Research and Reviews: Drug Delivery

A Brief Note on Drug Release Testing of Ophthalmic Drug Delivery Systems

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Commentary

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ABOUT THE STUDY

In vitro drug release testing is critical for ophthalmic delivery system optimization and improvement. These *in vitro* technologies are frequently used in the pharmaceutical business because they are cost-effective and simple to use. Several nanosized and ophthalmic preparations are evaluated for *in vitro* drug release using a variety of methods, including dialysis methods using modified apparatus I or II, membrane diffusion

techniques, including simple dialysis methods, and Franz diffusion cells are prepared *in situ* gels to prevent ocular bioavailability issues and remove anatomical barriers, a novel drug delivery system.

A range of anionic and nonanionic polymers are the basic evaluation variables for designing, producing, and assessing *in situ* gelling ophthalmic drug delivery systems. The end result was a long-acting formulation with a longer residence time. The prepared gel improved corneal residency and allowed for long-term drug release. To maximise solubility, rate of dissolution, and bioavailability, researchers studied the binary system of Atorvastatin (Atv) with the hydrophilic carrier (Gelucire 50/13 and Gelucire 44/14) in hard gelatin capsules. *In vivo* studies, *in vitro* dissolution testing, differential scanning calorimetry, X-ray Powder Diffraction (XRD), and Fourier-transform infrared spectroscopy revealed that the formulation of hydrophilic carrier Gelucire increased oral bioavailability of Atv while also improving *in vitro* dissolution rate.

By analysing and producing three mesoporous *silica* excipients, researchers were able to improve the rate and amount of dissolution of phenylbutazone, a poorly water soluble medication. Enhancement of phenylbutazone solubility utilising Syloid-based mesoporous silicas for oral horse use was demonstrated in a study. They found that at a 1:1 concentration, all three forms of Syloid *silica* increased drug release rate and extent due to improved drug loading capacities and amorphous form conversion. Syloid *silica*-based excipients could be employed to improve solubility and bioavailability of weakly aqueous medicines, according to the study. The solution of Quaternary Ammonium Hydroxide (QAH), which can be used to dissolve cellulose.

The influence of cationic structure on cellulose dissolving in a specified range of QAH with various cationic alkyl chains and QAH. They further evaluated the system using ID, 2D nuclear magnetic resonance, and Kamlet-Taft parameters, indicating that the presence of both ions (cations and anions) is critical for cellulose dissolution. The ability of cellulose to dissolve a mixture of ionic liquids was investigated, and the results were compared to single ionic liquids that were accessible.

The amount of cellulose dissolved in the ionic mixes of 3:7 mol/mol mixture of l-ethyl-3-methylimidazolium chloride [C2miml] [Cl] and l-ethyl-3-methylimidazolium acetate [C2mim] [OAcl], and the eutectic mixture of [C2miml] [Cl] and l-butyl-3-methylimidazolium chloride. They found that at 373K, the maximum dissolved amount of cellulose was 40 g per 100 g of solvent, i.e., from a [C2miml] [Cl]+[C2miml] [lOAcl] combination. They also looked at how Dimethyl Sulfoxide (DMSO) affected the rate of dissolution.

Even at high cellulose concentrations, the addition of 50 mol% DMSO increased dissolving substantially. Physical parameters such as viscosity and density were also evaluated for ionic mixes and compared to their parent chemical at the same time. The dissolved cellulose was regenerated with water and characterised using XRD and Thermogravimetry Analysis (TGA), which showed that cellulose I was converted to cellulose II during the dissolution and regeneration process.