1. Satyajit P et al. (2013) developed and evaluated microcapsules of zidovudine (AZT) by using olibanum resin as microencapsulating agent. The resin coated microcapsules were found to be spherical, discrete and free flowing. Microencapsulation efficiency was in a narrow range (81-88%) suggesting an identical distribution of drug in different batches. DSC and XRD results showed a partial modification in AZT’s solid state. Zidovudine release from optimized batches of resin coated microcapsules was slow and over 24 hours depending on the core: coat ratio. Drug release was found to be following Fickian diffusion mechanism.

2. Akifuddin SK et al. (2013) prepared Diltiazem-loaded microcapsules by ionotropic gelation technique employing Sodium carboxy methylcellulose, Xanthan gum as rate controlling polymers and Aluminium chloride as cross linking agent. Microcapsules obtained were discrete, spherical, free flowing and showed a maximum encapsulation efficiency of 91.20 ± 0.08%. Particle size of the microcapsules was found to be in the range of 1009 – 1311 μm. The in vitro drug release follows matrix-diffusion controlled release and the release mechanism was non-Fickian type controlled by swelling and relaxation of polymer. There was no significant change in drug content and cumulative drug release of drug-loaded microcapsules stored at different storage condition after 90 days.

3. Rohit BM et al. (2013) prepared and evaluated carvedilol microsphere using spray drying technique and to optimize the spray drying parameters to get the optimum formulation. The prepared microspheres were evaluated for the particle size, percentage drug entrapment and percentage drug release. The formulations containing ethyl cellulose, PEG 6000 and carvedilol were tested. The characterization of microsphere revealed the poor flowability of the spray-dried products due to significant cohesiveness and very small size (less than 20μm).

4. AppaRao B et al. (2012) formulated and evaluated olibanum resin-coated microcapsules of carbamazepine for are spherical, discrete, free flowing and were in multinucleate and monolithic type. Microencapsulation efficiency was in the range 99.0- 102.5 %. Carbamazepine release from controlled release by emulsification-solvent evaporation method. Resin coated microcapsules prepared the microcapsules was slow over 24 h.
5. Rao TV et al. (2012) formulated and evaluated the Indomethacin microcapsules for controlled drug delivery by emulsification solvent evaporation technique, using ethyl cellulose as coating material. The microcapsules were found to be discrete, free flowing high percentage of drug entrapment efficiency and also retard the release for 12 hrs. The in vitro dissolution data obtained confirmed that the formulations followed zero order kinetics and peppas release mechanism.

6. Rajesh M et al. (2012) formulated and evaluated Acyclovir microcapsules using biodegradable and non-biodegradable polymers namely egg albumin, guar gum and ethyl cellulose and its invitro evaluation by solvent diffusion method and heat coagulation method. Acyclovir loaded microcapsules formulated with guar gum showed an entrapment efficiency of 92.97%, with ethyl cellulose 91.96% and the entrapment efficiency with egg albumin was 90.61%. The SEM study showed that the microcapsules were free flowing, non aggregated and spherical between 700-1000 μm in diameter. The invitro release study was found to be the best in the case of acyclovir microcapsules formulated with guar gum.

7. Satyabrata B et al., (2012) developed Nicardipine Hydrochloride microcapsules with a coat consisting of Cyclohexane and a polymer such as Ethyl cellulose by Coacervation phase separation induced by the addition of non solvent. The maximum percentage of drug content was found to be 82.12 % in formulation F1 with the drug: polymer ratio (4:1) .Entrapment efficiency were found to be in the range of 80 % to 107% .The average particle size were found to be in the range of 123 μm to 88 μm. The in-vitro drug release for all the formulations F1 to F9 were found to be 6.8% to 17.14% drug release in first hour and 56.87% to 98.8% drug release at the end of 12 hrs. Among the nine formulations, F4 shows maximum drug release i.e. 98.8% at the end of 12 hrs.

