

Dietary fat preference and adolescent obesity: Genes, environments and possible brain mechanisms

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Obesity develops through multifactorial pathways that include brain-reward mechanisms regulating food intake and addictive behavior. Prenatal exposure to maternal cigarette smoking (PEMCS) is a well-established risk factor of obesity, but the underlying mechanisms are not known. Our recent research in the Saguenay Youth Study suggests that PEMCS may increase risk for obesity through subtle changes in the brain-reward system that promote preference for fat and that may in part develop through the combination of genetic and epigenetic variations in the opioid receptor mu 1 gene (*OPRM1*). In particular, we have shown that:

- PEMCS increases risk for obesity in adolescence (Obesity, 2010), and it may do so by enhancing dietary preference for fat, an effect associated with subtle structural changes in brain regions processing reward (Archives of General Psychiatry, 2012).
- PEMCS increases drug experimentation in adolescence, which is also an effect associated with subtle structural changes in brain regions processing reward (Archives of General Psychiatry, 2009).
- Dietary preference for fat is modulated by *OPRM1*, encoding a receptor expressed in the brain areas processing reward and known to regulate fat preference in animals (Molecular Psychiatry, 2013).
- The effect of the 'protective' (fat preference-lowering) *OPRM1* allele is not present among adolescents with PEMCS. Our preliminary results suggest that this gene-environment interaction (i.e., silencing of the 'protective' allele in 'exposed' but not 'non-exposed' adolescents) may be due to PEMCS-induced epigenetic modifications of *OPRM1*.

This research brings together two important public-health domains: Metabolic health (obesity) and mental health (addiction).

Biography

Zdenka Pausova obtained her M.D. degree from the Purkyne University (Czech Republic) in 1986. She then received research training in genetics at McGill University and the University of Montreal in Montreal, Canada (1990-1998). Currently, she is senior scientist in the Hospital for Sick Children and associate Professor in the Departments of Physiology and Nutritional Sciences at the University of Toronto, Canada. Her research focuses on the causes and consequences of adolescent obesity. She co-directs the Saguenay Youth Study aimed at investigating cardiometabolic and mental health, and genetic modifiers, in 1,000 Canadian adolescents and their parents.

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