Review article

Bimonthly published scientific journal

INTERNATIONAL JOURNAL of Indigenous Herbs and Drugs

ISSN-2456-7345

Phytocompounds used as excipients in mucoadhesive systems an outline on buccal tablets and films

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Abstract

Excipients from natural, semi synthetic, synthetic origin shares the major volumes in any pharmaceutical formulations. Natural derived additives play a multifunctional role in the pharmaceutical dosage forms. These natural excipients can be modified for it functionality to behave in a multifunctional effects which is beneficial to the therapeutic regimen. Excipients from natural sources categorized according to their functionality as disintegrating agent, binders, film forming agents, release modifiers, thickening agents, viscosity enhancers, stabilizers, emulsifiers, suspending agents and mucoadhesives. Mucoadhesives properties from natural polymers are widely explored by researchers in various mucoadhesive systems. In this review a brief concept of mucoadhesive systems of selected class of natural polymers were outlined.

Keywords: Excipients, Mucoadhesive,Buccal Tablets, Buccal Films, Chitosan, Alginate.

Introduction

Pharmaceutical dosage forms contain various components in addition to the active pharmaceutical ingredient to contribution in the formulation and manufacturing process. Those additives helps to optimize drug delivery in the optimized manner. With advent of drug delivery technology, excipients are currently included in newer dosage forms to accomplish specific functions and in fewer situations they directly or indirectly influence drug release and absorption. Numerous plant based pharmaceutical excipients are available nowadays [1-2]. Since they are abundance in the nature their use is explored in all the formulations due to its safety and economy. Excipients from natural origin are utilized in various preparations and are more favorable over synthetic polymers. Since they are low cost, economical and are available in the globe at present sufficient quantity [3]. Natural excipients offer wide advantages like nontoxic; they do not elicit any adverse effects on the body. Natural polymers are biodegradable in nature they do not cause any pollution as environmental friendly. Natural polymers are devoid of severe side effects as they are obtained from the natural source. Natural polymers provide nutritional supplement and are renewable source. Natural excipients have been widely explored as pharmaceutical excipients in different pharmaceutical drug delivery systems [4]. Natural polymers possess certain ideal properties [5-6] to state few like, Biocompatible, Biodegradable, fewer side effects, easily available from the natural sources, low cost, Nontoxic, shall be functionalized to obtain desired functionality. They too have certain hindrances, such as, while exposing to environment they prone to get microbial contamination, as well environmental factors will affect the production of natural polymers. As well, being renewable source availability may lead to affect the production. Excipients from plant origin pose several challenges such as being synthesized in small quantities, supply may differ to the location of the plants.

Shanmugarathinam A, Mallikarjun V, Saravanan R.. Phytocompounds used as excipients in mucoadhesive systems, an outline on buccal tablets and films,. Int J Ind Herbs Drugs 2017; 2(3): 44-.48.

Mucoadhesive systems

Mucoadhesion otherwise used as Bioadhesion be referred as a event of the polymers to adhere the biosurfaces for an enhanced duration which is influenced by interfacial molecular attractive forces acting between the two surfaces [7-8]. The term mucoadhesion as framed by considering the fact that there exists a adhesion between polymers with the mucosal surface layer. Mucoadhesive systems exists since long back from19th century, it has many applications including as surgical gum and denture adhesives. Major sites of mucoadhesive system can be explored includes oral buccal cavity, eye, nasal cavity, gastrointestinal tract, vagina.

Bioadhesion can be defined as a phenomenon of interfacial molecular attractive forces amongst the surfaces of the biological substrate and the natural or synthetic polymers, which allows the polymer to adhere to the biological surface for an extended period of time [9]. Bioadhesive polymeric systems have been used for a long time in the development of products for various biomedical applications which include denture adhesives and surgical glue. The term 'mucoadhesion' was coined for the adhesion of the polymers with the surface of the mucosal layer. The mucosal layer is made up of mucus which is secreted by the goblet cells and is a viscoelastic fluid [10-11].

