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Lollipops in Long Medical Journey – Overview

Sundaramoorthi C* [1], Rajaguru B [1], Manoranjan R [2], Sona M [2], Rajeshwari V[2]
[1,2] *Department of Pharmaceutics, KMCH college of Pharmacy*

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ABSTRACT
The article discusses the advantages of oral mucosal drug delivery over other routes of administration such as injectable and enteral methods. The oral mucosa provides a rich blood supply for rapid drug transport to the systemic circulation and avoids degradation by first-pass hepatic metabolism.Medicated lollipops are a type of solid dosage form that contains medication in a sweetened and flavored base. They dissolve slowly in the mouth and are used mainly for localized effects in the mouth, but can also be used for systemic effects if the drug is well absorbed through the buccal lining. They have advantages such as easy administration for patients who have difficulty swallowing pills and a pleasant taste. However, they have disadvantages such as limitations on the type of drugs that can be used in the formulation. There are two types of medicated lollipops: hard and soft. Hard lollipops have a low moisture content and do not disintegrate, while soft lollipops have a higher moisture content and can be chewed or dissolved in the mouth. Medicated lollipops can contain pain relievers, cough suppressants, anti-nausea medications, vitamins, minerals, and herbal extracts.

Keywords : Oral mucosa, Systemic circulation, Medicated Lollipops, Buccal lining.

INTRODUCTION

Oral drug delivery is the most favoured route of administration of various medications and tablets are the most widely accepted dosage form. Solid dosage forms are popular because of the ease of administration, accurate dosage, self medication, pain avoidance, and most importantly patient compliance. [1]

A drug can be administered via a many different routes to produce a systemic pharmacological effect. The most common method of drug administration is via per oral route in which the drug is swallowed and enters the systemic circulation primarily through the membrane of the small intestine. The parenteral route is not routinely used for self-administration of medication. It is probable that at least 90% of all drugs used to produce systemic effects are administered by the oral route.

Absorption of drugs after oral administration may occur at the various body sites between the mouth and rectum. In general, the higher up a drug is absorbed along the alimentary tract, the more rapid will be its action, a desirable feature in most instances. A drug taken orally must withstand large fluctuation in pH as it travels along the gastrointestinal tract, as well as resist the onslaught of the enzymes that digest food and metabolism by micro flora that live there. It is estimated that 25% of the population finds it difficult to swallow tablets and capsules and therefore do not take their medication as prescribed by their doctor resulting in high incidence of non-compliance and ineffective therapy.

Difficulty is experienced in particular by pediatrics and geriatric patients, but it also applies to people who are ill bedridden and to those active working patient who are busy or travelling, especially those who have no access to water. In these cases oral mucosal drug delivery is most preferred [2].

Several mucosal surfaces have been investigated as delivery routes including nasal, rectal, vaginal, ocular and oral. The level of keratinisation in mucous membranes and therefore the permeability barrier is not as extensive as the skin's stratum corneum. The oral mucosa, depending on the site, is between 4 and 4000 times more permeable compared to the skin.

Mucosal delivery sites have the advantage of delivering drugs directly into the systemic circulation and avoiding first pass drug metabolism in the liver and pre- systemic elimination of the drug in the gastrointestinal tract. [3]

ORAL MUCOSAL DRUG DELIVERY

Oral mucosal drug delivery is an alternative method of systemic drug delivery that offers several advantages over both injectable and enteral methods and also enhances drug bioavailability because the mucosal surfaces are

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usually rich in blood supply, providing the means for rapid drug transport to the systemic circulation and avoiding, in most cases, degradation by first-pass hepatic metabolism. The systems contact with the absorption surface resulting in a better absorption, and also prolong residence time at the site of application to permit once or twice daily dosing. For some drugs, this results in rapid onset of action via a more comfortable and convenient delivery route than the intravenous route. The clinical need for oral transmucosal delivery of a drug must be high enough to offset the high costs associated with developing this type of product. Transmucosal products are a relatively new drug delivery.[4]

Within the oral mucosal cavity, delivery of drugs can be categorised into three classes:

- Buccal delivery
- Sublingual drug delivery
- Local drug delivery

Buccal drug delivery: Buccal drug delivery is drug administration over the mucosal membranes lining the cheeks (Buccal mucosa).

Sublingual drug delivery: Sublingual drug delivery is systemic delivery of drugs through the mucosal membranes lining the surface of the mouth.

