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Modulation of Gut Microbiota in the Management of Non-Alcoholic Fatty Liver Disease: A Preclinical Assessment

Dr. Isabella Martínez-Rojas
University of Barcelona, Spain

Objectives: This study evaluates the impact of targeted gut microbiota modulation on the progression of non-alcoholic fatty liver disease (NAFLD) using probiotic and prebiotic interventions.

Material and methods: NAFLD was induced in rats through a high-fat, high-fructose diet for 12 weeks. Animals were treated with a synbiotic blend (probiotics + inulin) or probiotics alone for four weeks. Liver tissues were examined for steatosis, inflammation, and fibrosis. Serum markers including ALT, AST, triglycerides, and fasting glucose were measured. Fecal samples were analyzed through 16S rRNA sequencing to identify microbial shifts.

Results: Synbiotic-treated animals exhibited significant reductions in hepatic fat accumulation, inflammation, and oxidative stress. Improvements in insulin sensitivity and lipid profile were also observed. Microbiota analysis revealed increased levels of beneficial bacteria such as Lactobacillus and Bifidobacterium, accompanied by reduced abundance of pathogenic species.

Conclusion: Gut microbiota modulation through synbiotics offers a promising approach for preventing and managing NAFLD progression.

Biography

Dr. Arvind K. Subramanian is an associate professor of Pharmacology at the National Institute of Pharmaceutical Education and Research (NIPER), Hyderabad, India. His research focuses on nanomedicine development, natural product pharmacology, and hepatoprotective drug discovery. Over the past decade, he has contributed to advancing nanoformulation technologies aimed at improving therapeutic performance and bioavailability of plant-derived compounds. Dr. Subramanian has authored multiple peer-reviewed articles, supervised postgraduate research, and collaborated with biotechnology startups to promote translational applications of nano-herbal therapeutics. His work continues to support innovative solutions for drug-induced liver injury and metabolic liver disorders

imartinez.rojas@ub.edu

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