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ORIGINAL ARTICLE

Formulation, Solubilization, and In Vitro Characterization of Quercetin-Incorporated Mixed Micelles of PEO-PPO-PEO Block Copolymers

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Abstract

Quercetin (QCN) is a plant polyphenol with a variety of medicinal effects. Poor water solubility, on the other hand, restricts its therapeutic effectiveness. The purpose of this study was to develop mixed micellar systems using two biocompatible amphiphilic PEO-PPO-PEO triblock copolymers, Pluronic P123 (EO_{20}-PO_{70}-EO_{20}) and Pluronic F88 (EO_{104}-PO_{39}-EO_{104}), in order to enhance the aqueous solubility and oral bioavailability of QCN drug. The critical micelle concentrations (CMCs) of mixed P123/F88 micellar solutions were investigated using UV–visible spectroscopy with pyrene as a probe. Mixed P123/F88 micelles have low CMCs, indicating that they have a stable micelle structure even when diluted. The solubility of QCN in aqueous mixed P123/F88 micellar solutions at different temperatures was investigated to better understand drug entrapment. The QCN solubility increased with increasing temperature in the mixed P123/F88 micellar system. The QCN-incorporated mixed P123/F88 micelles were prepared using the thin-film hydration method and were well characterized in terms of size and morphology, compatibility, in vitro release and antioxidant profile. In addition, the cell proliferation activity of the mixed micelles was evaluated in the MCF-7 cell line. The QCN-incorporated mixed P123/F88 micelles had a small particle size (< 25 nm) and a negative zeta potential with a spherical shape. The in vitro release behaviour of QCN from a mixed P123/F88 micellar system was slower and more sustained at physiological conditions. The oxidation resistance of QCN-incorporating mixed P123/F88 micelles was shown to be considerably higher than that of pure QCN. An in vitro cell proliferation study revealed that QCN-incorporated mixed micells were effective in inhibiting tumour cell growth. In conclusion, the QCN-incorporated mixed P123/F88 micelle may be a promising approach to increase QCN oral bioavailability, antioxidant activity, and cell viability.

Keywords Mixed Pluronic micelles · Quercetin · Solubilization · In vitro release · In vitro cell proliferation activity

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