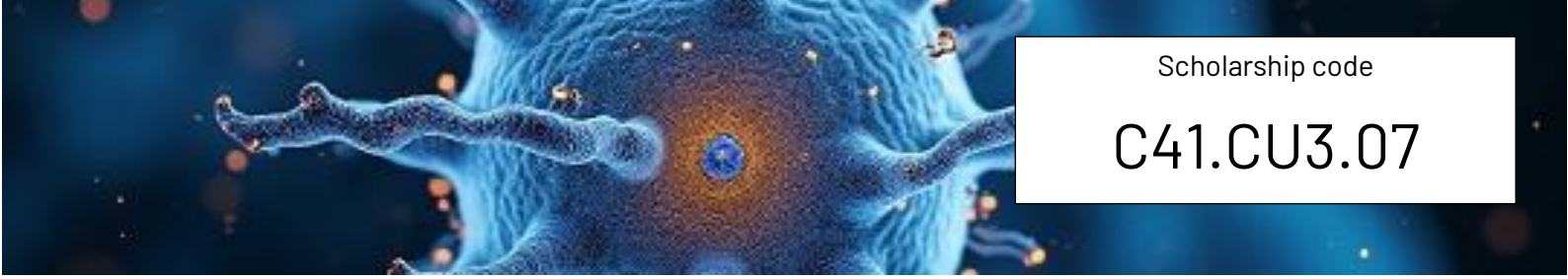

Scholarship code

C41.CU3.07

CU3 - BIOMOLECULAR AND BIOTECHNOLOGICAL SCIENCES

Epidemiological studies in birth cohorts and in vitro/vivo models for non-communicable diseases

Reference Person: Gaspare Drago

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Host University/Institute: Consiglio Nazionale delle Ricerche

Istituto per la Ricerca e Innovazione Biomedica (CNR-IRIB)

Location: Palermo (PA), Italy

Research Keywords: Exposome

Birth cohort

Biomarkers

Reference ERCs: LS7_9 Public health and epidemiology

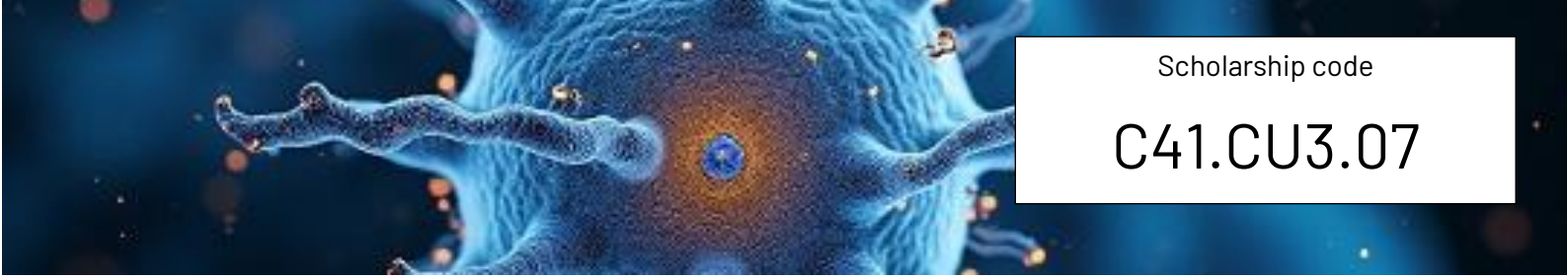
LS4_8 Impact of stress (including environmental stress) on physiology

LS7_2 Medical technologies and tools (including genetic tools and biomarkers) for prevention, diagnosis, monitoring and treatment of diseases

Available positions: 1

Description of the research topic

The relationship between environmental exposures and human health is one of the most critical issues in biomedical research. Growing evidence suggests that early life exposure to environmental hazards, along with the adoption of unhealthy lifestyles, may raise the risk for non-communicable diseases (NCDs) later in life. The complex interaction underlying the risk of chronic diseases – starting from intrauterine life – requires a greater knowledge of the events between environmental insults and the risk of future pathology. In this context, the concept of the exposome – defined as the totality of environmental exposures an individual experiences throughout his/her life, from conception onwards – has emerged as a key framework for understanding the environmental contribution to disease etiology. Birth cohort studies represent a valuable research model for investigating the impact of



