INSIGHTS INTO CHALLENGES OF LABELING "ADDED" SUGAR

Sweetener Systems Trends & Technologies Conference

November 2, 2016

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Outline

- New Nutrition Label and Definition
- Importance/Why?
- Current Analytical Methodology
- Possible to Determine?
- Product Analysis Scenarios
  - All Added Sugar
  - Natural and Added Sugar
  - All Natural Sugar
- FDA Requirements

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Nutrition Label Change, effective July 26, 2018

Original Label

Nutrition Facts

Serving Size 2/3 cup (55g)
Servings Per Container About 8

Amount Per Serving

Calories 230	Calories from Fat 72
	% Daily Value*
Total Fat 8g	**12%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**12%**
Dietary Fiber 4g	**16%**
Sugars 1g	
Protein 3g	
Vitamin A	10%
Vitamin C	8%
Calcium	20%
Iron	45%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily value may be higher or lower depending on your calorie needs.

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

New Label

Nutrition Facts

8 servings per container
Serving size **2/3 cup (55g)**

Amount per serving
Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

fda.gov

FDA Definition Of “Added” Sugars

Added sugars are either added during the processing of foods, or are packaged as such, and include:

- ✓ Sugars (free, mono and disaccharides)
- ✓ Sugars from syrups and honey
- ✓ Sugars from concentrated fruit or vegetable juices that are in excess of what would be expected from the same volume of 100 percent fruit or vegetable juice of the same type

Exceptions include:

- X Fruit or vegetable juice concentrated from 100 percent juices sold to consumers
- X Fruit or vegetable juice concentrates used towards the total juice percentage label
- X Fruit juice concentrates which are used to formulate the fruit component of jellies, jams, or preserves, or the fruit component of fruit spreads

Reason For Labeling “Added” Sugars

Overall health concern with a diet high in sugar

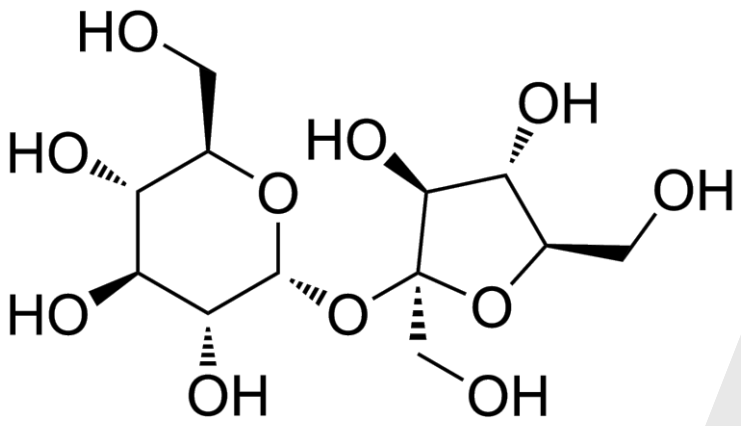
Health concerns:

- ❑ Tooth Decay
- ❑ Obesity
- ❑ Diabetes
- ❑ Heart Disease

Current Analytical Methodology For Quantifying Total Sugars

Most methodologies typically measure the most prevalent mono and disaccharides in the human diet and sum these for Total Sugar.

- ❑ Glucose
- ❑ Galactose
- ❑ Fructose
- ❑ Sucrose
- ❑ Maltose
- ❑ Lactose



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Current Analytical Methodology For Quantifying Total Sugars

- There are other monosaccharides and disaccharides present and currently being utilized to fortify products.
- Adjustment to methodology must be made in order to include the quantification for these other non-typical sugars.
  - Not an issue in terms of current technology and ability
  - An issue if sugar is not known to be included in product for 3rd party testing labs
  - If analytical lab is not informed, chromatography in many of these methods will shed light on presence of another sugar in the chromatographic profile.

Current Analytical Methodologies For Sugar Profile Analysis

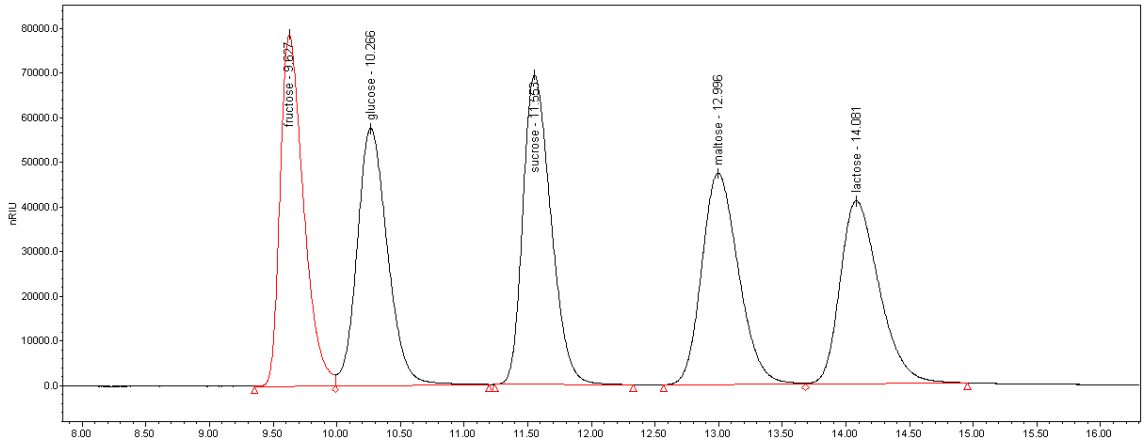
- Properties of Sugars:
  - Highly polar
  - Non-volatile
  - Similar molecular weights within classes
  - No chromophore
  - Weak acids

