

# **B-Healthy**

## **The Importance of Vitamins B6, B12 and Folic Acid**

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The necessity of folic acid and other B vitamins during pregnancy has been well documented, particularly for the prevention of neural tube defects. However, the B vitamins, specifically B6, B12, and folate are required for many basic biological functions, including their essential function as a component in the making of new body cells via their role in the production of DNA and RNA.

Vitamins B6, B12, and folate are cofactors necessary for many biochemical reactions, as are other B vitamins. As coenzymes, these compounds are necessary intermediaries of numerous metabolic steps. An adequate supply of these vitamin compounds is important, since without these cofactors to drive the reactions forward, the biochemical reactions are halted.

ATP (adenosine triphosphate) is the energy source of all biochemical reactions in the body. ATP requires many cofactors, vitamins and/or minerals, for reactions to proceed. Among the essential cofactors are the vitamins B6, B12, and folate. These vitamins serve as indispensable coenzymes in intermediary metabolism and during the synthesis of Pyrimidines and Purines, the foundations that comprise DNA and RNA. Their de novo synthesis requires vitamins B6, B12, and folate, thereby causing a disruption in a cell's genetic material during times of deficiency. Maintaining healthy levels is particularly important for those cells that divide rapidly, including blood cells and those lining the digestive tract.

As well as its importance stated above, folate also plays an important part in the formation of red blood cells. Folate, along with B12, is essential for the formation of hemoglobin in red blood cells. Several studies have addressed the relationship between Alzheimer's disease and low serum concentrations of folate, vitamin B12, and vitamin B6.<sup>1</sup> Furthermore, low folate levels have been linked to a build-up of homocysteine in the blood, increasing the risk of heart attacks, strokes, and other cardiovascular related problems.

Studies have indicated the benefit of vitamins B6, B12, and folate in the management of cardiovascular-related conditions, as they play a major role in homocysteine (Hcy) metabolism and concentration regulation. The metabolism

of homocysteine occurs via two major pathways. The first and most predominant of these is the remethylation of Hcy to methionine. This process, which is reversible, requires both vitamins B12 and folate as cofactors. Vitamin B12 is a required cofactor for methionine synthase, while folate is a required cofactor for 5, 10-methylenetetrahydrofolate reductase. The second step involves the transsulfuration pathway, which converts Hcy to cysteine and other products; however, this step is irreversible. Vitamin B6 is also involved as a cofactor for the enzyme cystathionine  $\beta$ -synthase, which is required to convert Hcy to cystathionine, and in turn acts directly to convert cystathionine to cysteine.<sup>2</sup>

A study of sublingual administration of vitamin B12 (cobalamin) has been studied and shown to be an effective, safe, and convenient means of providing rapid restoration of serum B12 concentrations for those having cobalamin deficiency.<sup>3</sup>

As stated above, the B vitamins B6, B12, and folate play key roles, mainly as cofactors, in many vital bodily reactions, and therefore are increasingly becoming a part of nutritional interventions.

### **References**

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