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Assessing role of lipid and polymer based delivery systems in inserts

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ABSTRACT

Majority of gynaecological, proctologic diseases were treated through rectal or vaginal delivery of medications, which can bypass the first pass metabolism and can produce required local effect. Inserts are evolutionary pharmaceutical dosageform that are semi solid at room temperature but upon insertion in cavities of humans, melt and release the drug localised. The inserts are advantageous since they can be placed at scare sites where blood perfusion is high that can enable for rapid absorption limiting many side effects. Ocular inserts represents the advanced technology in treating several ophthalmic diseases. Designing and development of optimum inserts is a challenge ever faced by Pharmaceutical researchers. In view of this, lipid and polymer based systems were additionally employed to improve the therapeutic efficiency of foresaid dosage forms. The review rationalises the importance of these inserts and their broad applications for multidisciplinary applications.

Keywords: Inserts; Suppositories; Ocular Inserts; Lipid; Polymers; Drug Delivery.

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INTRODUCTION

Active pharmaceutical ingredients (API) can be administered through a variety of routes, the widely used one is the oral followed by parenteral route. [1,2] In spite of long history of use of medications in the rectal and vaginal suppositories/pessaries form, they are less commonly used and the global market is also limited due to patient incompliance.

On the other hand, suppositories have several benefits, especially in the treatment of gynaecological, proctological diseases.[3,4] API mix with various bases and this interaction can provide satisfactory pharmacokinetics with acceptable tolerance.

The eye as a portal for drug delivery is generally used for local therapy against systemic therapy to avoid the risk of eye damage from high blood concentrations of the drug, which is not intended.[5] The exceptional anatomy and physiology of the eye make the organ impervious to the foreign substances, consequently posing the challenge to the formulator in overcoming of these protective layers without causing any permanent damage to the local tissues. Controlled release principles can be effectively applied in designing ocular inserts as an important approach in prolonging the drug residence time. Inserts are available in different shapes and sizes (Figure 1) [6]. In the present review, various methodologies for designing of insert such as suppositories/pessaries and ocular inserts were described in relation to several lipid/polymer based systems.

Figure 1: Various sizes and shapes of Suppositories

Types and designing of inserts

Suppositories are designed to deliver the medications through rectal and vaginal routes. Initially, they evolved as a more convenient form instead of liquid enema. Pessaries are frequently described as vaginal suppositories. These dosage forms were exhibited

several advantages- local effect on rectal mucosa; can be used effectively in pediatric, geriatric, unconscious patients; can also used for systemic benefit and avoids gastrointestinal irritation. Despite of all these, suppositories are few limitations such as patient acceptance, incomplete absorption and irritation to mucosa. Several local host factors may influence absorption in the rectum: the mucus layer, volume of rectal fluid, cell membrane, the tight junctions and the intracellular compartments arethe local barriers for absorption. The suppository bases should have certain physico-chemical properties and significant effect on the uniformity and dosing of API [3]. According to United States Pharmacopeia, there are six main classes of bases like [7-10] Cocoa butter, Glycerin gelatin, Polyethylene glycol, Cocoa butter substitutes, Surfactant basis and tablet suppositories or inserts. In some other sources, classification was done on basis of melting dissolution. Ocular inserts are the solid or semisolid preparations designed for ophthalmic preparations and these were placed in lower fornix and less commonly in upper fornix and cornea. These are usually fabricated with polymeric vehicle containing drug. Several advantages and disadvantages of ocular inserts were given in Figure 2.

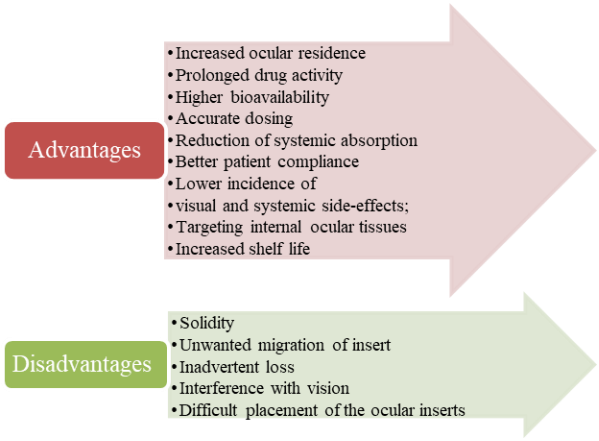

Figure 2: Advantages and disadvantages of ocular inserts

Polymers used for fabrication of ocular inserts; hydroxy propyl cellulose, poly vinyl pyrrolidone, hyaluronic acid, ethylene vinyl acetate, alginatemeudragitrs, collagen, polypeptide, ethyl cellulose and cellulose acetate pthalate [11-16]. Ocular inserts are majorily classified into Insoluble ocular inserts, Soluble ocular inserts and Bioerodibleocular inserts.

Application of Lipid/polymer based systems

Many significant efforts have been tried for the potential application of lipid-based drug delivery systems (LBDS), to provide the required site specific controlled release of wide range of drugs and bioactive agents by improving their solubility. These systems includes several novel drug delivery systems like nanoparticles, microspheres, mucoadhesion [17-37], liposome and nanofibers etc [38-59]. Application of these systems and polymers to overcome the drawbacks associated with inserts are studied. Several polymers like Chitosan, Alginate, PLGA, Polyvinylpyrrolidone, Zein ad Okra were used successfully. Additionally solid dispersion methodology is applied to enhance the solubility of Class II drugs [60-65]. Response surface methodology is applied to optimize the process parameters in the formulation of these systems [66-70]. Formulated LBDS are made into suppositories or insert to further enhance the residence time, thus finally improving the bioavailability.

Therapeutic areas

Inserts can be loaded with wide range of drugs like, Local Anesthetics, Protectants, Steroids, Astringents, Vasoconstrictors, Antiseptics, keratolytics, Anti-glaucoma, anti-bacterial and Anti-inflammatory etc.

CONCLUSION

Inserts were found to advantageous as it can eliminate several drawbacks associated with conventional drug delivery system. Application of lipid or polymer based systems, can further enhance the effectiveness of these systems in terms of residence time and bioavailability. However, polymer or lipid incompatibilities should be governed and careful preformulation studies need to be conducted. The safe and toxicological studies are strong advised for moving the product either to the preclinical or clinical trial phases. The importance of inserts lies in pediatric or geriatric patience indicating high compliance and minimal supervision since it is very safe to use.

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