Food Science & Nutrition:
Food Analogs

SWEETENERS

Objectives

- **List** the four main functions of food analogs.
- **Distinguish** between nutritive and nonnutritive sweeteners.
- **Compare** the performance of sugar substitutes

Functions of Food Analogs

- Food analogs are natural or manufactured substances used in place of traditional food products or ingredients

- Food analogs are designed to
  - save money
  - change the nutritive value of food
  - improve the performance of foods and compounds
  - replace foods that are restricted for health reasons

Functions of Food Analogs

- Food analogs are designed to

- Examples of food analogs include
  - texturized protein made from soybeans that costs less than meat and is lower in fat
  - artificial sweeteners that are ideal for people with diabetes

Food Analog Examples

Food Analog Examples

Food Analog Examples

The Pros and Cons of Food Analogs

Pros

- offer low-fat and reduced-calorie options
- keep prices of food products reasonable
- allow more food options for people with heart disease, food allergies, and diabetes

Cons

- viewed as drawbacks to the current food supply by some
- are not “natural”
- may tempt some people to avoid eating a variety of foods

Replacing Sugar

SUGAR

SUGAR SUBSTITUTES

Classification of Sweeteners

Nutritive

- Provides energy to the body
  - Sugar
  - Corn Syrup
  - High Fructose Corn Syrup
  - Sugar alcohols
    - Polyols

Non-Nutritive

- High-intensity sweeteners
- Sugar Substitutes

Nutritive Sweeteners

- **Polyols** are a group of low-calorie sweeteners that
  - are also known as sweet alcohols
    - Although NOT SUGAR and NOT ALCOHOL
  - are found naturally in apples, berries, and plums
  - include **sorbitol, mannitol, xylitol, maltitol, lactitol, erythritol, isolmalt, D-Tagatose, and hydrogenated starch hydrosylates (HSH)**

Nutritive Sweeteners

- Polyols
  - improve texture and reduce browning
  - helps control moisture content
  - extend the shelf life
  - do not promote tooth decay
  - non-carcinogenic
  - **may act as a laxative if eaten in large amounts**
  - are found in baked goods, ice cream, chewing gum, candy, and chocolates

Sugar Substitutes

- Consumer demand for lower-calorie foods tasting like high-calorie favorites prompted their development

- The sugar substitutes
  - add sweetness without adding as many calories as sugar
  - are important in many restricted diets

- Nonnutritive sweeteners provide no calories but nutritive sweeteners do

Nonnutritive Sweeteners

- **Saccharin**
  - remains stable in a wide range of foods under extreme processing conditions
  - was the first artificial sweetener
  - is **2,000** times sweeter than sugar
  - has a bitter aftertaste in high concentrations
  - has not been found to cause cancer in humans after 20 years of research

continued

Nonnutritive Sweeteners

- **Aspartame**
  - is a dipeptide made from aspartic acid and the amino acid phenylalanine
  - tastes almost identical to sugar, but is **200** times sweeter
  - is safely consumed at levels up to 50 mg per kilogram of body weight per day
  - is used in drinks, puddings, gelatins, chewing gum, and frozen desserts

Nonnutritive Sweeteners

- **Acesulfame K** (acesulfame potassium)
  - is an organic salt
  - is 130 times sweeter than sugar
  - is stable in high temperatures
  - has no known side effects
  - is approved for use in chewing gum, drinks, instant tea and coffee, gelatins, and puddings

continued

Nonnutritive Sweeteners

- **Stevioside**
  - a natural extract from the leaves of a plant
  - up to **300** times sweeter than sugar
  - stable at high temperatures and in acids

Nonnutritive Sweeteners

- **Sucralose**
  - is a disaccharide made in a 5-step process that replaces 3 hydroxyl groups with chlorine
  - is **600** times sweeter than sugar
  - cannot be digested, so it adds no calories
  - remains stable in processing, is soluble in water, and is easily added to foods

Nonnutritive Sweeteners

- **Neotame**
  - is from L-aspartic acid and L-phenylalanine combined with a methyl ester group and a neohexyl group
  - is **7,000 to 13,000** times sweeter than sugar
  - remains stable in high heat and is approved for baking applications
  - works as a flavor enhancer when used in low levels

New Developments in Sweeteners

- Artificial sweeteners are combined with a **bulking agent** to enhance the texture or thicken the consistency of food products
  - Polydextrose is a bulking agent that mimics the mouth feel of sugar and is used in reduced-calorie products
  - Other bulking agents include alginates, gum acacia, pectin, and xanthan gum

New Developments in Sweeteners

- *Brazzein* is a supersweet protein found in a vine plant that
  - is **2,000** times sweeter than sugar
  - remains heat stable at 98°C (208°F) for 2 hours
  - is stable across a wide pH range
  - can be genetically engineered in maize, then extracted through ordinary milling

Sugar Substitutes Experiment

Purpose:

- Evaluate hot and cold beverages sweetened with artificial sweeteners