Optimizing the fabrication process of microspheres for extended-release drug delivery: Internship at ACON Pharmaceuticals

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Abstract

Frequently and consistently taking pills to treat schizophrenia can be inconvenient or impossible for many patients. As a more reliable method to ensure patients consistently get their medicine, ACON Pharmaceuticals works to develop a procedure to make microspheres, small quantities of drug encased within polymers, for long-term diffusion of medicine into the bloodstream. Our goal was to continue upscaling this a process called "The China Method" and adjust it accordingly to continue to maximize drug loading on a larger scale, thus being ideal for mass production. The basis of the method consists of dissolving the polymer using dichloromethane (DCM), adding methanol (MeOH) and the drug to the solution, and then stirring the solution in 1% polyvinyl alcohol 88 (PVA-88) for 2 hours. With this method we have maximized the percentage of drugs loaded into the microspheres on the 30x scale and have moved on to the 50x scale. Furthermore, we began testing a second method, a new procedure that we explored with the purpose of finding a more time or material efficient technique to streamline the mass production of microspheres. This method requires melting the polymer and drug together, allowing the mixture to cool into a solid, and then breaking the solid apart with a rotational milling machine.

Another product produced by ACON Pharmaceuticals is nasal spray, a medicated solution intended to be delivered as a mist. We conducted solubility tests with different ratios of water, solubilizing molecules, and the drug, S212, to test the optimal water to drug ratio. We then made multiple samples of nasal spray with varying concentrations of the drug and solubilizing molecules.

Index Terms

microspheres, emulsion-evaporation, co-acervation, encapsulation rates, the China Method, solidification, fracture, rotational milling machine, nasal spray