Neglected Nutrients: Evidence, Gaps and Practice– B Vitamins

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The B vitamins are a group of eight essential water–soluble micronutrients that collectively play important roles in energy production, red blood cell synthesis, and cellular growth and are therefore vital to exercise metabolism, oxygen transport and training adaptation. More specifically, thiamine (B1), riboflavin (B2), niacin (B3), pantothenic acid (B5), and biotin (B7) function as components of coenzymes in intermediary metabolism (e.g., glycolysis, the tricarboxylic acid cycle, beta–oxidation, and the electron transport chain), whereas pyridoxine and related vitamers (B6) are involved in amino acid metabolism, glycogenolysis, and neurotransmitter synthesis. Folate (B9) and cobalamin (B12), in turn, are essential for DNA synthesis, cell division, and red blood cell production.

Although reference nutrient intakes for B vitamins are generally the same for athletes as for the general population, requirements for certain B vitamins are influenced by energy and macronutrient metabolism and may increase in athletes during periods of intensified training. For example, UK reference nutrient intakes for thiamine (0.09 mg/MJ or ~0.4 mg/1000 kcal) and niacin (1.58 mg niacin equivalents/MJ or 6.6 mg /1000 kcal) are expressed relative to energy intake, whereas riboflavin requirements (0.143 mg/ MJ or 0.6 mg/1000 kcal) have historically been linked to energy expenditure. Thiamine and vitamin B6 needs may also be influenced by carbohydrate and protein intakes, respectively. Some evidence further suggests that requirements for thiamine, riboflavin and vitamin B6 may increase following the initiation of an exercise program or with abrupt increases in training volume.

The B vitamins are widely distributed in both animal and plant foods, although vitamin B12 is naturally found only in animal foods, and folate is abundant in legumes, leafy green vegetables, certain fruits, fortified grains (depending on national fortification practices), and free–range eggs. Consequently, athletes consuming adequate energy and a varied diet can generally meet their B vitamin requirements. Those at greatest risk for inadequate intake or compromised status include athletes with low–energy availability or restrictive dietary practices, particularly during periods of intensified training. Athletes following vegan or near–vegan diets are also vulnerable to B12 deficiency and should obtain adequate daily intake from a reliable supplement or appropriately fortified foods, such as fortified meat– and dairy–alternatives, breakfast cereals and fortified nutritional yeast.

Despite their importance, there is little evidence that B vitamin supplementation improves performance in athletes with adequate status. Moreover, high dose supplementation or supplement stacking of certain B vitamins may result in adverse effects or toxicity. Excessive vitamin B6 intake is of particular concern because it can cause sensory peripheral neuropathy, characterized by tingling, numbness, and impaired sensation. High doses of niacin may produce flushing, gastrointestinal distress, itching, skin irritation, and dizziness. However, preliminary evidence from a small placebo–controlled trial suggested that short–term, high dose riboflavin supplementation before and during an ultra–endurance event may attenuate post–exercise muscle pain and soreness, although its effects on physiological recovery and subsequent performance remain uncertain. Nevertheless, routine B–vitamin requirements should generally be met through a varied, nutrient–dense diet, with targeted supplementation when warranted.