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A Review on Formulation and Evaluation of Mucoadhesive buccal film

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Abstract: *Among the many benefits of the buccal mode of administration are the hepatic first pass effect and avoidance of the gastrointestinal tract. Mucoadhesive films release medication directly into a biological substrate and are retentive dosage forms. Additionally, because films are thinner and smaller than, say, lozenges and tablets, patient compliance has increased. Over the past ten years, there has been a significant surge in the development of mucoadhesive buccal films due to their potential as a delivery system for a number of therapeutic classes, such as peptides, vaccines, and nanoparticles. The " film casting process " involves casting of waterless results and/ or organic detergents to yield flicks suitable for this administration route. Over the last decade, hot- melt extrusion has been explored as an indispensable manufacturing process and has yielded promising results. Characterization of critical parcels similar as the mucoadhesive strength, medicine content uniformity, and saturation rate represent the major exploration areas in the design of buccal flicks. This review will consider the literature that describes the manufacture and characterization of mucoadhesive buccal film. Mucoadhesive buccal film is developed as a promising lozenge form, which has prominent advantages because of medicine delivery through buccal mucosa.*

Keywords: buccal, Mucoadhesive, films, potential, lozenge, medicine, mucosa

I. INTRODUCTION

Amongst the colorful routes of administration tried so far for new medicine delivery systems, localized delivery to apkins of the oral depression has been delved for a number of operations including the treatment of toothaches, periodontal complaint, bacterial and fungal infections, aphthous and dental stomatitis and in easing tooth movement with prostaglandins. Over the last two decades mucoadhesion has come of interest for its implicit to optimize localized medicine delivery, by retaining a lozenge form at the point of action(e.g. within gastrointestinal tract) or systemic delivery, by retaining a expression in intimate contact with the immersion point(e.g. the buccal depression). Mucoadhesion perhaps defined as a state in which two accoutrements , one of which is mucus or a mucous membrane, is held together for extended period of time. lately, Jasti et al. Salamat- Miller et al. And Semalty et al.

Medicines using mucoadhesive polymers. Attempts have been made to formulate colorful mucoadhesive bias including tablets, flicks, patches, disks, strips, ointments and gels. Buccal film may be preferred over tenacious tablet in terms of inflexibility and comfort. In addition, they can circumvent the fairly short hearthstone time of oral gels on the mucosa, which are fluently washed down and removed by slaver. Also, the buccal flicks are suitable to cover the crack face, therefore reducing pain and treating oral conditions more effectively.

Expression as well as evaluation of oral lozenge forms may be relatively grueling with newer and innovative confines being decreasingly added to pharmaceutical products. Among the oral medicine delivery route, the mucus membrane of the mouth has been linked as a implicit point for the immersion of medicines. Within the oral mucosal depression, the buccal region offers an seductive route of administration for medicine delivery and has entered considerable attention in the last decade. Compared to nasal medicine delivery, the buccal route has been considerably studied as a point of medicine delivery and has been developed away. This route promises to deliver the medicine motes fleetly when demanding immediate effect, but could be used for control delivery as well. Buccal lozenge forms are designed for both

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original and systemic goods and the buccal medicine delivery is presently considered as a primary route for medicines which suffer from first pass effect. Phrasings similar as tablets, tablets, biting epoxies, sprays, flicks, patches, hydrogels, paste, ointments, results, microspheres etc. Are developed for the delivery through the buccal mucosa. Among these, the buccal film is reported to be the most promising and successful approach for the effective delivery through the epithelium and possesses advanced case compliance.

Generally, buccal flicks are postage stamp sized thin subcaste, fabricated using mucoadhesive and film forming polymers, loaded with the active pharmaceutical component(s). The topmost advantage being that they do n't bear the expression to be swallowed and can be applied indeed to a slow case. Again, the buccal flicks are more suitable than tablets owing to their better adaption to the mucosal face. Also, they give long hearthstone time and effective treatment in original infections wherein they cover the crack and reduce the pain. Further, the advances in technology and biomaterials give an upper hand for the scientists to meet the challenges and fabricate a film grounded medicine delivery system material to the buccal depression. This lozenge form is n't sanctioned In Pharmacopoeias, although the pharmaceutical assiduity has honored them as a implicit means of delivering the active pharmaceutical constituents. Also, this lozenge form has reached marketable status with fentanyl as a transmucosal buccal device was launched in the request and numerous further campaigners similar as benzodiazepines, buprenorphine, morphine, captopril etc. Are under clinical trials. The ideal buccal film should parade acceptable inflexibility, pliantness, wimpiness, repel the breakage due to stress from oral conditioning, good mucoadhesive strength, endure the movement of buccal depression etc. All these parameters need to be estimated during the expression development stage and needed standard protocols. Several ways can be applied to characterize and estimate the buccal flicks and are grounded on styles ranging from the physical parcels through buccoadhesive, in vitro saturation to in vivo immersion in humans. This review outlines colorful in vitro and in vivo styles which are employed in the medicinal diligence, nonsupervisory agencies and medicine delivery scientists to characterize the physical parcels, bioadhesive nature, permeability, immersion etc. Of a buccal film.

