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Betaine consumption as a new clinical approach to treatment and prophylaxis of folate-related pathologies

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Abstract

The most important pathway in the development of folate-related pathologies is an increase in the level of homocysteine (HC). HC, a cytotoxic and neurotoxic amino acid (when its level is ≥12 μmol/L), is 1 of the most widely studied compounds in cardiology, neurobiology, oncology, and embryology for the last 20 years. Given its toxicity, the processes of endogenous detoxification of HC are of particular interest to medicine. To date, the most studied pathway is that of remethylation (the conversion of HC to methionine), with the participation of B12- and B9-dependent methionine synthase. Less studied is remethylation with the participation of the choline derivatives betaine and betaine-HC-S-methyltransferase (BHMT). Therefore, the aim of this review was to conduct a theoretical analysis of available information regarding the contribution of betaine metabolism, its enzyme, and its genetic polymorphism to folate metabolism disturbances, and the development of folate-related pathologies. This review emphasizes the potential clinical significance of 2 factors that can influence the remethylation reaction of HC: the use of betaine and identifying the BHMT gene variants and their impact on the risk for developing certain folate-related pathologies, and treatment options. Moreover, with a high level of methylation of the BHMT gene and in the presence of its low-function variants (eg, rs3733890), it is necessary to use betaine as an additional methyl donor, especially during folate therapy. More clinical research is needed to identify the effects of the different BHMT gene variants on the individual risk for folate-related pathologies to better assess the clinical significance, the need for genetic testing, and betaine consumption.

Keywords: BHMT; Betaine; consumption; folate-related pathologies; gene.

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