International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 1 Jan-Feb 2023, pp: 1256-1262 www.ijprajournal.com ISSN: 2249-7781

Review on Buccal Tablets

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Submitted: 12-01-2023 Accepted: 25-01-2023

ABSTRACT
Buccal drugs were prepared the use of mucoadhesive polymers. Buccal drugs had been characterised for style of Parameters like hardness, weight uniformity, thickness, % friability, swelling index, mucoadhesive energy, Surface ph, drug–excipient interplay have a look at, drug content fabric uniformity and in vitro drug release observe. . The Continuous secretion of saliva and its next swallowing can bring about extensive drug depletion from theDosage form and therefore low bioavailability. Therefore, other transmucosal routes consisting of nasal, rectal, vaginal, Ocular and oral mucosae are being considered as options to traditional oral dosage paperwork for drug Delivery to keep away from the above terrible elements related to traditional oral delivery (i.E., capsules, capsules, Syrups, and so on.). Of those routes of shipping, the buccal oral mucosa has emerged as one of the intention web sites for Management of drugs in a vast kind of dosage paperwork, specifically for those tablets targeted for nearby delivery inside the oral hollow space and systemic absorption.

KEYWORDS
Buccal Tablets, Polymers, Mucoadhesion / Bioadhesion.

I. INTRODUCTION

The mucosa of the mouth may be very extraordinary from the relaxation of the gastrointestinal tract and morphologically is more much like skin. Although the permeability of pores and skin is extensively seemed as poor, it isn't normally favored that the oral mucosa lacks the best permeability confirmed through the intestine. Those variations inside the gastrointestinal tract can in large part be attributed to the organization of the epithelia, which serve very special capabilities. A simple, single-layered epithelium strains the stomach, small gut, and colon, which provides for a minimum delivery distance for absorbents. In evaluation, a stratified or multilayered epithelium covers the oral cavity and esophagus and, in common place with skin, consists of layers with various states of differentiation or maturation obtrusive on progression from the basal cellular layer to the surface. Tablets have been applied to the oral mucosa for topical programs for many years. However, recently there has been interest in exploiting the oral hollow space as a portal for delivering pills to the systemic stream. No longer withstanding the incredibly negative permeability traits of the epithelium, some of blessings are offered by means of this course of administration. Primary amongst those are the avoidance of first-skip metabolism, ease of get entry to to the transport site, and the opportunity of sustained drug transport predominantly thru the buccal. Buccal drugs are a kind of solid dosage shape administered orally in among the gums and the internal linings of the cheek.Those tablets, held inside the buccal pouch, both act on the oral mucosa or are hastily absorbed through the buccal mucosal membranedue to the fact tablets "absorbed through the buccal mucosa bypass gastrointestinal enzymatic degradation and hepatic first-bypass effect",prescribing buccal capsules is more and more not unusual among healthcare experts.

STRUCTURE AND FUNCTION OF ORAL MUCOSA

A stratified, squamous epithelium strains the oral hollow space. Three distinct types of oral mucosa can be identified, ie masticatory, lining, and specialized mucosa, The masticatory mucosa covers the gingiva and hard palate. It incorporates a keratinized epithelium strongly connected to underlying tissues by way of a collagenous connective tissue and as such is able to face up to the abrasion and shearing forces of the masticatory technique. The lining mucosa covers all other regions except the dorsal floor of the tongue and is blanketed through a nonkeratinized and subsequently greater permeable epithelium. This mucosa is capable of elastic deformation and subsequently stretches to accommodate speech and mastication necessities. The epithelium in people varies in thickness in accordance to the location, e.G., floor of the mouth, 190 μm; tough palate, 310 μm; buccal,580 μm.

