

Network biology of the gut microbial “signaling metabolome” and consequences for identification of drug targets

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The things we eat have a fundamental impact on our health and risk of disease. Gut microbiota play a major role in processing of food. The microbial-mammalian metabolic axis, which is influenced by the nutritional status and can introduce context-dependent variation in human response to dietary factors, goes in fact beyond metabolism. The study of human multifactorial diseases like insulin resistance, diabetes or obesity, represent a real healthcare challenge for the Western and developing world.

In a systems biology framework, integration of metabolic profiles with genome-wide genotyping and expression profiling data provides a platform to identify biomarkers and susceptibility genes for pathological components of the cardio-metabolic syndrome (glucose intolerance, insulin resistance, dyslipidemia, hypertension, obesity, coronary-artery disease). Metabolomic Quantitative Trait Locus (mQTL) mapping consists of the robust and accurate statistical integration of genome-wide genotyping (single nucleotide polymorphisms, microsatellites) and metabolome-wide profiling by NMR spectroscopy and Mass spectrometry, to identify candidate biomarkers and susceptibility genes in rodent models of human disease.

From a network biology angle, candidate genes and metabolites are then mapped onto the interactome, allowing an efficient visualisation of complex data, allowing the identification of mechanistic arguments, explaining the influence of gene variants on metabolic profiles and eventually disease phenotypes. Metabolic profiling enables the assessment of the effect of microbial metabolism in several aspects of insulin-resistance related pathologies and provides independent validation of several metagenomic studies.

Biography

Dr. Marc-Emmanuel Dumas is Lecturer in Systems Biomedicine. He studied in France and was awarded a PhD in “Biochemistry, Molecular and Cell Biology” in 2002. Dr. Dumas joined Imperial College in 2002. In 2007, he took an appointment at Ecole Normale Supérieure de Lyon (France), to initiate a metabolomics and systems biology group and was awarded a Young Investigator Award from the Agence Nationale de la Recherche. Dr. Dumas was appointed as Lecturer in Systems Biomedicine at Imperial College in 2009. He is an editorial board member of the Journal of Proteome Research, published by the American Chemical Association.