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The following slides were presented during the *Nancy and Bill Norton Education Series* Event at the University of Michigan Food for Life Kitchen. To view this presentation and the all videos available during this program, please visit <http://bit.ly/NES2020MI>.

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Sugar: Friend or Foe?

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What is Sugar?

- Sugar = sweet, soluble, crystalline carbohydrates
- Sugars are categorized as monosaccharides or disaccharides
- Sugars can be naturally occurring or added
- Naturally occurring sugars are found *naturally* in foods such as fruit (fructose and glucose) and milk (lactose).
- Added sugars are sugars and syrups put in foods during preparation or processing, or added at the table. (high fructose corn syrup, molasses, cane sugar, corn sweetener, fruit juice concentrates)



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Sugar Recommendation For General Health:

Limit refined carbohydrates and added sugars

Why? -> Diets rich in refined carbohydrates, particularly added sugars, promote inflammation and increase risk for:

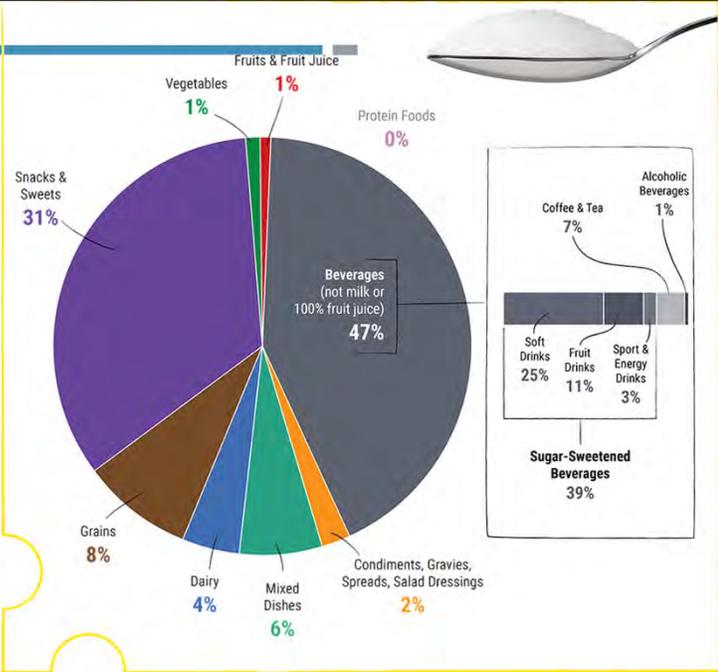
- NAFLD
- Insulin resistance and diabetes
- High triglycerides and heart disease
- Cancer

Augustin LSA. *Br J Nutr.* 2017 Oct 9;1-8.
Davy B. *Curr Opin Clin Nutr Metab Care.* 2016;19(4):282-8.
Stanhope KL. *Crit Rev Clin Lab Sci.* 2016;53(1):52-67.

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How Much Sugar Are We Eating?

The average American consumes ~17 teaspoons (68 grams) of **added sugar** per day!



DATA SOURCE: What We Eat in America (WWEIA) Food Category analyses for the 2015 Dietary Guidelines Advisory Committee. Estimates based on day 1 dietary recalls from WWEIA, NHANES 2009-2010.

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Limiting Added Sugars:

American Heart Association (AHA) recommends the following:

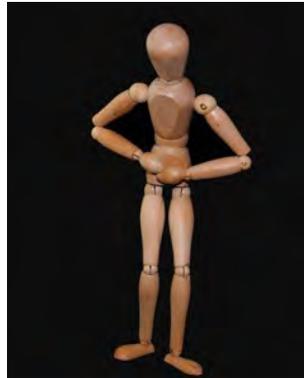


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Sugar and GI Symptoms

Can sugar cause GI symptoms?!



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Specific Sugar Intolerances:

- Sucrose / Maltose
- FODMAPs:
 - Lactose
 - Fructose
 - Oligosaccharides
 - Polyols

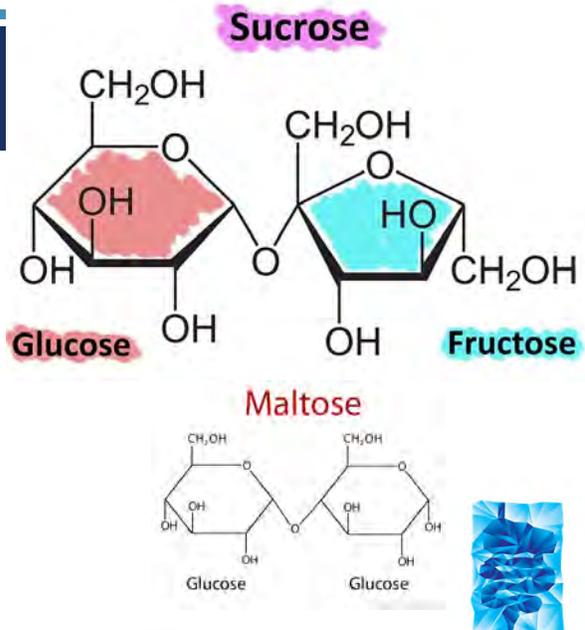


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Sucrose, Maltose, (& starch)

