FODMAP-TARGETING ENZYMES

specialized for fermentable or osmotic carbohydrates

	oligosaccharides			monosaccharides	disaccharides	sugar alcohols
CHO SUBSTRATE	**Fructan (inulin, levan, FOS)**	**Inulin**	**Galactooligo-saccharides (GOS)**	**Fructose (in excess of glucose)**	**Lactose**	**Polyols (mannitol, sorbitol)**
FUNCTION	Short-chain fatty acid production (SCFA) for microbiota health (prebiotic)			Energy		Natural laxative (in food); low cal sweetener (as additive)
TARGETING ENZYME	Fructan hydrolase (proprietary to FODZYME®)	Inulinase (Endo or Exo)	Alpha-galactosidase	Glucose isomerase (aka xylose isomerase)	Lactase **Endogenously produced**	Under development by FODZYME®
PREVALENCE OF INTOLERANCE*	24%		36%	30%**	49%	23%
LOW-FODMAP PORTION	<0.2-0.3g		<0.3g	<0.15g***	<1.0g	<0.4g
AVERAGE DAILY INTAKE	4g	2.6g	1.5g	13g	20g	4g
SYMPTOMS OF INTOLERANCE	Gas, bloating, some diarrhea, constipation, pain			Gas, bloating, diarrhea, some constipation, pain		
EXAMPLE FOOD SOURCES						

THE DIARRHEA DIETITIAN

FODZYME® BY KIWI BIOSCIENCES

GENERAL DIGESTIVE ENZYMES

targeted at other carbohydrates

REFERENCES

	disaccharides		polysaccharides		
CHO SUBSTRATE	**Sucrose**	**Maltose & isomaltose**	**Starch (amylose, amylopectin)**	**Pectin**	**Insoluble fiber (roughage)**
FUNCTION	Energy		Energy, bowel regularity	SCFA production for microbiota health (prebiotic), bowel regularity	Bowel regularity, satiety, blood sugar regulation
TARGETING ENZYME	Invertase, sucrase	Maltase, isomaltase	Amylase (diastase), glucoamylase, maltase	Pectinase	Beta-glucanase, cellulase, hemicellulase, phytase, xylanase
	Endogenously produced (except invertase)				
PREVALENCE OF INTOLERANCE*	10%	Limited research	Limited research	Highly rare	Highly variable & condition dependent
AVERAGE DAILY INTAKE	Limited research		94g	Limited research	10-15g
SYMPTOMS OF INTOLERANCE	Gas, bloating, diarrhea, crampling	Gas, bloating, diarrhea, crampling, nausea		Unknown; Rare anaphylaxis in pistachio and cashew allergies	Gas, bloating, diarrhea, constipation, pain
EXAMPLE FOOD SOURCES					

*In populations with gastrointestinal sensitivities; excludes hereditary (congenital) conditions. Note that research on tolerated amounts is highly limited.
Tolerances vary highly and depend on glucose:fructose ratio. *<0.4 when excess for fresh fruit and vegetables when 'fructose in excess of glucose' is the only FODMAP present. Excess fructose is defined as those that contain 0.2 g or more of of fructose compared with glucose per serving.
CHO: Carbohydrates

FAQs on digestive enzymes

What is enzyme activity and how is it measured?

Measured in international units (U), it signifies an enzyme's rate in catalyzing reactions under standard conditions. Factors like temperature, pH, time, enzyme properties, and administration method impact it. Enzyme activity units vary by substrate; for instance, Galacto-Oligosaccharide enzymes use Galactosidase Units (GalUs), and lactose enzymes use Acid Lactase Units (ALUs).

FODZYME, with ample GalUs and ALUs, introduces a unique fructan hydrolase for a wide range of fructans, lacking a standard unit. Nonetheless, FODZYME has effectively aided fructan-intolerant individuals since 2021. For a more precise evaluation, simulating the digestive tract shows FODZYME can break down 90% of a 3g fructan dose under gastric conditions, as demonstrated in our peer-reviewed research.

What is the difference between FODZYME and prescription pancreatic enzymes, like Creon?

Pancreatic Enzyme Replacement Therapy (PERT) corrects maldigestion in pancreatic disease. Encapsulated animal-derived enzymes survive stomach acidity, releasing in the duodenum to digest fat, protein, and carbs. PERT doses vary by age, and symptoms, and may involve concurrent use of proton pump inhibitors to raise duodenal pH, restoring optimal digestion.

