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# A REVIEW ON BUCCAL DRUG DELIVARY SYSTEM

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## ABSTRACT

The buccal region of the oral cavity is an attractive target for administration of the drug of choice, particularly in overcoming deficiencies associated with the latter mode of administration. Problems such as high first-pass metabolism and drug degradation in the gastrointestinal environment can be circumvented by administering the drug via the buccal route. Moreover, rapid onset of action can be achieved relative to the oral route and the formulation can be removed if therapy is required to be discontinued. It is also possible to administer drugs to patients who unconscious and less co-operative. To prevent accidental swallowing of drugs adhesive mucosal dosage forms were suggested for oral delivery, which included adhesive tablets, adhesive gels, adhesive patches and many other dosage forms with various combinations of polymers, absorption enhancers. In addition to this, studies have been conducted on the development of controlled or slow release delivery systems for systemic and local therapy of diseases in the oral cavity.

**KEYWORDS**

Bio adhesive polymers, Buccal formulations, Buccal Mucosa, permeation enhancers

## INTRODUCTION

Among the different medication delivery methods, the buccal route is a good substitute. The patients' preferred delivery method may be oral. The oral mucosal cavity contains the An appealing route of administration for systemic medication distribution is the buccal area. However, Certain kinds of medicines, particularly peptides and proteins, cannot be administered orally due to issues with hepatic first pass metabolism and gastrointestinal (GI) tract enzymatic breakdown. Drug distribution via the buccal route has several advantages. for systemic medication distribution, oral administration is preferred. These benefits include the potential for bypass. avoidance of the first pass effect and pre-systemic removal in the GI tract are two criteria that the oral cavity is a very desirable and practical location for systemic medication administration. Considering the low patient compliance for controlled medication delivery via nasal, sublingual, vaginal, and The buccal mucosa is relatively porous and has a high blood supply. It's buccal mucous linings The buccal and inner cheek formulations are positioned in the mouth between

### Oral mucosal sites

Within the oral mucosal cavity, delivery of drugs is classified into three categories,

1) **Sublingual delivery**: is the administration of the drug via the sublingual mucus (the membrane of the ventral surface of the tongue and the floor of the mouth) to the systemic circulation.

2**) Buccal delivery**: is the administration of drug via the buccal mucosa (the lining of the cheek) to the systemic circulation**.**

3)**Local delivery**: for the treatment of conditions of the oral cavity, principally ulcers, fungal conditions and periodontal disease. These oral mucosal sites differ greatly from one another in terms of anatomy, permeability to an applied drug and their ability to retain a delivery system for a desired length of time.

### Advantages of Buccal Drug Delivery System

Drug administration via buccal mucosa offers several Distinct advantage

1. Compared to other mucosal tissues, the buccal mucosa is robust and moderately permeable, with a plentiful blood supply.
2. Avoid exposing the medications to gastrointestinal fluids and the first-pass effect.

3. Simple membrane site access allows the Delivery system to be applied and localized. and was

simply removed.

4. Increase the effectiveness of numerous medications because they have prolonged interaction times with a mucosa.

**5**. High patient acceptance in comparison to other non-oral medication delivery methods.

6. Tolerance to possible sensitizers (in contrast to the skin and nasal mucosa).

7. Longer stay combined with controlled API release could result in lower frequency of administration.

8. There may also be significant cost savings and dose-related adverse effects

9.As a result of adhesion and intimate contact, The formulation stays longer at the delivery site Improving API bioavailability using lower API Concentrations for disease treatment.

**Disadvantages of Buccal Drug Delivery System**

The main challenges of buccal administration are:

1. Limited absorption surface area: The total surface area of the oral cavity membranes that can be used for medication absorption is 170 cm2, of which 50 cm2 represents non-keratinized tissues, including buccal membrane.

2. Mucosal barrier qualities.

3. The continual dilution of the saliva (0.5-2 l/day) from continuous salivation causes

drug.

4. The risk of unintentional choking The delivery system should not be swallowed.

5. Swallowing saliva may also result in the loss of a medicine that is dissolved or suspended drug.

**A SUMMARY OF ORAL MUCOSA**

One of the most crucial routes for drug administration is through the oral mucosa. It offers medication delivery through both local and systemic channels. a mouth's cavity

contains a significant amount of mucous membrane surface area for the full absorption of various

drugs. The entire surface area of the mucous membrane-lined mouth cavity is close to approximately

100 cm2 . The many components of the oral cavity are as follows:

• the sublingual region of the mouth

• the cheeks' buccal mucosa

• the gingiva (gums)

• the mucosa of the palate; and

• the lips' lining

The multilayered epithelial tissues that make up the oral mucosal cavity are further coated by mucus. The epithelial tissues contain an inner basal membrane. The lamina propria, a layer of connective tissues, is located inside the basement membrane. the

The lamina propria serves as the mechanical support.the submucosal portion of this

starts. is made up of the several types of blood vessels and nerves from the central nervous system.