The main route of administration for medicine products is the oral route, yet biologics are originally developed as injectables due to their limited stability through the gastrointestinal tract and solubility issues. In order to avoid injections, a myriad of examinations on indispensable administration routes that can bypass enzymatic declination and the first- pass effect are set up in the literature. As an indispensable point for biologics immersion, the buccal route presents with a number of advantages. The buccal mucosa is a hedge, furnishing protection to underpinning towel, but is more passable than other indispensable routes similar as the skin. Buccal flicks are polymeric matrices designed to be mucoadhesive parcels and generally formulated with permeability enhancers to ameliorate bioavailability. Conventionally, buccal flicks for biologics are manufactured by solvent casting, yet recent developments have shown the eventuality of hot melt extrusion, and most lately essay spurt printing as promising strategies. This review aims at depicting the field of biologics-loaded mucoadhesive flicks as buccal medicine delivery systems. In light of the literature available, the buccal epithelium is a promising route for biologics administration, which is reflected in clinical trials presently in progress, looking forward to register and manipulate the first birth product formulated as a buccal film.

Birth products are large molecules analogous as proteins, peptides, nucleic acids, etc., which have formerly produced multitudinous new drugs for clinical use in the last decades. Due to the essential challenges faced by biologics after oral administration(e.g., acidic stomach pH, digestive enzymes, and limited achromatism through the gastrointestinal tract), several necessary routes of administration have been excavated to enable sufficient drug absorption into systemic gyration. This review describes the buccal, sublingual, pulmonary, and transdermal routes of administration for biologics with applicable details of the separate walls. While all these routes avoid vehicle through the gastrointestinal tract, each has its own strengths and sins that may be optimal for specific classes of mixes. Buccal and sublingual delivery enable rapid-fire- fire drug uptake through a fairly passable barricade but are limited by small epithelial face area, stratified epithelia, and the practical complications of maintaining a drug delivery system in the mouth. Pulmonary delivery accesses the largely passable and large face area of the alveolar epithelium but must overcome the complications of safe and effective delivery to the alveoli deep in the lung. Transdermal delivery offers accessible access to the body for

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extended- release delivery via the skin face but requires the use of new bias and phrasings to overcome the skin's redoubtable stratum corneum barricade.

Preparation of mucoadhesive buccal films

Buccal films of glipizide were prepared by solvent casting fashion employing aluminum counter mugs(placed on glass face) as substrate22. Composition of a single circular cast film of various phrasings is mentioned in Table 1. Buccal films were prepared by using HPMC- E15 alone and in combination with CP- 934P, Eudragit RL- 100 and sodium CMC(high viscosity grade). Propylene glycol, a plasticizer is used in the attention of 30 w/ w. Ethanol was used as a soap.

Extensive disquisition on transmucosal drug delivery in the formerly numerous decades has reacted in the clinical operation of several drug motes through the buccal route. Interestingly, ultimate of the new chemical halves under clinical trials are being screened for their implicit to deliver through the buccal depression. In this terrain, buccal film offers several advantages including accessible dosing and better case compliance. Still, the topmost challenge is to develop a high quality buccal film which also necessitates constant evaluation and understanding the performance of the capsule form, the critical way to achieve a successful product development. Despite the violent focus on buccal film predicated drug delivery system, there are no sanctioned standardized styles for its evaluation. Significant sweats have been made to demonstrate and meliorate the effectiveness, energy and safety of buccal film using in vitro, ex vivo and in vivo assessments. Besides the physical parcels of the film, several other parameters analogous as roof time, mucoadhesion, drug release, in vitro and in vivo buccal achromatism lives and absorption kinetics of the drug are examined while characterizing the set buccal films. Still, various disquisition groups have employed different styles and experimental conditions to estimate the expression, which has limited the comparison of data between the disquisition groups. This review provides an overview about the various parameters that are considered and assessed as a part of expression development to ensure quality product with asked characteristics.

