EUROPEAN CONFERENCE

Conference Proceedings

VII International Science Conference
«Present and future: priority areas of research in scientific and educational activities»

February 17-19, 2025
Prague, Czech Republic

PRESENT AND FUTURE: PRIORITY AREAS OF RESEARCH IN SCIENTIFIC AND EDUCATIONAL ACTIVITIES

Abstracts of VII International Scientific and Practical Conference

Prague, Czech Republic
(February 17-19, 2025)

UDC 01.1

ISBN – 9-789-40378-463-2

The VII International scientific and practical conference «Present and future: priority areas of research in scientific and educational activities», February 17-19, 2025, Prague, Czech Republic. 225 p.

 Collection of scientific articles published is the scientific and practical publication, which contains scientific articles of students, graduate students, Candidates and Doctors of Sciences, research workers and practitioners from Europe, Ukraine and from neighboring countries and beyond. The articles contain the study, reflecting the processes and changes in the structure of modern science. The collection of scientific articles is for students, postgraduate students, doctoral candidates, teachers, researchers, practitioners and people interested in the trends of modern science development.

The recommended citation for this publication is: Nesterova M. Priority areas of scientifical and educational activity in the legal framework. Abstracts of VII International Scientific and Practical Conference. Prague, Czech Republic. Pp. 77-78.

URL: https://eu-conf.com/en/events/present-and-future-priority-areas-of-research-in-scientific-and-educational-activities/

DISACCHARIDES AND THEIR ROLE IN LIVING ORGANISMS

Valentyna Slipchuk
Doctor of Sciences in Pedagogy, Professor,
Professor of the Department of Medical Biochemistry
and Molecular Biology,
Bogomolets National Medical University,

Anastasiia Rusnak
student of medical faculty №1,
specialty 222 “Medicine”,
Bogomolets National Medical University,
Kyiv, Ukraine,

Carbohydrates are integral components of all living organisms and are usually an available immediate source of energy. They can account for up to 80% of total caloric intake in the human diet. Disaccharides are one of the main sources of energy for cells in living organisms. After being consumed, they are broken down into monosaccharides (glucose and fructose), which are oxidized for energy during cellular respiration [1].

Disaccharides also play a significant role in the metabolism of living organisms. In particular, at the molecular level, glucose derived from disaccharides regulates blood sugar levels, ensuring the body's energy balance, and emphasizes the need to balance carbohydrate intake [1]; eating low-GI fruits and non-starchy vegetables not only stabilizes blood glucose levels but also improves metabolic health by mitigating hyperglycemia-induced inflammation and oxidative stress [2; 3]. Galactose, which is formed from the disaccharide lactose (milk sugar), is essential for the synthesis of glycolipids and glycoproteins, which are important for the functioning of the nervous system. D-galactose can be rapidly absorbed in the human intestine and metabolized to provide energy to the human body, and is used to treat heart and brain aging in vitro and in vivo [4].

Disaccharides are also used as sweeteners and functional additives in the food industry to improve the texture and flavor of products. The products of disaccharide breakdown in living organisms can serve as a food source for beneficial bacteria in the intestine, promoting their growth and maintaining a healthy microbiome.

Fructose, derived from sucrose, affects hormonal balance, in particular, insulin and leptin levels, which regulate appetite. Metabolism of fructose differs markedly from that of glucose due to its almost complete hepatic extraction and rapid hepatic conversion into glucose, glycogen, lactate, and fat. High fructose intake has indeed been shown to cause dyslipidemia and to impair hepatic insulin sensitivity. Hepatic de novo lipogenesis and lipotoxicity, oxidative stress, and hyperuricemia have all been proposed as mechanisms responsible for these adverse metabolic effects of fructose [7].