- The sugar(s):
 - Sucrose: sugar / table sugar
 - Maltose: main sugar used in barley malt, corn syrup, and rice syrup
 - Starch: common carbohydrate in a typical American diet i.e. potatoes, rice, pasta, breads. Complex digestion -> broken down to maltose and dextrins
- Congenital sucrase-isomaltase deficiency (CSID)



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SUCROSE AND STARCH DIGESTION

Sucrase-isomaltase is an enzyme that helps the body digest sucrose, maltose, and starch.

An absence or reduction in sucrase & isomaltase may result in symptom induction due to the inability or reduced ability for sucrose and starch digestion.

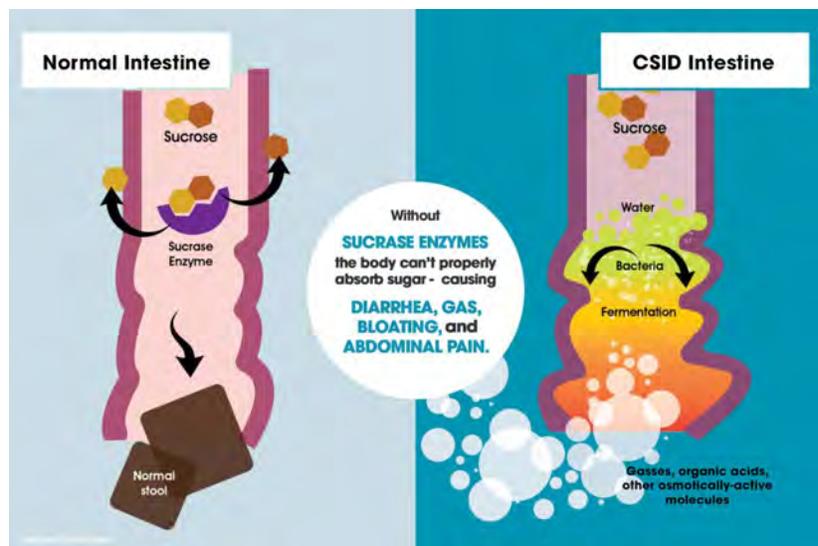


Image from www.sucroseintolerance.com

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Congenital Sucrase-isomaltase Deficiency:

Treatment/Nutrition Therapy:

- Diet +/- prescription enzyme with meals
- Enzyme: Sacrosidase – will help with Sucrose tolerance/digestion.
- If not taking the enzyme – will need to limit sucrose for couple weeks to assess symptom improvement then reintroduce to find specific tolerance
- *Tolerating Starch*
 - No enzyme for starch digestion. May need to limit.
 - It might be easier to tolerate potatoes, rice, and pasta that are rinsed (to remove some starch) and boiled or cooked well
 - Eating protein and/or fat with starch may improve tolerance
 - Examples: Eat natural peanut butter with a cracker,
 - Chewing food well helps with the digestion of starch



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FODMAPs

Fermentable

Oligosaccharides – few simple sugars linked together (fructans, GOS)

Disaccharides – double sugar (lactose)

Monosaccharides – single sugar (fructose)

And

Polyols – sugar alcohols (sorbitol, mannitol, isomalt, xylitol, glycerol)

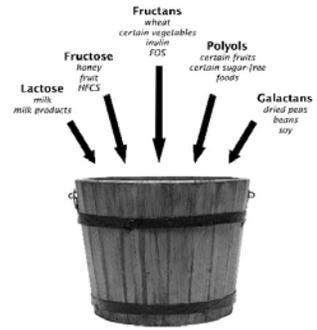


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What are FODMAPs

- Short-chain carbohydrates
- Poorly absorbed in the small intestine & delivered to the colon
- **Rapidly fermentable** by gut bacteria resulting in gas and SCFA
- Small, **osmotically active** molecules increasing water load to the colon



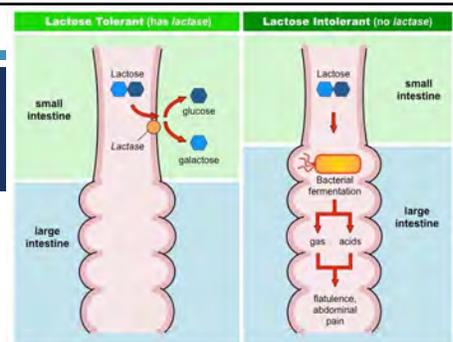
All dietary FODMAPs go into the same "bucket."

The bucket represents your unique, personal capacity to tolerate FODMAPs carbohydrates from all sources. If your FODMAPs intake exceeds your capacity for digestion and absorption in the small intestine, overflow into the large intestine occurs. This may result in IBS symptoms in sensitive individuals.

