



NUTRITION

Nomenclature, characteristics, and dietary intakes of sugars

Teresa A. Marshall, PhD, RD/LD

The World Health Organization (WHO) published strong recommendations in 2014 for a reduction in the intake of free sugars throughout the human life span and an intake of free sugars not to exceed 10% of total dietary energy intake.¹ The draft of WHO guidelines was developed based on the totality of evidence associating free sugars intake with dental caries and obesity. Moynihan and Kelly² conducted a comprehensive systematic review addressing the effect of sugars on dental caries, and Te Morenga and colleagues³ investigated the relationships between sugars and body weight.

Free sugars, defined by WHO as “monosaccharides and disaccharides added to foods by the manufacturer, cook, or consumer, plus sugars naturally present in honey, syrups, and fruit juices,”⁴ are associated with both caries and body weight.¹ Data of moderate quality, yet consistent among studies, suggest that caries is lower when free sugars intakes are reduced to levels less than 10% of dietary energy; further reductions in free sugars intake may produce additional benefits.² Investigators also observed consistent associations between free sugars intake and body weight; adults with lower dietary sugars intake had lower body weights, whereas adults with higher sugars intake had higher body weights.³ The odds of being overweight or obese also were associated with higher intake of free sugars consumed as sugar-sweetened beverages.

OBJECTIVES

The WHO guidelines and the findings of systematic reviews underscore the importance of limiting sugars intake for both oral and systemic health.¹⁻³ The oral health care practitioner (OHCP) is in a unique position to inform and guide patients in restricting sugars intake to improve oral and systemic health. Just how to restrict

Dr. Marshall is an associate professor, Department of Preventive and Community Dentistry, University of Iowa College of Dentistry, N335 DSB, Iowa City, IA 52242, e-mail teresa-marshall@uiowa.edu. Address correspondence to Dr. Marshall.

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ABSTRACT

Background and Overview. The World Health Organization has recommended a reduction in free sugars intake throughout one’s life span to decrease the burden of noncommunicable diseases, including caries and obesity. The author defines sugars’ nomenclature, describes sugars’ roles in food, and identifies current sugars intake.

Conclusions. The oral health care practitioner can identify added sugars intake and provide guidance to patients to decrease their intake of added sugars while improving nutrient intake and reducing caries risk.

Practical Implications. Intake of added sugars increases the burden of chronic diseases in the United States. The oral health care practitioner is in a position to provide dietary guidance to patients to reduce both oral and systemic diseases.

Key Words. Caries; diet; nutrition; sucrose.

JADA 2015;146(1):61-64

<http://dx.doi.org/10.1016/j.adaj.2014.11.007>

sugars intake is complicated by the nomenclature of sugars, as well as by the ubiquitous nature of sugars in our food supply. The objective of this report is to define the terms used to describe sugars in professional and lay readings, and to explain the role of sugars in our food system. This knowledge is essential for OHCPs to educate their patients to make better food choices and reduce their sugars intakes.

Sugars nomenclature. The plural “sugars” is inclusive of all sugars, whereas the singular “sugar” refers to sucrose. Other terms used to define individual and group sugars vary among and between professionals and laypeople. Biochemists, health professionals, food scientists, and the public use different terms for similar compounds. Structurally, sugars are classified as monosaccharides or disaccharides (Table 1). Monosaccharides are single-ring sugars, and disaccharides are composed of 2 monosaccharides. Foods typically are composed of 1 or more monosaccharides or disaccharides, either naturally present or added during processing. Health care professionals and researchers usually categorize sugars within foods based on their inherent properties relevant to the health

TABLE 1

Chemical classification of sugars.			
CHEMICAL CLASSIFICATION	SCIENTIFIC NAME	SUBUNITS	COMMON NAME
Monosaccharides	Glucose	NA*	NA
	Fructose	NA	Fruit sugar
	Galactose	NA	NA
Disaccharides	Sucrose	Glucose and fructose	Table sugar
	Lactose	Glucose and galactose	Milk sugar
	Maltose	Glucose and glucose	NA

* NA: Not applicable.

