



Udo's
Choice®

NEW!

Udo's Choice® Ultimate Digestive Enzymes

A small logo for Udo's Choice, featuring the brand name in a white, sans-serif font inside a green, rounded rectangular shape with a white border. The logo is positioned in the bottom left corner of the slide, above a solid orange horizontal bar.

UDO'S CHOICE

What are Enzymes?

- Enzymes are large protein molecules that are present in all living things, their functions are to:
 - convert food to energy and assist in building new cell material
 - control the metabolic processes
- Enzymes are bio-catalysts; they speed up chemical processes and reactions by:
 - binding to the starting material (substrate), catalyzing the reactions then releasing themselves so they can react again
- Enzymes are not consumed in reactions, they lose activity over time and eventually need replenishment

Types of Enzymes

- Enzymes can be classified by types of substrates they work on:
 - Carbohydrases (amylases) work on carbohydrates to break down starch into simple sugars
 - Proteases break long protein chains or polypeptides into smaller amino acid chains and eventually into single amino acids
 - Cellulases, which are not found in the human system, break the bonds in fiber - by disrupting the structure of the fiber matrices or cell walls which envelop most of the nutrients in plants, cellulase increases the nutritional benefit of fruits and vegetables
 - Lipases digest fats or triglycerides into free fatty acids and glycerol
 - Pepsin, trypsin and peptidases break down proteins into amino acids
 - Amylase reduces large carbohydrates such as starches and other polysaccharides to simpler sugars including sucrose, lactose, and maltose

Types of Enzymes cont'd

- Enzymes can also be classified into the type of reaction they catalyze
 - Hydrolases- split molecules
 - Synthetases- join molecules
 - Tranferases- move groups of atoms from one molecule to another
- Enzymes are very specific as to which substances/cells they react with, in comparison to inorganic catalysts such as acids, bases, metals and metal oxides
- Over two thousand different enzymes have been identified, most are not involved in digestion but other processes throughout the body
- Enzymes are derived from plant source, animal source and microbial source, for example papain from papayas and rennet from calf stomachs
- Over the last 100 years, and especially since mid 1960s, microorganisms have become the most important source of enzymes
- Microorganisms can be selected to produce almost any kind of enzyme in almost any quantity

The History of Enzymes

- Most cultures around the world have food-fermentation processes in their culinary history brewing, baking, alcohol, cheeses, yogurts, fermented vegetables such as sauerkraut, kimchi, miso, natto, etc
- In 1876, William Kuhne proposed the name 'enzyme' to denote 'unorganised ferments' (ferments isolated from the viable organisms in which they were formed) 'en-zyme' means 'in yeast'
- In 1897 the Buchner brothers demonstrated that cell free yeast extract could convert glucose into ethanol and carbon dioxide just like viable yeast cells, indicating that the conversion was not ascribable to yeast cells as such, but to their nonviable enzymes
- In 1874 Danish chemist Christian Hansen produced first specimen of rennet by extracting dried calves' stomachs with a salt solution; considered the first enzyme preparation of relatively high purity, and used for industrial purposes

The History of Enzymes cont'd

- Japanese scientist Takamine developed fermentation processes for industrial production of fungal amylase with the culture of *Aspergillus oryzae* on moist rice or wheat bran - 'Takadiastase' is still used as a digestive aid
- The method of fermentation suggested by Takamine, the 'surface culture' or 'semisolid culture' is still actively used in the production of various enzymes
- The first detergent enzyme
- Otto Röhm was the first chemist to isolate and use enzymes in technical applications leading to a revolution in production and use detergents around 1914
- 1920 he introduced enzymes in the pharmaceutical industry and 1934 in the food industry (pancreatin which contains trypsin, breaking down proteins)

Enzyme Deficiency

- Naturally, the human body produces enzymes necessary for food digestion and absorption of nutrients, however, if the body does not produce enough enzymes, there are several consequences:
 - poor nutrient assimilation and food intolerances
 - inflammatory bowel conditions, crohn's, colitis, leaky gut, etc
 - chronic indigestion, bloating, constipation, diarrhea
 - impaired immunity
 - allergic reactions
 - poor wound healing
 - skin problems and mood swings
 - nutritional deficiencies with resulting long-term degenerative diseases

Enzyme Supplementation

- Supplemental enzymes can improve digestion and help assure that the maximum level of nutrient absorption is attained
- Food enzymes play an important role by predigesting food in the upper stomach before hydrochloric acid has been secreted
- Supplementation of food enzymes is often beneficial due to the prevalence of over-cooked and processed foods in our diets
- Unlike supplemental enzymes of animal origin, plant enzymes work at the pH found in the upper stomach
- Salivary enzymes continue their digestive activity in the upper stomach they can digest up to 60% of ingested starch, 30% of the ingested protein, and 10% of ingested fat already during the first 30 to 60 minutes after swallowing the food
- Although salivary enzymes accomplish a significant amount of digestion, their activity is limited to a pH level above 5.0

