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INFLUENCE OF FEEDING RATS WITH STARCH COMBINED WITH CASEIN AND CASEIN HYDROLYSATES ON CHANGES IN THE ABSORPTION OF GLUCOSE AND AMINO ACIDS INTO THE BLOOD

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ABSTRACT: The work studied in vitro the effect of feeding rats with starch together with casein and casein hydrolysates on changes in the absorption of glucose and amino acids into the blood. The study found that feeding rats with starch together with casein contributes to lower blood glucose levels compared to similar results of feeding rats only with starch and amino acids only with casein. At the same time, feeding rats with starch together with casein hydrolysate promotes a more pronounced decrease in glucose, which was less than the indicators of feeding only starch, and starch together with casein. Also, a pronounced decrease in amino acids, less than the indicators of feeding only casein, and starch together with casein. These changes may be associated with the formation of starch-casein, as well as starch-peptide complexes that prevent the hydrolysis of starch by salivary amylase and casein and casein hydrolysates by gastric juice.

Key words: starch, casein, interaction, digestion, absorption, feeding, rats, glucose, amino acids.

ВЛИЯНИЕ КОРМЛЕНИЯ КРАХМАЛОМ СОВМЕСТНО С КАЗЕИНОМ И ГИДРОЛИЗАТАМИ КАЗЕИНА НА ИЗМЕНЕНИЕ ГЛЮКОЗЫ И АМИНОКИСЛОТ В КРОВИ

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АННОТАЦИЯ: В работе изучались in vitro влияние кормления крыс крахмалом совместно с казеином и гидролизатами казеина на изменение всасывание глюкозы и аминокислот в кровь. В результате исследования установлено, что кормление крыс крахмалом совместно с казеином способствует более низким показателям в крови глюкозы по сравнению с аналогичными результатами кормления крыс только крахмалом и аминокислот только казеином. Вмести с тем кормление крыс крахмалом совместно с гидролизатом казеина оказывает содействие более выраженному снижению глюкозы, которое было меньше показателей кормления только крахмалом, и крахмалом совместно с казеином. Также выраженному снижению аминокислот, меньше показателей кормления только казеином, и крахмалом совместно с казеином. Данные изменения могут быть связаны с образованием крахмально-казеиновых, а также крахмально-пептидных комплексов, препятствующих гидролизу крахмала слюнной амилазой и казеина и гидролизатов казеина желудочным соком.

Ключевые слова: крахмал, казеин, взаимодействие, переваривание, всасывание, кормление, крысы, глюкоза, аминокислоты.

KRAXMALNI KAZEIN VA GIDROLIZATLARI BILAN BIRGALIKDA ISTE’MOL QILISHNING QONDAGI GLYUKOZA AMINOKISLOTALARGA TA’SIRI

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ANNOTATSIYA: Ishda kalamushlarni kraxmal va kazein, shuningdek, kazein gidrolizatlari bilan oziqlantirish natijasida in vitro sharoitida glyukoza va aminokislotalarning qonga so'rilishi o'zgarishi o'rganildi. Tadqiqot natijalariga ko'ra, kalamushlarni kraxmal va kazein bilan oziqlantirish ularni faqat kraxmal yoki faqat kazein bilan oziqlantirgandagi natijalarga nisbatan

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qonda glyukoza miqdorining pastroq bo'lishiga olib keladi. Shuningdek, kalamushlarni kraxmal va kazein gidrolizatlari bilan oziqlantirish glyukozaning sezilarli darajada kamayishiga yordam beradi, bu

faqat kraxmal va kraxmal hamda kazein bilan oziqlantirishga nisbatan pastroq ko'rsatkichlarga ega. Shuningdek, aminokislotalarning kamayishi ham kuzatilgan, bu faqat kazein va kraxmal-kazein bilan oziqlantirishga nisbatan past.

Kalit so'zlar: kraxmal, kazein, o'zaro ta'sir, hazm qilish, so'rilish, ovqatlantirish, kalamushlar, glyukoza, aminokislotalar.

