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On The COVER

Digestive Enzymes: The Missing Link

Enzymes are a vital component of the digestive process, essential to the body's absorption and full use of food. The capacity of a living organism to make enzymes diminishes with age, and some scientists believe that humans could live longer and be healthier by guarding against the loss of our precious enzymes.

by Marilyn Bitomsky

Enzymes are responsible for every activity of life-even thinking requires enzyme activity. There are two primary classes of enzymes responsible for maintaining life functions: digestive and metabolic. The primary digestive enzymes-proteases, amylases and lipases-function as biological catalysts, helping to break down protein, carbohydrates and fats. Raw foods also provide enzymes that naturally break down food for proper absorption. Metabolic enzymes are responsible for the structuring, repair and remodeling of every cell, and the body is under a great daily burden to supply sufficient enzymes for optimal health. Metabolic enzymes operate in every cell, every organ and every tissue, and they need constant replenishment.

Digestion of food takes a high priority and has a high demand for enzymes. When we eat, enzymatic activity begins in the mouth where salivary amylase, lingual lipase and ptyalin initiate starch and fat digestion. In the stomach, hydrochloric acid activates pepsinogen to pepsin, which breaks down protein, and gastric lipase begins the hydrolysis of fats. Without proper enzyme production, the body has a difficult time digesting food, often resulting in a variety of chronic disorders.

Poor eating habits, including inadequate chewing and eating on the run, can result in inadequate enzyme production and hence malabsorption of food. And this is exacerbated with aging, since that is a time of decreased hydrochloric acid production as well as of a general decline in digestive enzyme secretion.

Saliva is rich in amylase, while gastric juice contains protease. The pancreas secretes digestive juices containing high concentrations of amylase and protease as well as a smaller concentration of lipase. It also secretes a small concentration of maltase, which reduces to dextrose. Animals eating raw food often have no enzymes at all in saliva, unlike humans. However, dogs fed on a high carbohydrate, heat-treated diet, have been found to develop enzymes in their saliva within a week in response to enzyme depleting foods.

One of America's pioneering bio-chemists and nutrition researchers Dr. Edward Howell, in his book *Enzyme Nutrition*, cites numerous animal studies showing that animals fed diets that are deficient in enzymes suffer from enlargement of the pancreas, as huge amounts of pancreatic enzymes are squandered in digesting foods that are devoid of natural enzymes. The result of this wasteful outpouring of pancreatic digestive enzymes is a decrease in the supply of crucial metabolic enzymes and impaired health.

How significant is an enzyme deficiency to overall health? For starters, organs that are overworked enlarge in order to perform the increased work load. Those with congestive heart failure or aortic valvular disease often suffer from an enlarged heart-not a healthy condition. When the pancreas enlarges in order to produce more digestive enzymes, there becomes a deficiency in the production of life-sustaining metabolic enzymes, as available enzyme-producing capacity is used in digesting food, instead of supporting cellular enzymatic functions. The tremendous impact that wastage of pancreatic enzymes can have on health and even life itself has been established in animal studies. The critical question is how this applies to human health.

For a good part of the 20th Century, European oncologists have included enzyme therapy as a natural, non-toxic therapy against cancer. Almost all of the leading alternative cancer specialists treating Americans prescribe both food enzymes and concentrated enzyme supplements as primary or adjuvant cancer therapies. Nicholas Gonzalez, M.D., a New York City cancer specialist, uses

very high doses of supplemental pancreas enzymes as a primary anti-tumor therapy. Dr. Gonzalez's clinical successes have led conventional drug companies to seek to duplicate these natural therapies and offer them as adjuvant drug therapies. One might assume that if pancreatic enzymes are efficacious in treating existing cancers, that maintaining a large pool of these precious enzymes in the body would help to prevent cancer from developing in the first place. Epidemiological studies on human populations show that those who eat fresh fruits and vegetables that are loaded with natural enzymes have dramatically reduced levels of cancer and other diseases. Whether the high enzyme content of these foods is partially responsible for their anti-cancer effect has not been proven, but the evidence is compelling.

Digestive organs such as the pancreas and liver produce most of the body's digestive enzymes, while the remainder should come from uncooked foods such as fresh fruit and vegetables, raw sprouted grains, seeds and nuts, unpasteurized dairy products, and from enzyme supplements.

Eating food in its natural, unprocessed state is vital to the maintenance of good health, and a lack of it in the modern diet is directly responsible for much degenerative disease. Cooking of food, particularly if heat is prolonged and over 118 degrees Fahrenheit, destroys enzymes in that food, leaving what is commonly consumed by the modern person - an "enzymeless" diet. This is how by middle age we become metabolically depleted of enzymes. The glands and major organs, including the brain. suffer most from this deficiency. The brain may actually shrink as a result of a cooked, over-refined diet devoid of enzymes the body so desperately needs. As stated earlier in this article, to try to meet the deficiency, the pancreas swells. Laboratory mice fed on heat-processed enzymeless food have a pancreas two or three times heavier than that of wild mice eating their natural enzyme diet of raw food.

