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1) Project title
Natural Compounds as Modulators of Inflammaging: Identification and Characterization of Novel Anti-inflammatory and Geroprotective Agent
2) Abstract (max 500 words)
<p>Aging is inevitably associated with a chronic, low-grade, sterile inflammatory state known as "inflammaging", a term coined to describe the progressive increase in pro-inflammatory markers observed in older individuals. This phenomenon represents a major driver of age-related diseases, including cardiovascular disorders, neurodegeneration, metabolic syndrome, and cancer. Despite its clinical relevance, effective pharmacological strategies to counteract inflammaging remain limited, and the search for safe, well-tolerated modulators is a pressing research priority.</p> <p>Natural compounds — including polyphenols, terpenoids, alkaloids, and flavonoids — have long been recognized for their pleiotropic biological activities, particularly their ability to modulate inflammatory pathways with limited side effects. However, a systematic investigation of their mechanisms of action in the context of inflammaging, as well as rigorous preclinical validation, is still largely lacking.</p> <p>This PhD project aims to screen and identify natural compounds with significant anti-inflammaging activity through <i>in vitro</i> and <i>in silico</i> approaches, and to elucidate the molecular mechanisms underlying their activity. Particular attention will be devoted to key inflammatory pathways such as NF-κB signaling, NLRP3 inflammasome activation, mTOR regulation, and the senescence-associated secretory phenotype (SASP). Mitochondrial dysfunction and oxidative stress, as interconnected and upstream drivers of inflammaging, will also be investigated, evaluating the capacity of selected compounds to restore cellular homeostasis and delay the onset of senescence.</p> <p>By combining biochemistry, molecular biology, and pharmacology, this project seeks to bridge the gap between traditional knowledge on natural products and modern aging biology, ultimately contributing to the development of innovative nutraceutical or pharmacological strategies to promote healthy aging.</p>