The maximum vascularity is provided by the submucosal portion for full absorption of the

drugs. The keratinized epithelium and the soi mucosa are both present in the human oral mucosa.

mouth floor, lips, cheek, and palate).Three layers make up the majority of the oral mucosa.

as depicted in Figure

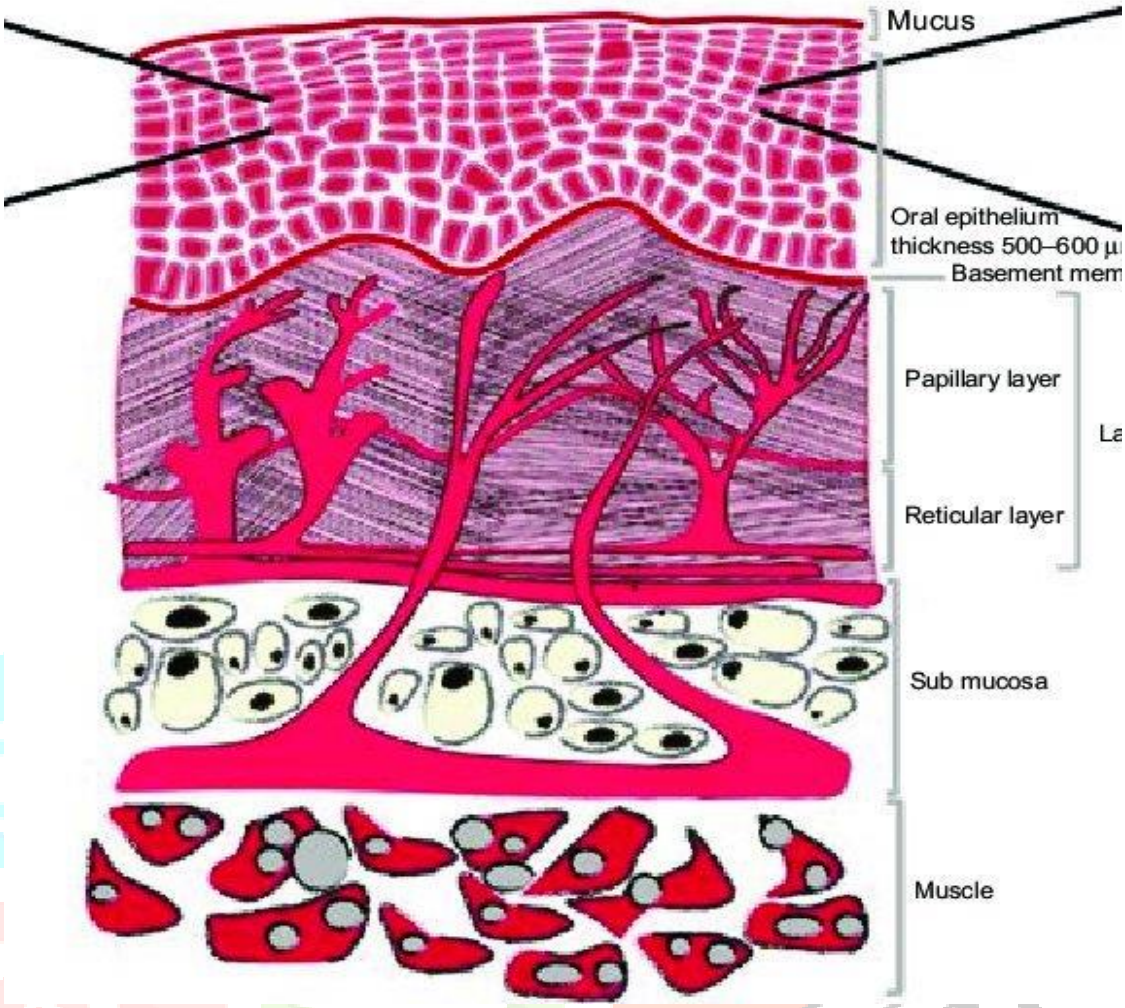


Fig.1.Overveiw of oral mucosa.

**Drug permeability through buccal mucosa**

There are two potential drug absorption pathways via the squamous stratified epithelium of the oral mucosa: trans cellular (passing through the cell intracellular) and Para cellular (passing through the cell intercellular).

According to reports, the Para cellular pathway accounts for the majority of permeation across the buccal mucosa. through the membrane-coating granules' production of intercellular lipids

**Molecular flexibility**

It is important for interpenetration and enlargement. As Water soluble polymers become cross linked, the mobility Of the individual polymer chain decreases. As the cross Linking density

increases, the effective length of chain Which can penetrate into the mucus layer decreases

even Further and bio adhesion strength is reduced.

Hydrogen bonding capacity

Hydrogen bonding is another important factor in Mucoadhesion of a polymer. Park and

Robinson found That in order for mucoadhesion to occur, desired Polymers must have

functional groups that are able to Form hydrogen bonds. They have also confirmed that

Flexibility of the polymer is important to improve this Hydrogen bonding potential.

