but you may be able to find a copy at your local library or from a used book retailer on the Internet. Another good choice is Dr. Edward Howell's book, *Enzyme Nutrition: the Food Enzyme Concept*, which I referred to earlier.

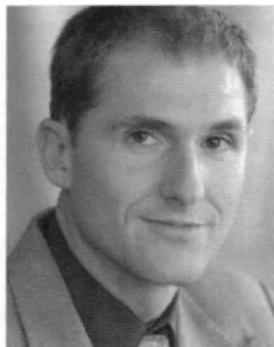
To prevent the depletion of enzymes from shortening your life, you must consume digestive enzymes in sufficient quantity to adequately digest what you eat. Your body will then be free to produce more metabolic enzymes to keep you healthy and prevent the myriad of diseases that plague us today.

Take a serious look at the power of enzymes and make the choice to implement their amazing ability to heal, build and restore health by simply introducing more digestive enzymes into our diets. Eat more raw foods and add digestive enzyme supplements when consuming processed and cooked foods! It will take a conscientious effort on your part but you can do it! Make the choice today.

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## About the Author



Tracy Gibbs, PhD, has an extensive background in pharmacognosy, the study of medicines derived from natural sources. Gibbs studied chemistry, hematology and botanical medicine in Japan where he received an honorary PhD from the Graduate School of Health Knowledge and Sciences (English name). He is a member of the International Iridology Practitioners Association, a board member in the International Health Food Research Foundation in Nagoya, Japan, and a member of the American Society of Pharmacognosy. Gibbs has lectured worldwide on the clinical applications of herbal medicine. Gibbs operates an herbal medicine school in Japan and one in the United States where students can learn how to use herbs in everyday situations.

Gibbs has authored several books and booklets including *My Home Pharmacy*, *Phytonutrients: The Drugs of the Future* and *Your Blood Speaks*. Two of these books have been translated into Japanese-language editions.

Additionally, Gibbs is the owner and founder of Health Education Corporation, which specializes in nutritional blood evaluation, educational seminars, literature production and personal counseling. Gibbs is a co-owner and chief formulator for NutraNomics, Inc., a Salt Lake City-based corporation that specializes in the research and development of nutritional supplements and herbal products.