Journal of Biomedical Engineering
ISSN: 1001-5515
MANUSCRIPT
Vol. 40 No. 3 (2023)

A REVIEW ON BUCCAL DRUG DELIVERY SYSTEM

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ABSTRACT:
Buccal drug delivery system is a promising drug delivery route that has gained significant attention in recent years. It offers several advantages over traditional drug delivery systems, including rapid onset of action, avoidance of first-pass metabolism, improved patient compliance, sustained drug release, reduced dosage requirements, and better safety profile. Buccal drug delivery system can bypass the gastrointestinal tract and first-pass metabolism, resulting in improved drug efficacy and reduced side effects. However, there are also several disadvantages, including variability of buccal mucosa, limited drug absorption, patient acceptability, difficulty in formulation, regulatory challenges, and cost. Careful consideration of these factors is necessary when determining the appropriate drug delivery system for a given medication. Overall, buccal drug delivery system offers a promising alternative for the delivery of various drugs, and its advantages make it an attractive option for improving drug delivery and patient outcomes.
Keywords: Buccal drug delivery system, first pass metabolism, advantages, Patient compliance

INTRODUCTION [11]:

Buccal drug delivery system is an innovative approach for the delivery of drugs through the buccal mucosa, which is the inner lining of the cheek. This method provides a non-invasive and convenient way to administer drugs compared to traditional methods such as oral or parenteral administration. In this article, we will review the current state of research and development in buccal drug delivery system.

Buccal drug delivery system is that it provides a rapid onset of action as the drug is absorbed directly into the bloodstream through the buccal mucosa [6]. This results in a faster therapeutic response and improved patient compliance [6, 27]. Additionally, buccal drug delivery system can bypass the first-pass metabolism, which is a common problem with oral drug administration [6, 3, 10, 27, 29]. This means that the drug can be delivered in a more efficient manner, resulting in reduced dosage and fewer side effects.

DOI: 10.105515/JBE.40.3.38

Various types of drug delivery systems have been developed for buccal delivery, including mucoadhesive tablets, films, and gels [10, 36]. Mucoadhesive tablets are the most commonly used drug delivery system as they provide prolonged contact time with the buccal mucosa, resulting in sustained drug release [27]. Films and gels are other drug delivery systems that are becoming increasingly popular due to their ease of use and convenience [11, 27].

1. Biocompatibility: The drug delivery system should be non-toxic and non-irritating to the buccal mucosa, as well as not causing any allergic reactions.
2. Mucoadhesion: The drug delivery system should adhere well to the buccal mucosa and provide prolonged contact time to enhance drug absorption.
3. Controlled release: The drug delivery system should be able to control the rate of drug release to achieve the desired therapeutic effect.
4. Stability: The drug delivery system should remain stable and retain its physical and chemical properties during storage and use.
5. Ease of use: The drug delivery system should be easy to use and administer, with minimal discomfort to the patient.
6. Cost-effectiveness: The drug delivery system should be cost-effective and scalable for large-scale production.
7. Flexibility: The drug delivery system should be adaptable to a wide range of drug formulations and therapeutic applications.
8. Regulatory compliance: The drug delivery system should meet the regulatory requirements for safety and efficacy, and be approved for use in clinical settings.
9. Patient acceptance: The drug delivery system should be acceptable to patients in terms of taste, appearance, and ease of use.

Overall, an ideal buccal drug delivery system should provide an efficient and convenient way to deliver drugs through the buccal mucosa, while also meeting the above characteristics to ensure safety, efficacy, and patient acceptance.

Buccal drug delivery system has several advantages over other traditional drug delivery systems. Some of the advantages are [2, 36, 37, 38, 39]:

1. Rapid onset of action: Buccal drug delivery system provides a rapid onset of action as the drugs are absorbed directly into the bloodstream through the buccal mucosa. This results in a faster therapeutic response.
2. Avoidance of first-pass metabolism: Buccal drug delivery system can bypass the first-pass metabolism, which is a common problem with oral drug administration. This means that the drug can be delivered in a more efficient manner, resulting in reduced dosage and fewer side effects.
3. Improved patient compliance: Buccal drug delivery system provides a non-invasive and convenient way to administer drugs compared to traditional methods such as oral or

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parenteral administration. This improves patient compliance, as it reduces the discomfort associated with injections or the inconvenience of taking pills [24].

4. Sustained drug release: Buccal drug delivery system provides prolonged contact time with the buccal mucosa, resulting in sustained drug release. This can improve the efficacy of the drug and reduce the frequency of dosing.
5. Reduced dose: Buccal drug delivery system can provide a more targeted delivery of drugs to the site of action, resulting in reduced dosage requirements and fewer side effects.
6. Better safety profile: Buccal drug delivery system has a better safety profile compared to other drug delivery systems, as it avoids the gastrointestinal tract and first-pass metabolism, reducing the risk of adverse effects.

Overall, buccal drug delivery system offers a promising alternative for the delivery of various drugs, and its advantages make it an attractive option for improving drug delivery and patient outcomes.