Buccal tablets

Extending the adhesive property of the dosage form is the important property to be considered while developing buccal based mucoadhesive systems. Multiunit system of mucoadhesive bilayer buccal tablets consisting carvedilol incorporated chitosan microspheres were prepared and evaluated for better bioavailability and therapeutic efficacy of carvedilol [12]. This mucoadhesive system of chitosan found to have better controlled in vitro release properties, thus chitosan proved to be better excipient for the mucoadhesive systems by exhibiting better swelling and bioadhesive properties. Bioadhesive tablets comprising ketoprofen, chitosan, alginate prepared by direct compression method. Adhesion force of the intraoral tablets was comparable with commercial preparation [13]. Ketoprofen were rapidly absorbed when given as buccal tablets and this combination of chitosan and alginate are potential combination for buccal tablets. Chitosan as bioadhesive polymer were evaluated using repaglinide buccal tablets [14]. The buccal repaglinide tablet showed a mucoadhesion beyond 12 h with sufficient release of drug upto 84% during this period.

Mucoadhesive tablets were prepared using varying concentrations of sodium alginate, using direct compression method [15]. Terbutaline sulphate was used a drug of choice, the buccal tablets showed swelling index upto 59%, mucoadhesive strength were upto satisfactory level and the invitro release of terbutaline sulphate buccal tablets were shown upto 8h period of study. Sumatriptan examined for buccal tablets using chitosan alone and in combination with other natural polymers. Direct compressed chitosan comprising buccal tablets were showed better mucoadhesive strength and the tablets parameters were optimum [16]. These buccal tablets comprising chitosan were able to release sumatriptan upto 8 h duration. Buccal tablets were investigated for the chlorhexidine incorporated chitosan microsphere which was further compressed into buccal tablets [17]. The results were promising to develop intra oral tablets of chlorhexidine loaded chitosan buccal dosage forms.

Buccal tablets consisting of losartan potassium and sodium alginate polymer were prepared to regulate the release profile of the drug [18]. Direct compression method

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was adopted to develop mucoadhesive tablets and it's evaluated for mucoadhesive property. Mucoadhesive strength were high for all the formulations and the drug release profiles were extended duration. Sodium alginate influences mucoadhesive property [19] and it was evaluated using Carbopol and nitroglycerin. The buccal tablets were evaluated for adhesive property and found to be influenced by sodium alginate as well the in vitro release profile of nitroglycerin also found to be influenced by the presence of sodium alginate. Nitroglycerin release was prolonged by adding the sodium alginate polymer in different formulations.

Buccal films

Chitosan films consisting of lidocaine were prepared by solvent casting technique [20]. The film possesses good bioadhesive property and to showed extended release profile of lidocaine. Thus lidocaine loaded chitosan film suitable for buccal films for prolonged release of drug. Antimicrobial agent was incorporated in chitosan film and its efficacy was evaluated. Chlorhexidine gluconate loaded chitosan oral films were able to prolong the release up to 4h which may be advantageous for periodontal therapy [21]. The antimicrobial efficacy was increased with increasing concentration of chitosan.

In this research work various physicochemical characters of sodium alginate films were evaluated for the suitable parameters required to prepare ideal oral film as drug delivery system [22]. Higher concentration of sodium alginates in the film produced uneven, air entrapped film. Also the air entrapment was clearly visible in the film. Lower concentration of alginate films produced even, smooth surface and clear transparent films with adequate tensile strength. Solvent casting techniques were employed to prepare atenolol loaded sodium alginate buccal patches [23].

Several mucoadhesion parameters including mucoadhesive strength, adhesive force, bond strength were characterized and it was satisfactory to maintain them in buccal cavity. In this work carvdilol nanosuspension is impregnated to buccal film consisting of sodium alginate polymer and evaluated. It was found that increase release of drug due to enhance surface area of film, as well the film has good mucoadhesive property.

Conclusions

Use of natural derived pharmaceutical excipients were briefed with the focus to mucoadhesive systems. Phytochemical based excipients and their derivatives are continuously booming in the herbal based industrial sectors. The focus of pharmaceutical industries turning into economical, low cost, biodegradable, ecofriendly excipients production. The researchers are exploring the various possibilities of bringing out newer excipients into the market, these were evidenced from the numerous research publications. Still there are tremendous market opportunities are available to explore the possibilities to scale up the production and to discover newer class of excipients from natural sources.

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