TABLE 2

Definitions of sugar terms used in scientific literature.		
SUGAR TERMS	DEFINITION	EXAMPLES
Sugars	Term inclusive of all sugars	Natural and added sugars
Sugar	Sucrose from sugar cane or sugar beets	Table sugar, sucrose
Total Sugars	Sum of added and natural sugars in a food	Sucrose added to food and fructose, glucose in fruit such as in a fruit pie
Added Sugars	Sugars and syrups added during food processing	Sucrose, high-fructose corn syrup, glucose syrup, maple syrup
Natural Sugars	Sugars present in raw foods	Fructose, glucose in fresh grapes, maltose from wheat grain
Refined Sugars	Sugars concentrated from food commodity	Sucrose as table sugar
Processed Sugars	Sugars produced from food commodity	Glucose, fructose in high-fructose corn syrup
Nonmilk Extrinsic Sugars	Sugars located outside of cellular walls; excludes lactose found in milk	Sucrose added to baked goods; fructose, glucose in 100% fruit juice
Intrinsic Sugars	Sugars located in cellular walls	Fructose, glucose in fresh fruit
Nutritive Sweeteners	Sugars providing energy	All natural and added sugars

concern under investigation (Table 2). For example, total sugars intake often is distinguished from intake of added sugars when investigating relationships with chronic diseases. Food scientists and the lay consumer focus on sugars (that is, total sugars) found on the Nutrition Facts Label⁵ and sugars reported in the ingredient list (Box 1⁶). The Nutrition Facts Label proposed by the US Food and Drug Association in February 2014 would identify added sugars, as well as total sugars.⁷

Sugars characteristics. Sugars are found naturally in foods of plant origin (that is, fruits, vegetables, and grains), dairy products, and honey and are added to processed foods, most notably sugar-sweetened beverages, candies, syrups, and dessert products. Although dietary sugars provide energy (that is, 4 kilocalories per gram), their hedonistic qualities appeal to the consumer and encourage consumption.⁸ Infants are born with an innate preference for sweetness, and early exposure encourages a preference for sweet foods. Foods with added sugars typically are sweeter than foods containing natural sugars and are among the top sources of total sugars intakes in the diets of children living in the United States (Box 2⁹).

In addition to sugars' sweetness, chemical characteristics of sugars are important to the food industry. Sugars contribute individual flavors and react with amino acids (that is, the Maillard reaction¹⁰) to produce a characteristic caramel flavor and brown color. Sugars function as a preservative by inhibiting bacterial growth, preserve moisture by binding to water, decrease the freezing point of the food, and can modify the rate and nature of crystallization.^{10,11} The food industry uses these characteristics to produce sensorially desirable foods with relatively long shelf lives.

Sugars intake. The WHO has recommended an overall reduction in free sugars intake and, specifically, that intake is not to exceed 10% of total energy intake (Box 3). These recommendations are slightly lower than those of the American Heart Association (AHA), which recommended no more than 100 and 150 calories per day from added sugars for women and men, respectively.¹² In the United States, children aged 2 to 19 years participating in the National Health and Nutrition Examination Survey (NHANES) 2005-2008 consumed 16.3% of total energy from added sugars, with intakes ranging from 13.5% for girls

aged 2 to 5 years to 17.5% for boys and young men aged 12-19 years.¹³ Women and men participating in the NHANES 2005-2010 consumed 13.2% and 12.7%, respectively, of their total energy intake from added sugars.¹⁴ Although these intakes greatly exceed both WHO and AHA recommendations, added sugars intakes have decreased from 18% in 1994-1998 for children aged 2 to 18 years.¹⁵ Some of the sugars listed in Table 2, notably high-fructose corn syrup, are added increasingly to snack foods to enhance taste, texture, and color, in stark contrast to recommendations to reduce consumption of these added sugars.

The US Dietary Guidelines and ChooseMyPlate do not provide specific recommendations for intake of added sugars.^{6,16} However, both resources include recommendations that energy from added sugars and solid fats not exceed 5%-15% of total energy, depending on

ABBREVIATION KEY. AHA: American Heart Association. NHANES: National Health and Nutrition Examination Survey. OHCP: Oral health care practitioner. WHO: World Health Organization.

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