

Optimizing Nutrition for the Brain: Umbrella Review of Nutrients and Bioactive Food Components to Support Brain Health

The role of nutrition in supporting brain health has rapidly emerged as a leading frontier in nutrition science. Human studies over the past decade suggest that specific nutrients and bioactive compounds—including polyphenols, omega-3 fatty acids, B-vitamins, choline, vitamin K, and others—may influence cognitive domains such as memory, attention, executive function, processing speed, and mood in disease-free populations across the lifespan. Yet the evidence base is fragmented across numerous individual studies and systematic reviews with heterogeneous methods, outcomes, and quality assessments, limiting translation into dietary guidance and product development. For example, polyphenol-rich interventions (e.g., cocoa flavanols, berries, green tea) report tentative cognitive benefits but inconsistent effects across reviews, while reviews and umbrella analyses of omega-3 fatty acids suggest small favorable effects with weak evidence credibility.

Despite promising evidence, no recent umbrella review has focused on nutrients and bioactives in order to synthesize findings on cognitive and mood outcomes in cognitive disease-free populations while resolving essential practical questions about dosage and exposure duration (acute vs. long-term, and duration of long-term). A new umbrella review is therefore very timely, adding to prior understanding of nutrient-brain effects.

Our Specific Aims are to synthesize information from published reviews in order to:

- 1) Identify priority nutrient/bioactive candidates for cognitive and mood outcomes across the lifespan;**
- 2) Quantify dosage and distinguish acute versus short- and long-term effects;**
- 3) Integrate an understanding of mechanistic correlates to explain observed functional benefits.**

2. Research Approach

This umbrella review will bring together 3 medical students to work with the research team. Students will be trained to follow established best practices for evidence synthesis and reporting, using a pre-registered protocol to ensure methodological transparency and rigor. Mechanistic outcomes, including inflammatory markers and cerebral perfusion measures, will be included when reported jointly with functional outcomes to enhance biological interpretation. Searches will be conducted in MEDLINE (PubMed), Embase, PsycINFO, and the Cochrane Database of Systematic Reviews, partnering with the Dartmouth Health Sciences and Biomedical Libraries.

The quality of included reviews will be assessed using the AMSTAR-2 tool, and the certainty of evidence for each nutrient–outcome relationship will be summarized using the GRADE framework when available. Risk-of-bias assessments conducted within the systematic reviews will be documented, as will all disclosures of funding sources and conflicts of interest to facilitate transparent interpretation. Several methodological and conceptual challenges are anticipated in conducting this umbrella review, and we will incorporate mitigation strategies into the protocol to ensure rigor, transparency, and interpretability of findings.

3. Research Team

The research team have all worked together and have strong expertise for the proposed work.

- Suzannah Gerber, PhD, Research Scientist, nutrition and food scientist, seasoned systematic reviewer, and Cochrane Review certified author;
- Susan Roberts, PhD, Senior Associate Dean for Foundational Research, Professor of Medicine and Epidemiology, lead scientist on several systematic reviews with expertise in nutrition for brain health with general nutrition expertise including as member of two DRI committees;
- Karen Blackmon, PhD. Board-certified clinical neuropsychologist with research expertise on cognition and measurement of brain health;
- Jeffrey Blumberg, PhD. Advisor and Emeritus Professor, Friedman School of Nutrition at Tufts University, and expert in bioactive food constituents;
- Pamela Bagley, BA. Lead Dartmouth College Systematic Review Specialist Library partner.