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Water in Oil Microemulsion for Nanocomposite Particles and Its Application in Oral Drug Delivery

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Nanocomposite particles, synthesized from silica and the polysaccharide alginate are to be used in enhancing oral drug delivery. The mucoadhesive properties of the polysaccharide can prolong the drug residence time in the gastrointestinal tract as well as provide a means of drug release. Silica is biocompatible and can improve the stability of the nanocomposites. Also silica can easily be modified for further specific targeting delivery. These composite nanoparticles are synthesized using the sol-gel reaction occurring in a water in oil microemulsion. The microemulsion utilizes the thermodynamic stability created between the water and oil phases and the surface-active agent, the surfactant. The micelles that are formed serve as platforms for the encapsulation of the polysaccharide as the silica precursor, tetraethyl-orthosilicate (TEOS), undergoes condensation reactions to produce a silica network. Trials with differing weight ratios of alginate have produced monodisperse particles in nanosize diameter when viewed on a transmission electron microscope (TEM). With the current alginate nanocomposite, drug uptake and release can begin to be modeled using a model drug. This model drug can be added to the microemulsion process and integrated into the nanocomposite utilizing the same sol-gel reaction. Future work involves determining how the reagents used in the microemulsion factor into the shape, size, and composition of the nanoparticle. Additionally, the current alginate nanocomposites are to be tested for their uptake of the model drug, with the hope that an actual drug can be loaded into the particle in the near future.