

Digestive Enzymes

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Digestive enzymes are complex proteins that aid in the digestion of fats, proteins, and carbohydrates; and facilitate the absorption of nutrients. Humans produce enzymes in several areas of the gastrointestinal tract which interact with food in the mouth, stomach, and small intestine. There are three classes of digestive enzymes; proteases break down protein into amino acids, lipases digest fat, and amylase breaks down carbohydrate and starch.

Significant production of enzymes occurs in the pancreas. The pancreas consists of endocrine tissue that produces substances like insulin, glucagon, and somatostatin; and exocrine tissue that produces digestive enzymes which are then mixed with sodium bicarbonate. This enzymatic "juice" travels through the pancreatic duct and the hepatic duct and ends up in the duodenum, where it is used to break down macronutrients in foods.

When the pancreas is unable to produce adequate enzymes for the body's digestive needs, serious complications can result. Exocrine pancreatic insufficiency (EPI) is defined as the inability to digest food due to low or no production of digestive enzymes by the pancreas. EPI-related diseases include cystic fibrosis, chronic pancreatitis, acute pancreatitis, pancreatic cancer, and Schwachman-Diamond syndrome. EPI can also result from removal of the pancreas, after which supplemental digestive enzymes are required for life.

Chronic pancreatitis is an inflammatory disorder and one of the most common causes of EPI, and the most common cause of it is alcohol abuse. It is estimated that at least 70% of chronic pancreatitis is attributed to excessive alcohol intake.¹ Smoking² and high-fat diets³ are also significant contributing factors to chronic pancreatitis.

Another common cause of EPI is cystic fibrosis, a genetic disorder that affects the lungs, pancreas, and many other organs. A defective gene causes CF patients to develop a buildup of mucus, which in the pancreas interferes with the production of digestive enzymes.

Diabetics also often have EPI. About 35% of type 2 diabetics and 50% of type 1 diabetics have EPI.⁴

In addition to treatment for EPI-related conditions, digestive enzymes are often recommended to treat lactose intolerance. It is estimated that 75% of adults worldwide do not produce enough lactase to digest lactose in milk products.⁵ I disagree with the use of enzymes in order for people to consume dairy products without discomfort, since consuming dairy products increases the risk of many diseases, including juvenile

diabetes,^{6 7} prostate cancer,⁸ breast cancer,⁹ osteoporosis,¹⁰ chronic infections, constipation, asthma,¹¹ allergies, and autoimmune disease.¹²

Some health professionals have suggested the digestive enzymes may be useful for celiac patients, who must avoid all gluten because even trace amounts of it can cause significant damage to the small intestine. While it can be challenging to consume a medically gluten-free diet, studies have not shown that taking digestive enzymes alleviates symptoms, reduces antibody production, or prevents damage to the small intestine for those who take enzymes and continue to consume gluten-containing foods.^{13 14} Celiac patients are advised to adhere to a medically gluten-free and optimal diet and to take probiotics in order to both avoid further damage to the intestine and to restore health from damage due to gluten intake and poor dietary habits prior to the diagnosis of celiac disease.

Other than lactase deficiency (which may be a normal adaptation that follows weaning from breast milk), few people suffer from real digestive enzyme deficiencies. However, an increasing number of health professionals are recommending that patients take digestive enzymes to treat a growing number of gastrointestinal symptoms and conditions which include gas, bloating, constipation, diarrhea, irritable bowel, reflux, and inflammatory bowel disease. Some even suggest that a wide variety of non-GI symptoms including fatigue and blood glucose dysregulation may be signs of enzyme insufficiency.¹⁵ These practitioners often justify their diagnoses by using alternative labs to perform stool tests. Many of these labs use different reference ranges and lower diagnostic thresholds than mainstream labs, which results in more diagnoses. Other and much more common causes of gastrointestinal disorders should be ruled out before considering enzyme insufficiency as the culprit.

For those who do not have pancreatic insufficiency/EPI, there is little evidence to support the use of digestive enzymes for their conditions because they are due to other causes. For example, negative changes in the gut microbiome are a factor in the development of conditions like inflammatory bowel disease, some gastrointestinal infections, irritable bowel, liver disease, reflux, gas, constipation, diarrhea, and bloating.¹⁶ Diet is also a major contributing factor.^{17 18 19 20 21 22} Some people claim that they “feel better” when taking digestive enzymes, but they are often prescribed by alternative practitioners along with many other supplements and protocols at the same time, making it difficult to attribute improvement to enzymes alone. And addressing symptoms rather than underlying causes does not result in long-term health improvement.

In fact, even when digestive enzymes are prescribed for conditions for which they are actually indicated, they can be ineffective if used alone and without addressing other underlying causes. For example, several studies show that small intestinal bacterial overgrowth is common in patients with chronic pancreatitis and EPI,²³ and some studies show that patients with EPI and SIBO often do not get better even after taking

digestive enzymes.^{24 25} In addition to taking pancreatic enzymes, patients with SIBO require probiotic treatment, and low-fat diets and alcohol restriction are required for successful treatment for patients with chronic pancreatitis.²⁶

While enzyme insufficiency may accompany both type 1 and type 2 diabetes, long-term outcomes for people with type 1 diabetes improve with an optimal diet, and many type 2 diabetics can achieve complete remission with the right dietary changes.^{27 28 29} in these cases, treatment with digestive enzymes should be used as an adjuvant, and in many cases should be used for a short time until health improvement via diet can be achieved.

The most commonly used pancreatic enzymes are derived from animal sources such as bovine, porcine, and ox pancreas extracts, with porcine being the most often used. Some enzymes are derived from plants. Bromelain is a proteolytic enzyme from pineapple fruit and stems, and papain is an enzyme from the papaya fruit. Still other enzymes are derived from bacterial or fungal sources.

Digestive enzymes can be purchased over the counter, but for some conditions, such as cystic fibrosis, prescription-grade enzymes are required. There are some potential side effects of taking enzymes, which include stomach pain, headache, gas, constipation, diarrhea, upset stomach, nausea, vomiting, and heartburn. Rare but serious side effects include allergic reactions like impaired breathing, swelling of the mouth, tongue or throat, tightness in the chest, rash or hives, and itching. Patients who are allergic to pork should be very cautious since many digestive enzymes include porcine extract.

Other cautions include that taking antacids that contain calcium or magnesium can reduce the efficacy of digestive enzymes. Enzymes containing amylase can interfere with the action of diabetes medications like alpha—glucosidase inhibitors.

The bottom line is that digestive enzymes are helpful for people who have diseases that result in pancreatic insufficiency. They are not helpful for others, who should work with a competent health practitioner to diagnose and treat the real causes of their conditions.

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