Current Analytical Methodologies For Sugar Profile Analysis

- High Performance Liquid Chromatography (HPLC)
  - Common column technologies include:
    - Aminopropyl column, NH_2
      - Sugars separated based on a partition formed with the water
    - Size exclusion/ligand exchange
      - Sugars separated based on molecular weight and complexing with metal counterions

Current Analytical Methodologies For Sugar Profile Analysis

- High Performance Liquid Chromatography (HPLC)
  - Common detection platforms with these columns:
    - Charged Aerosol Detection (CAD)
    - Refractive Index (RI)
    - Evaporative Light Scattering Detector (ELSD)
    - Fluorescence Detector *Derivatization Required



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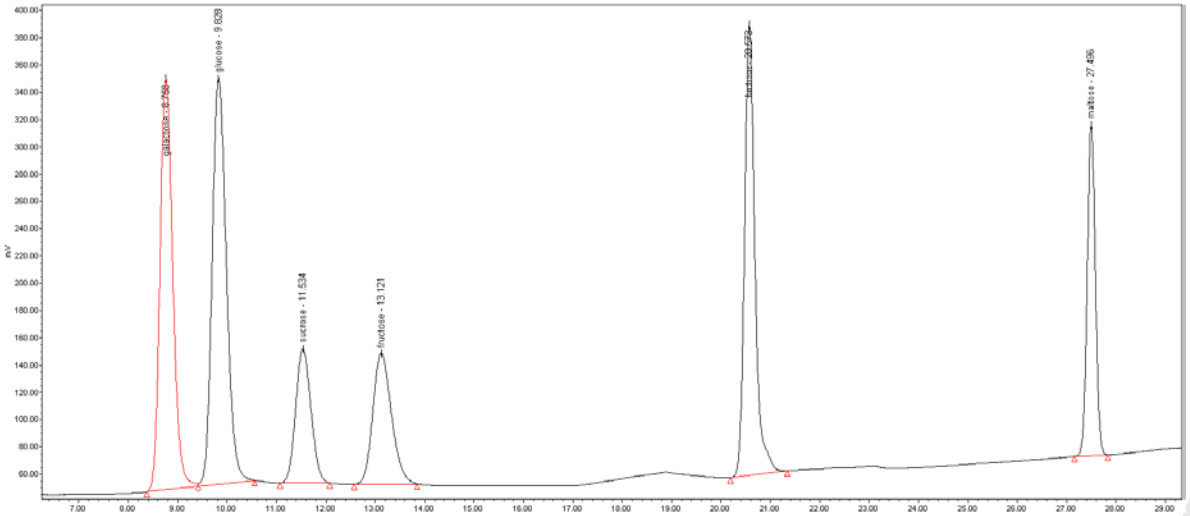
Current Analytical Methodologies For Sugar Profile Analysis

- Ion Chromatography (IC)
  - Anion exchange columns
    - Sugar deprotonated at high pH and separated based on pKa
  - Pulsed amperometric detection (PAD)



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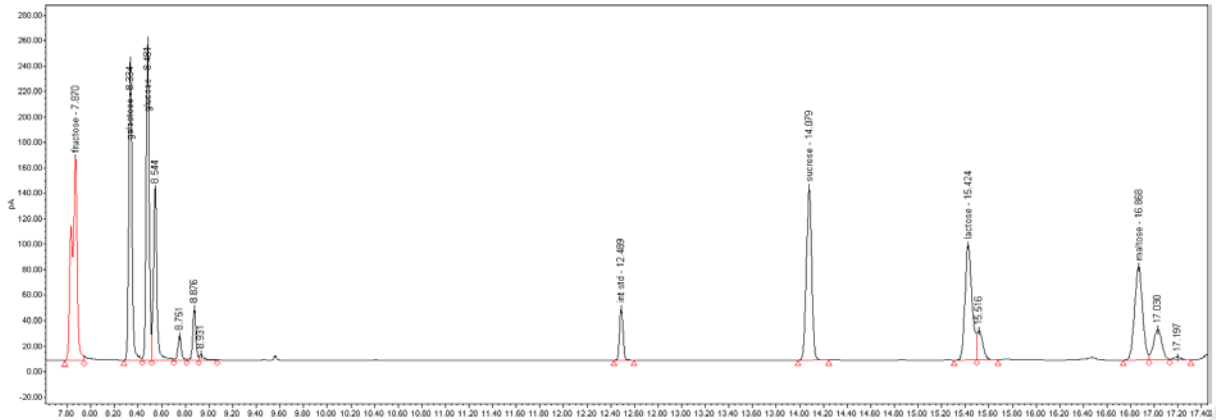
Current Analytical Methodologies for Sugar Profile Analysis