If foods are eaten uncooked, fewer of the body's digestive enzymes are required to perform the digestive function. The body thereby adapts to the plentiful, external supply by secreting fewer of its own enzymes, preserving these enzymes to assist in vital cellular metabolic functions. Frying is one of the worst cooking methods since it occurs at a much higher temperature than boiling, damaging protein as well as destroying enzymes. Many digestive disorders such as bloating may be related to an enzyme deficit that begins in middle age.

Enzymes can also be wasted by lifestyle factors. Enzymes do more work with increasing temperatures, and they are used up faster. For example, a fever induces faster enzyme action, and hence is unfavorable for bacterial activity. Enzymes have been found in the urine not only after fevers but also after strenuous athletic activity.

Animals harness the power of enzymes in food by burying or covering it, thereby allowing enzyme activity to begin and food to be predigested. That way animals preserve their own enzyme supply. In fact, animals-and also the people of some native cultures-teach us not only about how to preserve our enzyme supply, but also about disease prevention through efficient use of enzymes. Although whales have up to six inches of fat keeping them warm, for instance, their arteries are unclogged. Similarly Eskimos, who frequently eat large quantities of fat, are often not obese. Both these groups eat the fat-digesting enzyme lipase in the form of raw foods.

In vitro and controlled in vivo studies using internal and parenteral routes have examined the effectiveness of different types and sources of plant enzymes in a wide range of conditions, including maldigestion, malabsorption, pancreatic insufficiency, steatorrhoea, celiac disease, lactose intolerance, arterial obstruction and thrombotic disease.

Enzymes derived from the Aspergillus oryzae fungus have been subjected to numerous studies evaluating their role in supporting healthy digestive function. Moreover, several human studies suggest the proteolytic enzymes derived from this fungus may play a role in anti-inflammatory and fibrinolytic therapy. These enzymes appear to be relatively heat stable and they are also active throughout a wide pH range, important because most enzymes are deact*ated in stomach acid. These enzymes. synthesized from fungus, contain no fungal residue even though that is their derivation. Modern filtration technology enables these fungal enzymes to be ideal for human consumption.

Oral supplementation of digestive enzymes taken just before or at mealtimes can assist digestion, according to Dr. Mark Percival. Writing in Nurntional Peads, he says although most supplemental enzymes are labile and will deactivate when exposed to stomach acid, if they are taken just before or with a meal, some of the enzymes remain active. "The enzymes are physically protected" by the meal, allowing for some enzymatic activity to occur in the stomach. And for those enzymes that make it through to the small intestine. they may help with digestion there as well. Because pH plays a major role in enzymatic activity, the enzymes derived from Aspergillus "may be highly useful as they appear to be remarkably stable, even when subjected to an acidic environment." Dr Howell says he chews an enzyme capsule with his food in order to start the digestive process as soon as the food is consumed. Enzyme activity has been shown to begin even before the food is swallowed.

Dr. Arnold Renshaw, from Manchester in England, reported in Annals of Rheumatic Disease that he had obtained good results with enzyme treatment of over 700 patients with rheumatoid arthritis, osteoarthritis or fibrositis. "Some intractable cases of ankylosing spondylitis and Still's disease have also responded to this therapy." He went on to say that of 556 people with various types of arthritis, 283 were found to be much improved, and a further 219 were improved to a less marked extent. Of 292 cases of rheumatoid arthritis, 264 showed improvement of various degrees. The longer the duration of the disease, the longer time before

improvement was observed, although most started to show improvement after just two or three months of enzyme therapy. Despite these favorable findings, digestive enzyme therapy in conventional medicine has been reserved to those diseases that directly result in a pathological deficiency of pancreas-derived digestive enzymes.

Common digestive disorders may benefit from enzyme replacement. In pathological digestive diseases, the oral intake of exocrine pancreatic enzymes is of key importance in the treatment of maldigestion in chronic pancreatitis with pancreatic insufficiency, according to Schneider et al. They studied the therapeutic effectiveness of a conventional and an acid-protected enzyme preparation, and an acid-stable fungal enzyme preparation in the treatment of severe pancreatogenic steatorrhoea. The results showed that a supplemental enzyme preparation is best for patients with chronic pancreatitis and prior Whipple's procedure (a surgical procedure performed on pancreatic cancer patients), while patients with an intact upper gastrointestinal tract fare best with an acid-protected porcine pancreatic enzyme preparation.

Dr. Brad Rachman says that 58% of the population suffers from some type of digestive disorder, and a lack of optimal digestive function associated with enzyme inadequacy may lead to malabsorption and numerous related conditions. The problem is exacerbated in the elderly because their production of gastric HCl may be suboptimal. "This can be a significant factor that can impact nutrient absorption along with the creation of maldigestive-type symptoms. Bacterial production of hydrogen and methane are determined after a carbohydrate challenge. Excessive levels of these gases reflect overgrowth of bacteria in the upper gut." Help is at hand, he says, with enzyme replacement. Dr Rachman says enzymes administered orally at meals may improve the digestion of dietary protein and thereby decrease the quantity of antigenic macromolecules leaking across the intestinal wall into the bloodstream. Such leaks may trigger the body's defenses against exposure to what it perceives as foreign protein or polypeptide invaders, producing the symptoms of allergy.