**Charge**

Some generalizations about the charge of bioadhesive Polymers have been made previously, where nonionic Polymers appear to undergo a smaller degree of adhesion Compared to anionic polymers. It has been shown that

Some cationic polymers are likely to demonstrate Superior mucoadhesive properties, especially in a neutral Or slightly alkaline medium. Additionally, some cationic High-molecular-weight polymers, such as chitosan, have Shown to possess good adhesive properties.

**Buccal films**

These are the newest dosage forms created, designed for buccal administration.
Buccal films offer greater comfort and flexibility than

pills that stick. Buccal films are chosen over adhesive tablets as a result. Along with these,

They have saliva that is easy to remove and wash, and their residence times are short. On the oral mucosa gels. The area around the wound is shielded primarily through movies when the medication is taken orally for local distribution and to alleviate the pain in order to treat the condition more successfully. A great movie

should be flexible, supple, elastic, and strong enough to endure

damage brought on by mouth movements under stress.

It should have strong bio adhesive properties and retain in the mouth to deliver the intended effect.

Film swelling shouldn't happen

**Non-attached drug delivery systems**

This includes Fast dissolving tablet dosage forms, Chewing Gum formulations and Micro-porous hollow fibers. The Local physiological environment greatly affects the

Nonattached drug delivery system, e.g. the presence of Saliva and the intake of foods and liquids.

**Bio adhesives**

Bio adhesives are chemicals that can interact with biological systems.
for an extended period of time, material is being retained on them or holding them together. Time. Applying bio adhesive to any mucous or non-mucous membranes is possible, and Additionally, it lengthens the time that the medicine is in touch with the person absorbing Membrane. Sodium alginate, carbomers, and polymers are the most widely utilized bioadhesives. Gelatin, polycarbophil, HPMC, and HPC, etc.

The bio adhesive should have the following characters

- It should not produce any residue on mucosa layer.
- It should be inert and compatible with biological Environment.
- It should adhere to the mucus membrane aggressively.

**Buccal tablets**

Buccal tablets have a diameter of about 5-8 mm and are tiny, flat, and oval in shape. The most used method for creating buccal tablets is direct compression; other

Additionally, methods like wet granulation can be used. These pills adhere to buccal surfaces

mucosa when saliva is present. They are made to release the medication in one of three ways:

targeting the buccal mucosa or injecting multiple times into the saliva.

**Microspheres, microcapsules, micro particles**

The local irritation caused by microspheres or Microcapsules or micro particles at the site of adhesion is Less and provide comfortable sensation of a foreign object Within the oral cavity.

**Wafers**

.Wafer is a drug delivery system with surface layers Possessing adhesive properties.

**Lozenges**

Bioadhesive lozenge offers prolonged drug release with Improved patient compliance compared to Conventional Lozenges, thus avoiding multiple daily dose.
Microparticles, microcapsules, and microspheres
Microspheres, microcapsules, or microparticles at the point of adhesion generate less local discomfort and give a more comfortable impression of a foreign object inside the oral cavity.

**Wafers**

A medication delivery method called a wafer has surface layers with sticky characteristics.
Lozenges
The delayed medication release provided by bioadhesive lozenges increases patient compliance. to Traditional Lozenges, preventing the need for numerous daily doses.

**Semi-solid buccal adhesive dosage forms.**

**Gels**

Bioadhesive polymers that create gels in which cross-linked polyacrylic acid is employed
For an extended period of time, mucosal surfaces are fixed to deliver the release in a controlled manner.
and medication at the location of absorption. Drug usage of bioadhesive polymers produre stricted. has a limited therapeutic window because they are unable to administer a precise medicinal dosage to the site.

**Criteria followed in polymer selection**

- It should form a strong non covalent bond with The mucin/epithelial surface.
- It must have high molecular weight and narrow Distribution.
- It should be compatible with the biological Membrane.
- The polymers that are commonly used as Bio adhesive in pharmaceutical applications are:
- Natural polymers, Ex: Gelatin, sodium alginate.
- Synthetic and semi synthetic polymers, Ex: PVA, PEG, HPMC, PVP, Carbomers etc.(10)

**Ideal Characteristics of Buccal Drug Delivery System**

• Should stay attached to the attachment site for a few hours; • Should release the medicine gradually.

• Should offer unidirectional drug release that is directed toward the mucosa.

• Ideally, it should speed up and increase drug absorption.

• Shouldn't irritate or inconvenience the patient in any way.

• Should not disrupt daily activities like talking and drinking.

## CONCLUSION

The buccal mucosa offers several advantages for Controlled drug delivery for extended periods of time. The Mucosa is well supplied with both vascular and lymphatic Drainage and first-pass metabolism in the liver and presystemic elimination in the gastrointestinal tract are Avoided. The area is well suited for a retentive device and Appears to be acceptable to the patient. With the right Dosage form design and formulation, the permeability And the local environment of the mucosa can be Controlled and manipulated in order to accommodate Drug permeation. Buccal drug delivery is a promising area For continued research with the aim of systemic delivery Of orally inefficient drugs as well as a feasible and Attractive alternative for non-invasive delivery of potent Peptide and protein drug molecules. However, the need For safe and effective buccal permeation/absorption Enhancers is a crucial component for a prospective future In the area of buccal drug delivery.

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