8. Gandhi et al (2012) prepared and evaluated floating microspheres of Pioglitazone hydrochloride by emulsion solvent diffusion-evaporation method using Eudragit S-100. The optimum batch of microspheres exhibited some rough surfaces with good flow and packing properties, prolonged sustained drug release, and remained buoyant for more than 10 hrs, high entrapment efficiency was found upto 89% w/w. Scanning electron microscopy confirmed the hollow structure with particle size in the order of 270 μm. The studies revealed that decrease in particle size of the microspheres increase the drug
release from the floating microspheres. The results of 32 full factorial design revealed that the Polymer: Drug (P: D) ratio (X1) and stirring speed (X2) significantly affected drug entrapment efficiency, percentage release after 8 h and particle size of microspheres.

9. AppaRao B et al., (2012) formulated and evaluated Olibanum resin coated microcapsules of carbamazepine by emulsification-solvent evaporation method. The resin coated microcapsules prepared are spherical, discrete, free flowing and were of multinucleate and monolithic type. Microencapsulation efficiency was in the range 99.0-100.7%. Carbamazepine release from the microcapsules was slow over 24h and depended on core: coat ratio, wall thickness and size of the microcapsules. The release was by non-Fickian diffusion when the drug release was more slow as in the case of all microcapsules of size 20/35 and microcapsules, OMC4 of size 35/50. Good linear relationship was observed between wall thickness of the microcapsules and release rate.

10. Abhijeet A et al., (2012) prepared and evaluated floating microsphere of Captopril using different gas forming agents are used such as sodium bicarbonate and calcium carbonate by Ionotropic gelation technique. The prepared microsphere exhibited prolonged drug release (~ 12 hr) and remained buoyant for more than 12 hr. The optimized formulations H3, H6 were kept for short term stability study. The conditions for stability study were 40°C and relative humidity of 75% from the study; it was observed that there is no significant change in drug entrapment and drug release rate.

11. Sujata DB et al., (2012) developed Telmisartan Microspheres by Emulsion solvent evaporation (ESE) technique using different ratios of ethyl cellulose polymer and drug. Prepared microspheres were evaluated for drug entrapment efficiency, micromeritic characters, floating behaviour and in vitro drug release. This revealed polymer drug ratio has influence on drug release.

12. Chowdary KPR et al., (2011) prepared HPMC based mucoadhesive microcapsules of diclofenac and evaluated the microcapsules for mucoadhesiveness and controlled drug release characteristics by the orifice-ionic gelation method. Microencapsulation efficiency was found to be in the range 98.7 % - 103.5 %. Drug release from the HPMC – alginate microcapsules was found to be slow and extended over a period of 12 h. Mucoadhesion testing performed by in vitro wash-off test indicated good mucoadhesive
property of HPMC-alginate microcapsules with a slower wash-off when compared to non-mucoadhesive EVA microcapsules.

13. Manna et al., (2011) prepared sodium valproate Microcapsules from sodium alginate, hydroxypropylmethyl cellulose-K4M, carbopol 934P & sodium CMC using 10% w/v calcium chloride solution by ionic gelation method. The formed Microcapsules were spherical in shape and of sizes between 798 µ to 952µ. Carbopol 934P was found to be most effective in controlling drug release from microcapsules followed by sodium CMC. Drug release was found to be best from the formulation having carbopol 934P and followed Super case II transport.

14. MominurRahman MD et al. (2011) prepared Diclofenac sodium (DS) microspheres with two different polymers such as ethyl cellulose (EC) and cellulose acetate phthalate (CAP) by Emulsification-solvent evaporation method. The size of the microspheres varied between 560-920 µm and has high loading efficiency of 90%. After first 2 hours of dissolution in 0.1 N hydrochloric acid, EC microspheres released 24% of DS whereas CAP microspheres released only 2% DS. After 4 hours of dissolution in phosphate buffer, 60% DS was released from EC microspheres and almost all drug was released from CAP microspheres. Combination of EC and CAP showed more sustaining action in the dissolution media.

