The Health Applications of Digestive Enzymes

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General Features

The vast majority of Digestive Enzymes in the body are secreted by the pancreas and the epithelial cells of the upper intestinal tract. Saliva and stomach juices contain small quantities of Digestive Enzymes, such as amylase, lipase and pepsin, but these sources do not factor significantly into the overall digestion of a meal or snack.[1] In certain conditions, such as cystic fibrosis and pancreatitis, there is a corresponding pancreatic enzyme deficiency, and supplementation of Digestive Enzymes has been shown to be a legitimate aspect of treatment.[2] In health conditions, where there has been damage to the intestinal tract epithelial cells, (e.g., giardiasis, damage from non steroidal anti-inflammatory drugs, excess alcohol consumption, celiac disease and Crohn's disease) or an in-born defect resulting in insufficient lactase enzyme synthesis (lactose intolerance), the use of Digestive Enzymes is also of proven value.[3,4,5,6] There is also evidence that many people show a trend towards reduced digestive enzyme concentrations as they age. Some authorities link this decline to an increased risk of degenerative diseases and provide some evidence that digestive enzyme supplementation may be beneficial to counter these outcomes as we age.[7] Other studies reveal that digestive enzyme supplementation may be helpful in the management of various arthritic and allergic conditions as well as being a potentially important adjunctive treatment for certain cancers.[2,8,9]

Clinical Application and Mechanism of Action

1. **Post-Meal Bloating and Abdominal Discomfort (Indigestion or Dyspepsia)**

Evidence has shown that digestive enzyme supplementation can improve digestion of a large, high fat, very rich meal, in individuals with normal digestive processes. The subjects given the Digestive Enzymes reported less bloating, perception of gas and fullness after consuming the same large, high fat, very rich meal as those given the placebo. One clinical observation of significance suggests that individuals who chronically experience post-meal (postprandial) bloating, belching or gas tend to have low gastric acidity if the symptoms arise shortly after consuming a meal, whereas in patients where these symptoms develop an hour or more after eating, the problem is more likely to be a result of digestive enzyme deficiency.[10] Some reports indicate that 58% of the population suffer from some type of digestive disorder and may thus, benefit from the use of digestive enzyme supplementation.[7]

2. **Cystic Fibrosis, Pancreatitis, Crohn's Disease, Celiac Disease**

These conditions have been shown to benefit from the use of digestive enzyme supplementation as insufficient digestive enzyme synthesis and secretion are hallmark features of each of these conditions.[2,3,4,5,6]

3. **Arthritic Conditions**

Although not well acknowledged, some health practitioners indicate good results with various arthritic patients when Digestive Enzymes are added to the treatment program. Dr. A. Renshaw from Manchester in England, reported in the Annals of Rheumatic Diseases that

he obtained good results with enzyme treatment in over 700 patients with rheumatoid arthritis, osteoarthritis, or fibrositis. Some cases of ankylosing spondylitis and Still's disease (Juvenile Rheumatoid Arthritis) have also responded well to this intervention.[7] Other reports include favorable outcomes in patients with multiple sclerosis and lupus (systemic lupus erthymatosus). The mechanism of action in these cases appears to involve interaction with the body's immune system. Animal and human studies demonstrated that, in certain instances, a person can develop a leaky gut, which implies that the normal gut lining has been damaged or is somehow defective, allowing certain partially digested food matter to be absorbed from the gut into the bloodstream. Once in the bloodstream these substances trigger a response from the immune system, producing immune complexes (a type of antigen-antibody reaction), with accompanying inflammatory reaction and a worsening of the above-noted conditions. German researchers have shown that the use of digestive enzyme supplements in these cases can dissolve and clear these immune complexes, helping to improve the patient's overall condition.[2,11,12]

4. Cancer Treatment Support

Studies on humans and animals suggest that Digestive Enzymes may also be of value in the prevention and treatment of certain cancers. The Scottish embryologist, Dr. John Beard, proposed in 1906 that pancreatic enzymes represent the body's main defense against cancer and would be useful in cancer treatment. Acting on his hypothesis, a number of researchers pursued this line of investigation and the medical literature in the first two decades of the 20th century provided documentation of several case reports of tumor regression and even remission in terminal cancer patients treated with pancreatic enzymes.[9]

Dr. Beard (an embryologist) discovered that in all animals the pancreas is secreting enzymes well before birth. Beard also noted that the placenta of all mammals invades the uterus and then on a certain day, its invasive growth is shut off, which in humans is 56 days after conception. Beard realized that the day the placenta stopped growing was the same day the pancreas started producing enzymes. From this he theorized that pancreatic Digestive Enzymes were a signaling agent that stopped the cancer-like invasion of the placenta into the uterus. Despite the ridiculing he received for this theory, Beard and others went on to shown that Digestive Enzymes can, in fact, stop the growth of invasive cells, including many different human cancer cell lines.13 After Beard's death in 1923, the enzyme theory was largely forgotten until 1963, when Dr. Gonzalez, a doctor involved in the use of Digestive Enzymes, was diagnosed with pancreatic cancer and treated himself with high dose oral pancreatic enzymes. The treatment was successful and in 1993, Dr. Gonzalez was asked by the National Cancer Institute (NCI) to present some of his cancer cases. He presented 25 cases involving a variety of different cancers. Based on his presentation, Dr. Gonzalez was a awarded a research grant from the NCI to perform a study on 12 patients with diagnosed pancreatic cancer.[9,13]