Introduction: There is growing interest in the role of carbohydrate intake in metabolic syndrome and the subsequent health consequences associated with glycemia and type 2 diabetes [6]. Meals that result in a slower rate of carbohydrate absorption result in a more controlled release of glucose into the bloodstream. These foods have a lower glycemic index (GI) value. The GI system ranks carbohydrate foods based on their postprandial glycemic concentration [3]. High GI foods are associated with a rapid increase in blood glucose and insulin levels after consumption [2]. Hyperinsulinemia can reduce the effectiveness of insulin by downregulating insulin receptors, leading to insulin resistance [8], which, in addition to impairing pancreatic β-cell function, is a risk factor for the development of type 2 diabetes [4]. Studies have reported benefits of low GI diets on metabolic syndrome, i.e. improved blood glucose control and glucose tolerance [10], improved insulin sensitivity [9], and decreased insulin resistance [7].

It is well known that proteins in a given food matrix can influence the rate at which carbohydrates are metabolized in vivo [7]. It has been suggested that addition of the milk protein fractions, α- or β-casein, to waxy maize starch would have a postprandial glucose-lowering effect. Previous rheological, microscopic, and simulated gastrointestinal digestion studies have shown limited granule swelling and decreased maltose and glucose levels when starch is gelatinized with casein fractions. These results were not observed when starch was gelatinized with whey fractions (α-lactalbumin and β-lactoglobulin) [5]. The aim of the study: to study the effect of feeding rats with starch together with casein and casein hydrolysates on changes in the absorption of glucose and amino acids into the blood. Material and methods. The work studied in vitro on 72 rats the effects of the interaction of starch with casein and casein hydrolysates on changes in their absorption into the blood. For this purpose, biochemical studies were carried out to determine the concentration of glucose and amino acids in the blood. These parameters were compared in the blood before feeding, as well as after feeding after 1 hour and 3 hours. In group 1, starch was used for feeding, in group 2, casein was used for feeding, in group 3, a mixture of starch and casein 1:1, and in group 4, starch and casein pre-hydrolyzed by gastric juice 1:1. The study of glucose in the blood was carried out by biochemical methods (standard kits of Vector-Best, Russia). The determination of amino acid parameters in the blood was carried out using the ninhydrin reaction [1].

The obtained data were statistically processed using standard Microsoft Excel 2007 programs with calculation of mean values (M), their errors (m), and also the reliability coefficient of

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the difference of mean values Student-Fisher (t).

Results. From the obtained data on rats it was established that in animals fed with starch, 1 hour after feeding the blood glucose concentration index in relation to the indices before feeding was 172±15.8%, which was reliably higher than the results of rats without feeding. At the same time, in rats 3 hours after feeding the studied index was at the level of 125±10.6%, which was not reliably higher than the results before feeding. In addition, in rats fed with a mixture of starch and casein 1:1, 1 hour after feeding the blood glucose concentration index was equal to 153±13.7%, which was also reliably higher than the results of rats without feeding. In rats, 3 hours after feeding, the same indicator studied was 135±11.9%, which was significantly higher.

