PROJECT

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1) Project title
Innovative Therapeutic Strategies for Cartilage Inflammation and Degeneration: An Integrated In Vitro and In Vivo Approach
2)Abstract (max 500 words)
Degenerative knee osteoarthritis (KOA) and other joint pathologies represent a growing public health challenge, particularly in an aging society. These conditions, characterized by chronic inflammation and cartilage degeneration, affect not only elderly patients but also individuals who have suffered joint trauma or surgical interventions, significantly compromising their quality of life. This three-year doctoral project aims to explore new therapeutic strategies targeting inflammatory and degenerative processes in joints, with a particular focus on chondrocyte senescence and its role in disease progression. The main objective is to identify molecules, both of natural and synthetic origin, capable of improving cartilage functionality and reducing joint inflammation. The research will be developed through an integrated in vitro and in vivo approach: 1. In vitro studies on human chondrocyte cultures to: o Evaluate the effect of selected compounds on cellular senescence markers and senescence-associated secretory phenotype (SASP) factors. o Analyze the impact of these molecules on inflammatory signaling pathways and chondrocyte functionality. o Compare the efficacy of natural extracts (e.g., from Curcuma longa, Boswellia serrata) with innovative synthetic molecules. 2. In vivo studies on animal models of osteoarthritis to: o Assess the efficacy of the most promising compounds in reducing joint inflammation and preserving cartilage integrity. o Analyze effects on joint functionality and pain. o Study the molecular mechanisms involved in the therapeutic action. The project aims to develop associative therapies that can integrate or improve conventional treatments, with the ultimate goal of offering new therapeutic options to enhance mobility and reduce pain in patients affected by joint pathologies. Special attention will be given to identifying compounds with a favorable safety profile, suitable for long-term treatments in elderly patients or those with comorbidities.

This multidisciplinary study will combine advanced techniques in cell biology, pharmacology, and biomolecular analysis, contributing to shedding light on the pathogenetic mechanisms of osteoarthritis and opening new perspectives for targeted and personalized therapeutic interventions.