- Gas Chromatography (GC)
  - Polar capillary columns
    - Sugar is derivatized to a volatile trimethylsilyl derivative
  - Flame Ionization Detection (FID)



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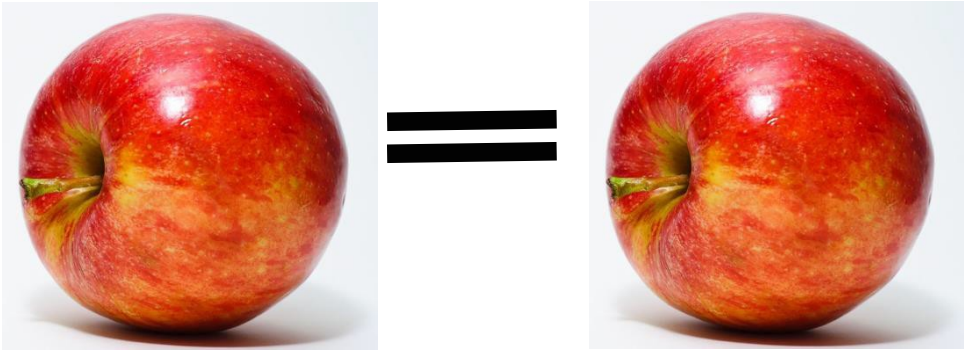
Can we determine what is “Added” versus “Natural” ????

- The current technology used for sugar profile analysis cannot distinguish between sugar that has been added or is naturally occurring.
- The properties being utilized to separate and detect do not provide differentiation between the same monosaccharide or disaccharide.



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Can we determine what is “Added” versus “Natural”????

- Stable carbon isotope mass spectrometry is able to distinguish the source of plant origin for sugar based on the ^{13}C to ^{12}C ratio (Jahren, 2006)
  - Different plant species will exhibit a different ratio (e.g. corn and cane versus beet or maple)
  - This is currently a qualitative approach to determining adulteration of the product with added sugar from a cheaper source (e.g. corn syrup)

Can we determine what is “Added” versus “Natural”????

- There are NO quantitative methods currently available that will give the amount of sugar on a gram basis that has been “Added” to a product

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Product Analysis Scenarios

ALL ADDED SUGARS

- The fact that the majority of these products are made with “Added” sugar and no ingredients that contain natural sugars makes this scenario much easier.
- The sugar profile quantified will be all “Added”
- However, a scenario where fruit or fruit juice concentrates are used to formulate the fruit or juice portion is an exception

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Product Analysis Scenarios

NATURAL AND ADDED SUGARS

- This is by far the most difficult scenario when both fruits or vegetables that have innate amounts of sugars are mixed with “Added” sugars to improve taste or sweetness.
- This also brings up the question of non-enzymatic browning and fermentation.
  - Processing of the product via heat or fermentation with both natural and “Added” sugar present can change the amount that was both “Added” or natural.
  - The amount of “Added” sugar may be less in the finished product.

Product Analysis Scenarios

ALL NATURAL SUGARS

- This is similar to the all “Added” sugar products
  - If none of the ingredients used are defined as sugar then the remaining sugar is assumed to be from natural source.
  - Adulteration can be present in these scenarios, where the product states all natural sugar
    - There is still no quantitative methods to determine how much of the sugar is adulterated to possibly improve taste and sweetness, but can be qualitatively determined to have a different source of sugar in the product
    - The Total Sugar in the product will give insight into the possibility that sugar was “Added”

Any Ideas On How To Quantitate “Added” Sugar From An Analytical Standpoint????

MARKERS OR INDIVIDUAL INGREDIENT ANALYSIS

- The carbon isotope ratio is one step forward
- Impurities or markers present in the production of high fructose corn syrup or corn syrup that are consistent enough to use for quantitation?
- Individual ingredient analysis, and then calculation applied by the manufacturer using the proprietary formula to determine the “Added” sugar in the product SAFEST……BUT CAN BE AFFECTED BY PROCESSING

FDA Requirements For Compliance Due To No Available Quantitative Method

DOCUMENTATION AND RECORDS

- The FDA will require manufacturers to make and keep certain written records to verify the declarations of added sugars
- Manufacturers are allowed to submit a petition for foods they are unable to reasonably approximate the amount of added sugars for an alternative means of compliance

Questions ?

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References

- FDA Federal Register / Vol. 81, No. 103 / Friday, May 27, 2016 / Rules and Regulations
- *Jahren, AH, et al. Am J Clin Nutr 2006; 84:1380-4.*