While buccal drug delivery system has many advantages, there are also several disadvantages to consider. Some of the main disadvantages are [2, 8, 36]:

1. Variability of buccal mucosa: The buccal mucosa can vary significantly between individuals in terms of thickness, texture, and permeability. This can affect the drug absorption and can make it difficult to predict drug delivery outcomes.
2. Limited drug absorption: The buccal mucosa has a limited surface area for drug absorption, which can limit the amount of drug that can be delivered through this route.
3. Patient acceptability: The taste and texture of some buccal drug delivery systems can be unpleasant to some patients, which can reduce patient compliance.
4. Difficulty in formulation: Buccal drug delivery system requires careful formulation to ensure drug stability, bioavailability, and compatibility with the buccal mucosa. This can be challenging and time-consuming.
5. Regulatory challenges: Regulatory approval for buccal drug delivery systems can be complex and time-consuming, which can limit their availability.
6. Cost: Buccal drug delivery systems can be more expensive than traditional drug delivery systems, which can limit their widespread use.

Overall, while buccal drug delivery system has many advantages, there are also several disadvantages to consider. Careful consideration of these factors is necessary when determining the appropriate drug delivery system for a given medication.

The buccal layers refer to the layers of tissue in the cheek area of the mouth. These layers are composed of several structures including skin, fat, muscles, nerves, blood vessels, and mucous membranes.

The buccal fat pad is a specific structure located within the buccal layers. It is a rounded mass of

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fat that is situated between the buccinator muscle and the facial muscles. The buccal fat pad helps to provide cushioning to the muscles of the cheek during chewing and speaking [1, 6, 21].
The buccal mucosa is another important structure within the buccal layers. It is the moist, pink-colored lining of the inner cheek that contains glands that produce saliva. The buccal mucosa plays an important role in maintaining oral health by helping to lubricate the mouth, protect against infection, and aid in the digestion of food.

Anatomy of Buccal Mucosa: The buccal mucosa is the moist, pink-colored lining of the inner cheek. It is composed of several layers of tissue, including [8]:

1. Epithelium: The outermost layer of the buccal mucosa is composed of stratified squamous epithelium. This layer is responsible for protecting the underlying tissues from physical and chemical damage.
2. Lamina propria: The layer beneath the epithelium is the lamina propria, which is composed of loose connective tissue. This layer contains blood vessels, nerves, and lymphatic vessels, as well as various types of cells involved in immune defense.
3. Submucosa: The submucosa is a layer of connective tissue that lies beneath the lamina propria. It contains larger blood vessels and nerves, as well as glands that secrete saliva.
4. Muscle layer: The muscle layer of the buccal mucosa consists of the buccinator muscle, which is responsible for moving food around the mouth during chewing.