15. Senthil A et al. (2011) investigated the design of chitosan loaded mucoadhesive microspheres of gliclazide: in vitro and in vivo evaluation by simple emulsification phase separation technique. On the basis of the 2 preliminary trials 3 full factorial designs were employed, to study the effect of independent variable X polymer-to-drug and the stirring speed X on dependent variables percentage mucoadhesion, drug entrapment efficiency and particle size. The optimized formulation 2 exhibited a high drug entrapment efficiency of 60%, swelling index 0.42, Percentage of mucoadhesive after 1 hour 62% and the drug release was also sustained for more than 10 hours. In vivo testing of the mucoadhesive microspheres to albino Wistar rats demonstrated significant hypoglycemic effect of gliclazide.
16. Pradeep B et al., (2011) prepared Valacyclovir hydrochloride loaded Ethyl cellulose microcapsules by the solvent evaporation technique. The process induced the formation of microcapsules with the incorporation efficiency of 80% to 90%. Microcapsules matrices showing spherical surface, which was confirmed by scanning electron microscopy study. The mean particle size and entrapment efficiency were found to be varied by changing various formulation parameters. The in vitro release profile could be altered significantly by changing various formulation parameters to give a sustained release of drug from the microcapsules.

17. Maryam M et al. (2011) developed a multiparticular floating-pulsatile drug delivery system for time and site specific drug release of Piroxicam by the emulsion solvent diffusion method using Eudragit S as an enteric acrylic polymer. The obtained microballoons were spherical with no major surface irregularity and mean particle size ranging from 250 to 380. Formulations showed a slight amount of release ranging from 0.7 to 11% in acidic medium (SGF) with complete release of drug in simulated intestinal fluid (SIF) in 3 h. Encapsulation efficiency of different formulations varied from 90 to 98%.

18. Porwal A et al. (2011) investigated to characterize, optimize and evaluate Microballoons of Propranolol hydrochloride by the non-aqueous O/O emulsion solvent diffusion evaporation method using Eudragit RSPO as polymer. Microballoons remained buoyant for more than 12 hrs for the optimized formulation and extended sustained release for 12 hrs. Statistical analysis (ANOVA) showed significant difference (p < 0.05) in the cumulative amount of drug released after 30 min, and up to 12 hrs from optimized formulations.

19. Josephine JLJ et al., (2011) developed floating microspheres of Stavudine by emulsion solvent diffusion method using Eudragit RS 100 as a rate controlling polymer. The prepared microspheres were found to be spherical and free flowing and remain buoyant for more than 12 hrs. The drug-loaded microspheres (A1) showed encapsulation efficiencies up to 88% and also showed good micromeritic properties for their suitability as oral dosage forms. The microspheres having lower densities exhibited good buoyancy effect and hence, these could be retained in the gastric environment for more than 12 h.
20. Ashok A et al. (2011) prepared Metformin HCl microcapsules consisting of alginate and Gum Karaya by employing Ionotropic Gelation process and Emulsification Ionotropic Gelation process. Metformin HCl release from the microcapsules was slow and followed zero order kinetics \( (r > 0.98) \) and followed non–Fickian \( (n \text{ value 0.5 to 1}) \) release and depended on the coat: core ratio and the method employed in the preparation of microcapsules. Among the two methods Emulsification Ionotropic Gelation method was found to be more suitable for Controlled release of MetforminHcl over a long period of time. These microcapsules were subjected to in-vitro wash of test and exhibited good mucoadhesive property.

21. Karan SM et al., (2011) prepared verapamil hydrochloride microcapsules with different polymers such as ethyl cellulose, Eudragit RL100, Eudragit RS 100 by solvent evaporation method using an acetone /liquid paraffin system. Verapamil hydrochloride loaded microcapsules have encapsulation efficiencies ranged from 88.70 – 96.52%. The highest encapsulation efficiency of formulation having drug: polymer ratio 1:3 can be explained through the fact that the amount of drug in per unit polymer is greater than that in other formulations. The release of verapamil hydrochloride from Eudragit RL-type was more compared to Eudragit RS-type

22. Solanki NS et al., (2011) focused to enhance bioavailability and reduce the short half- life problem of Furosemide by preparation of sustained release microcapsule. Cellulose acetate microcapsules were prepared by co-acervation phase separation technique and phase separation was induced using distilled water. Prepared microcapsules were evaluated for Particle Size Analysis, Flow properties i.e. Angle of Repose Carr’s Index and Hauser’s Ratio, Scanning Electron Microscopy, Coating Wall Thickness, Drug Content and Microencapsulation efficiency, Dissolution studies. All the studies were performed in triplicate and standard deviation was calculated.