The overall survival rate for pancreatic cancer is normally less than one percent at five years, after diagnosis. It is one of the most highly malignant cancers of humankind, is considered to be incurable at this time, and is the fifth leading cause of cancer death in the United States, claiming 27,800 lives in 1996. In the two-year study by Gonzalez, he was able to significantly improve survival in the majority of patients who followed his protocol, which included diet, nutritional supplements, detoxification procedures and large doses of

proteolytic enzymes (25-40 gms of porcine lyophilized pancreas product daily, taken in capsule form, away from meals, and spread evenly throughout the day). Gonzalez has now gone on to receive full funding to do multi-institute studies using Digestive Enzymes, based on these encouraging preliminary results.[9]

HIV and AIDS

Nutrient malabsorption is a negative prognostic factor in acquired immunodeficiency syndrome (AIDS). Recent studies have shown that pancreatic insufficiency is a co-determining factor of malabsorption in these cases. As such, a study was performed to test the efficacy of pancreatic enzyme supplementation in AIDS patients with known fat malabsorption problems. The study showed that the use of the digestive enzyme product Creon, at a dose of 1000 units of lipase enzyme per gram of ingested dietary fat, was highly effective in reducing fecal fat loss. The researchers indicate that if other double-blind studies reveal similar findings, then pancreatic enzyme supplementation can be added to the weapons in the fight against HIV/AIDS-associated malabsorption.[14]

Dosage and Standardized Grade

Digestive Enzymes are available in two forms, those derived from the glands of animals (usually hog pancreas), and those derived from non-animal sources (e.g., the fermentation of wheat bran by Asperigillus oryzae to yield carbohydrases such as alpha and beta amylase, cellulase, lactase, sucrase and maltase, as well as protease I and protease II Digestive Enzymes). Bromelain and papain enzymes are also available from the pineapple stem and the papaya, respectively.

Potency of Digestive Enzymes is often listed as U/gm, where U equals activity units, and 1 unit (U) is defined as the amount, which catalyzes the transformation of one micromole of substrate per minute under defined conditions (e.g., 25 degrees C and optimal pH conditions). Each commercial digestive enzyme product has a different composition and U/g potency, making it very difficult to decide which of these is effective for certain applications. For improvement of digestion and general health support, the following minimum requirements would define a respectable digestive enzyme product on a per dosage basis:

- Amylase - 24,000 U/g
- Proteases - 6,000 U/g
- Cellulase - 200 U/g
- Lactase - 4,000 U/g
- Lipase - 1,000 U/g [15,16]

1. General Health Support and Improved Digestion (see above minimum requirements)
2. Celiac Disease - a proven intervention has used a pancreatic enzyme source yielding 5,000 IU of lipase, 2,900 IU of amylase, and 330 IU of protease. Patients took six to ten capsules per day[17]
3. Multiple Sclerosis and Cystic Fibrosis - a product known as Pancreatin (10X) has been used in these cases, at 350-700 mg, three times per day between meals, where IX potency indicates that the preparation of hog pancreatic enzymes has in each milligram not less that 25 USP units of amylase activity, not less than 2 USP units of lipase activity, and not less than 25 USP units of protease activity (USP represents United States Pharmacopoeia). A full strength product usually provides 10 times the 1X dosage or is listed as 10X potency.[18]
4. Cancer Treatment - the study by Gonzalez used 25-40 gms per day of porcine lyophilized pancreas product in the treatment of pancreatic cancer.[9]
5. HIV/AIDS - researchers used a product known as Creon at 1,000 units of lipase enzyme per gram of ingested fat.[14]

6. Severe Pancreatic Insufficiency - doses as high as 1,000,000 USP units of Pancreatin were successful in managing severe pancreatic insufficiency in a clinical trial.[19]

Adverse Side Effects, Toxicity and Contraindications

At supplemental doses used to improve digestion and health optimization, Digestive Enzymes are not associated with any adverse side effects or toxicity. Studies using significantly higher doses for the treatment of cancer, allergies and pancreatic insufficiency etc., have also reported very few side effects and/or cases of intolerance.[2,3,4,5,6,7,8,9,10,11,12,13,14,17,19]

Drug-Nutrient Interactions

There are no well-known drug-nutrient interactions for Digestive Enzymes, although the inclusion of high dose bromelain may potentially enhance the anti-clotting effects of warfarin. It is best not to take betaine hydrochloride at the same time as Digestive Enzymes to improve digestion, as the acidity from betaine hydrochloride will denature the Digestive Enzymes, rendering them inactive. Experts suggest taking betaine hydrochloride at the beginning of a meal and Digestive Enzymes at the end of a meal, when these supplements are being used to improve digestion and absorption.[20]

Pregnancy and Lactation

During pregnancy and lactation, the only supplements that are considered safe include standard prenatal vitamin and mineral supplements. All other supplements or dose alterations may pose a threat to the developing fetus and there is generally insufficient evidence at this time to determine an absolute level of safety for most dietary supplements other than a prenatal supplement. Any supplementation practices beyond a prenatal supplement should involve the cooperation of the attending physician (e.g., magnesium and the treatment of preeclampsia.)

References: Pregnancy and Lactation

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