

REVIEW ARTICLE

Formulation of Furosemide Microspheres Made By Mixed Solvency Concept

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ABSTRACT

The aim of present study is to explore mixed solvency concept in preparation of hollow floating microspheres of furosemide using emulsification solvent evaporation method. Furosemide, a potent loop diuretic, is used in the treatment of edema of hepatic, cardiac, pulmonary and renal failures and in chronic hypertension. The dose related adverse effects have been observed and the treatment with conventional tablets produced short period of maximum diuresis, which is inconvenient to the patients. For this purpose development of oral gastroretentive controlled drug delivery system, it modify the GI transit time. Mixed solvency concept also used in this formulation because furosemide drug is poorly water soluble. This is phenomenon of increase in solubility of poorly soluble drugs by the addition of more than one solubilizing agent. This concept is to enhance the solubility of Furosemide in ethyl acetate and to make ethyl acetate a strong solvent for emulsification solvent evaporation process by the use of solubilizer and limit the use of toxic organic solvents. It explores possibility of using ethyl acetate: ethanol as a combination of solvents to prepare hollow floating microspheres replacing dichloromethane: ethanol combination which is reported to produce hollow microspheres. This study may be reduce the individual concentration of solubilizer and so reduce their toxicity and it may be provide environmentally friendly methods.

Key words: Mixed solvency method, Furosemide, floating microspheres.

INTRODUCTION

Gastroretentive drug delivery system is also known as type of controlled drug delivery system. It is also called as floating systems or hydrodynamically controlled systems are low-density systems that have sufficient buoyancy to float over the gastric contents and remain buoyant in the stomach without affecting the gastric emptying rate for a prolonged period of time. While the system is floating on the gastric contents, the drug is released slowly at the desired rate from the system. This results in an increased GRT and a better control of the fluctuations in plasma drug concentration.

Approaches of Gastro Retention

A number of approaches have been used to increase gastric retention time of a dosage form in stomach by employing a variety of concepts that is

- Floating system
- Bio/ Muco-adhesive systems
- Swelling and expanding systems
- High density systems

- Incorporation of passage delaying food agents
- Ion exchange resins
- Osmotic regulated system

This study may be focuses on the approaches of floating system to achieve gastric retention. The following approaches have been used for the design of floating dosage forms of single and multiple unit systems. In this review may be formulated multiple-unit dosage form that is hollow microspheres. Hollow Microspheres have high loading capacity and many polymers have been used such as albumin, gelatin, starch, polymethacrylate, polyacrylamine, and poly alkyl cyanoacrylate. Microspheres have a characteristic internal hollow structure and show an excellent *in vitro* floatability. The solvent evaporation technique of microencapsulation is widely applied in pharmaceutical industries to obtain the controlled release of drug. The obtained polymer microspheres with drug trapped inside can degrade and release the encapsulated drug slowly with a specific release profile. The success of any

microencapsulation method depends on many factors such as the drug solubility, partition coefficient, polymer composition, molecular weight etc. Among the various microencapsulation methods, emulsion solvent evaporation technique is often widely used to prepare microcapsules of water insoluble drugs (within the water insoluble polymer). Hollow microspheres may be prepared by the emulsion solvent evaporation method using Eudragit as an enteric acrylic polymer with Furosemide as various polymer/drug ratios in a mixture of ethyl acetate and ethanol it replace the dichloromethane: ethanol mixture. This method may be reduces the toxicity of organic solvent.

Furosemide is benzoic-sulphonamide-furan. It is a diuretic with fast onset and short duration that is used for edema, hypertension and chronic renal insufficiency. It is a high ceiling diuretic. It acts by inhibiting Na-K-2Cl symport in the thick ascending limb of Loop of Henle. It is an inhibitor of carbonic anhydrase. Furosemide increases renal excretion of water, sodium, potassium, chloride, calcium, magnesium, hydrogen, ammonium and bicarbonate. It causes renal venodilation and transiently increases glomerular filtration rate. The design of a gastro retentive dosage form is desirable to retain the dosage form in the stomach. This assists in improving the bioavailability of the drug at the site of absorption.

This review also exploring the mixed solvency concept because the Furosemide drug may be used in formulation is poorly water soluble. This drug has been classified as a class IV drug as per the biopharmaceutical classification system (BCS) as a result of its low solubility and oral bioavailability; one of the major causes of its low oral bioavailability is its solubility. Therapeutic effectiveness of a drug depends upon the bioavailability and ultimately upon the solubility of drug molecules. For this purpose enhance the aqueous solubility of Furosemide by application of mixed solvency. This concept show all substances have solubilizing power and all substances whether liquids, solids or gases may enhance the solubility of poorly soluble drugs. It is increase the solubility of poorly soluble drugs by the addition of more than one solubilizing agent. Solubilizers like Hydrotropes (Niacinamide, sodium ascorbate, urea, sodium benzoate), co-solvents (propylene glycol, PEG 200, 300, 400) and water soluble solids (PEG 4000, 6000, Cyclodextrins) in varying concentrations may be used that may show additive or synergistic enhancement in solubility.

These Solubilizers do not cause any toxicity and are non volatile. It may reduce the total concentration of individual solubilizer necessary to produce modest increase in solubility by employing combination of agents in lower concentrations from the point of view of safety of solubilizer.

CONCLUSION

This review may be focus on mixed solvency concept. It reduces high cost of organic solvent used in formulations, pollution cause by organic solvents and toxicity due to residual solvent. Its applications may be apply in various fields of pharmacy. This concept also increases solubility of Furosemide and use in development of oral gastroretentive drug delivery system for furosemide. This system may be modifying the GI transit time which can overcome the dose related adverse drug effects and release the drug to maintain its plasma concentration for a longer period of time.

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