
Abstract
The B vitamins are water-soluble vitamins that are required as coenzymes for reactions essential for cellular function. This review focuses on the essential role of vitamins in maintaining the one-carbon transfer cycles. Folate and choline are believed to be central methyl donors required for mitochondrial protein and nucleic acid synthesis through their active forms, 5-methyltetrahydrofolate and betaine, respectively. Cobalamin (B12) may assist methyltetrahydrofolate in the synthesis of methionine, a cysteine source for glutathione biosynthesis. Pyridoxal, pyridoxine and pyridoxamine (B6) seem to be involved in the regeneration of tetrahydrofolate into the active methyl-bearing form and in glutathione biosynthesis from homocysteine. Other roles of these vitamins that are relevant to mitochondrial functions will also be discussed. However these roles for B vitamins in cell function are mostly theoretically based and still require verification at the cellular level. For instance it is still not known what B vitamins are depleted by xenobiotic toxins or which cellular targets, metabolic pathways or molecular toxic mechanisms are prevented by B vitamins. This review covers the current state of knowledge and suggests where this research field is heading so as to better understand the role vitamin Bs play in cellular function and intermediary metabolism as well as molecular, cellular and clinical consequences of vitamin deficiency. The current experimental and clinical evidence that supplementation alleviates deficiency symptoms as well as the effectiveness of vitamins as antioxidants will also be reviewed.