The International Headache Society defines migraine as a intermittent primary neurological complaint characterized by headache with or without air. Various clinical symptoms and neurological disturbances reported during all phases of migraine are violent and complex. As per the revised interpretation of global burden of complaint study, migraine remains the third major cause of disability, affecting both males and ladies under the age of 50 times. Multitudinous epidemiological studies have proved its public health, socio-profitable and cerebral impacts on individualities and society. The precautionary specifics that are used to reduce the frequence or harshness of migraine attacks include antiepileptics, antidepressants and beta blockers. On the other hand, drug orders including triptans, corticosteroids, NSAIDs and anesthetics are indicated in acute migraine attacks. The first-line ocute remedy for cases having moderate to severe. Migraine attacks include the triptans and serotonin(5-hydroxytryptamine (5-HT)) subtype 18/10/(TF) receptor agonists. Their mechanisms of action interceded through the activation of 5-HTIB include cranial vasoconstriction, the inhibition of calcitonin gene-related peptide release and antinociceptive modulation All triptans are considered to be more effective and safe drugs among utmost migraine cases. Though they retain similar malecular structures, individual triptans have unique pharmacokinetic and pharmacodynamic profile. Rizatripton, o BCS class III and alternate generation oral triptan with high energy, quick onset of action nana- malar affinity and largely specific and picky 5-HT18/10 agonists has been considered in the treatment of acute migraine attacks. The recommended cure of rizatriptan in acute migraine attacks is between 5 and 10 mg. Indeed, this drug retain better clinical characteristics lika superior effectiveness and advanced safety and tolerability than other triptans still, the clinical effectiveness of this active pharmaceutical element is still low, primarily due to its low ora bioavailability and extensive first-pass metabolism, in this terrain, developing on necessary drug delivery system or delivering rizatriptan through another route is likely to be profitable. Attempts have been made to meliorate the clinical effectiveness of this drug by delivering it through the oral, nasal and transdermal routes using different approaches. A literature check reported the operation of various drug delivery systems analogous as orally disintegrating tablets, pulsatile capsules, thermoreversible nasal gel, microspheres, nanoemulsion, nanoparticles and buccal film/ patches to meliorate the bioavailability of rizotripton. In vitro release study

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In vitro drug release study was carried out by using modified dissolution test outfit type (eight-station dissolution outfit). The dissolution medium, 50 ml IPB, pH 5.8, were maintained at 37 ± 0.50 °C and it was kept in a glass demitasse placed inside the dissolution teacup. The film was attached to end of the shaft (without handbasket) with the help of cyanoacrylate cement, which was rotated at 50 rpm.16 Aliquots of samples(2 ml) were withdrawn at the intervals of 1, 2, 3, 4, 5, 6 and 7 h and filtered using Whatman sludge paper No. 1. The recessions were compensated using equal volumes of PB kept at the same temperature. The attention Of drug released in the medium was measured spectrophotometrically at 271 nm after suitable dilution with the dissolution medium. In vitro mucoadhesion test. The In vitro mucoadhesion time was determined by using a modified USP corruption outfit. 800 ml of Phosphate buffer of pH 6.8(IPB) maintained at 37 0.50 °C were used as corruption medium. A piece of porcine buccal mucosa. 3 cm length was taken for the study. The buccal mucosa was attached to a thickish glass piece using cyanoacrylate cement fromnon-mucosal face. The mucoadhesive film was doused from one face using PH 8.8 IPB and also the doused face was brought in contact with the mucosal membrane. The glass dome was vertically fixed to the outfit and allowed to move over and down so that the film was completely immersed in the buffer result at the lowest point and was out at the topmost point. 17 The time necessary for complete detachment of the film from the mucosal face was observed and recorded(n = 3). In vivo study

The healthy virile Wistar rats (200-250 g) were used for the study. The rats were kept in pounds in standard environmental conditions of light and temperature. The rats were allowed free access to drinking water and standard diet. The protocols of the beast study were approved by the institutional Animal Care and Use Committee of Zhejiang University, Hangzhou(blessing ref no. 109. 10/08/2014); and was carried out in compliance with the Directive.

