RESEARCH TOPIC MECM_17

Environmental Exposure and Mental Health: The Entanglement of Particulate Matter and Diet in the severity of schizophrenia spectrum disorders

Curriculum
MECM Standard

Research Area
Neuro

Laboratory name
Cell Biology of the Synapse Lab

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Abstract
Schizophrenia spectrum disorders include severe psychiatric conditions with a multifactorial etiology, involving genetic, environmental, and lifestyle factors. How these elements converge in disease progression remains unclear. Yet, elucidating and modifying their interactions, and the underlying biological mechanisms, will improve patient outcomes. This project pioneers an innovative, integrative approach combining population studies, biomarker profiling, and functional analyses. We will investigate the role of circulating extracellular vesicles from patients as mediators of paradigmatic environmental triggers, such as air pollution and dietary patterns. We will define their functional role at the cellular level, dissecting their impact on neuronal fitness, networks activity, synaptic assembly and function, mitochondria dynamics and epigenetics. The results will be instrumental in defining strategies to optimize patient care, by mitigating the effects of non-modifiable risk factors, with the potential for a deep impact on public health.

Main technical approaches
The present project foresees a close collaboration with the neuropsychiatric unit of Policlinico Hospital (Milan) and University of Milan, which will recruit schizophrenic patients and isolate extracellular vesicles. The PhD student will integrate complementary techniques to investigate the biological mechanisms underlying the effects of modifiable environmental factors (air pollution and dietary patterns) on schizophrenia severity. The candidate will employ advanced confocal and functional imaging, biochemistry, methylome analysis and molecular tool to manipulate gene function and assess how patient-derived extracellular vesicles affects the assembly and function of neuronal circuits.

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Scientific references

1. Monti et al 2025 "Short-term exposure to particulate matter and apparent temperature is associated with schizophrenia severity in Italy" Psychiatry Res

2. Monti et al 2025 "Influence of Air Pollution Exposure on the microRNA Content of Neuronal Extracellular Vesicles in Subjects Affected by Major Depressive Disorder" Environ Health

3. Assendorp et al 2024 "CTNND2 moderates the pace of synaptic maturation and links human evolution to synaptic neoteny" Cell Rep

4. Nicholson et al 2022 "Role of brain extracellular vesicles in air pollution-related cognitive impairment and neurodegeneration" Environ Res

5. Adamowicz et al 2021"Dietary Behaviors and Metabolic Syndrome in Schizophrenia Patients" J Clin Med

Type of contract

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