Carbohydrate and sugar intake

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Carbohydrates

- Carbohydrates are the main energy providing nutrients.
- The main nutritional role of carbohydrates is to supply glucose to tissues that can use only glucose as a source of energy, such as the brain and red blood cells.
- In terms of physiological classification, carbohydrates are classified into carbohydrates that can be digested by human digestive enzymes, and dietary fiber that cannot be digested. When classified according to the degree of polymerization, carbohydrates are divided into sugars (1 degree or 2 degrees of polymerization), oligosaccharides (3–9 degrees of polymerization), and polysaccharides (10 or more degrees of polymerization).

Reference

• Ministry of Health, Labour and Welfare, Japan. Dietary Reference Intakes for Japanese, 2020. 2019.

Classification of carbohydrates

Carbohydra		Sugars	Monosaccharides	Glucose, fructose, galactose		
			Disaccharides	Sucrose, lactose, maltose		
	Δνа	ilable rbo- lrates	Oligosaccharides	Oligosaccharides		
	ca		Polysaccharide	Starches, dextrin		
	hyd		Sugar alcohol	Xylitol, sorbitol		
tes			Others	Aspartame, acesulfame K, stevi		
	Dietary fiber			Cellulose, hemicellulose, pectin		

Reference

• Cummings JH, Stephen AM. Carbohydrate terminology and classification. Eur J Clin Nutr. 2007; 61(Suppl 1):S5-18.

Sugars

- Sugars are classified into **monosaccharides**, such as glucose and fructose, and **disaccharides**, such as sucrose.
- Sugars are not exclusively used as sweeteners but also increase palatability or preservability of foods.
- Monosaccharides are available in fruits, vegetables, and honey. Recently, industrially produced sugars, such as (high-fructose) corn syrup (isomerized sugars), are included in carbonated drinks, canned fruits, and ice creams.
- Disaccharides are dimers of saccharides, such as sucrose, lactose, and maltose.

Reference

• Erdman JW Jr. et al. Present Knowledge in Nutrition 10th Edition, 2014; 74-75.

Relationship between sugar intake and health outcomes

Obesity

Many studies have reported a positive association between sugar intake (especially sugar-sweetened beverage intake) and energy intake or body weight.

The USDA set the upper limit for added sugar intake to reduce energy intake.

Oental caries

Many studies have demonstrated the relationship between sugar intake and dental caries.

Other disease

Recently, studies reporting the association of sugar-sweetened beverage intake with the incidence of type 2 diabetes and heart disease have increased. However, the inconsistent results suggest that further studies are required to clarify the influence of sugars on health outcomes.

Reference

- World Health Organization. Sugars intake for adults and children Guideline. 2015.
- U.S. Department of Health and Human and Human Services and U.S. Department of Agriculture. Dietary Guidelines for Americans 2015-2020. 2015.
- Imamura F et al. Consumption of sugar sweetened beverages, artificially sweetened beverages, and fruit juice and incidence of type 2 diabetes: systematic review, meta-analysis, and estimation of population attributable fraction. BMJ 2015; 351: h3576.
- Vasanti S Malik et al. Intake of sugar-sweetened beverages and weight gain: a systematic review. Am J Clin Nutr 2006; 84: 274-88.
- Cm Brown et al. Sugary drinks in the pathogenesis of obesity and cardiovascular diseases. Int J Obesity 2008; 32, S28-S34.

Recommendations for daily intake

• WHO

- Regarding its relationship with body weight and dental caries, the 2015 guideline strongly recommends reducing the intake of free sugars* to less than 10% of total energy intake.
- Based on its relationship with dental caries, the guideline conditionally recommends a further reduction in the intake of free sugars to **below 5% of total energy intake** (equal to six teaspoonfuls [approximately 25 g] for adults).

*Including monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook, or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates.

🖲 Japan

 Mainly because of the lack of information on sugar intake and its relationship with health outcomes in Japan, there are no recommendations for sugar intake in Japan.

Reference

- World Health Organization. Sugars intake for adults and children Guideline. 2015.
- Ministry of Health, Labour and Welfare, Japan. Dietary Reference Intakes for Japanese, 2020. 2019.

Dietary guidelines for carbohydrates and sugars in other countries

Country					★** **		
	US	UK c	France ^d	Nordic countries ^e	China ^f	South Korea ^g	Japan ^h
Carbo- hydrates	45-65 %E ª	50 %E	40-55 %E	45-60 %E	50-65 %E	55-65 %E	50-65 %E
Sugars*	【DGA】 ^a <10 %E 【AHA】 ^b Men: 150 kcal (37.5 g) Women: 100 kcal (25 g)	<5 %E	100 g	<10 %E	<10 %E	<10 %E	Not set

DGA: Dietary Guidelines for Americans, AHA: American Heart Association

*added sugars for US, Nordic countries, China, and South Korea; free sugars (excluding sugars in fruits, vegetable, and milk) for UK; total sugars (except for lactose) for France

Reference

a U.S. Department of Health and Human Services and U.S. Department of Agriculture. Dietary Guidelines for Americans 2015-2020. 2015

b Rachel K. Johnson et al. Dietary Sugars Intake and Cardiovascular. Circulation 2009; 120: 1011-1020

c Scientific Advisory Committee on Nutrition. Carbohydrates and Health. 2015

d French Agency for Food, Environmental and Occupational Health & Safety. Updating of the PNNS guidelines: revision of the food-based dietary guidelines. 2016

e Nordic Council of Ministers. Nordic Nutrition Recommendations 2012. 2014

f Chinese Nutrition Society, Dietary Reference Intakes for Chinese (2013). 2014

g Ministry of Health and Welfare, Republic of Korea. 2015 Dietary Reference Intakes for Koreans. 2015

h Ministry of Health, Labour and Welfare, Japan. Dietary Reference Intakes for Japanese, 2020. 2019.