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Systematic Review of Dietary Fiber Characteristics Relevant to Appetite and Energy Intake Outcomes in Clinical Intervention Trials of Healthy Humans

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Abstract : Dietary fiber (DF) intake has been associated with lower body weight or less weight gain. These effects are generally attributed to putative effects of DF on appetite. Many intervention studies have tested the effect of DFs on appetite-related measures, with inconsistent results. However, DF includes a wide category of different compounds with diverse chemical and physical characteristics, and correspondingly diverse effects in human digestion. Thus, inconsistent results between DF consumption and appetite are not surprising. The specific contribution of different compounds with varying physico-chemical properties to appetite control and the mediating mechanisms are not well characterized. This systematic review aimed to assess the influence of specific DF characteristics, including viscosity, gel forming capacity, fermentability, and molecular weight, on appetite-related outcomes in healthy humans. Medline and FSTA databases were searched for controlled human intervention trials, testing the effects of well-characterized DFs on subjective satiety/appetite or energy intake outcomes. Studies were included only if they reported: 1) fiber name and origin, and 2) data on viscosity, gelling properties, fermentability, or molecular weight of the DF materials tested. The search generated 3001 unique records, 322 of which were selected for further consideration from title and abstract screening. Of these, 149 were excluded due to insufficient fiber characterization and 124 for other reasons (not original article, not randomized controlled trial, or no appetite related outcome), leaving 49 papers meeting all the inclusion criteria, most of which reported results from acute testing (<1 day). The eligible 49 papers described 90 comparisons of DFs in foods, beverages or supplements. DF-containing material of interest was efficacious for at least one appetite-related outcome in 51/90 comparisons. Gel-forming DF sources were most consistently efficacious but there were no clear associations between viscosity, MW or fermentability and appetite-related outcomes. A considerable number of papers had to be excluded from the review due to shortcomings in fiber characterization. To build understanding about the impact of DF on satiety/appetite specifically there should be clear hypotheses about the mechanisms behind the proposed beneficial effect of DF material on appetite, and sufficient data about the DF properties relevant for the hypothesized mechanisms to justify clinical testing. The hypothesized mechanisms should also guide the decision about relevant duration of exposure in studies, i.e. are the effects expected to occur during acute time frame (related to stomach emptying, digestion rate, etc.) or develop from sustained exposure (gut fermentation mediated mechanisms). More consistent measurement methods and reporting of fiber specifications and characterization are needed to establish reliable structure-function relationships for DF and health outcomes.

Keywords : appetite, dietary fiber, physico-chemical properties, satiety
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