Modeling the Particle Size Distributions of Calcium Alginate Breads for the Controlled Oral Drug Delivery Systems

[1]Swaprakash Yogeshwaran

[1]Arizona State University, United States

[*]**Corresponding author:** Swaprakash Yogeshwaran, email: syogeshw@asu.edu

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Abstract

An ideal drug-delivery system shows absorption with minimal adverse effects, which is determined by the route of administration. Oral drug delivery systems are the most preferred drug administration route due to its convenience, cost-effectiveness, and high patient compliance. The challenges in oral drug delivery include aqueous solubility, membrane permeability, and chemical and enzymatic stability of the encapsulated drugs. Alginates are established among the most versatile biopolymers, used in a wide range of applications. The conventional use of alginate as an excipient in drug products**,** generally depends on the thickening, gel-forming and stabilizing properties. A need for prolonged and better control of drug administration has increased the demand for tailor-made polymers. Alginate is a natural polymer that is biocompatible, biodegradable, and produces no systemic toxicity on administration. It is a family of polysaccharides composed of ÃŽÂ±-L-guluronic acid (G) and ÃŽÂ²-D-mannuronic acid (M) residues, arranged in homo-polymeric blocks of each type (MM, GG) and hetero-polymeric blocks (MG). The properties of the beads prepared by ionotropic gelation are influenced by formulation and processing parameters. Particle size distributions are important characteristics of microstructures in multiphase materials and modeling the particle size in drug delivery systems is a key parameter. The Weibull function is advantageous for modeling particle and section size distributions because it provides tractable analytic representations of these distributions. This project focuses on the DOE (Design of Experiments) to model particle size for Calcium Alginate beads.