Abstract

Liver diseases like non-cancerous liver diseases like alcoholic cirrhosis, viral hepatitis, drug-induced hepatotoxicity, etc. and hepatocellular carcinoma (HCC) account for about 2 million fatalities per year worldwide. Synthetic drug therapy is being used to treat the malady, however, is accompanied by serious adverse effects. In contrast, natural products have been quite promising in treating various hepatic disorders including HCC by the virtue of their anti-oxidant, anti-inflammatory, and chemopreventive properties. Consumption of polyphenol-enriched foods can be a suitable alternative in combating these chronic liver disorders. However, the poor pharmacokinetic attributes of these phytoconstituents limit their therapeutic efficacy and require high and multiple doses for achieving a desired therapeutic effect. Nanoscale formulations of these flavonoids have come up with the prospect to overcome these limitations and improve their therapeutic efficacy. Biomaterials-based nanoparticles (NPs) hold the promise to revolutionize medical treatment with more potent, less toxic, and smart therapeutics. Nanoparticles can encapsulate or covalently conjugate hydrophobic drugs to greatly enhance their aqueous solubility and in turn bioavailability. Normally most of the drugs achieve high hepatic concentration, still, their targeting is necessary because the liver is the major organ in the body equipped for uptake, detoxification, metabolic transformation, and excretion of xenobiotics leading to rapid clearance which decreases its bioavailability. Galactose has been widely used to target asialoglycoprotein receptor expressed in liver and many research groups have reported this specialized liver targeting. This research aimed to develop and optimize an effective drug delivery system (PLGA NPs formulation) of Qr and API to improve their therapeutic effect against non-cancerous CLDs and HCC, respectively. The therapeutic effects of the nanoformulations have been assayed by employing suitable in vitro and in vivo models and compared with the free flavonoids. Special attention has been on non-invasive liver scintigraphic analysis using 99mTc-labeled sulphur colloid and mebrofenin to reveal the hepatoprotective efficacy of the selected flavonoids and their respective formulations.