Maternal obesity and cognitive dysfunction in the offspring: cause-effect role of the GUT MicrobiOME and early dietary prevention (GUTMOM)

A research line was started in 2010 to identify (modifiable) early-life factors affecting the risk of chronic diseases over the lifespan, as supported by:

- The EU Commission (Developmental origins of healthy and unhealthy aging: the role of maternal obesity, EU-FP7-DORIAN, 10 members, IFC: Coordinator)
- The European Foundation for the Study of Diabetes, EFSD/Roche Grant (IFC: Principal investigator)
- The CNR-Flagship-Project InterOmics (IFC: Unit Leader, collaborators IIT-CNR, UNISA. Subproject “Identification of biomarkers for risk evaluation and prevention of obesity complications: the gut microbiota”)

These projects were primarily focused on cardiovascular and metabolic diseases, whereas GUTMOM addresses cognitive decline.

**JPI-GUTMOM PROJECT**

Early life is fundamental for brain and microbiota development. Gut microbiota influences brain function. Maternal obesity affects maturation of gut microbiota and is an important predictor of cognitive dysfunction in the offspring. Cognitive decline through life is an increasingly invalidating condition, due to population ageing and the high frequency of predisposing factors (obesity, unhealthy diets). We hypothesize that the negative effects of maternal obesity on cognitive function in the offspring are partly mediated by the microbiota and its metabolites, offering the opportunity for non-invasive risk-screening and risk-reduction by tailored foods and diets, since earliest life stages. We use: a) birth cohorts to identify gut bacteria and metabolites that are related to maternal obesity and cognitive development in early life; b) animal models to investigate cause-effect mechanisms, and develop tailored microbiota-targeted interventions, improving cognition. We will develop policy-relevant leads and a design of a clinical trial for future exploitation.

The plan includes 5 research work-packages (WP01-05), together with dissemination, management and training activities (WP06-07). Data management will follow the FAIR principles. The Consortium involves 6 academic centers and a private industry.

**Coordinator:** National Research Council (IT), Institute of Clinical Physiology

- University of Valencia (ES), Dept. Physiology, Medicine Faculty
- Radboud UMC (NL), Metagenomics group, CMBI
- Max Planck Gesellschaft (DE), Max Planck Institute of Psychiatry
- University of Helsinki (FI), Dept. General Practice, Primary Health Care
- Istituto Superiore di Sanità (IT), Center for Behav. Sciences, Mental Health
- Mead Johnson Nutrition (NL), R&D, Global Discovery

**In the same research line, IFC is also Partner of the**

HDHL-INTIMIC Knowledge Platform on Food, Diet, Intestinal Microbiomics and Human Health, a Consortium of 52 Partners aiming to collect and harmonize microbiota & metabolome data. IFC is supported via GUTMOM (MIUR), and MiSVILUPPO (MIPAAFT).

**Keywords:** maternal obesity, microbiome, cognitive function

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