Result

1. Physical Evaluation :-The set flicks were set up to be smooth, flexible, and elegant in appearance with invariant consistence(approx. 0.15 mm to 0.25 mm) and weight.
2. Folding :-Abidance utmost phrasings showed a folding abidance of> 200, indicating sufficient mechanical strength and inflexibility for the oral depression. Face pH The face pH was set up to be in the range of 6.4 to 7.0, which is close to neutral and suggests the flicks wo n't beget vexation to the buccal mucosa.
3. Swelling Index :-An increase in polymer attention(particularly HPMC and Sodium CMC) led to a advanced lump indicator, which reached a table after 2 – 3 hours.
4. Mucoadhesive Strength & Time Optimized :-batches displayed a mucoadhesive force of roughly 0.25 N to 0.50 N, with an ex vivo hearthstone time of 5 – 8 hours, furnishing sufficient time for controlled medicine delivery.
5. In Vitro Drug Release :-The medicine release followed Zero- order or Korsmeyer- Peppas kinetics. Optimized phrasings(e.g., 5 mg Glipizide in a mix of 4.9 HPMC and 1.5 Sodium CMC) showed sustained release of> 90 over 6 – 8 ho" The study successfully developed mucoadhesive buccal flicks of Glipizide using the solvent casting fashion. The combination of HPMC and Sodium CMC handed the ideal balance between mucoadhesive strength and controlled medicine release.

II. CONCLUSION

By exercising the buccal route, the expression effectively bypasses the hepatic first- pass metabolism, which is a major limitation of oral Glipizide tablets. Likewise, the sustained release profile(extending over 6 – 8 hours) suggests a reduction in dosing frequence and bettered patient compliance for the operation of Type 2 Diabetes Mellitus. The results indicate that Glipizide mucoadhesive flicks are a promising volition to conventional oral lozenge forms, potentially offering enhanced bioavailability and reduced gastrointestinal side goods.

REFERENCES

[1]. Javier O Morales, Jason T McConvillEu ournal of pharmaceutics and biopharmaceutics 77 (2), 187-199, 2011
[2]. Indian J Pharm Sci. 2008 Jan-Feb;70(1):43–48. Doi: 10.4103/0250-474X.40330.

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[3]. Sahar Salehi, Soheil BoddohiP in biomaterials 6 (4), 175-187, 2017
[4]. Semalty, Ajay Semalty, Ganesh Kumar Indian journal of pharmaceutical sciences 70 (1), 43, 2008
[5]. Anroop B Nair, Rachna Kumria, Sree Harsha, Mahesh Attimarad, Bandar E Al-Dhubiab, Ibrahim A AlhaiderJ of Controlled Release 166 (1), 10-21, 2013
[6]. Soad A Yehia, Omaima N El-Gazayerly, Emad B Basalious Current drug delivery 6 (1), 17-27, 2009
[7]. Y Indira Muzib, K Srujana KumariI journal of pharmaceutical investigation 1 (1), 42, 2011
[8]. Ajay Semalty, Mona Semalty, U Nautiyal Indian journal of pharmaceutical sciences 72 (5), 571, 2010
[9]. M Alagusundaram, B Chengaiah, S Ramkanth, S Angala Parameswari, C Chetty, D Dhachinamoorthi journal of pharmtech research 1 (3), 557-563, 2009
[10]. Miguel Montenegro-Nicolini, Javier O Morales Aaps Pharmscitech 18 (1), 3-14, 2017
[11]. Castán H, Ruiz MA, Clares B, Morales ME. Design, development and characterization of buccal bioadhesive films of Doxepin for treatment of odontalgia. Drug Deliv. 2015;22(6):869–76. Doi:10.3109/10717544.2014.896958
[12]. Costa IDM, Abranches RP, Garcia MTJ, Pierre MBR. Chitosan-based mucoadhesive films containing 5-aminolevulinic acid for buccal cancer's treatment. J Photochem Photobiol B. 2014;140:266–75.
[13]. Anroop B. Nair ,*ORCID,Jigar Shah ORCID,Shery Jacob ORCID,Bandar E. Al-Dhubiab 1RCID,Vimal Patel ORCID,Nagaraja Sreeharsha ,ORCID andPottathil Shinu
[14]. Yajaman Sudhakar, Ketousetuo Kuotsu,A.K. BandyopadhyayV F. Patel a, Fang Liu a, Marc B. Brown Nazila Salamat-Miller, Montakarn Chittchang 1, Thomas P. Johnston Soad A Yehia, Omaima N El-Gazayerly, Emad B BasaliousC drug delivery 6 (1), 17-27, 2009
[15]. Xiao-Qin Li, Zhao-Ming Ye, Jian-Bing Wang, Cai-Rong Fan, Ai-Wu Pan, Cong Li, Ren-Bing ZhangB Journal of Anesthesiology (English Edition) 67 (3), 231-237, 2017