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Myricetin solid lipid nanoparticles: Stability assurance from system preparation to site of action

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Abstract:

Myricetin - a natural flavonoid - has attracted a great interest due to its antioxidant and free-radical scavenging potential. However, its physicochemical instability critically impairs its dosage form design, evaluation and administration. In an attempt to protect from degradation, MYR was encapsulated into Gelucire-based solid lipid nanoparticles (SLNs). The impact of medium pH, processing temperature and different additives on the drug degradation either in free or nanoencapsulated form was assessed. MYR stability was further monitored in essential biorelevant fluids. Investigations have led to the recommendation that the presence of fat-soluble antioxidant is necessary during SLN preparation to protect the drug at high temperature. Meanwhile, physiological buffers as well as simulated fluids should be supplemented with stabilizers as tween 80 and Poloxamer 407, in addition to water-soluble antioxidant such as sodium sulfite. Interestingly, mucin-containing fluids are suggested to provide better protection to MYR, in contrast, cell culture media do not guarantee MYR stability. The degradation kinetics changed from 1st to 2nd order mechanism after MYR nanoencapsulation. In presence of the aforementioned additives, MYR-SLNs significantly reduced the drug degradation rate constant up to 300-folds and prolonged the half-life time up to 4500-folds compared to free MYR in physiological buffers (One-way ANOVA, $p < 0.05$). As a proof of concept, in vitro release experiment in presence of phosphate buffer (pH 7.4) supplemented with these additives ensured sustained release of MYR over > 8 h with no signs of degradation. The study emphasizes virtuous guidance regarding appropriate nanoencapsulation conditions and evaluation attributes ensuing MYR physicochemical stability. © 2017

Reference:

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