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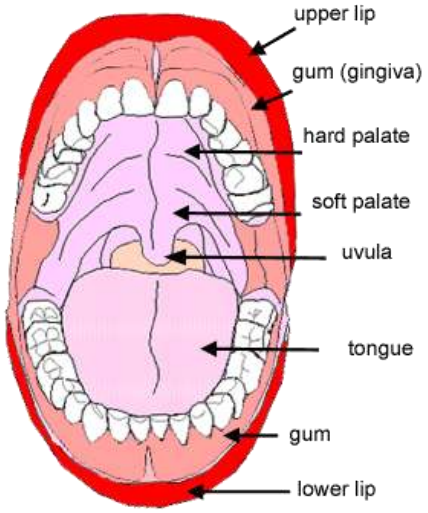

The regional differences in morphology result in different permeability characteristics that have considerable influence on the design and siting of drug delivery systems. The differentiation process that gives rise to the regional differences occurs as the keratinocytes migrate from the buccal layers to the epithelial surface. Within the basal layer the keratinocytes are cuboidal or columnar with a surrounding plasma membrane and containing the usual intracellular organelles.

The local differences in morphology bring about exceptional permeability traits that have full-size affect on the layout and siting of drug delivery structures. The differentiation procedure that gives rise to the regional differences happens because the keratinocytes migrate from the buccal layers to the epithelial surface. Inside the basal layer the keratinocytes are cuboidal or columnar with a surrounding plasma membrane and containing the usual intracellular organelles. A regular population of epithelial cells is maintained via the division of the basal keratinocytes at a rate equating to the desquamation of floor cells. Getting old and ailment can bring about a loss of this balance, that may cause a thickening (hypertrophia) or thinning (atrophia) of the epithelium. The media turnover time is slower for keratinized tissue, e.G., difficult palate 24 days and buccal mucosa 13 days. Additionally relevant to the development of drug shipping structures are the floor regions of the human mouth occupied via keratinized (50%) and nonkeratinized (30%) tissues. Chances are expressed on the subject of the overall floor location of the mouth. Desmosomes are still gift among cells within the floor mobile layer wherein intercellular areas are both wide and abnormal. Membrane-coating granules appear as about 200-nm spheres within the prickle cellular layers. Which finally fuse with cell membranes to discharge their contents in the superficial mobile layer.

ADVANTAGE OF BUCCAL TABLETS

- First pass -the liver is bypassed, so the bioavailability of medication is higher.
- Speedy absorption-because of the good blood deliver, the absorption vicinity is typically pretty speedy, specially for fat-soluble tablets.
- Drug balance-the ph inside the oral hollow space is notably impartial. Therefore, the drug can be greater stable.
- Fast absorption-Due to the good blood supply, the absorption area is usually quite fast, especially for fat-soluble drugs.
- Drug stability-the pH in the oral cavity is relatively neutral. Therefore, the drug may be more stable.[47][48]

DISADVANTAGE OF BUCCAL TABLET

- It is inconvenient to hold the dose in the mouth. If any a part of the dose is swallowed, that component must be dealt with as an oral dose and go through first-pass metabolism.
- Usually greater appropriate for small doses.
- The taste of medicine might also need to be maske[47][48]

BUCCAL TABLET PREPARATION

Buccal tablets were prepared with different combination of polymer using direct compression method. [12] The tablets consist of drug releasing polymer layer and a backing layer of ethyl cellulose which gives unidirectional release of drug. They are prepared by following two steps. In first step drug polymer mixture is prepared by mixing thoroughly drug with mucoadhesive polymers. Other excipient used in formulation are diluents, permeation enhancer, organoleptic agents are added to the above mixture in glass mortar to form a blend. The lubricantis mixed with blend and then itis compressed.[13]

Direct compression method

Manufacturing of tablets using direct compression method involves processes that can be condensed to three. The order following these processes first involves using induced die feeders, dry binders and lastly by using direct compression excipients.

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In the process of using induced die feeders, a special feeding device is used. The device prevents segregation and complements the powders to flow down the die cavity of the pharmaceutical tablet compression machine from the hopper. Employing the induce die feeder usually minimizes entrapment of air thereby increasing the density of the filling powder and its susceptibility to compaction. Commonly used for a compact formulation that does not fill the die cavity.