Over-the-counter enzymes like FODZYME tackle FODMAPs, aiding those with varied sensitivities. They act quickly in an acidic environment (pH 4.0-5.5), breaking down FODMAPs upon contact with food. Given the typical 30-minute transit to the intestines, FODZYME finishes its task before PERT comes into play, minimizing concerns about interaction. Extensive research on this interaction is lacking.

How did you arrive at FODZYME's enzyme formula?

FODZYME's three enzymes formula is designed to tackle the most common FODMAP triggers: fructans, galactans/GOS, and lactose. These FODMAPs are not only the most likely to cause symptoms, they're also highly prevalent in the average diet.

Note that FODZYME does not target fructose or polyols (though the FODZYME team is hard at work on an enzyme that will address polyols). For patients with fructose intolerance, glucose isomerase (also called xylose isomerase) is available.

Also note that some digestive enzymes may target other carbohydrates such as starch, pectin, or maltose, but research does not suggest that these carbohydrates cause GI symptoms or that digestive enzymes targeting them are indicated.

Does taking FODZYME with acid-suppressing medications or other digestive enzymes influence their efficacy?

FODZYME is designed to maximize the availability of enzymes to their substrates at the post-prandial gastric pH. Acid-suppressing medicines are used to re-establish normal digestive conditions and should not alter FODZYME's ability to target and break down FODMAPs, though this is not something we have tested clinically.

However, remember that FODZYME itself is a protein, so concurrent use of over-the-counter digestive enzymes that target proteins (proteases) may decrease FODZYME's efficacy. To avoid this, we recommend avoiding the use of FODZYME with proteases. Also note that protein maldigestion outside of pancreatic disease is highly rare.

Are there any contraindications or interactions with other medications or supplements?

The enzymes used in FODZYME's formulation have a long history of safety and are generally recognized as safe (GRAS) in FDA opinion letters by the FDA. Those with galactosemia, a highly rare, hereditary condition, should consult with their healthcare provider about using FODZYME. There is little to suggest the use of FODZYME with supplements or medications is unsafe. There is a small body of research on the use of alpha-galactosidase digestive enzymes and alpha-glucosidase inhibitors, a class of medications for diabetes that inhibit the absorption of carbohydrates.

Examples of these medications include acarbose and miglitol and their side effects can include flatulence and diarrhea. Concurrent use of alpha-galactosidase digestive enzymes and alpha-glucosidase inhibitors may diminish, but not fully deplete, the activity of acarbose. It can help address gastrointestinal symptoms related to acarbose use.

What happens to fructose liberated when fructans are broken down? Is the fructose:glucose ratio maintained?

Fructose and fructans have differing tolerance thresholds. For FODMAP-sensitive individuals, it takes 10.5-21g of fructose to trigger symptoms, compared to just 0.75-1.5g of fructan. If FODZYME broke down all the fructans in 0.5g of garlic, it would add ~0.5g of extra fructose, well below the threshold.

Research indicates that 70% of liberated fructose from fructan breakdown is absorbed during small intestinal transit. Fructan-rich foods generally have enough glucose to balance fructose, maintaining a 1:1 ratio to prevent symptoms.

What's the difference between fructans and inulin? What other kinds of fructans are there?

Fructans is a general term that includes several types of oligosaccharides, which can have varying chain lengths, structures, and types of linkages. Inulin is a type of fructan composed of long chains of fructose units, typically with a terminal glucose. Inulin is found in a variety of plants and often used in supplements to add prebiotic fiber.

Another category of fructan includes levan, which has a different type of linkage between fructose units than inulin. Additional members of the fructan family includes fructooligosaccharides (FOS), which are shorter in length than inulin. Various types of fructans are found in common plants and most plants contain a mix of different types of fructans. Interestingly, genus, species, seasonality, environmental conditions, and much more all play a role in influencing how much of each fructan type are present.

Why is FODZYME a powder?

We know from extensive testing that mixing enzymes directly into food is the most effective way to deliver a digestive enzyme like FODZYME. Enzymes need to mix well with the food components they're acting on and under the ideal conditions.

FODZYME's powder form maximizes the enzymes' ability to break down FODMAPs before they arrive in the colon, where they are known to cause gut distress.

Over-the-counter digestive enzymes that are encapsulated generally use cellulose encapsulation, which delays and prevents homogenization between the enzymes and food.