

Title: Effects of variation in preparatory conditions in forming Eudragit microspheres for drug delivery

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Abstract:

The use of polymer microspheres for drug delivery has promise for delivering acid-sensitive compounds through the stomach and is also of interest in delivering pharmaceutical compounds directly to the colon in the treatment of colonic carcinomas, or other colon-specific issues (Nhire and Derle, 2014). Drug-loaded microparticles are useful in cases where even distribution and release of drug throughout the gastrointestinal tract may prove beneficial, such as in cases where drug safety is of concern and the intended use may be long-term (El-Say, 2016; Youshia and Lamprecht, 2016). However, particulate systems have a serious difficulty— early drug leakage that limits their ability to deliver to the areas of interest. One solution to this problem is to use pH-sensitive polymers to form drug-loaded particulate systems, which protect the drug in the acidic environment of the stomach but swell and release polymer at higher pHs (Youshia and Lamprecht, 2016). Microspheres are often formed using some type of emulsion method, such as an emulsion solvent evaporation method, which has multiple factors that could affect the final product. An increase in relative surfactant volume results in microspheres with an increased drug encapsulation rate and a smaller size, while an increase in dispersal phase volume results in a decrease in microsphere volume, though typically with a loss of encapsulation

efficiency (El-Say, 2016; Rawat and Saraf, 2009). This proposal aims to explore the effects of pH on encapsulation rate and microsphere size. In a basic or neutral solution pH the carboxyl groups in these polymers will be deprotonated, resulting in negative charges that repel individual chains and cause the “swelling” that allows for drug release (Vollrath et al., 2010). We propose that the pH of an aqueous external phase may have an effect on microsphere characteristics by protonating the chains and reducing their repellent charges at different rates. The following experiment is proposed to test this hypothesis. A series of aqueous solutions ranging in pH from 2-6 and containing a set amount of fluorescein dye as well a selected surfactant will be added to 20 mL of a rapidly suitable organic solvent containing a set amount of Eudragit S100, a pH-dependent polymer that dissolves at a pH of 7. The solution will be stirred until the solvent has evaporated, after which the microspheres can be isolated and evaluated for size and the amount of fluorescein they contain. The latter will be measured by placing a given weight of microspheres in a slightly basic solution, allowing the microspheres to dissolve and release the incorporated fluorescein. Aliquots of the solution will then be measured against a standard curve of fluorescein using a fluorimeter to determine the amount of fluorescein taken up by a given amount of microspheres. It is expected that lowering the pH will have a positive effect on encapsulation efficiency, since previous studies have found that faster polymer solidification seems to prevent drugs from leaking into the continuous phase (El-Say, 2016), but may increase the size of the microspheres due to a faster rate of carboxyl protonation.

References

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