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Longitudinal multi-omics profiling in response to exercise in healthy and pre-diabetic individuals

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Lack of Physical Activity (PA) has been identified as the fourth leading risk factor for global mortality (WHO, 2009) and a major contributor to disability from non-communicable diseases such as metabolic disorders (e.g., type 2 diabetes, T2D), cardiovascular, neurological diseases and cancer. Conversely, PA has multiple physiological benefits (physically and mentally) and effectively prevents and treats non-communicable diseases. Despite undisputable evidence that regular PA has a profound beneficial impact, the molecular mechanisms by which PA promotes human health remains poorly understood and have not been characterized at a personalized level. In this context, we present an integrated Personal Omics Profiling (iPOP) for the comprehensive molecular profiling of blood-based analytes that we apply to track the molecular changes associated with exercise. Multi-omic profiling (transcriptome, proteome, immunome, metabolome and lipidome, etc.) revealed significant differences between pre-diabetics and healthy controls at rest, implicating pathways related to chronic inflammation and insulin regulation as well as novel connections to T2D. Participants went through an acute bout of exercise (maximal cardiopulmonary exercise) that was followed by a dense sampling at 2 min, 15 min, 30 min, 1 h, 2 h, 4 h, 6 h and 24 h post-exercise. The exercise perturbation was associated with a wealth of bio-molecular changes spanning multiple omics that culminated at 15 min post-exercise including inflammation, glucose and energy metabolism. Interestingly, the omic response to exercise differed between pre-diabetics and healthy controls. This study represents the most in-depth profiling of molecular changes associated with exercise and may offer new strategies for preventing and treating T2D.

Biography

Kevin Contrepois is an expert in metabolite profiling using LC-MS. He is the Director of Metabolomics and Lipidomics in Pr. Michael Snyder laboratory at Stanford University, California, USA. By integrating multi-omics data sets, he is interested in the discovery of biomarkers and in understanding the pathogenesis of common diseases (i.e. diabetes and cardiovascular disorders), with a special emphasis on host-gut microbiome interactions. He has published nine peer-reviewed articles in top-tier journals (Nature Communications, Cell Systems, Cell Reports) that were cited 146 times. He has received his PhD from the University of Paris-Sud (France) in 2012.

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