

Whole-body systems approaches for Gut Microbiota-targeted Health Management

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Human beings are superorganisms with two genomes in operation for emergence of phenotypes, the genetically inherited human genome (25,000 genes) and the environmentally acquired human microbiome (over 1 million genes). The two genomes need to work in harmonious integration to maintain our health. Nutrition plays a crucial role in directly modulating our microbiomes and health phenotypes. Particularly, high-fat diets can turn gut microbiome from partner for health to “pathogen” for metabolic diseases. Accumulating evidences are supporting the new hypothesis that obesity and related metabolic diseases develop as a result of a low-grade, systemic and chronic inflammation induced by diet-disrupted gut microbiota. Many traditional, natural, whole foods may be employed to re-engineer this disrupted gut microbiota for early prevention of metabolic syndromes. Due to the tight integration of gut microbiota and human global metabolism, molecular profiling of gut microbiomes and urine metabolites can provide us new systems approaches for quantitative assessment and monitoring of our health at the whole-body level. These whole-body systems approaches measure human health based on the results of interactions between the two genomes and the environments. Large scale population-based studies with these whole-body level systems methods will generate pre-disease biomarkers with predictive power; thus make preventive health management of populations with rapidly changing disease spectrums possible through re-engineering of the imbalanced gut microbiomes with natural, whole foods.