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(57) Abstract :

The present invention relates to a stability-driven bioavailability enhancement platform utilizing nano-lipid carriers and solid lipid nanoparticles for pharmaceutical and nutraceutical applications. The invention provides novel pharmaceutical compositions comprising a lipid matrix formed from solid lipids selected from glyceryl monostearate, glyceryl behenate, and cetyl palmitate, combined with liquid lipids including medium-chain triglycerides and oleic acid, stabilized with biocompatible surfactants. The nano-lipid carriers exhibit particle sizes of 50 to 500 nanometers, encapsulation efficiencies exceeding 85 percent, and demonstrate exceptional physical stability under accelerated storage conditions. The formulations achieve two to five-fold enhancement in oral bioavailability through improved dissolution, enhanced intestinal permeability, lymphatic transport, and protection from presystemic metabolism. The manufacturing process employs hot homogenization and ultrasonication techniques using generally recognized as safe excipients. The invention addresses limitations of existing lipid nanoparticle technologies including drug expulsion and polymorphic instability through incorporation of crystallization modifiers and antioxidants.

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