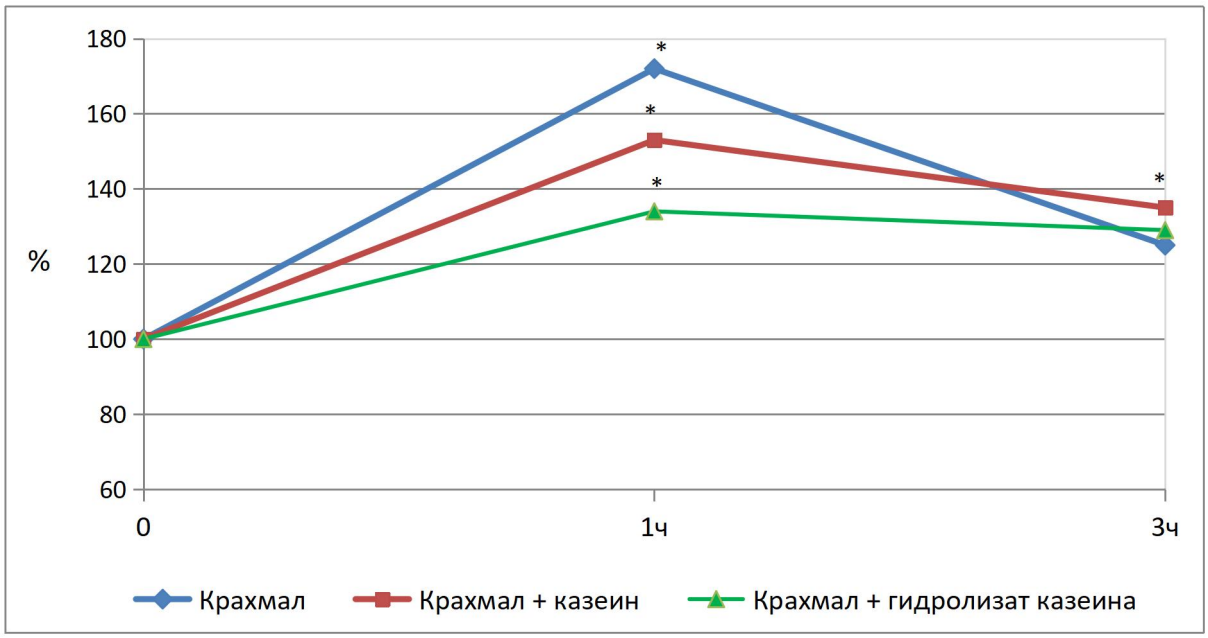

Figure 1. Changes in glucose absorption in rats before and 1 and 3 hours after feeding with starch, starch together with casein and starch together with casein hydrolysate hydrolyzed gastric juice.

* - values significantly different from the values before feeding.

values before feeding. At the same time, in rats fed with a mixture of starch and casein hydrolysate, 1 hour after feeding, the result of glucose concentration in the blood was 134±11.3%, which was also significantly higher than the results of rats without feeding. Also, in these same rats, the glucose concentration was not significantly lower than the same value in rats fed with starch, as well as starch together with casein. In addition, in rats, 3 hours after feeding with a mixture of starch and pre-hydrolyzed casein, the glucose concentration level was equal to 129±10.8%, which was not significantly higher than the values before feeding and not

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significantly higher than the values of rats fed only with starch (Fig. 1).

In the studies conducted on rats, it was also found that in animals fed with casein, 1 hour after feeding, the result of the concentration of amino acids in the blood in relation to the values before feeding was 159±13.6%, which was significantly higher than the values of rats without feeding. At the same time, in rats, 3 hours after feeding, this value was equal to 128±10.6%, which was significantly higher than the values before feeding. In animals fed with starch together with casein in