23. Lena MT et al., (2011) encapsulated atenolol within floating alginate-ethylcellulose beads as an oral controlled-release delivery system using aqueous colloidal polymer dispersion (ACPD) method. All prepared atenolol beads remained floating on 0.1 N HCl (pH 1.2) medium over 24 hours. Besides, high yield beads of 73.07- 84.31% was obtained. Encapsulation efficiencies were in the range of 33.10 % -79.04 %, and were found to
increase as a function of increasing drug: polymer mixture ratio and the gelling agent concentrations. Moreover, atenolol release profile from the beads was affected by the pH of the dissolution medium. It was found to be slowest in 0.1 N HCl (pH 1.2) and fastest in phosphate buffer (pH 6.8).

24. Jagadeesh N et al., (2011) developed Metoprolol succinate containing microparticles from polymethacrylate polymers (Eudragit S100, RSPO, RLPO) by non-aqueous emulsion solvent evaporation method. Increasing the drug to polymer concentration of Eudragit RSPO increased the entrapment efficiency of about 93.27 %, buoyancy of 80.6%. The optimized formulation prolonged the release for 8 hours in a sustained fashion following zero order kinetics. Both floating and sustained release properties were achieved in multiunit floating drug delivery system developed in this present study.

25. Shantveer V et al., (2010) developed sustained release matrix tablets of anti-hypertensive drug propranolol hydrochloride. Hydroxypropyl methyl cellulose K100M used as a rate retarding polymer where as lactose and dibasic calcium phosphate are used as diluent. The results of the present study point out that the rate of propranolol hydrochloride release from HPMC K100M matrices are mainly controlled by the drug – HPMC ratio. When the influence of excipients on the release of drug was examined, the excipients lactose enhanced the release rate of propranolol hydrochloride, however the dibasic calcium phosphate (DCP) demonstrated slower release rate. The dissolution t50% and t90% values for the co-excipients were in the order of lactose>dibasic calcium phosphate.

26. Narayana CR et al. (2010) developed non-effervescent multiparticulate floating Microballoons of famotidine using Eudragit - L100 polymer by emulsion solvent diffusion method. The drug encapsulation was found to be 80 % against the predicted 76 %. The in vitro percentage buoyancy was around 86 ± 0.42 with good floatability of upto 12 h. Histopathogical studies also supported the possibility of any toxicity on lower animal models. The mean gastric volume for control, famotidine and FAL-D1 was found to be 6.51 ± 0.199, 4.01 ± 0.130 and 3.93 ± 0.098 ml. Free acidity and total acidity for the optimized formulation by pylorus ligation method was found to be 48.16 ± 1.16 mEq/l/100g and 151.50 ± 1.505 mEq/l/100g respectively compared to 57.66 ± 2.27 and 180.33 ± 1.14 of control group, 44.83 ± 1.66 and 134.83 ± 1.424 mEq/l/100g of pure
drug. Appreciable rise in the pH towards alkalinity 5.133 ± 0.202 of FAL-D1 substantiated the ulcer protection activity of the formulation

27. Najmuddin M et al., (2010) prepared floating microspheres of ketoprofen using Eudragit S 100 and Eudragit L 100 as polymer by emulsion solvent diffusion method using Eudragit S 100 and Eudragit L 100 as polymer. Formulation prepared with Eudragit S 100 drug: polymer ratio (1:2) which exhibited excellent micromeritic properties, percentage yield, in vitro buoyancy, incorporation efficiency and percentage drug release 92.26% for a period of 12 hrs. Results show that as increase in drug: polymer ratio affects the particle size, percentage yield, in vitro buoyancy and drug release of microspheres.

28. Patil DA et al. (2009) developed and optimized mucoadhesive microcapsules of gliclazide. Alginate microcapsules coated with mucoadhesive polymer chitosan were prepared by ionotropic gelation technique utilizing calcium chloride as a cross linking agent. The microcapsules coated with mucoadhesive polymer chitosan exhibited good mucoadhesive property in the in vitro wash off test and also showed high drug entrapment efficiency. The in vitro drug release study indicated that the swelling is the main parameter that controls the release rate from microcapsules.

