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Editorial

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Special issue on advances and controversies in B vitamins and choline

This special issue is aimed to report on results from the conference on "Advances and Controversies in B Vitamins and Choline" which was held on March 5–8, 2012 in Leipzig, Germany. The conference was a continuation of the earlier four biannual international conferences that were held in Saarbrücken starting in 2001. The earlier conferences focused on the topic hyperhomocysteinemia. The continuous interest in B vitamins, their metabolic aspects and relationship to diseases prompted us to organize this conference and to extend the topic to include the related nutrient, choline.

The discovery of vitamins in the early 1900s, the description of their chemical structures and the clarification of their metabolic functions are important steps in the history of modern nutritional, biochemical and medical sciences. Later it was shown that choline, folate and vitamins B6 and B12 are involved in the synthesis and methylation of DNA, the formation and maintenance of myelin sheaths or the synthesis of neurotransmitters. The B vitamins and other related nutrients (choline, betaine, cysteine, methionine) are cofactors or substrates for one-carbon metabolism, a central and fast developing scientific area that links our diet to disease processes and outcomes. S-Adenosylmethionine (SAM) is generated by methyl group transfer from 5-methyl-tetrahydrofolate to homocysteine and it serves as a universal methyl group donor for more than 100 biochemical reactions. Deficiency in B vitamins and choline are closely related to epigenetic modifications causing changes in gene expression, which have an impact on disease risk. This is thought to be especially important for two stages of life, the prenatal period and higher age.

The relationship between age-associated diseases (such as dementia, osteoporosis and vascular diseases) and B vitamins has been a central research area during the past decades [1]. Of particular importance is the potential role of vitamins in disease prevention. For example, neural tube defects (NTDs) are among the most frequent congenital malformations of the central nervous system that can be prevented by folic acid supplementation [2, 3]. Meanwhile, more than 50 countries have introduced folic acid fortification programs of staple food in order to reduce the NTD risk by improving maternal folate status. A new aspect in this research field is the role of choline [4] as a methyl donor and as a precursor for phosphatidylcholine during pregnancy, pre- and postnatal life [5–7].

Despite the consistent association between hyperhomocysteinemia and cardiovascular diseases, most secondary prevention trials failed to show that homocysteine lowering by B vitamins improves clinical outcome [8]. In the case of stroke prevention the situation is somewhat different [9]. In recently published meta-analyses including data from 19 studies, 47,921 participants were analyzed using a fixed-effects model. It has been shown that B vitamin supplementation has a significant protective effect on stroke, but no effect on the risk of cardiovascular end points or all-cause mortality [8]. This is in agreement with observations reporting that folic acid fortification programs, introduced in the USA and Canada since 1998, also reduced the prevalence of stroke when compared with the period before fortification [10].

Dementia is a common neurodegenerative disease in elderly people. Besides age, more than 20 non-genetic risk factors for dementia have been described, but only very few are modifiable. Low concentrations of B vitamins (folate, B12, B6) and elevated plasma homocysteine levels are candidate risk factors for both Alzheimer's disease and vascular dementia [1, 11]. Many studies have shown associations between cognitive dysfunction or dementia and homocysteine and/or B vitamins. Low B vitamin levels are common and occur particularly in vulnerable sections of the population, for example, elderly subjects. Biologically plausible mechanisms have been proposed to account for these associations. The effect of B vitamins on cognitive function is controversial. However, B vitamin supplementation over 2 years lowered plasma homocysteine in elderly subjects with mild cognitive impairment, delayed brain shrinkage and improved cognitive function [12, 13].

This special issue covers a wide spectrum of current topics in B vitamin and choline research. Some papers deal with folate metabolism, deficiency and supplementation or with the role of choline and betaine in one-carbon metabolism. Others report the importance of B vitamins and choline in the central nervous system [14]. The effect of vitamin supplementation on bone health and other diseases are interesting topics with clinical relevance. Furthermore, this special issue addresses new insights on vitamin B12 metabolism, homocysteine and genetic aspects. We hope that this special issue of the conference "Advances and Controversies in B Vitamins and Choline" will meet the interest of many readers of the journal *Clinical Chemistry and Laboratory Medicine*.

Conflict of interest statement

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