Pharmaceut Reg Affairs 2012, 1:4
http://dx.doi.org/10.4172/2167-7689.S1.007

OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Conference and Exhibition on
Pharmaceutical Regulatory Affairs

November 23-24, 2012 Hyderabad International Convention Centre, India

Fabrication of self-assembled layer-by-layer microcapsules for encapsulation of model charged lipophilic molecule

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The aim of current study is to investigate the influence of different encapsulation parameters on entrapment of a model lipophilic molecule, rhodamine into self-assembled layer-by-layer (LbL) microcapsules.

Charged polymers including polyallylamine hydrochloride (PAH) and poly (sodium-4-styrene sulfonic acid) (PSS) were used to prepare microcapsules on a sacrificial calcium carbonate template. Microcapsules with six bilayers of charged polymers were characterized using scanning electron microscope (SEM), differential scanning calorimeter (DSC) and Fourier-transform infrared spectroscopy (FT-IR). Influence of incubation time, drug concentration, pH and ionic strength on entrapment of rhodamine into microcapsules was studied.

Microscopy showed that calcium carbonate microspheres and LbL microcapsules were spherical in shape, with average particle size of 1.5±0.7µm and 2.3±0.2µm respectively. FT-IR studies showed proportional increase in area of characteristic peaks of PAH and PSS in prepared microcapsules. DSC thermograms showed interaction of polymers in microcapsules and rhodamine entrapment with shift in Tg of polymers and Tm of rhodamine. One hour incubation of microcapsules with rhodamine solution showed encapsulation efficiency of 60.27±1.65%. Rhodamine showed increased encapsulation in microcapsules with increase in concentration from 0.25–1mg/mL and pH from 2 to 8 with maximum of 42.80 ± 5.27% at pH 6.75. Increase in salt concentration from 0 – 0.5M show increase in encapsulation efficiency from 42.80 ± 5.27% to 61.00 ± 4.08%.

In-vitro release studies showed controlled release of rhodamine from microcapsules with 64% released over a period of 48hr in comparison to 98% release at 5hr for rhodamine solution.

Our studies showed that self-assembled LbL microcapsules can be developed as carriers for controlled delivery of charged lipophilic molecules.

Biography

Rahul Sharma is currently pursuing M. pharm in pharmaceutics from Department of Pharmacy, BITS Pilani Hyderabad campus. He has been working on layer by layer technology for the fabrication and characterization of polyelectrolyte films and microcapsules since last 10 months under the guidance of Dr. V.V. Vamsi Krishna, Head of department, Department of Pharmacy, BITS Pilani Hyderabad campus.

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Optimization of glimepiride multiparticulate system using noval liquid layering technique

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Glimepiride belongs to a 'second –generation" sulfonylurea used in treatment of type 2 diabetes mellitus. It exhibits poor aqueous solubility hence needs enhancement in dissolution and bioavailability. The solubility of drug was improved by pellets, prepared by layering the active material onto an inert core. Selection of the carrier and size of sugar spheres were two critical variables that were found to affect the dissolution of drug. Carrier loaded pellets were prepared by using mannitol, microcrystalline cellulose and starch as carriers and different sizes of the starter seeds like #30/44, #24/30, #16/24 and #10/16 were prepared. In vitro dissolution studies were carried out to study the effect of nature of carrier and size of the non-pariel seeds on drug release. Mannitol was found to be the effective carrier of active ingredient. Its characteristics of high solubility, low hygroscopisity and extreme inertness helps in improving stability and dissolution of finished formulation. Non-pareil seeds prepared by #30/44 sieve showed better solubility of insoluble drug. The results showed that drug release of glimepiride was found to increase with pellets having mannitol as carrier and decrease with respect to increase in size of non-pareil seeds.

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