University of Naples Federico II

Department of Pharmacy

International PhD course in

Nutraceuticals, Functional Foods and Human Health

Development and study of novel plant-based food ingredients for dietary supplements active against metabolic liver steatosis.

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Project description

Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD) is a disease that affects about one quarter of the population, with higher prevalence in countries with high rates of obesity and metabolic syndrome, of which MASLD is the hepatic component. MASLD, which involves fat accumulation in the hepatocytes of non-alcoholic subjects, may progress to metabolic-induced steatohepatitis (MASH), which can cause cirrhosis and cancer. MASLD pathogenesis involves insulin resistance with increased circulating free fatty acids, stored as triglycerides in the liver, and oxidative stress with inflammation and consequent hepatocyte damage. The development of MASLD is slow, and in the initial stages, it is possible to reverse this condition through dietary interventions and the use of food supplements, preventing or delaying the progression towards MASH. The most well-known plant-based substances active against MASLD are berberine, curcumin, cynarin, catechins, and silymarin. However, there are more than a hundred plants allowed in food supplements under the current legislation that boast a traditional hepatoprotective effect. Therefore, given the very high prevalence of MASLD, the project aims to develop new plant-based food ingredients to reduce liver fat accumulation and oxidative damage and develop new healthy products. The project consists of selecting plants with a low economic and environmental impact (not belonging to species protected by CITES) and to which a hepatoprotective effect is traditionally ascribed, and developing optimized extraction methods with Design of Experiments based on the predominant use of water. Then, we will study the extract metabolic profile (by UHPLC-MS), identifying the extracts with the highest content of bioactive compounds, bioaccessibility (by simulated in vitro digestion and fermentation), bioavailability (by Transwell and PAMPA assay), and efficacy in cellular systems (HepG2-OA cells) through the evaluation of the expression of key lipogenic genes (DGAT1 and FASN) and oxidative stress-related genes (SOD and CAT) by RT-PCR.

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