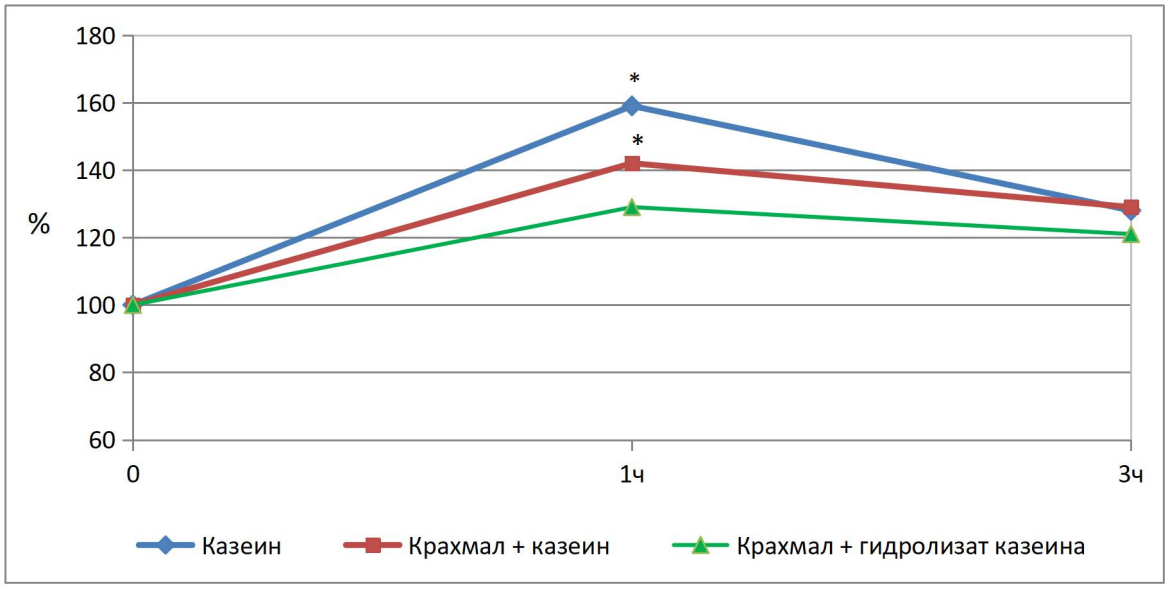

Figure 2. Changes in amino acid absorption in rats before and 1 and 3 hours after feeding with casein, starch together with casein, and starch together with casein hydrolysate hydrolyzed gastric juice.

* - significantly different values in relation to the values before feeding.

in a 1:1 ratio, 1 hour after feeding, the level of amino acid concentration in the blood in relation to the values before feeding was 142±12.5%, which was significantly higher than the results of rats before feeding. At the same time, in rats 3 hours after feeding with starch together with casein, this indicator was at the level of 129±11.2%, which was not significantly higher than the values before feeding. In addition, in rats fed a mixture of starch and pre-hydrolyzed casein, 1 hour after feeding, the values of amino acid concentration in the blood were not significantly higher than the results of rats before feeding. At the same time, in rats, 3 hours after feeding with starch and pre-hydrolyzed casein, this result was equal to 121±10.6%, which was not significantly higher than the values before feeding (Fig. 2).

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Discussion of results. The obtained results of the study showed that when feeding rats only with starch, after 1 hour there was a significant increase in blood glucose levels in relation to the results of this indicator before feeding. Then, after 3 hours, there was a significant decrease in glucose to a value that was not significantly lower than the level after 1 hour and not significantly higher than the results before feeding. At the same time, when feeding rats a mixture of starch with casein, the glucose level after 1 hour also significantly increased in comparison with the values of this indicator before feeding. Meanwhile, the glucose value was not significantly lower than the similar result when feeding only with starch. At the same time, after 3 hours, there was a decrease in the glucose value, which was not significantly lower than the values 1 hour after feeding, but significantly higher than the results before feeding. In addition, when feeding rats with a mixture of starch and casein hydrolysate, a reliable increase in glucose was also noted by the end of 1 hour, but the value of this indicator was less than the results of glucose when feeding rats with starch and casein and even less than the results of feeding rats only with starch. After 3 hours, a decrease in the glucose value was noted, which was not significantly lower than the values 1 hour after feeding, and also not significantly higher than the results before feeding.The presented data also revealed that when rats were fed only casein, after 1 hour there was a reliable increase in the amino acid level in the blood relative to the value of this result before feeding. Then, after 3 hours, a decrease in the amino acid level was noted to a degree that was not reliably less than the value that was by the end of 1 hour and not reliably greater than the values before feeding. At the same time, when rats were fed a mixture of starch and casein, the amino acid level after 1 hour also increased reliably compared to the values of this result before feeding. Meanwhile, the amino acid level was not reliably less than the same value when feeding only casein. At the same time, after 3 hours, a decrease in the amino acid level was noted, which was not reliably lower than the values 1 hour after feeding, and also not reliably greater than the values before feeding. In addition, when feeding rats with a mixture of starch and casein hydrolysate, an insignificant increase in amino acids was noted by the end of 1 hour, and the size of this indicator was lower than the amino acid value when feeding rats with starch and casein and significantly lower than the results of feeding rats only with casein. Along with this, after 3 hours, a decrease in the amount of amino acids was observed, which was not significantly less than the results 1 hour after feeding, and also not significantly more significant than the indicators before feeding. Thus, feeding rats with starch together with casein contributed to lower blood glucose levels compared to similar results of feeding rats only with starch. At the same time, feeding rats with starch together with casein hydrolysate resulted in a more pronounced decrease in glucose, which was lower than the indicators of feeding only with starch, as well as starch together with casein. A similar direction of changes was noted in the absorption of amino acids, so when feeding rats with starch together with casein contributed to lower amino acid levels in the blood compared to similar values when feeding rats only with casein. At the same time, when rats were fed starch together with casein hydrolysate, a more pronounced decrease in amino acids was observed, and was lower than the results of feeding only casein, as well as starch together with casein. These changes may be associated with the formation of starch-casein, as well as starch-peptide complexes that prevent the hydrolysis of starch by salivary amylase and casein and casein hydrolysates by gastric juice.

