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An Insight into the Mechanisms of the Association of Thyroid Function with Homocysteine Concentration

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Key words: hypothyroidism, homocysteine, remethylation cycle, transsulfuration pathway.

Introduction: High homocysteine (Hc) concentration is associated with variety of pathologies. Thyroid hormones (TH) may interfere with amino acid metabolism. The aim of the study was to gain insight into the mechanisms of Hc metabolism disorders in thyroid function suppression.

Methods: The rats were administered thiamazole to simulate hypothyroidism, which was confirmed by the levels of free triiodothyronine (fT3), free thyroxine (fT4) and thyroid stimulating hormone (TSH) in the blood. The level of Hc in blood, as well as the activity of the enzymes of the remethylation cycle (S-adenosyl methionine synthase [S-AMS], S-adenosyl homocysteine hydrolase [S-AHH], betaine homocysteine methyltransferase [BHMT]) and transsulfuration pathway (cystathionine β-synthase [CBS] and cystathionine γ-lyase [CGL]) in liver were measured. We studied the associations of TH with the Hc level and enzyme activities using multiple linear regression analyses.

Results: There was a significant negative association of fT3 and fT4 with Hc and positive association of TSH with Hc. We also registered the high positive association of fT3 and fT4 with S-AMS, S-AHH, BHMT and CBS but found no association with CGL. In contrast, TSH showed significant negative correlation with S-AMS, S-AHH, BHMT and CBS.

Discussion: Hypothyroidism results in the slowing down of remethylation reactions in the methionine-Hc cycle and suppression of the transsulfuration transformation of Hc to cysteine in the liver, causing the increase of the Hc concentration in blood. Thus, the significant risk factors for the development of atherosclerosis, endothelial dysfunction and hypercoagulation in hypothyroid conditions may be disorders in the processes of remethylation and transsulfuration of sulphur-containing amino acids in organs.

Conclusion: Lower thyroid function is associated with higher Hc concentration. These data provide new insights into the effects of TH on remethylation and transsulfuration pathways of Hc metabolism.

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