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Research Award Brief

Dopamine Mediated Relearning of Food Motivation and Taste Preferences Following Bariatric Surgery (2016 - 2018)

PI: Susan Carnell, Ph.D.
Assistant Professor
Department of Psychiatry and Behavioral Sciences
School of Medicine

Co-PIs:

Kimberley E. Steele, M.D., Ph.D., FACS
Associate Professor
Department of Surgery
School of Medicine

Dean Wong, M.D.
Professor
Departments of Radiology & Psychiatry and Behavioral Sciences
School of Medicine

Brian Caffo, Ph.D.
Professor
Center for Global Health and Department of Biostatistics
School of Public Health

Tim Moran, Ph.D.
Professor
Department of Psychiatry and Behavioral Sciences
School of Medicine

Research Question: How does bariatric surgery cause obese individuals to relearn their taste preferences and their desire to consume high-calorie foods? How does this relearning lead to reduced calorie intake and weight loss?

Interdisciplinary Approach: We will combine behavioral measures with a novel PET imaging application to investigate neural mechanisms underlying the relearning of taste preferences and food reward in bariatric surgery.

Potential Implications of Research: The results will improve our understanding of plasticity in brain circuits underlying food reward and the contribution of dopamine to the learning of eating habits. They will also help improve bariatric surgery practices and inform the development of new obesity treatments.

Obesity is a major personal and public health concern, with over a third of adults in the United States currently obese. Weight loss can be very challenging and so increasing numbers of obese individuals are now opting for surgical solutions – nearly 200,000 individuals sought bariatric surgery in 2015. One increasingly popular form of bariatric surgery is vertical sleeve gastrectomy (VSG), in which the size of the stomach is reduced. Weight loss after VSG is often attributed to patients' reduced ability to consume large volumes; however, evidence suggests that patients also seem to display reduced interest in and consumption of high-calorie (e.g. high-sugar, high-fat) foods. This may be because VSG causes a relearning of taste preferences and food reward – the drive to consume certain foods. Dopamine, a neurotransmitter involved in learning and motivation, plays a vital role in food reward, and is particularly dense in the striatum, a region deep inside the brain. For this project, we will explore whether post-surgical changes in the intake of high-calorie foods are partly driven by a relearning of food reward and taste preferences resulting from altered dopamine functioning in the striatum. To do this, we will recruit patients undergoing VSG and use Positron Emission Tomography (PET) – a brain imaging technique – to measure dopamine levels in the striatum before and after surgery. Importantly, we will use PET to measure not only baseline dopamine levels, but also dopamine release in response to consumption of high-calorie food, which could be even more important for the relearning of food reward and taste preferences. We will also examine correlations between post-surgical dopamine changes, and changes in self-report measures of diet, taste preferences, and food motivation, assessed at multiple time-points from 1-4 weeks before surgery to one year after surgery. This study will help establish the character and time course of surgery-related changes in brain systems underlying food reward and taste preferences. It will also help us understand the extent to which these changes are mediated by changes in dietary intake. The results promise to teach us more about how plasticity in brain circuits contributes to weight loss from bariatric surgery, and why some people but not others are able to maintain their post-surgical weight loss. What we learn about dopamine-mediated learning mechanisms could also be relevant to other behavioral disorders such as addiction.