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# Micronutrient Intakes and Status in the Protein Transition: A Systematic Review †

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**Abstract:** A food systems transformation is required to improve both human and planetary health. A reduction in the consumption of high-impact animal-based foods will be necessary, especially in high-income settings. Ensuring nutritional adequacy in this transition is critical, as animal-based foods are dense sources of many micronutrients. This review systematically summarised the available literature to assess the impact of reducing the environmental impact of diets, through the transition from animal to plant-based protein, on intakes and status of vitamins A, D, and B12, folate, calcium, iron, iodine, and zinc. The PRISMA guidelines were followed, and a review protocol was prospectively registered with PROSPERO [CRD42021239713]. Seven databases were searched for studies published between January 2011 and October 2022. Independent screening of titles and abstracts and a review of the full-text articles were completed by two reviewers. Fifty-six studies met the inclusion criteria, mainly from high-income countries ($n$ = 49). Most studies were based on the modelling of dietary data ($n$ = 45). Ten studies stratified observational data using an environmental outcome, and there was one randomised controlled trial (RCT). The RCT compared three levels of plant protein intake; intakes and status of vitamin B12 and iodine decreased significantly in the group with the highest proportion of plant protein. None of the other studies reported on nutritional status. Intakes of zinc, iron, calcium, and vitamins D, B12, and A were lower in observed diets with lower greenhouse gas emissions, and diets with a higher plant protein intake showed similar results, except iron was higher. Iron was also higher in diets adhering best to the EAT-Lance guidelines; however, heme iron reduced in one study. Vitamin B12 and zinc were consistently lower in diets modelled to reduce environmental impacts, while some studies found lower levels of vitamins A and D as well as calcium, which was influenced by fortified foods. Dietary optimisation of existing representative data showed that meeting nutritional, environmental, and cost constraints is technically feasible, supporting all components of a sustainable diet. This review highlights the need for high-quality intervention studies reporting biomarkers of nutritional status to pave the way for evidence-based strategies to promote both human and planetary health.

**Keywords:** sustainable diets; micronutrients; dietary intake; nutritional status; environmental impact; dietary change; public health



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