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BIOCHEMICAL BASIS OF HOMOCYSTEINE METABOLISM

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Annotation: *Homocysteine is a sulfur-containing amino acid that is formed during the metabolism of methionine. This amino acid is not part of proteins, but is an important intermediate product in biochemical reactions. Elevated levels of homocysteine in the blood are associated with the risk of developing various diseases, including cardiovascular and cognitive impairment. Therefore, homocysteine metabolism plays a key role in maintaining homeostasis in the body and is an important object of research in biochemistry and medicine.*

Keywords*: Homocysteine , remethylation , methionine, cysteine, cystathionine -β-synthase (CBS).*

BIOCHEMICAL PATHWAYS OF HOMOCYSTEINE METABOLISM

The metabolism of homocysteine in the body involves two main biochemical pathways: remethylation to methionine and transsulfuration to cysteine.

1. Remethylation homocysteine to methionine. This process occurs with the participation of the enzyme methionine synthase , which requires vitamin B12 as a cofactor . Folic acid (in the form of 5-methyltetrahydrofolate) also plays a key role in this reaction by facilitating the transfer of a methyl group to form methionine. This pathway is important for maintaining the level of methionine necessary for the synthesis of proteins and other biologically active compounds.

2. Transsulfuration homocysteine to cysteine. In this process, homocysteine reacts with serine by the enzyme cystathionine β- synthase (CBS) to form cystathionine , which is then hydrolyzed to cysteine and α- ketobutyrate . Vitamin B6 (pyridoxal phosphate) is a necessary cofactor for these reactions. Cysteine, in turn, is involved in the synthesis of glutathione , one of the most important antioxidants in the body.

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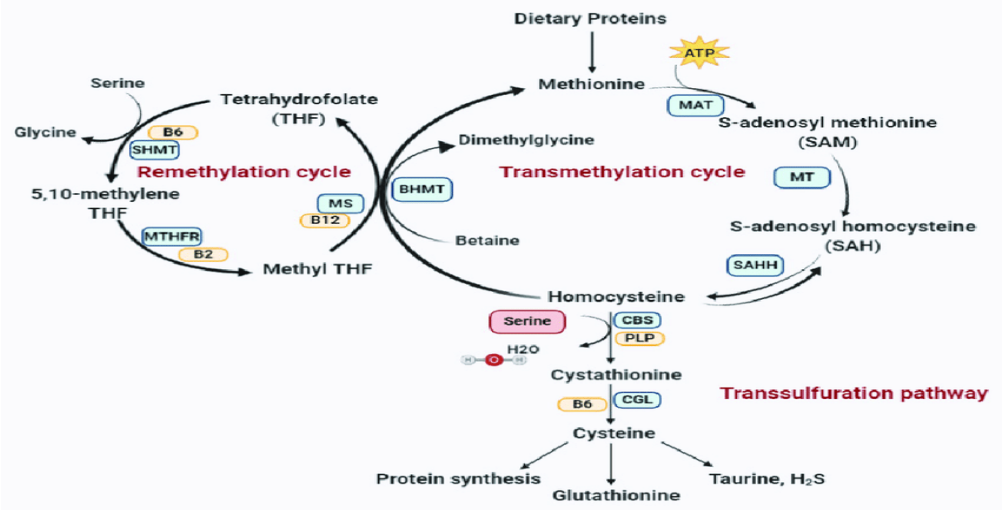

homocysteine levels in the body

of homocysteine levels depends on many factors, including genetics, metabolic health, and external influences.

1. Genetic factors. Mutations in the genes encoding key enzymes of homocysteine metabolism can lead to disruption of its metabolism and increased levels in the blood. It is especially important to note the role of methylenetetrahydrofolate reductase (MTHFR), which is responsible for the reduction of 5-methyltetrahydrofolate necessary for remethylation homocysteine . MTHFR gene polymorphisms (eg, C677T) are associated with increased homocysteine levels and the risk of cardiovascular disease.

2. External factors. A diet that includes adequate amounts of B vitamins, especially B6, B12 and folic acid, plays a key role in maintaining normal homocysteine levels . Deficiency of these vitamins can lead to hyperhomocysteinemia . Additionally, conditions such as chronic stress, kidney and liver disease, and a sedentary lifestyle can contribute to elevated homocysteine levels .

Maintaining normal homocysteine levels is important for health. Elevated concentrations of this amino acid can lead to the development of serious diseases such as atherosclerosis, stroke and dementia. It is important to consider both genetic and environmental factors affecting homocysteine metabolism to prevent the development of hyperhomocysteinemia . Regular consumption of B vitamins and a healthy lifestyle help normalize homocysteine levels and reduce the risk of associated diseases.

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