29. Sandile MK et al., (2009) prepared microcapsules containing verapamil and propranolol and to evaluate the kinetics and mechanism of drug release from the microcapsules using USP Apparatus 1. The microcapsules were manufactured using Eudragit RS and RL polymers by solvent evaporation. The formulations containing drug/polymer ratio 1:4 (w/w) were the most appropriate with respect to encapsulation efficiency of 70%, flow properties with Hausners ratio of 1.2, drug loading was about 15–20% and drug release characteristics, in all cases.

30. Yadav AV et al. (2009) formulated Aceclofenac microcapsules using ethyl cellulose as the retardant material by an emulsion solvent evaporation method. All microcapsules obtained were discrete, large sized, free flowing and spherical in shape. Aceclofenac release from microcapsules followed higuchi model and influenced by the size of the microcapsules. Slow release of Aceclofenac from ethyl cellulose microcapsules over 12 hours was observed.
31. Pachuau P et al. (2008) formulated and evaluated a matrix microsphere system for Salbutamol sulphate and Theophylline. Ethylcellulose was used as a retardant polymer by emulsion solvent evaporation using acetone/light liquid paraffin system. The prepared microspheres were white, free flowing and spherical in shape. The drug-loaded microspheres showed 67-91% of entrapment and release was extended upto 6 to 8 h. Scanning electron microscopy study revealed that the microspheres were spherical and porous in nature.

32. Prakash K et al. (2007) prepared and evaluated microcapsules of Lamivudine using various cellulose polymers by the solvent evaporation method. The microcapsules were spherical and free flowing. The entrapment efficiency was 76-86%. The release of drug from the microcapsules extended up to 8 to 12 hours. SEM revealed that the microcapsules were porous in nature. The release kinetics study revealed that the prepared microcapsules were best fitted to the zero order for F-2, F-4 and F-5 formulations and Higuchi model, for F-1 and F-3 microcapsules.

33. Ofokansi KC et al. (2007) developed Cefuroxime sodium-loaded microspheres containing admixtures of gelatin and porcine mucin via an emulsification-cross linking technique. Results showed that high entrapment efficiency, most notably manifested in microspheres formulated with equal portions of gelatin and mucin, led to a high release up to 85%. Formulations based on varying portions of gelatin and mucin also showed high drug loading efficiency which also resulted in high drug release in SIF within 3 h. The mean AUC was shown to be formulation-dependent with values of 168±1.93μg.h/ml for the control, 262±3.47 μg.h/ml for microspheres based on gelatine only and 328±2.55 μg.h/ml for microspheres formulated with equal parts of gelatin and mucin.

34. Jayvadan KP et al. (2005) formulated and systematically evaluated in vitro and in vivo performances of mucoadhesive microspheres of glipizide by simple emulsification phase separation technique using Glutaraldehyde as a cross-linking agent. The best batch exhibited a high drug entrapment efficiency of 75%. Percentage mucoadhesion after 1 hour was about 78%. The drug release was sustained for more than 12 hours. In vivo testing of the mucoadhesive microspheres to albino Wistar rats demonstrated significant hypoglycemic effect of glipizide.
35. Wen-Ho C et al., (1996) prepared Nifedipine-loaded albumin microspheres by a chemical cross-linking method to develop a sustained release form. Albumin microspheres prepared with different amounts of Glutaraldehyde indicated different release kinetics. Increasing the Glutaraldehyde concentration decreased the release rate of nifedipine from albumin microspheres as a result of formation of greater structural strength and more tightly texture. Besides, albumin microspheres gave an adequate fit to either zero order or spherical matrix model, depending on the extent of cross-linking reaction.

36. Sudhamani T et al. developed Ibuprofen microspheres by using ethylcellulose as carrier by the solvent evaporation method. The prepared microspheres were subjected to various evaluation and invitro release studies. Highest percentage of loading was obtained by increasing the amount of ibuprofen with respect to polymer. The prepared microspheres had good spherical geometry with smooth surface as evidence by SEM. The invitro release studies showed that ibuprofen microspheres of 1:2 ratios showed better sustained effect over a period of 8 hours.