

B Vitamins in the nervous system: Current knowledge of the biochemical modes of action and synergies of thiamine, pyridoxine, and cobalamin

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Abstract

Background: Neurotropic B vitamins play crucial roles as coenzymes and beyond in the nervous system. Particularly vitamin B1 (thiamine), B6 (pyridoxine), and B12 (cobalamin) contribute essentially to the maintenance of a healthy nervous system. Their importance is highlighted by many neurological diseases related to deficiencies in one or more of these vitamins, but they can improve certain neurological conditions even without a (proven) deficiency.

Aim: This review focuses on the most important biochemical mechanisms, how they are linked with neurological functions and what deficits arise from malfunctioning of these pathways.

Discussion: We discussed the main role of B Vitamins on several functions in the peripheral and central nervous system (PNS and CNS) including cellular energetic processes, antioxidative and neuroprotective effects, and both myelin and neurotransmitter synthesis. We also provide an overview of possible biochemical synergies between thiamine, pyridoxine, and cobalamin and discuss by which major roles each of them may contribute to the synergy and how these functions are inter-related and complement each other.

Conclusion: Taking into account the current knowledge on the neurotropic vitamins B1, B6, and B12, we conclude that a biochemical synergy becomes apparent in many different pathways in the nervous system, particularly in the PNS as exemplified by their combined use in the treatment of peripheral neuropathy.