

FOOD-BASED BIOMARKERS, DIET QUALITY, AND CARDIOMETABOLIC HEALTH

Abstract Text:

Accurate assessment of human diet is the cornerstone of nutritional epidemiology. Biomarkers that are sensitive and specific to food intake can provide objective information that improves the characterization of diet. Advances in metabolomic profiling techniques now permit the discovery of novel food biomarkers, although, thus far, only a limited number of robust food biomarkers have been identified. This proposal represents major research efforts to significantly accelerate the advances in the research of nutrition and health by conducting three research projects: 1) food biomarker discovery and validation; 2) examination of food biomarkers in relation to cardiometabolic health, with a focus on coronary heart disease (CHD); and 3) evaluating food biomarker-guided precision nutrition to improve diet quality and cardiometabolic health. These complementary, inter-connected projects will be led by an investigator team consisting of researchers in the US, Ireland, and Northern Ireland with expertise in metabolomics, nutritional biomarker research, nutritional and chronic disease epidemiology, bioinformatics, and dietary intervention studies. The proposed projects will be jointly funded, without overlapping jurisdictions, by the NIH/USDA, Health Research Board and Science Foundation Ireland in the Republic of Ireland, and the Health and Social Care R&D Division in Northern Ireland through the unique US-Ireland R&D Partnership Programme. Dr. Lorraine Brennan, an internationally recognized leader in food biomarker discovery and metabolomics, will lead efforts in identifying novel food biomarkers using urine samples through controlled human feeding studies in Ireland. Dr. Qi Sun and his US team will lead efforts in evaluating the performance of food markers in assessing habitual diet among free-living individuals who are participants of the Nurses' Health Studies (NHS) and Hispanic Community Health Study / Study of Latinos (SOL). In addition, the US investigators will use food markers to construct a diet quality score and subsequently examine this score in relation to CHD risk in the NHS and SOL studies. Dr. Jayne Woodside will design food marker-guided precision nutrition guidance and evaluate the efficacy of the dietary guidance on improving diet quality and cardiometabolic health through a randomized intervention study in Ireland (North and South). This proposal will leverage the interdisciplinary expertise of the Trans-Atlantic team, rich resources of multi-ethnic cohorts in the US, and a unique cost-sharing mechanism by multiple funding agencies. This project will facilitate discoveries of novel food markers, provide further evidence that links food markers with CHD risk in US men and women with diverse ethnic background, and demonstrate the utility of incorporating food markers in designing precision nutrition strategies for improving diet and human health. This study has a great potential to advance dietary assessment methodology and the development of more effective dietary interventions to improve cardiometabolic health.

Public Health Relevance Statement:

Novel biomarkers are needed to facilitate more accurate and objective measurements of food intake. The proposed study aims to discover and validate biomarkers using urine samples for various foods of public health importance, use novel and existing food biomarkers to construct a diet quality index, examine the food marker-based score in relation to cardiometabolic health, and evaluate the efficacy of using food marker-guided precision nutrition advice to improve diet quality and cardiometabolic health, through multiple, complementary projects led by three teams from the US, Ireland, and Northern Ireland. The study will help to identify food markers that can aid in better characterization of human diet, examination of associations with cardiometabolic diseases, and design of precision nutrition strategies for improving diet quality and metabolic health.