Blending →Dry Granulation → Milling →Lubrication → Compression → Packaging

Wet Granulation method

Wet granulation method is a process of size enlargement in which fine powder particles are agglomerated or brought together into larger, strong and relatively permanent structure called granules using a suitable non-toxic granulating fluid such as water, isopropanol or ethanol (or mixtures thereof). The granulating fluid can be used alone or as a solvent containing binder or granulating agent. The choice of the granulating fluid depends greatly on the properties of the materials to be granulated. Powder mixing, in conjunction with the cohesive properties of the granulating agent, enables the formation of granules. The characteristics and performance of the final product, greatly depends on the extent to which the powder particles interact with each other to form aggregates (granules).

EVALUATION

TABLET THICKNESS AND TABLET DIAMETER

Ten tablets were randomly selected and measured using a digital vernier caliper. The tablet thickness and tablet diameter should be within + 5% variation of standard value [2]

HARDNESS TEST

Ten tablets were randomly selected and the tablet hardness was measured using Vanguard Pharmaceutical Machinery, Inc. The in-house tablet hardness is 6.8 to 15 kg [2][3]

FRIABILITY

Where Wi is the initial weight and Wf is the final weight of the tablet before and after the friability test. The percent friability must not be more than 0.8% for new formulations [2]

$$\textbf{\% Friability}=\frac{\textbf{Initial weight}-\textbf{Final weight}}{\textbf{Initial weight}}$$

DISINTEGRATION TEST

A 1000 Ml beaker was filled with 900 Ml of distilled water and was maintained at a temperature of 37 + 0.5 Oc. Six tablets were placed in each of the cylindrical tubes of the basket. To avoid floating of the tablets, discs were used. The time taken to break the tablets into small particles was recorded. The limit for buccal tablets is 4 hours [4]

WEIGHT VARIATION TEST

Twenty tablets were weighed together and separately using analytical balance. The average weight and percent variation of the tablet were calculated. The weight uniformity was determined according to USP specification [2][5]

MOISTURE ABSORPT ION STUDIES

Agar at 5% w/v was dissolved in hot water and then transferred to a petri dish and was allowed to be solidified. Prior to the study, six tablets were placed in a vacuum overnight to remove moisture. They wereweighed initially and then positioned on the top of the agar and incubated at 37 oC for one hour. At the end of the test, the tablets were reweighed and the percent moisture absorption was calculated using the formula:

$$\%\textbf{moisture absorption} = \frac{\textbf{Wi} \times \textbf{Wf}}{\textbf{Wf}} \times \textbf{100}$$

Where Wf is the final weight and Wi is the initial weight of the tablets [6]

SURFACE PH STUDY

The surface pH must be closed to the salivary pH, so that it would not irritate the buccal mucosa. The salivary pH has the range of 6.5 to 7.5. The tablets were allowed to swell for 2 hours in 1 mL of distilled water. The surface pH of the tablet was then measured using a digital pH meter. The pH electrode was placed near the surface of the tablet and was allowed to equilibrate for 1 minute before reading the measurement [7]

SWELLING INDEX STUDIES

The swelling study was performed on petri dishes containing 1% agar gel. Four tablets were weighed and placed in a petri dish. The petri dishes contained 4 tablets, and each was placed in an incubator at 37 oC + 1 oC. After 0.5, 1, 1.5, 2, 2.5, 3 hours, excess water on the surface was carefully removed using the filter paper without pressing. The tablets were reweighed and the swelling index was calculated using the formula:

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$$\text{swelling index} = \frac{Wi \times Wf}{Wi} \times 100$$

Where Wi is the initial weight and Wf is the final weight of the tablet. Appropriate swelling property of buccal formulations is needed for proper adhesion.[8]

