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The use of nutritional supplements to induce ketosis and reduce symptoms associated with keto-induction: a narrative review.

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Abstract

BACKGROUND: Adaptation to a ketogenic diet (keto-induction) can cause unpleasant symptoms, and this can reduce tolerability of the diet. Several methods have been suggested as useful for encouraging entry into nutritional ketosis (NK) and reducing symptoms of keto-induction. This paper reviews the scientific literature on the effects of these methods on time-to-NK and on symptoms during the keto-induction phase.

METHODS: PubMed, Science Direct, CINAHL, MEDLINE, Alt Health Watch, Food Science Source and EBSCO Psychology and Behavioural Sciences Collection electronic databases were searched online. Various purported ketogenic supplements were searched along with the terms "ketogenic diet", "ketogenic", "ketosis" and ketonaemia (/ ketonemia). Additionally, author names and reference lists were used for further search of the selected papers for related references.

RESULTS: Evidence, from one mouse study, suggests that leucine doesn't significantly increase beta-hydroxybutyrate (BOHB) but the addition of leucine to a ketogenic diet in humans, while increasing the protein-to-fat ratio of the diet, doesn't reduce ketosis. Animal studies indicate that the short chain fatty acids acetic acid and butyric acid, increase ketone body concentrations. However, only one study has been performed in humans. This demonstrated that butyric acid is more ketogenic than either leucine or an 8-chain monoglyceride. Medium-chain triglycerides (MCTs) increase BOHB in a linear, dose-dependent manner, and promote both ketonaemia and ketogenesis. **Exogenous ketones** promote ketonaemia but may inhibit ketogenesis.

CONCLUSIONS: There is a clear ketogenic effect of supplemental MCTs; however, it is unclear whether they independently improve time to NK and reduce symptoms of keto-induction. There is limited research on the potential for other supplements to improve time to NK and reduce symptoms of keto-induction. Few studies have specifically evaluated symptoms and adverse effects of a ketogenic diet during the induction phase. Those that have typically were not designed to evaluate these variables as primary outcomes, and thus, more research is required to elucidate the role that supplementation might play in encouraging ketogenesis, improve time to NK, and reduce symptoms associated with keto-induction.

KEYWORDS: Betahydroxybutyrate; Ketoflu; Ketogenic diet; Ketoinduction; Ketone supplement; Ketosis; Leucine; Medium chain triglycerides; Short chain fatty acids

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