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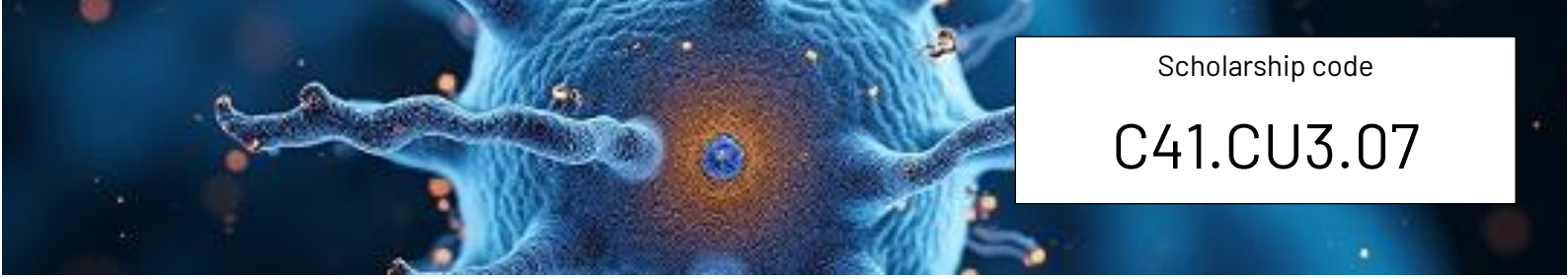
environmental factors over time. By following mother-child pairs from gestation through early life, these studies enable the identification of associations between early exposures and later health outcomes, including developmental and metabolic conditions. These cohorts often include extensive biological sample collections, clinical assessments, and detailed environmental exposure data, forming a solid foundation for studying the human exposome. In parallel, advances in omics technologies and experimental models are making it possible to explore the biological mechanisms underlying observed associations. The integration of longitudinal epidemiological and omics data – such as genomics, epigenomics, metabolomics, and proteomics – along with in vitro and in vivo models, enables researchers to move beyond correlation, toward understanding causal pathways and biological responses to environmental stressors. Exploring the interactions between environmental, biological, and behavioral factors – and their impact on human health – through experimental models and advanced techniques enables the validation of epidemiological data, the elucidation of pathogenic mechanisms, and the identification of clinically relevant biomarkers. This integrative approach has broad practical implications: it can inform early risk assessment, guide the discovery of predictive biomarkers for chronic diseases, support evidence-based regulatory decisions on environmental contaminants, and foster the development of targeted prevention strategies and personalized interventions.

Research team and environment

The PhD project will be carried out at IRIB-CNR (Institute for Biomedical Research and Innovation) in Palermo, within a multidisciplinary team including the Environmental Epidemiology and Molecular Immunology groups. The epidemiology group has solid expertise in longitudinal studies on environmental and lifestyle risk factors affecting maternal and child health. Since 2018, it coordinates the neonatal environment and health outcomes (NEHO) birth cohort, investigating maternal exposure to pollutants, circulating microRNA alterations, and children's growth trajectories. The Molecular Immunology group conducts in vitro and in vivo studies on pollutant-induced innate immune modulation and cell signaling. In collaboration with the epidemiology group, it contributes to identifying early biomarkers and elucidating molecular mechanisms linking environmental exposures to chronic disease risk.

Suggested skills for this research topic

The ideal candidate holds a Master's degree in biology, biotechnology, or related disciplines, including medicine. Experience in data analysis, basic laboratory techniques, handling of biological samples, as well as familiarity with bioinformatics tools and multi-omics data analysis, may represent preferential qualifications, as they are relevant to the activities required for the position. An interest in interdisciplinary research combining molecular and epidemiological approaches is important. The ability to work in a team and manage tasks independently is desirable. Proficiency in English (spoken and written) is required for



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communication and publication. Knowledge of Italian is not mandatory but may be helpful for integration and fieldwork.