Dr. Howell agrees that allergies can also be helped by enzyme additions to the diet. So too can excessive cholesterol levels, he says. Discussing cholesterol and atherosclerosis, he quotes a 1962 study by three British doctors, CW Adams, OB Bayliss and MZ Ibrahim, who set out to discover why cholesterol clogs arteries, ultimately manifesting in heart disease. They found all enzymes studied became progressively weaker in the arteries as people aged, and the hardening became more severe. They suggested a shortage of enzymes is part of the mechanism which allows cholesterol deposits to accumulate in the inner part of arterial walls. Blood tests conducted by Stanford University researcher LO Pilgeram in 1958 demonstrated progressive decline in lipase in the blood of atherosclerosis patients with advancing middle and old age.

About the same time, Becker, Meyer and Necheles at Michael Reese Hospital in Chicago found enzymes in the saliva, pancreas, and blood became weaker with advancing age. They speculated that fat may be absorbed in the unhydrolyzed state in atherosclerosis. They also found definite improvement in the character of fat utilization following the use of enzymes. Intravenous administration of brinase, a proteolytic enzyme preparation from Aspergillus oryzae, was found by an Irish research group, Fitzgerald et al, to be beneficial in the treatment of chronic arterial obstruction. Patients were observed for three months before receiving six intravenous infusions of either saline or brinase over two weeks. During the observation period, no changes were observed. After the infusion, 17 of the 27 obstructed arterial segments were found to have resumed blood flow, and the number of patent segments increased from it to 27. No improvements were observed in the placebo-treated patients.

Considerable evidence exists to support the beneficial effects of enzymes, natural and supplemental. And it is obvious that plant enzymes benefit specific conditions. Research dealing with intact absorption of food substrates proves undoubtedly that non-digested food substrates enter the blood and that plant enzymes break down different food substrates that would otherwise be passed into the blood without being fully digested.

The time when our normal ability to produce enzymes is greatest is in our youth, a time of rapid growth, and in most cases a time of no serious illness. When we age and our food enzymes become depleted, we begin to suffer a broad range of health complaints.

How long we live and in what state of health is determined by our enzyme potential, according to Dr. Howell. Referring to a study by Dr. Meyer and his associates at Michael Reese Hospital in Chicago, Dr. Howell said the enzyme of the saliva in young adults is 30 times stronger than that in people aged over 69 years. Similarly, a German study by Eckardt of 1200 urine specimens found almost twice as much of the starch-digesting enzyme, amylase, in young people as in old.

So humans eating an enzymeless diet use up vast quantities of their enzyme potential through secretion of the pancreas and other digestive organs, resulting in a shortened life-span, illness, and lowered resistance to all types of stress.

University of Illinois researcher. GA Leveille discovered in the early that enzyme activities in the tissues become weaker with aging. Conducting experiments on rats, he found that at the age of 18 months - which is considered old age for rats - enzyme free fabricated diets, enzyme activity had shrunk to less than 20% of its level at one month of age. And Dr. Howell agrees: "the more lavishly a young body gives up its enzymes, the sooner the state of enzyme poverty, or old age. is reached."

The answer is substitution of raw food for cooked as much as possible. By eating foods with their enzymes intact and by supplementing cooked foods with enzyme capsules, Dr. Howell suggests we can stop abnormal and pathological aging processes.

He singles out raw milk, bananas, avocados, seeds, nuts, grapes, and other natural foods as rich in food enzymes. He also suggests enzyme supplements be taken with all cooked food and, under medical supervision, large doses in enzyme therapy to treat certain diseases. We are what we eat. Few would disagree with this adage, but not everyone realizes it is not quite so simple. Enzymes make the digestion of food possible. This means we must make maximum use of enzyme activity, both internal enzymes and those we consume either in food or as supplements.

Further Reading

Annals of Rheumatk Disease (1947)

Fitzgerald DE, Frisch EP, Milliken jC. Relief of chronic arterial obstruction using intravenous brinase. *Scand j Thor Cardiovasc Surg* 1979; 13:327-32

Howell E. Enzyme Nutrition: The Food Enzyme Concept. Wayne, NJ; Aver' Publishing Group, 1985 Percival M. *Nutritional Pearls* (vol 35)

Rachman B. Unique features and application of non-animal derived enzymes. *Clinical Nutrition Insights* 1997; 5(10)

Schneider MU, Knoll-Ruzicka S, Domschke et al. Pancreatic enzyme replacement therapy *Hapatogastroenteroogy* (1985) Apr; 32(2):97-102

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