University of Naples Federico II

Department of Pharmacy

International PhD course in

Nutraceuticals, Functional Foods and Human Health

PROJECT TITLE: Synbiotic intervention to counteract early-life antibiotic-induced alteration of gut-brain crosstalk. Focus on gut microbiota reshaping of brain epigenetic landscape.

Tutor: Prof.ssa Francesca Lembo **Co-tutor: Prof.ssa Elisabetta Buommino**

Project description:

The project falls within the scope of the study of the microbiota–gut–brain axis, whose alterations have been associated with neurological and behavioral disorders.

Early-life dysfunction of the gut-brain axis attributable to gut microbiota perturbation can inform long-term health trajectories with a specific high-risk impact for neurodevelopmental disorders. Antibiotic exposure in early life is a major environmental factor strongly influencing gut microbiota composition. We aim to investigate whether early-life gut microbiota perturbations drive changes in brain function by reprogramming the host epigenome, specifically DNA methylation patterns, influencing the risk for neurologic and neuropsychiatric diseases later in life. We propose a comprehensive approach encompassing behavioral tests, the definition of methylome of specific brain areas as well as GM analysis in a mouse model of early-life antibiotic-induced experimental dysbiosis. Spontaneous reconstitution of the antibiotic-depleted microbiota will be used to assess the plasticity of behavioral responses and DNA methylation signatures. A treatment with a complementary synbiotic, as ideal candidate as modulator of gut-brain communication, namely a combination of the probiotic *Lactobacillus reuteri* (*Limosilactobacillus reuteri*) and the prebiotic 2'-fucosyllactose (2'FL) will be used to intervene on microbiota and gut equilibrium as well as on CNS homeostasis, possibly hindering the development of pathophysiological traits. This treatment will be tested to prove microbiota involvement in host epigenetic modulation of gut-brain crosstalk and to counteract the biological and behavioural effects of early-life dysbiosis. Within a translational context, this approach prompts attempts to restore the correct trajectory of gut microbiota functionality following early-life dysbiosis to counteract the effects of altered gut-brain crosstalk possibly leading to neurologic impairment.

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