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Lactose:

- Lactose = a sugar found in dairy products (Disaccharide)
- Normally broken down by an enzyme called lactase
- Lactose intolerance = Impaired ability to digest lactose
- Affects ~65% of the world's population



Malik TF, Panuganti KK. Lactose Intolerance. <https://www.ncbi.nlm.nih.gov/books/NBK532285/>

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Lactose Intolerance:

- The treatment:
 - Find specific tolerance level
 - Can use alternatives (i.e. soy/almond/oat/cashew milks, yogurts, ice cream, etc.)
 - Use of lactase-enzymes and lactase-enzyme treated products (i.e. lactose-free milk)
 - Probiotics and prebiotics may help



Leis. 2020 May 20;12(5):1487. doi: 10.3390/nu12051487.

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Fructose:

- A sugar found naturally in fruits, honey, some vegetables, and added to various products (Monosaccharide)
- Ability of the human intestines to absorb fructose is limited – if consuming TOO much, can create symptoms
- ~40% of the general population exhibit limited ability to absorb fructose
 - Considered to have “fructose malabsorption”



Mansueto P, Seidita A, D'Alcamo A, et al. Role of FODMAPs in patients with irritable bowel syndrome: a review. Nutr Clin Prac 2015; 30:665–682.

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Fructose Malabsorption/Intolerance:

- The treatment/alternatives:
 - Limit fructose intake / find specific tolerance
 - Limit/avoid high fructose foods:
 - Fruit: apple, pear, Asian pear, watermelon, fig, mango, cherries
 - Vegetables: artichokes, sugar snap peas, asparagus
 - Sweeteners: HFCS, crystalline fructose, honey
 - Choose fruits/vegetables that don't have excess fructose
 - Example: Banana, cantaloupe, honeydew melon, clementines, oranges, grapes



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Oligosaccharides

- Technically **not sugar**. But ARE short-chain carbohydrates that may contribute to symptoms in those with IBS.
- Sources: inulin, chicory, wheat, rye, barley, garlic, onions, artichokes, beans
- The intolerance: Humans lack digestive enzymes to completely digest/break these down, fermented in everyone. Some may be more sensitive than others to this.



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Oligosaccharides

- The treatment / alternatives:
 - Limit intake / find specific tolerance
 - Use of digestive enzymes
 - Find alternatives that work for you (i.e. sourdough bread, garlic infused olive oil, chives, green tops of spring onions)



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Sugar Alcohols

- Sugar alcohols, or polyols, are a naturally occurring carbohydrate. They are sweeteners that have about half the calories of regular sugar.
- Sources:
 - Found naturally in fruits/vegetables (apples, apricot, avocado, cauliflower, peach, plum, prunes)
 - In products: sugar-free gum, sugar-free candies, cookies, drinks, throat lozenges
- The intolerance: laxative effect, can cause GI distress in some – esp. when consumed in large amounts

erythritol
glycol
glycerin
iditol
isomalt
lucitol
maltitol
mannitol
ribitol
sorbitol
xylitol

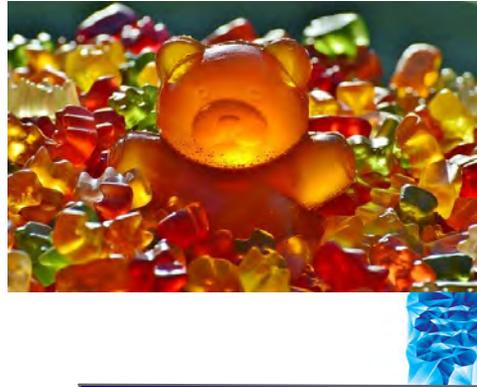


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Sugar Alcohols

- The treatment/alternatives:
 - Limit intake / find specific tolerance
 - Use real sugar products like gum vs sugar-free
 - Limit fruits/veggies that contain polyols



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Unsugarcoated Advice:

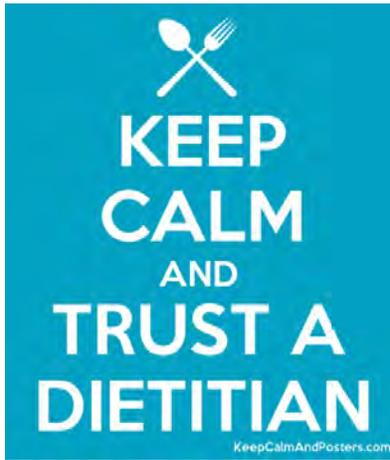
- Step 1: Work with a physician for proper workup / diagnosis / care
- Step 2: If you have a sugar (or other food intolerance or digestive disease) and are struggling with what to eat, work with a GI dietitian
 - Goals: Specific to each patient, expand variety in diet while minimizing GI symptoms
- Step 3: Enjoy the foods, including some with added sugars, that you tolerate



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Thank you!!!



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