Enzyme Supplementation cont'd

- Plant enzymes are active in the pH range from 3.0 to 9.0 and can facilitate the utilization of a much larger amount of protein, carbohydrates and fat before HCL is secreted in sufficient amounts to neutralize their activity
- Plant enzymes can play a significant role in improving food nutrient utilization
- In addition to protease, amylase, lipase, and cellulase, it is important to get a concentrated source of the disaccharides lactase
- Disaccharide intolerance occurs when insufficient levels of disaccharides enzymes are secreted in the small intestine causing malabsorption and physical discomfort
- Lactase deficiency is considered the most common and well-known form of carbohydrate intolerance
 - Lactase digests lactose milk sugar into glucose and galactose. Most mammals, including humans, have high intestinal lactase activity at birth. But this enzyme activity may decline to low levels already during childhood and remain low throughout adulthood
 - Approximately 70% of the world's population is deficient in intestinal lactase with more than one-third of the U.S. population presumed to be unable to digest dairy products

Enzyme Supplementation cont'd

- Supplemental lactase has been found to decrease the symptoms of lactose intolerance associated with the consumption of dairy foods
- Prevalence of processed and refined foods in the American diet means that we consume a large amount of sucrose sugar which can contribute to undue digestive stress
- It is theorized that unrecognized sucrose intolerance is a contributing factor in many allergies
- Alpha-Galactosidase hydrolyzes the raffinose-series sugars
 - Raffinose-series sugars are also prevalent in cruciferous vegetables and turnips, onions, beans
 - These complex sugars are not digested within the human gastrointestinal system but instead are fermented by intestinal flora and may commonly produce flatus
- Food sensitivities/intolerance are often interrelated with leaky gut, inflammation, yeast overgrowth which disrupt the production and release of these enzymes, causing difficulty in digestion and absorption of nutrients and accompanying symptoms of ill health

Enzyme Supplementation cont'd

- Often it may be the diseased gut and disrupted digestion that is the reason for health problems, not a specific food
- Enzyme supplementation can often assist in restoration of the digestive process, thus better assimilation of nutrients, thus a more effective healing process
- Healthy gut lining supports the growth of healthy cells and their natural secretions including natural enzyme production
- Supplemental enzymes increase the nutritive benefit of foods
- The use of enzymes to increase the nutritive benefit of food has long been established in the food industry
- Over the last twenty years, numerous studies have been conducted which show the advantage of using enzymes as pre-digestive factors in increasing nutrient yields

Enzyme Supplementation cont'd

- Plant-based foods can offer a unique problem for the mammalian digestive system.
- Proteolytic enzymes of the gastrointestinal tract do not completely digest certain plant proteins
- In contrast, animal proteins are typically well digested in the mammalian digestive tract
- Protease and lipase have been used to increase the nutritive value available from both alfalfa and clover
- Protein absorption from fatty foods such as fish or seeds can be improved by incorporating lipase
- Fiber content of plant foods can bind proteins and other nutrients
- Treatment of alfalfa with a combination of cellulase and pectinase was found to enhance protein availability from the leaves by nearly 50%
- Cellulase was used to increase digestibility of protein in wheat bran by 35%

Enzyme Supplementation cont'd

- Studies using *Aspergillus niger* cellulase for predigestion consistently show significantly increased nutritive benefit of vegetable foods
- Use of polysaccharidases, such as cellulase, can increase calories per unit weight of plant foods by transforming a portion of the fiber into utilizable sugar
- Use of cellulase to digest cell walls of vegetable feeds for increased digestibility is widely accepted in animal feed industry, particularly for cattle, pigs, and poultry
- Research on the use of various enzyme preparations has been conducted for over 30 years and clearly establishes that the digestibility of nutrients and productivity of animals can be increased

Enzyme Inhibitors

- Naturally occurring enzyme inhibitors are another consideration in the supplementation of exogenous enzymes
 - Various plant foods (especially grains, legumes and other seeds) are known to possess potent trypsin and alpha amylase inhibitors
- Wheat albumin proteins contain a fraction which effectively inhibits human alpha amylase but do not inhibit fungal amylase
 - it is established that significant anti-amylase activity survives process and baking to interfere with normal digestion
- Egg whites and soybeans are perhaps the best known sources of trypsin inhibiting compounds
 - These inhibitors are effective due to the similarity of their structures to the binding site of trypsin. Supplementation of exogenous proteases with differing configurations of binding sites is thus beneficial

Safe organisms and the fermentation process

- Only those organism that do not produce any toxins are selected for use in the fermentation process
- Enzyme derived from *Aspergillus* fermentation were first used in food production at the turn of the century. Since their introduction, there has never been a documented case of illness from mycotoxins associated with fermented enzymes
- Enzymes are isolated proteins not living organisms
 - no living *Aspergillus* cells remain in the isolated enzyme after the extraction process is complete
 - Mycotoxins are not protein based substances