Disaccharides are a special type of glycosides in which the anomeric hydroxyl group of one monosaccharide is combined with the hydroxyl group of a second monosaccharide to remove water elements. They are commonly used as protective agents, as disaccharides can be used as cryoprotective agents during freezing and protective agents in the freeze-drying process of biological products [5]. Disaccharides can be classified as reducing and non-reducing. The unusual type of bonding between the two anomeric hydroxyl groups of glucose and fructose in sucrose means that neither a free aldehyde group (on the glucose fragment) nor a free keto group (on the fructose fragment) is available for reaction unless the bond between the monosaccharides is broken. For this reason, sucrose is known as a non-reducing disaccharide. Solutions of sucrose do not show a mutation that involves the formation of an asymmetric center in an aldehyde or keto group. If the bond between the monosaccharides that make up sucrose is broken, the optical rotation of sucrose changes from positive to negative. The change in optical rotation sign from positive to negative is the reason why sucrose is sometimes called an inverted sugar. Lactose is one of the most common disaccharides found in the diet of people around the world. It consists of two aldohexoses, β-d-galactose and α-d-glucose, connected in such a way that the aldehyde group on the anomeric carbon of glucose can react freely. That is, it is a reducing disaccharide. Lactose can play a role as a prebiotics [6].

Disaccharides are poorly or very slowly hydrolyzed by digestive enzymes in the human body. They provide the body with energy, especially in newborns and children. In some people, a deficiency of the lactase enzyme leads to lactose intolerance [6].

The disaccharide maltose is biologically important because it is a product of the enzymatic breakdown of starch during digestion. Maltose is composed of α-d-glucose linked to a second α-d-glucose unit so that maltose is a reducing disaccharide. Maltose, which is readily hydrolyzed to glucose and can be metabolized by animals, is used as a sweetener and as a food for infants with limited lactose tolerance.

Conclusions. Carbohydrates can account for up to 80% of the total calorie intake in the human diet. Disaccharides are one of the main sources of energy for cells in living organisms. Simple carbohydrates derived from disaccharides are essential in living organisms: 1) for the synthesis of glycolipids and glycoproteins, which are essential for the functioning of the nervous system; 2) affect hormonal balance, in particular insulin and leptin levels; 3) can serve as a source of nutrition for beneficial bacteria in the intestines, promoting their growth and maintaining a healthy microbiome; 4) play the role of prebiotics (lactose); 5) provide the body with energy, especially in newborns and children.

References

1. Finelli, C. (2019). Contribution to molecular nutrition: Carbohydrates. *Molecular Nutrition: Carbohydrates*; Academic Press: Cambridge, MA, USA. 91–112. https://doi.org/10.1016/B978-0-12-849886-6.00001-X

2. Nirmala Prasadi, V.P.; Joye, I.J. (2020). Dietary fibre from whole grains and their benefits on metabolic health. *Nutrients*, 12, 3045.

3. Franz, M.J., MacLeod, J., Evert, A., Brown, C., Gradwell, E.; Handu, D., Reppert, A., Robinson, M. (2017). Academy of Nutrition and Dietetics nutrition practice guideline for type 1 and type 2 diabetes in adults: Systematic review of evidence for medical nutrition therapy effectiveness and recommendations for integration into the nutrition care process. *J. Acad. Nutr. Diet.* 117, 1659–1679. Available online: https://europepmc.org/article/med/28533169

4. Cherry Bo-Htay, Thazin Shwe, Siriporn C. Chattipakorn, Nipon Chattipakorn. (2019). Chapter 17 - The role of d-galactose in the aging heart and brain, Editor(s): Vinood B. Patel, *Molecular Nutrition: Carbohydrates*, 285-301. https://doi.org/10.1016/B978-0-12-849886-6.00022-7.

5. Tse-Chao Hua, Bao-Lin Liu, Hua Zhang. (2010). 6 - Protective Agents and Additives for Freeze-drying of Pharmaceutical Products. *Freeze-Drying of Pharmaceutical and Food Products*, 170-186. https://doi.org/10.1533/9781845697471.170.

6. James R. Daniel, Nevena Vidovic. (2018). Carbohydrates, Role in Human Nutrition. *Reference Module in Food Science*. Elsevier. https://doi.org/10.1016/B978-0-08-100596-5.02927-9

7. Luc Tappyand, & Kim-Anne Lê. (2010). Metabolic Effects of Fructose and the Worldwide Increase in Obesity. *Physiological Reviews*, 90(1), 23-46. https://doi.org/10.1152/physrev.00019.2009