



The effect of dietary salt in the development of obesity and diabetes

Background and experimental design

Type 2 diabetes (T2D) represents a serious public health problem and social burden, affecting 418 million people worldwide. In Australia, about 1 million adults have T2D and the annual cost of T2D is estimated 14.6 billion. T2D is a major risk factor of cardiovascular diseases, which is the top cause of mortality globally. Obesity is a primary cause of type 2 diabetes, contributing to 90% of type 2 diabetic cases in Australia. Unfortunately, current obesity treatments have proven to be relatively ineffective and more effective treatments are urgently needed to curb the epidemic of obesity and diabetes.

Widespread consumption of high sugar, high fat food has largely contributed to the prevalence of obesity and diabetes. Such diets are often accompanied by increased consumption of processed food, where salt is typically used as an appetizing agent or food preservative. Whilst excessive salt intake has been widely recognized as a strong risk factor for hypertension and other cardiovascular diseases, its impacts on metabolic homeostasis have been much less studied, especially in the setting of nutritional oversupply and obesity, where nothing is known.

Importantly, our preliminary data demonstrates that short-term (3-week) salt intake showed improved glucose tolerance, however, long-term salt treatment (8-weeks) impaired glucose tolerance in chow-fed wild type mice, a metabolic defect that is commonly associated with high fat feeding. These data for the first time suggest that excessive salt intake is linked to glucose metabolism and short-term and long-term high salt intake have opposing metabolic outcomes even under a chow feeding. However, the precise mechanisms that control the transition from positive metabolic effects to negative effects remain elusive. Moreover, given that a long-term high salt intake increases cardiovascular risks, especially with a high fat diet (HFD), it is important to evaluate the metabolic outcomes of chronic salt intake in conjunction with a HFD.

Therefore, in this proposal, we will use mouse models to systemically characterize the effects of salt intake on beta cell function and glucose metabolism under both chow and high fat feeding. The successful candidate will be based in the Garvan Institute.

Animal models, Methods and molecular technologies involved

- Mouse models fed with a chow or a high fat diet
- In vivo metabolic profiling: Body composition measurement by DEXA and/or EchoMRI; Glucose tolerance test; Insulin tolerance test; Indirect caloric energy expenditure measurement; Temperature measurement by infrared camera
- Ex vivo and in vitro cell treatment & analysis: Pancreas perfusion and islet isolation; Primary islet cell culture and treatments
- Molecular biology techniques: RNA and protein extraction; qPCR; Western blotting; Immunofluorescence/immunochemistry; immunoprecipitation; RIA; ELISA; histology
- Microscopic analysis: imaging using Light microscope, fluorescence microscope, confocal microscope
- High throughput next generation RNA sequencing analysis

Neuroendocrinology Group's research interests

- The Neuroendocrinology Group's field of study is geared toward major contemporary health issues of diabetes and obesity. Our study focusses on understanding how the brain and peripheral tissues coordinate to control body weight, insulin secretion and whole-body energy & glucose homeostasis with an emphasis on the role of brown fat and white fat browning in the development of obesity, diabetes and cancer.
- The candidates will investigate the underlying molecular mechanisms that contribute to the development of diabetes and obesity employing state-of-the-art technologies in metabolic and neuroscience research.

Contact Details

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