

INFLUENCE OF THIAMINE INJECTIONS ON THE FOLIC ACID BALANCE IN WHITE RATS ORGANISM

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Abstract

The interaction of thiamine and folic acid in the organism of white rats were carried out under intramuscular injections of thiamine. The research was conducted on 120 white Wistar rats weighing 150-200 g, which were divided into two groups, one was injected with thiamine, and the second was a control group. All animals were obtained the standard ration of the vivarium.

After intramuscular injections of thiamine in dose 1 mg/kg mass it was established, that folic acid content after 60-240 min after injection decrease in small intestine and muscles of animals. Meanwhile, this indication in liver and blood increased.

These data achieve that thiamine injection leads to changes of folic acid content in different tissues.

Key words: thiamine injection, folic acid, metabolism, rats.

A significant number of investigations are devoted to study of the inter-vitamin relations mechanisms, which can occur in the direction of synergism or antagonism. One of the examples of synergistic interaction between vitamins is a vitamins B-complex that act together, and therefore it is expediently that they enter the body in the form of the complex. Moreover, all the vitamins B-complex are interrelated, because the lack of one of them, can effect on the number of others. Some vitamins of this complex cannot replace others.

First of all the vitamins B-complex is important for energy functioning of the body. Also, in combination with specific proteins, they facilitate the decomposition of food into constituent elements, for assimilation by its cells of the body.

We studied the interaction between folic acid, which is the main component of compounds known as folates, and the thiamine. Folates participate in metabolic processes, are responsible for the process of hematopoiesis, activate the work of the stomach and intestines, and are necessary elements for the formation of immunity.

Folic acid is a compound from the folacin group. In connection with the fact, that the physiologically active form of this compound is folic acid [1], studies of the interaction between folic acid and compounds, which are able to redox reactions, are becoming topical. One such compound is thiamine. It is a water-soluble vitamin, mainly concentrated in the liver, as well as in skeletal muscles and kidneys. Thiamine is able to regulate the metabolism and content of m vitamins in the body [2, 3, 4].

However, the interaction of thiamine and folic acid in the body was not studied enough. Therefore, the main goal of our investigation was to study the effect of thiamine intramuscular injections on the folic acid balance in the body of white rats.

Materials and methods

In experiment were used 120 white Wistar rats weighing between 150-200 g, which were divided into two groups:

1. Animals, which in vivo were given thiamine intramuscular injections at a dose of 1 mg / kg.
2. Control group.

Both groups were kept on a standard ration of the vivarium.

The investigation was conducted in dynamics. Decapitation time was 1; 2; 4; 24 hours. The material of the study was serum, homogenates of the liver, muscles and small intestine. The tissue samples were homogenized (1:10) with 0.9% NaCl and centrifuged at 9000 g for 20 minutes. The tissue supernatant obtained after homogenization was used for biochemical studies.

The folate determination in the supernatant was carried out by the fluorimetric method [5].

The results of the studies were processed by conventional methods with the determination of the t-criteria for the reliability of the differences by Student's t- test. Significantly different results were considered for $p \leq 0,05$.

All manipulations with animals were carried out in accordance to European Convention for the Protection of Animals, which are used for experimental scientific purposes.

Results and discussions

The results of our study indicate the organ-specific distribution of folate in the tissues of the test animals (Table 1). As can be seen from the table, for both groups of animals, the maximum concentration of folic acid was observed in the liver and small intestine. Slightly

less its concentration is in the muscles, and the minimum value of the indicator is observed in blood.

Table 1

Influence of thiamine injections on the dynamics of folates distribution in tissue of white rats (mg/g)

Objects	Groups of rats	
	control	thiamine
	1 hour	
Blood	0,091±0,008	0,102±0,011
Liver	9,023±0,880	12,131±0,988*
Muscles	2,412±0,2731	1,364±0,142*
Small intestine	4,374±0,456	3,382±0,391*
	2 hours	
Blood	0,090±0,009	0,134±0,014*
Liver	9,141±1,021	14,244±0,163*
Muscles	2,541±0,284	1,421±0,156*
Small intestine	4,282±0,481	3,141±0,245*
	4 hours	
Blood	0,087±0,008	0,154±0,020*
Liver	9,004±0,831	13,387±1,112*
Muscles	2,483±0,256	1,632±0,151*
Small intestine	4,232±0,441	3,141±0,322*
	24 hours	
Blood	0,084±0,007	0,093±0,009
Liver	9,106±0,928	10,423±1,323
Muscles	2,512±0,260	2,317±0,241
Small intestine	4,312±0,429	4,123±0,448

*p<0,05

As can be seen from the table, thiamine injections lead to an increase of the folate level in the liver at all time of the experiment, except for 24 hours. The maximum effect of thiamine on folate levels in the liver was observed into 2 hours after the injection. After 24 hours, the folate level was the same as in the control group.

In the small intestine, the folate level decreased into 1, 2 and 4 hours after thiamine injections. After 24 hours, this effect was absent.

The results of the study in Table 1 show that thiamine injections at a dose of 1 mg / kg lead to an increase of the folate levels in blood into 2 hours and 4 hours after the injection. After 24 hours, the level of folic acid in blood was the same as in the control group. The obtained result shows, that the distribution of folates in tissues and organs occurs quite intensely.

In muscles, the thiamine injection leads to decrease of folate levels in 1, 2 and 4 hours after injection. After 24 hours, this effect was absent, which can be explained by the transition of folic acid formed during physical exertion into other active forms.

The obtained data can be explained by the existence of several ways of thiamine metabolism in the body. The main way of thiamine entering into the body is the gastrointestinal tract. The initial stages of accumulation and transformation of thiamine are realized to a greater extent in the small intestine, which causes a dynamic change in its content in the small intestine, and as a consequence a decrease in the level of folate. The main depot for thiamine and the organ, where its main transformations take place, is the liver. In addition, the liver and tissues around it have the ability to accumulate folates and, if necessary, return them to blood. From the liver, metabolized folates are transported to other organs. Thus, the distribution of this vitamin in blood and organs primarily depends on its absorption in different parts of the gastrointestinal tract.

The results of our study show that thiamine injections lead to changes in the distribution of folic acid between the tissues of animals. The level of this compound increases in blood and liver, but simultaneously decreases in the muscles and small intestine.

Conclusions

1. Intramuscular injections of thiamine at a dose of 1 mg / kg lead to an increase in folate levels in blood and liver of rats in 1, 2 and 4 hours after injection. After 24 hours, this indicator approaches that of the control group.

2. The level of folate decreases in muscles and the small intestine in 1, 2 and 4 hours after thiamine injections. The resulting data can be explained by the redistribution of folates between organs and tissues of the body.

3. Thiamin is able to influence the process of the redistribution of folates in the body of rats.

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