OC16 - **Personalized nutrition and human microbiome for NCD prevention and treatment**

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Non-Communicable Diseases (NCDs), such as obesity, type 2 diabetes and cardiovascular diseases, are defined as non-genetic non-infectious medical disease, which progress slowly, are present throughout life, and constitute a major health and economic problem. In fact, they are the current leading cause of death around the world posing also a huge economic threat because they require expensive treatment and reduce the working population, through incapacitation or premature death.

Several evidences in literature are supporting the hypothesis that defective in utero programming, the process by which a stimulus at a critical period of development results in a lifelong effect, is the main responsible for a broad range of NCDs. In fact, this period corresponds to a window in which the biological system has a high degree of plasticity and is very sensitive to the uterine environment stimulus provided by the mother. Therefore, the first line of defence against NCDs is to avoid/reduce the adverse events during in utero programming induced by common maternal lifestyle choices. Therefore, in a world characterized by an overwhelming increase in the prevalence of obesity and other related metabolic disturbances, such as type 2 diabetes, metabolic syndrome and cardiovascular diseases, tailored nutrition prescription represents a promising approach for both the prevention and management of these NCDs.

However, to translate the growing increase of findings emerging from basic nutritional science into meaningful and clinically relevant lifestyle advices, the access to large omics (genomics, transcriptomics, proteomics, epigenetic, metagenomics, metabolomics, etc.) data has revolutionized biology leading to the emergence of systems biology for a better understanding of biological mechanisms. All the omics sciences need to be taken into account in designing personalized and unbiased nutritional solutions not only for the in utero programming but also for individuals or population sub-groups, where the usefulness of tailored dietary advices to adequately anticipate individual responses to nutritional intakes is one of the main goals of precision nutrition.

Among omics, gut microbiota composition profiling is emerging as a key feature of precision nutrition and as a priority in nutritional interventions; the impact of specific dietary factors on the ecological diversity is the subject of many ongoing investigations. Looking at the relation between gut microbiota composition and obesity, there are accumulating evidences that the propensity toward adult obesity has early developmental origins and follows an intergenerational cycle. In fact, it has been demonstrated that microbiota has been found to have the ability to pass features from one generation to the next via maternal contact as well as environmental contact, thus suggesting that there already exists a significant interplay between the environmental microbes and the developing gastrointestinal tract of the fetus before delivery. Moreover, maternal microbiome may be considered as a “second genome” potentially plastic and responsive to many dietary habits, food behavior and other external factors, exerting its effect on subsequent generations via epigenetic mechanisms.

Therefore, the ability of gene-diet interactions to modify gut microbiota composition, and the existing link between food consumption, disease development and gut bacteria diversity, suggest that gut microbiota should be considered when designing personalized nutrition advices.

References

de Toro-Martìn, 2017; Yamashiro, 2017; Tang, 2017; Chang et al. 2015