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Formulation and characterization of curcumin loaded oil marbles for improved delivery

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Curcumin, a bioactive compound derived from *Curcuma longa*, is one of many active pharmaceutical ingredients limited by poor water solubility. Despite its wide-ranging therapeutic properties, including anti-inflammatory, anticancer, and antioxidant effects, curcumin's clinical application is limited by its low bioavailability. To overcome these challenges, self-microemulsifying drug delivery systems (SMEDDS) offer a promising strategy by enhancing solubility and absorption through the formation of stable microemulsions in aqueous environments.

This study explores the development of a novel formulation of curcumin using Oil marbles, a type of semi-solid SMEDDS. The formulation consists of a mixture of oils, surfactants, and co-surfactants that, when exposed to water, spontaneously form microemulsions and facilitate the solubilization of curcumin, a lipophilic compound. Additionally, the Oil marbles are coated with a powder, combining the benefits of both liquid formulations, which enhance bioavailability, and solid dosage form, which improves handling and stability.

The focus of the research was to formulate curcumin into Oil marbles and assess its release behavior. The formulation process involved testing curcumin solubility in various oils, with ternary phase diagrams used to determine optimal oil, surfactant, and co-surfactant combinations that support efficient self-emulsification. The resulting microemulsions were characterized through droplet size analysis and visual inspection. Dissolution testing revealed significant improvements in the release kinetics of curcumin, highlighting the potential of this formulation to enhance curcumin's therapeutic effect.