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INFLUENCE OF FRUCTOSE AS A SUGAR SUBSTITUTE ON THE CONTENT OF GLUCOSE AND INSULIN IN THE BLOOD SERUM

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Abstract:

This work investigated the effect of a substitute for natural fructose sugar on the level of glucose and insulin in the blood serum in rats. It was found that the administration of fructose to animals for 30 days at a dose of 600 mg/kg orally leads to an increase in the amount of glucose and insulin in the blood, as well as to increased development of insulin resistance. The results obtained using fructose, a natural sugar substitute, showed results similar to those in type 2 diabetes.

Purpose of the study: to evaluate the effect of fructose, a substitute for natural sugar, on the amount of glucose and insulin in the blood serum.

Material and research methods: studies were carried out on 16 white male rats weighing 160-180 g. An aqueous solution of pure fructose was administered orally to the animals for 2 months at a dose of 600 mg/kg. Blood was taken from the tail vein of the experimental animals at the beginning of the experiment (control), as well as on days 30 and 60 of the study. In animals, the amount of glucose in the blood plasma was determined on a biochemical analyzer Humastar 100 (Germany), and the amount of insulin was determined on an immunoassay laboratory analyzer Mindray 96 (Mindray, China). Based on the data obtained, the homeostatic model (HOMA-Ir) of D. R. Matter et al was applied to assess insulin resistance. (1985), as well as the insulin resistance index (IRI) by M. H. Duncan et al. (1995). The obtained data were subjected to statistical processing.

Result of the study and discussion: The results obtained showed that before the start of the experiment, the amount of glucose in the blood of the animals was 4.4 ± 0.8 mmol/l (Table No. 1). It was found that the amount of insulin in the blood of these animals was 9.5 ± 0.91 mU/l. Calculations showed that the control HOMA-Ir was equal to 1.86, and IRI was 1.67. On the 30th day of the experiment, the amount of glucose in the blood of the experimental animals increased by 60% compared to



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the control indicator, and on the 60th day by 75%. This increase was statistically significant ($P < 0.05$).

Table 1. The effect of fructose on carbohydrate metabolism parameters

	Glucose mmol/l	Insulin, mU/l	HOMA-IR	IRI
Initial indexes	4,30 ± 0,52	10.5 ± 0.91	1,86	1.67
30th day of the experiment	6,86 ± 0,65	17.74 ± 0.35*	5.36*	4.82*
60th day of the experiment	7.45±0.70	16.69 ± 4.26	5.49	4.94

* $p < 0.001$ significance to initial indexes.

The amount of insulin increased on day 30 by 69.1% ($p < 0.001$) and by 59.3% ($p > 0.05$) on day 60 of the experiments. HOMA-Ir and IRI values were 2.8 times higher on day 30 than in the control group. On the 60th day of the experiment, the HOMA-Ir and IRI indicators exceeded the control indicators by 2.9 times. The results show that under the influence of fructose, hyperglycemia, and hyperinsulinemia develop in the body. A sharp increase in HOMA-Ir and IRI indicates that the experimental animals have developed insulin resistance.

Conclusion

Thus, the results obtained showed that the use of natural fructose at this dose may cause increased insulin resistance. This currently requires an even deeper and additional study of the importance of fructose for the body.