Microbial enzymes vs animal enzymes

- Fermentation by microorganisms have been a long tradition of use in foods
- Microbial enzymes are active in the pH range of 3.0 to 9.0 (which includes pH of upper stomach) and can facilitate the utilization of a much larger amount of protein, carbohydrates and fat
- Fermented microbial enzymes exhibit activity throughout the entire digestive process
- Animal-based enzymes function only at the narrow pH ranges found at specific anatomical sites - for example pepsin is only active in the highly acidic environment of the active stomach
- Some enzymes of animal origin are destroyed by the low pH within the stomach unless they are made with enteric coating
- pancreatin, trypsin and chymotrypsin are only active in the alkalinity of the duodenum

Microbial enzymes vs animal enzymes cont'd

- Enteric coating can prevent the dissolution of the enzymes and prevent any digestive benefit. Studies have shown that non-enteric coated products can be more effective than coated products
- Because microbial plant based enzymes are able to begin breakdown and pre-digestion of food, they reduce the possibility of leaky gut reactions
- Sources for microbial enzymes are *non-animal sources such as aspergillus oryzae, bacillus subtilis, ananas comosus, bromelain and carica papaya or papain, aspergillus niger, rhizopus oryza, hordeum vulgare, trichoderma and longbrachiatum*

Udo's Choice® Ultimate Digestive Enzymes

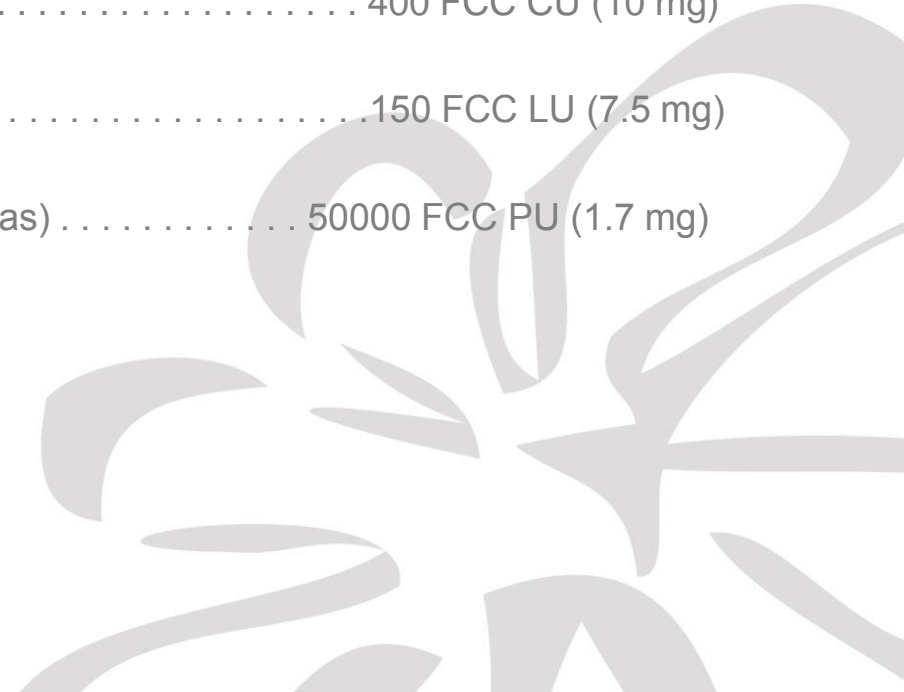
Immediate Relief (formerly Ultimate Digestive Enzymes)

- Helps reduce gas production/flatulence following a meal rich in fermentable carbohydrates (such as cruciferous vegetables, pulses/legumes/ beans and whole grains)
- Especially suited to support starch digestion; consider in cases of dairy intolerance; difficulty digesting beans and other legumes; for people making a change toward a vegetarian diet; this enzyme complex may be suited to have in your bag when traveling and eating out at restaurants where you cannot fully control what you get onto your plate
- Decreases food allergies
- Prevents symptoms of certain food intolerances such as beans, grains, and dairy
- Lower protein and fat digesting potency but with added lactase
- Prevents moderate cases of gas and bloating
- Promotes regularity and improves digestion
- Prevents uncomfortable feeling of fullness after a meal
- Gluten Free, Non-GMO, Vegan

Udo's Choice® Ultimate Digestive Enzymes

Immediate Relief Enzymes:

Alpha-amylase (Aspergillus oryzae)	5000 FCC DU (50 mg)
Lactase (Aspergillus oryzae)	3000 FCC ALU (30 mg)
Alpha-galactosidase (Aspergillus niger)260 FCC GalU (26 mg)
Protease 4.5 / Protéase 4.5 (Aspergillus oryzae)	12500 FCC HUT (25 mg)
Cellulase (Trichoderma longibrachiatum)	400 FCC CU (10 mg)
Lipase (Triacylglycerol lipase / lipase triacylglycérole, Rhizopus oryzae)	150 FCC LU (7.5 mg)
Stem bromelain / Broméline de tige (Ananas comosus, pineapple stem / tige d'ananas)	50000 FCC PU (1.7 mg)



THANK YOU

