

MEMBRANE HYDROLYSIS OF MALTOSE IN THE SMALL INTESTINE UNDER THE INFLUENCE OF DIETS WITH DIFFERENT CONTENT OF CARBOHYDRATES IN EARLY POSTNATAL ONTOGENESIS

Mangul Olga¹, Sheptitsky Vladimir^{2*}

¹Moldova State University, Chisinau, Republic of Moldova

²Institute of Physiology and Sanocreatology, Chisinau, Republic of Moldova

*E-mail: septitchi@mail.ru

The purpose of this work is to study the membrane hydrolysis of maltose and the absorption of glucose derived from maltose in isolated loops of the rat small intestine under the influence of diets with different carbohydrate content in early postnatal ontogenesis. The studies were performed on male Wistar rats. After weaning the rat pups of the experimental groups were kept for 6 weeks on diets with a high (78.2% of energy intake) or low (27.9% of energy intake) content of carbohydrates or on a carbohydrate-free diet, then a part of the animals of each of the experimental groups were kept on a standard diet for 3 days, 2 or 6 weeks, or 4 months. Animals kept after weaning on a standard diet served as controls. For the study of digestive and transport processes, the method of perfusion of isolated loops (20 cm) of the rat small intestine in situ was used. Maltase activity was determined in the intestinal mucosa by the glucose oxidase method. It was found that a high-carbohydrate diet leads to an increase in maltose hydrolysis and absorption of the resulting glucose (by 1.2–1.5 times) depending on the initial maltose concentration (12.5; 25 and 37.5 mM). Under the conditions of a low-carbohydrate diet, the studied parameters do not change at a low concentration of maltose (25 mM) and at its higher concentrations they decrease by 1.3-1.5 times. Changes in glucose absorption are accompanied respectively by an increase or decrease in the active component of its transport. As a result of a carbohydrate-free diet there is a sharp decrease in maltose hydrolysis and especially glucose absorption (by 3 or more times). The transfer of animals from a low-carbohydrate diet to a standard diet leads to normalization of glucose absorption after 3 days and membrane hydrolysis of maltose after 2 weeks. The transfer of animals from a high-carbohydrate diet to a standard one leads only to a partial normalization of the intensity of hydrolysis and transport processes even after 6 weeks. The transfer of animals from a carbohydrate-free diet to a standard one causes a gradual increase in membrane hydrolysis of maltose and glucose absorption, however, even after 6 weeks, their intensity is 1.5 times lower than in the control group. The activity of maltase was reduced compared to the control immediately after leaving the low-carbohydrate and especially carbohydrate-free diets and, to a lesser extent, 4 months after the transfer of rats from the carbohydrate-free diet to the standard one. As a result of a high carbohydrate diet, maltase activity increases markedly and remains above the corresponding control values for the next 4 months.

Thus, long-term high-carbohydrate and carbohydrate-free diets in early postnatal ontogenesis in contrast to a low-carbohydrate diet, contribute to the development of disorders in the membrane hydrolysis of maltose and absorption of the glucose derived from maltose in the small intestine.

Keywords: postnatal ontogenesis, membrane hydrolysis of maltose, absorption of glucose, diets with different carbohydrate content, development of disorders in the membrane.