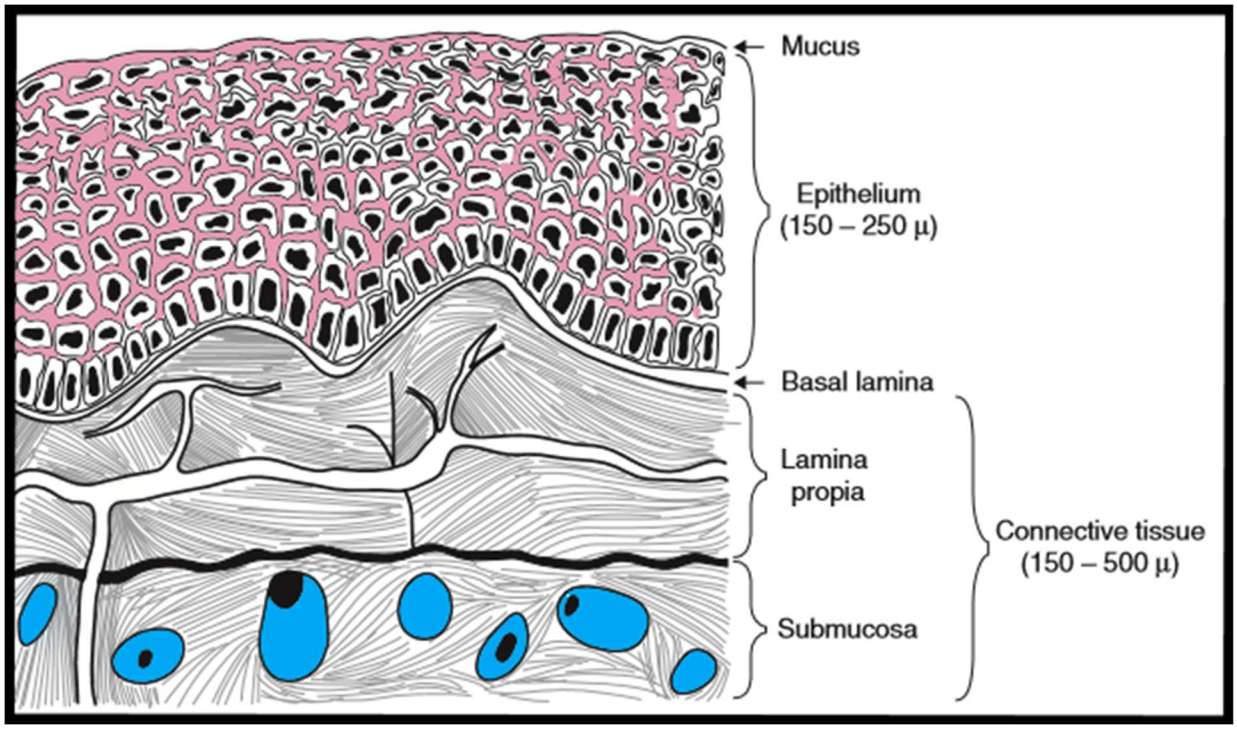

Fig: Structure of buccal mucosa

The buccal mucosa plays an important role in maintaining oral health by protecting against

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infection and aiding in the digestion of food.

A novel buccal dosage form refers to a new and innovative method of delivering medication through the buccal mucosa. The buccal route of drug administration is becoming increasingly popular due to its advantages such as rapid onset of action, avoidance of first-pass metabolism, and better patient compliance.

Some examples of novel buccal dosage forms include:

1. Buccal films: These are thin, flexible sheets that adhere to the buccal mucosa and release medication upon contact with saliva.
2. Buccal tablets: These are solid dosage forms that dissolve or disintegrate in the mouth, delivering medication to the buccal mucosa.
3. Buccal sprays: These are liquid dosage forms that are delivered as a fine mist to the buccal mucosa. They are quickly absorbed and provide rapid onset of action.
4. Buccal patches: These are transdermal patches that are applied to the buccal mucosa and release medication over a period of time.

Novel buccal dosage forms offer a promising avenue for drug delivery, and ongoing research is focused on developing new formulations and optimizing existing ones for improved patient outcomes.

There are several types of buccal dosage forms, which are designed to deliver medication through the buccal mucosa (inner cheek). These dosage forms are designed to offer a number of advantages over other routes of drug administration, such as rapid onset of action, avoidance of first-pass metabolism, and improved patient compliance. Here are some common types of buccal dosage forms[10].

- Buccal Tablets: These are small tablets that are placed between the cheek and gum to dissolve slowly, releasing medication over time. Buccal tablets are convenient to use and can be formulated to provide immediate or sustained release of medication.
- Buccal Films: These are thin, flexible sheets that adhere to the buccal mucosa and deliver medication upon contact with saliva. Buccal films are easy to use, and can provide rapid or sustained release of medication.
- Buccal Patches: These are transdermal patches that are applied to the buccal mucosa and release medication over a period of time. Buccal patches are discreet and can provide sustained release of medication.
- Buccal Sprays: These are liquid dosage forms that are delivered as a fine mist to the buccal mucosa. Buccal sprays are easy to use and can provide rapid onset of action.
- Buccal Gels: These are semi-solid or gel-like formulations that are applied directly to the buccal mucosa. Buccal gels are designed to provide sustained release of medication and can be formulated with a variety of active ingredients.

Mechanism of Action of Buccal Absorption [8]:

DOI: 10.105515/JBE.40.3.38

The buccal dosage form comes into contact with the buccal mucosa and dissolves or disintegrates in the saliva, releasing the medication. Drugs are absorbed through the buccal mucosa by passive diffusion of non-ionized species across the epithelium's intercellular gap, which is largely controlled by a concentration gradient. The main transport mechanism is the passive movement of non-ionic species across the lipid membrane of the buccal cavity. Like many other mucosal membranes, the buccal mucosa has been described as a lipoidal barrier to the passage of medications, and the more lipophillic the drug molecule, the more easily it is absorbed. A first order rate process may accurately capture the rate of medication absorption in the mouth. There are a number of possible obstacles to buccal medication absorption. By adjusting the drug concentration in the mouth, salivary secretion modifies the buccal absorption kinetics from drug solution, according to Dearden and Tomlison (1971).

Evaluation of buccal drug delivery system:

There are different methods for the evaluation of buccal drug delivery system. These includes weight variation, dimension, hardness, drug content, dissolution, uniformity of content, swelling index, mucoadhesive property for tablets, films and patches and viscosity for gel.

Conclusion [1],[10]:

Drug delivery via the buccal mucosal (local) and transmucosal (systemic) routes remains difficult. The main challenges stem from the small absorption area and the mucosal barrier qualities, especially in the case of medicines intended for a transmucosal administration. The potent physiological elimination processes of the oral cavity that transport the formulation out of the absorption site are elements that must be taken into account during the design of buccal drug delivery systems, particularly in the case of local delivery. The review has brought attention to develop the buccal drug delivery system especially to bypass the first pass metabolism. Beyond typical polymer networks, researchers are looking for additional creative drug delivery technologies. Scientists are developing buccal adhesive systems using various tactics to enhance the bioavailability of medications taken orally by modifying formulation strategies such as the inclusion of pH modifiers, enzyme inhibitors, permeability enhancers, and so on.

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