INTRODUCTION:

Bioadhesion is a topic of current interest in the design of drug delivery systems. In recent years many such bioadhesive drug delivery systems have been developed for oral, buccal, nasal, rectal and vaginal routes for both systemic and local effects. The term ‘bioadhesive’ describes materials that bind to biological substrates, such as mucosal membranes and in bioadhesive drug delivery systems [Bramhankar D.M et al., 2002], the term bioadhesion is used to describe the bonding or adhesion between a synthetic or natural polymer and soft tissues such as epithelial cells [Chien Y.W.,(1992)]. The bioadhesive drug delivery formulation highlights the fact that readily accessible sites are utilized, with the eye, oral cavity and vagina being targeted. The GI tract and the nasal cavity have also been extensively examined as a site for bioadhesive drug delivery.

Interest in controlled and sustained release drug delivery has increased considerably during the past decade and, in selected areas, it’s now possible to employ fairly sophisticated system which is capable of excellent drug release control. The self-regulating insulin delivery system by using lectin and oral osmotic tablet are illustrative examples. However, for oral administration, all of these systems are limited to some extent because of gastrointestinal (GI) transit. Thus, the duration of most oral sustained release products is approximately 8-12 hours due to the relatively short GI transit time, and the possibilities to localize drug delivery system in selected regions of the gastrointestinal tract (GIT) for the purpose of localized drug delivery are under investigation.

Several approaches have been suggested to increase GI transit time, addressing the issue of localized drug delivery. The controlled gastric retention of solid dosage forms may be achieved by the mechanisms of mucoadhesion, [Hoffman A, (1998)], [Hwang SJ et al (1998)] flotation,[Hoffman A et al (1999)] sedimentation,[Deshpande AA et al (1996)],[Singh BN et al (2000)] expansion,[Moes AJ.(1993)], [Vasir JK et al (2003)] modified shape systems,[Timmermanns J et al (1990)] or by the simultaneous administration of pharmacological agents[Yeole PG et al, (2005)], that delay gastric emptying. Both low and high-density drug delivery systems have been suggested as possible approaches to extend the transit time but the results of exploratory studies area equivocal. In another system in which particle size, relative to stomach retropulsion has been suggested as a means to delay stomach emptying and thereby prolong transit time. This phenomenon is also relatively short duration, particularly drug delivery system administered in absence of food. An alternative approach is to employ mucoadhesive polymers that adhere to
mucin/ epithelial surface. Such polymer applied to any mucus membranes and perhaps non-mucus membrane as well. Thus, mucoadhesive polymers would find application in the eye, nose, vagina and GIT including the buccal cavity and rectum.[ Jain NK. (1997)]

An ideal dosage form is one, which attains the desired therapeutic concentration of drug in plasma and maintains constant for entire duration of treatment. This is possible through administration of a conventional dosage form in a particular dose and at particular frequency. In most cases, the dosing intervals much shorter than the half life of the drug resulting in a number of limitations associated with such a conventional dosage form are as follows: [Bramankar DM et al, (1995)]

- Poor patient compliance; increased chances of missing the dose of a drug with short half-life for which frequent administration is necessary.
- A typical peak plasma concentration time profile is obtained which makes attainment of steady state condition difficult.
- The unavoidable fluctuation in the drug concentration may lead to under medication or over medication as the steady state concentration values fall or rise beyond in the therapeutic range. The fluctuating drug levels may lead to precipitation of adverse effects especially of a drug with small therapeutic index whenever overmedication occurs.

The above problems can be overcome by the development of effective and safer use of existing drugs through concepts and technique of controlled and targeted drug delivery system.

The controlled drug delivery system is one, which delivers the drug at a predetermined rate, locally or systemically for a predetermined period of time.

The targeted drug delivery system is one, which delivers the drug only to its site of action and not to the nontarget organs or tissues.

The advantages of controlled drug delivery system over the conventional dosage form are as follows [Bramankar DM et al, (1995)];

- Improved patient convenience and compliance due to less frequent drug administration.
- Reduction in fluctuation in steady state levels and therefore better control of disease condition and reduced intensity of local or systemic side effects.
- Increased safety margin of high potency drugs due to better control of plasma levels.
- Maximum utilization of drug enabling reduction in total amount of dose administered.
Reduction in health care costs through improved therapy, shorter treatment period, less frequency of dosing.

The mucosal layer lines a number of regions of the body including the gastrointestinal tract, the urogenital tract, the airway, the nose, the ear and the eye. These represent potential sites for attachment of any bioadhesive system and hence, the mucoadhesive delivery system includes the following [Merkle, H.P. et al (1990)], [Jain N. K. (2002)]

- Buccal drug delivery system.
- Oral mucoadhesive drug delivery system.
- Rectal drug delivery system.
- Vaginal drug delivery system.
- Ocular drug delivery system.
- Nasal drug delivery system.
- Gastro intestinal drug delivery system

Since the bioadhesive drug delivery systems involves the use of bioadhesive polymers to prolong contact time in the various mucosal routes of drug administration. The ability to maintain a delivery system at a particular location for an extended period of time has great appeal for both local as well as systemic drug bioavailability. Drug absorption through a mucosal surface is efficient because mucosal surfaces are usually rich in blood supply, providing rapid drug transport to the systemic circulation and avoiding degradation by gastrointestinal enzymes and first pass hepatic metabolism.

Biodhesive drug delivery systems are delivery systems, which utilized the property of bioadhesion of certain polymers, which become adhesive on hydration. And hence can be used for targeting a drug to a particular region of the body for extended periods of time. Bioadhesive polymers find application in the eye, nose and vaginal cavity as well as the GI tract including the buccal cavity and rectum [Choudhary K. P. R et al (2000)].

The present work will involve the design and development of bioadhesive drug delivery systems by using different polymeric systems which got place in the drug delivery research in order to prolong contact time in the various mucosal route of drug administration as the ability to maintain a delivery system at a particular location for an extended period of time has a great appeal for both local disease treatment as well as systemic drug bioavailability. Considerable
attention is focused on the development of controlled drug delivery systems, offering the advantages of better therapeutic efficacy and is easier to comply with than the conventional regimens requiring more frequent dosing. The success achieved with the bioadhesive formulation as adhesion of bioadhesive drug delivery devices to mucosal membranes leads to an increased drug concentration gradient at the absorption site and therefore improved bioavailability of systemically delivered drugs and also used to target local disorders at the mucosal surface to reduce the overall dosage required and minimize side-effects that may be caused by systemic administration of drugs.

In present study among various bioadhesive polymers such as, carbopol, hydroxypropylmethyl cellulose, carboxymethyl cellulose, sodium alginate, gelatin, gaur Gum, polyvinyl pyrrilodone, chitosan, polyethylene glycol will be studied along with their effect of combination and composition of various polymer materials on development of various better different bioadhesive drug delivery systems.

**Advantages of Bioadhesive Drug Delivery Systems:**

- Controlled administration of a therapeutic dose at a desirable rate.
- Maintenance of drug concentration within an optimal therapeutic range for prolonged duration of treatment.
- Maximization of efficacy-dose relationship.
- Reduction in fluctuation in steady state levels and therefore better control of disease condition and reduced intensity of local or systemic side effects.
- Minimization of the need for frequent dose intake.
- Enhancement of patient compliance.