

**Understanding the impact of radical changes in diet and the gut microbiota on brain function and structure: Rationale and design of the EMBRACE study (<https://mbmc-cmcm.ca/projects/embrace-project/>)**

**Tair Ben-Porat (PhD)<sup>1,2</sup>, Kelly Acevedo Benitez (BSc)<sup>3</sup>, Angela Alberga (PhD)<sup>1</sup>, Marie-Claude Audet (PhD)<sup>4,5</sup>, Sylvie Belleville (PhD)<sup>3,6</sup>, Tamara Cohen (PhD, RD)<sup>7</sup>, Julie Favron-Godbout (BSc)<sup>2,6</sup>, Pierre Y. Garneau (MD)<sup>8</sup>, Kim L Lavoie (PhD)<sup>2,9</sup>, Patrick Marion (B.A.)<sup>2</sup>, Samira Mellah (PhD)<sup>3</sup>, Radu Pescarus (MD)<sup>8</sup>, Elham Rahme (PhD)<sup>10,11</sup>, Sylvia Santosa (PhD)<sup>1,12,13</sup>, Anne-Sophie Studer (MD)<sup>8</sup>, Dajana Vuckovic (PhD)<sup>14</sup>, Robbie Woods (PhD)<sup>2</sup>, Reyhaneh Yousefi (M.Sc)<sup>1,2</sup>, Simon L Bacon (PhD)<sup>1,2</sup>, for the EMBRACE Study Team**

**Background:** Bariatric surgery (BS) leads to profound changes in gut microbiota and diet, both of which may interact to impact gut-brain communication. There is a larger variability in how cognitive function changes post-surgery. How BS-induced modifications in the gut microbiota and dietary patterns influence the variability in cognitive function is still unclear.

**Aims:** To elucidate associations between BS-induced changes in dietary and gut-microbiota patterns with post-surgical cognition and brain structure; and to examine biological changes (e.g., inflammatory state, hormonal changes, short chain fatty acids, neurotransmitters and

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<sup>1</sup> Department of Health, Kinesiology, and Applied Physiology, Concordia University, Montreal, QC, Canada

<sup>2</sup> Montreal Behavioural Medicine Centre (MBMC), Centre intégré universitaire de santé et de services sociaux du Nord-de-l'Île-de-Montréal (CIUSSS-NIM), QC, Canada

<sup>3</sup> Research center of the Institut Universitaire de Gériatrie de Montréal (CRIUGM), Centre intégré universitaire de santé et de services sociaux du Centre-Sud-de-l'Île-de-Montréal (CIUSSS-CSMTL), Montreal, QC, Canada

<sup>4</sup> School of Nutrition Sciences, University of Ottawa, Ontario, Canada

<sup>5</sup> The Royal's Institute of Mental Health Research, Ottawa, Ontario, Canada

<sup>6</sup> Department of Psychology, University of Montreal, Montreal, QC, Canada

<sup>7</sup> Faculty of Land and Food Systems, University of British Columbia (UBC), Vancouver, British Columbia, Canada

<sup>8</sup> Division of Bariatric Surgery, Department of Surgery, CIUSSS Du-Nord-De-L'île-De-Montréal, University of Montréal, Montreal, Canada

<sup>9</sup> Department of Psychology, University of Quebec at Montreal (UQAM), Montreal, QC, Canada

<sup>10</sup> Department of Medicine, Faculty of Medicine and Health Sciences, McGill University, Montreal, QC, Canada

<sup>11</sup> Center for Outcomes Research and Evaluation, Research Institute of the McGill University Health Centre (MUHC), Montreal, QC, Canada

<sup>12</sup> Metabolism, Obesity and Nutrition Lab, PERFORM Centre, Concordia University, Montreal, QC, Canada

<sup>13</sup> CIUSSS Du-Nord-De-L'île-De-Montréal, University of Montréal, Montreal, Canada

<sup>14</sup> Department of Chemistry and Biochemistry, Concordia University, Montreal, QC, Canada

their precursors) pre- to post-BS as potential mediating/moderating factors of these relationships.

**Methods:** A total of 120 adult patients ( $\geq 30$  years) scheduled to undergo a primary BS along with 60 age-, sex-, and body mass index (BMI)-matched patients on the surgery waitlist will undergo assessments 3M pre-surgery and 6M and 12M post-surgery (or an equivalent time for the waitlist group). Additionally, 60 age- and sex-matched non-bariatric surgery eligible individuals will complete the pre-surgical assessments only. Evaluations will include sociodemographic and health behavior questionnaires, physiological assessments (anthropometrics, blood-, urine-, and fecal-based measures), neuropsychological cognitive tests, and structural magnetic resonance imaging. Cluster analyses of the dietary and gut microbiota changes will define the various dietary patterns and microbiota profiles, then using repeated measures mixed models, their associations with global cognitive and structural brain alterations will be explored.

**Significance:** Insights generated from this study could be used to develop individually-targeted neurodegenerative disease prevention strategies, as well as providing critical mechanistic information.

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**Registration details:** Trial registration number: NCT05318781  
(<https://www.clinicaltrials.gov/>)