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Opinion Article

Albumin Nanoparticles Loaded With Hepatic Steatosis in Non-Alcoholic Fatty Liver Disease

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DESCRIPTION

Non-Alcoholic Fatty Liver Disease (NAFLD) is a multifactorial disease characterised by abnormal lipogenesis, chronic systemic inflammatory and hyperactive Endoplasmic Reticulum (ER) stress. Plant-derived Celastrol (CEL) appeared to be a potential anti-inflammatory and anti-obesity medication, but human trials were hampered by poor oral bioavailability. The current study aimed to create biodegradable albumin-based nanoparticles that would carry CEL to the liver and treat NAFLD. By using high pressure homogenization, CEL was entrapped in to produce CEL-loaded Lac-BSA nanoparticles. Non-Alcoholic Fatty Liver Disease (NAFLD) is a worldwide health problem with a strong pathophysiological relationship to obesity, prediabetes, diabetes and cirrhosis, hepatocellular cancer. NAFLD advances over time from abnormal lipid accumulation to non-alcoholic steatohepatitis and may progress to fibrosis and permanent cirrhosis. Because of the characteristics of fat deposition in hepatocytes the early stage of NAFLD is referred to as hepatic steatosis.

More than half of those at risk of NAFLD may develop reversible hepatic steatosis, whereas a small number may advance to more severe steato hepatitis and fibrosis. Prolonged lipid buildup in the liver increases hepatic insulin resistance, causes Endoplasmic Reticulum (ER) stress, mitochondria stress and hyper activation of different proinflammatory signals. Excessive hepatic lipid buildup may be produced by an increase in *de novo* lipogenesis and fatty acid absorption or a reduction in fatty acid oxidation and Very Low-Density Lipoprotein (VLDL) secretion. As a result, prompt reprogramming of hepatic lipid metabolism is an essential therapeutic target for preventing NAFLD from progressing to Non-Alcoholic Steato Hepatitis (NASH) and cirrhosis. According to pharmacological studies, CEL may reduce body weight through the increasing leptin activity and thus decreasing food intake, up regulating antioxidant and lipolytic genes and activating the HSF1-PGC1 transcriptional axis to increase energy expenditure against obesity. The poor bioavailability and significant gastrointestinal retention of CEL, however, severely limit its medicinal utility. Nonetheless, alternative Nano medicine delivery strategies found to be beneficial for increasing the oral administration efficiency of CEL. In this vein, CEL nanoparticles were created by loading CEL into PEG-PCL nano-micelles.

As a result, lipid nanoparticles hold immense promise for accomplishing the goal of controlled and site-specific medication delivery. They are constructed of synthetic or natural polymers and are well-suited to improve medicine administration while reducing toxicity. They have evolved into a versatile alternative to liposomes as drug carriers over time. The capacity of nanoparticles to penetrate through numerous anatomical barriers, sustained release of their contents and stability in the nanometer range are crucial for their efficient employment in medicine administration. However, the widespread use of nanoparticles in clinical treatment has been hampered by the need for more safe polymers that have regulatory approval, as well as their high cost. Lipids have been proposed as an alternative carrier to avoid the limitations of polymeric nanoparticles, particularly for lipophilic medications.

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