SURFACE PH STUDY

The surface pH study of buccal tablet is important in order to determine the possibility of any side effects in vivo. As an acidic or alkaline pH may cause irritation to the buccal mucosa, so it should be close to neutral as possible. For Surface pH determination combined glass electrode was used. The tablet was allowed to swell by keeping it in contact with 1 mL of distilled water (pH 6.5 ± 0.05) for 2 hours at room temperature. The pH was measured by bringing the electrode in contact with the surface of the tablet and allowing it to equilibrate for 1 minute. [11]

STABILITY STUDY

The tablets were stored for 3 months and the samples were tested after a period of 30, 60, and 90 days. The samples were analyzed using the quality control tests such as hardness, friability, thickness, content uniformity, weight variation, and moisture absorption studies and in-vitro tests such as swelling studies, mucoadhesive strength, stability in human saliva, and drug release.[12]

In-vitro Release

In vitro drug release from buccal tablets was done by using United State pharmacopeia (USP) Type II rotating Paddle type apparatus. One side of buccal tablet was attached to a glass disk with instant adhesive. The disk was put in the bottom of dissolution vessel. [13] Dissolution vessel containing suitable amount of phosphate buffer pH 6.8, samples at pre-determined time intervals are taken out and replaced with fresh buffer medium. The samples are filtered and made suitable dilution and analyzed by an U.V Spectrophotometer.[14]

LIST OF THE DRUG FOR BUCCAL MUCOADHESIVE TABLETS

DRUG	BIOADHESIVE POLYMER USED	REFERENCE
Buprenorphine	**HEMA and Polymeg**	**17**
Buspirone HCL	Carbopol 974, HPMCK4L	18
Chlorhexidine diacetate	Chitosan and sodium alginate	19
Triamcinolone acetonide	**Carbopol 934P and Sodium CMC**	**44**
Zinc sulfate	EC and Eudragit®	45
Sumatriptan succinate	HPMC and Carbopol	46
Chlorpheneramine malrate	**Hakea gum, Carbopol 934, HPMC**	**19,20**
clotrimazol	Carbopol 974P, HPMCK4M	21
carvedilol	Carbopol 934 with HPC, HPMC	22
Pindolol	Carbopol 934 and sodium CMC; HPMC and HPC	40
Piroxicam	HPMC and Carbopol 940	41
Propranolol HCI	HPMC and PC	42
Sodium fluride	Eudragit® and/or EC	43
Cetylpyridinium chloride	**Sodium CMC and HPMC**	**24**
Diltiazem HCI	Carbopol 934, HPMCK4M	25
Ergotamine tartrate	Carboxyvinyl polymer and carbopol	26
Nifedipine	**CMC and Carbopol**	**37**

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Nystatin	Carbomer, HPMC	38
Omeprazol	Sodium alginate, HPMC	39
Felodipine and Pioglitazone	**HPMC, Sodium CMC and carbopol**	**27**
Felidipine	HP-β-CD- felodipine complex and HPMC	28
Hydralazine HCL	Carbopol 934P and CMC	29
Metronidazol	**HEC, HPC, HPMC, or Na**	**34**
Miconazole nitrate	combined with Carbopol 940 HPMC, sodiumCMC, Carbopol, Sodium Alginate	35
Nalbuphine	Carbopol 934 and HPC	36
Hydrocortisone acetate	**HPMC, Carbopol 974P, or PC**	**30**
Insulin	Carbopol 934 with HPC or HPMC	31
Luteinizing hormone	PVP K30, PVP K90, Carbopol 934P	32
Metaclopromide	Carbopol,HPMC,PC,Sodium CMC	33

II. CONCLUSION :

Buccal delivery is an alternative for delivering medication by the buccal route. This mucosa is richly vascularized and more accessible for administering and removing a dosage form. There are several advantages to using this route, such as avoiding presystemic elimination, rapid absorption, prolonged residence of the dosage form, and reducing fluctuation in plasma steady state levels. These favorable opportunities make it possible to develop a better Buccal Route Delivery System.

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