Chapter 15

Food Analogs: Substitute Ingredients

Objectives

- List the four main functions of food analogs.
- Distinguish between nutritive and nonnutritive sweeteners.
- Compare the performance of fat replacers to the performance of fat.
- Describe advantages and disadvantages of potassium chloride as a salt substitute.

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



Functions of Food Analogs

- Food analogs are designed to
 - replace foods that are restricted for health reasons
- 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

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

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

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



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



- 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



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

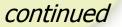


©Heike Rau/Shutterstock.com



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



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

- Polyols are a group of low-calorie sweeteners that
 - are also known as sweet alcohols
 - are found naturally in apples, berries, and plums
 - include sorbitol, mannitol, xylitol, maltitol, lactitol, erythritol, isolmalt, D-Tagatose, and hydrogenated starch hydrosylates (HSH)
 - helps control moisture content



Polyols

- improve texture and reduce browning
- extend the shelf life
- do not promote tooth decay
- may act as a laxative if eaten in large amounts
- have a synergistic effect in food
- are found in baked goods, ice cream, candy, and chocolates

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



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 reducedcalorie products
 - Other bulking agents include alginates, gum acacia, pectin, and xanthan gum

Fat Substitutes

- The average American consumes more fat than is recommended
- Health concerns caused researchers to develop substitutes that mimic fat in foods
 - Food scientists look for ways to keep the positive qualities of fat while reducing or eliminating negative qualities

Starch-Based Fat Replacers

- These lower-calorie fat replacers
 - mimic the mouthfeel of fat
 - cannot create flaky texture in baked goods
- The most common types are
 - vegetable gums, dextrins, maltodextrins, polydextrose, and pectin
- Carrageenan helps low-fat hamburgers retain juices



Starch-Based Fat Replacers

Oatrim, a hydrolyzed oat flour, is used commercially in baked goods

Cellulose gels are used in low-fat salad

dressings



©GVictoria/Shutterstock.com

Protein-Based Fat Replacers

- Simplesse is made by a process called microparticulation
 - Milk and egg proteins are heated and processed to form balls that swell in water and mimic the mouthfeel of fat
- This fat replacer is unsuitable for frying
 - Uses include frozen desserts, mayonnaise, salad dressings, yogurt, butter, puddings, cheese, and baked goods



Protein-Based Fat Replacers

- LITA is made from corn gluten
- Trailblazer is made from egg white and milk
- Starch and protein-based fat replacers release flavor all at once rather than gradually
- Sugar is often increased in foods with fat replacers to make up for a lack of flavor

Manufactured Fats

Olestra

- is a sucrose polyester with 6 to 8 fatty acids attached at the site of hydroxyl groups on a sucrose molecule
- can be solid or liquid depending on the fatty acids used
- looks, feels, and performs like fat
- cannot be digested by the body and therefore provides no calories



Manufactured Fats

SALATRIM

- is derived from soybean oil and other natural fat sources
- is made of 3 fatty acids attached to a glycerol molecule
- will not endure frying
- provides about half the calories of fat
- may cause abdominal discomfort, nausea,
 bloating, and headaches at 40 grams per day

Salt Substitutes

- Most Americans consume more sodium than the body needs
- High levels of sodium are connected to high blood pressure, a risk factor for heart disease
 - This is the reason for salt substitute research
- Sodium is often a hidden additive in processed foods



Salt Substitutes

- Potassium chloride
 - may benefit heart patients on low-sodium diets that need extra potassium
 - has a slightly bitter aftertaste
- Potassium is a soft metal that combines with chlorine to form salts
- Other salt substitutes include
 - sodium-free herbs and spices

Recap

- Food analogs have several functions including
 - saving money
 - altering the nutritive value of foods
 - improving food performance
 - offering an alternative option for restricted diets

Recap

- Nonnutritive sweeteners provide no calories, but nutritive sweeteners do
- Fat replacers perform the same functions as fat in food products
- Potassium chloride, herbs, and spices are salt-free alternatives that are used to season foods