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Conclusions: Feeding rats with starch together with casein promotes lower blood glucose levels compared to similar results of feeding rats with only starch and amino acids with only casein. At the same time, feeding rats with starch together with casein hydrolysate promotes a more pronounced decrease in glucose, which was less than the indicators of feeding only starch and starch together with casein. Also, a pronounced decrease in amino acids, less than the indicators of feeding only casein and starch together with casein. These changes may be associated with the formation of starch-casein and starch-peptide complexes that prevent the hydrolysis of starch by salivary amylase and casein and casein hydrolysates by gastric juice.

REFERENCES| СНОСКИ | IQTIBOSLAR:

1. Симонян А. В. Саламатов, А. А., Покровская, Ю. С., & Аванесян, А. А. Использование нингидриновой реакции для количественного определения α-аминокислот в различных объектах: методические рекомендации //Метод. рек., Волгоград, Изд-во ВолГМУ. – 2007. –106. С.

2. Augustin, L. S., Kendall, C. W., Jenkins, D. J., Willett, W. C., Astrup, A., Barclay, A. W., ... & Poli, A. Glycemic index, glycemic load and glycemic response: an International Scientific Consensus Summit from the International Carbohydrate Quality Consortium (ICQC) //Nutrition, Metabolism and cardiovascular diseases. – 2015. – Т. 25. – №. 9. – С. 795-815.

3. Brand-Miller J. C. Brand-Miller, J. C., Stockmann, K., Atkinson, F., Petocz, P., & Denyer, G. Glycemic index, postprandial glycemia, and the shape of the curve in healthy subjects: analysis of a database of more than 1000 foods //The American journal of clinical nutrition. – 2009. – Т. 89. – №. 1. – С. 97-105.

4. Derakhshan, A., Tohidi, M., Arshi, B., Khalili, D., Azizi, F., & Hadaegh, F. Relationship of hyperinsulinaemia, insulin resistance and β-cell dysfunction with incident diabetes and pre-diabetes: the Tehran Lipid and Glucose Study //Diabetic Medicine. – 2015. – Т. 32. – №. 1. – С. 24-32.

5. Kett A. P. et al. Influence of milk proteins on the pasting behaviour and microstructural characteristics of waxy maize starch //Food Hydrocolloids. – 2013. – Т. 30. – №. 2. – С. 661-671

6. Lennerz, B. S., Koutnik, A. P., Azova, S., Wolfsdorf, J. I., & Ludwig, D. S. Carbohydrate restriction for diabetes: rediscovering centuries-old wisdom //Journal of Clinical Investigation. – 2021. – Т. 131. – №. 1. – С. 1-12.

7. Meng H. et al. Effect of macronutrients and fiber on postprandial glycemic responses and meal glycemic index and glycemic load value determinations //The American journal of clinical nutrition. – 2017. – Т. 105. – №. 4. – С. 842-853.

8. Saltiel A. R. Insulin signaling in health and disease //The Journal of Clinical Investigation. – 2021. – Т. 131. – №. 1. – С. 142241-142241.

9. Tay, J., Luscombe-Marsh, N. D., Thompson, C. H., Noakes, M., Buckley, J. D.,

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Wittert, G. A., ... & Brinkworth, G. D. A very low-carbohydrate, low–saturated fat diet for type 2 diabetes management: a randomized trial //Diabetes care. – 2014. – Т. 37. – №. 11. – С. 2909-2918.

10. Zafar, M. I., Mills, K. E., Zheng, J., Regmi, A., Hu, S. Q., Gou, L., & Chen, L. L. Low-glycemic index diets as an intervention for diabetes: a systematic review and meta-analysis //The American journal of clinical nutrition. – 2019. – Т. 110. – №. 4. – С. 891-902.