Local drug delivery: Local drug delivery is drug delivery among the oral cavity.[5]

DESIGNING A ORAL MUCOSAL DRUG DELIVERY SYSTEM

Permeability of the oral mucosa

The oral mucosa is a squamous cell epithelium comprised of highly proliferating basal keratinocytes which replenish the overlying epithelial cells which differentiate and eventually shed as the cells become more superficial Fig (1.3). The permeability barrier is responsible for preventing exogenous and endogenous materials from entering the body across the oral mucosa and prevents loss of fluid from the underlying tissues to the environment. The permeability barrier is comprised predominantly of the lipid content of the upper layers of the epithelium. As supra- basal cells differentiate they form strong intercellular desmosomal junctions and form membrane coating granules on their apical surfaces. [7,8]

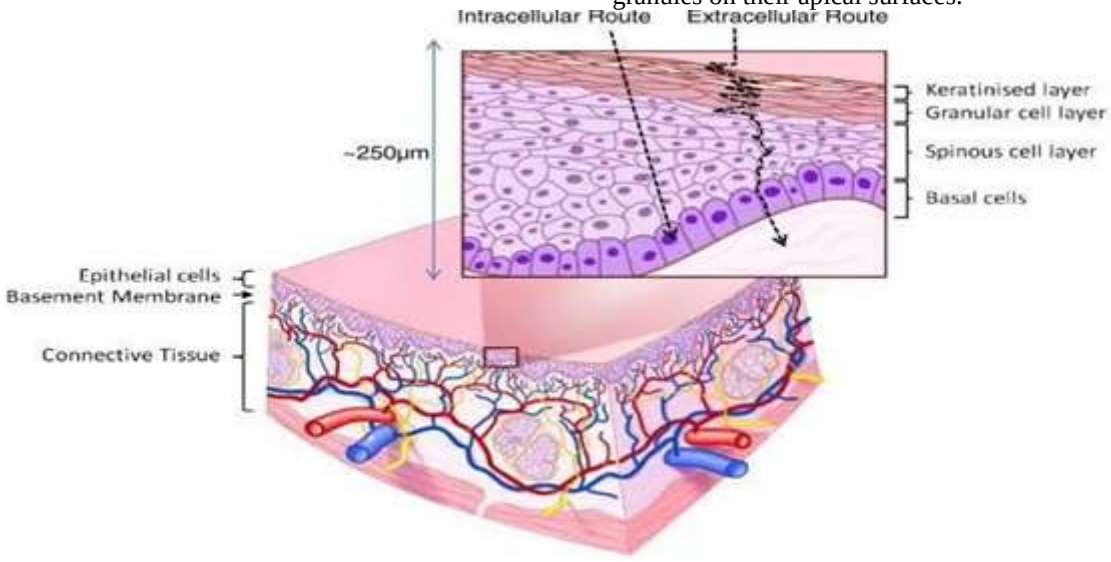

Figure 1: Structure of the Oral Mucosa

These membrane coating granules release lipophilic material into the intercellular spaces to ensure epithelial cohesion. This lipophilic material slows the passage of hydrophilic materials across the epithelium.[9] It has also been hypothesised that tight junctions may play a role in permeability barrier function however these are not commonly found in the oral epithelium.

The epithelium is the major barrier to permeability with the connective tissue providing some resistance to lipophilic materials due to the connective tissues high level of hydration. There is variation in permeability across different regions of the oral mucosa due to the differing thickness of the epithelium and degree of keratinisation at different sites. Keratinised tissues display a lower

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permeability than non-keratinised tissues, this is however due to the lipid composition of the membrane coating granules in the keratinised vs. non-keratinised tissues rather than the presence of keratin itself .The degree of permeability is least in keratinised gingiva followed by the buccal mucosa with the most easily permeated area of the oral mucosa being the sublingual mucosa. [4]

Absorption via buccal mucosa:

There are two permeation pathways for passive drug transport across the oral mucosa:

- Para cellular
- Tran cellular

Permeants can use these two routes simultaneously, but one route is usually preferred over the other depending on the physicochemical properties of the diffusant.

Since the intercellular spaces and cytoplasm are hydrophilic in character, lipophilic compounds would have low solubilities in this environment. The cell membrane, however, is rather lipophilic in nature and hydrophilic solutes will have difficulty permeating through the cell membrane due to a low partition coefficient. Therefore, the intercellular spaces pose as the major barrier to permeation of lipophilic compounds and the cell membrane acts as the major transport barrier for hydrophilic compounds. Since the oral epithelium is stratified, solute permeation may involve a combination of these two routes. [6]

Drug absorption via the oral mucosa is a passive diffusion process. By simplifying the oral mucosa into a hydrophobic membrane, Fick's first law can be used to describe the drug absorption process. Parameters such as diffusion coefficient, partition coefficient and thickness of the tissue are inherent properties of the drug and the mucosa. Other parameters, such as surface area, duration of drug delivery and concentration are controlled by the dosage form and formulation. Free drug concentration is a key issue in terms of developing transmucosal drug delivery dosage forms. [10]

Desirable drug physicochemical properties for formulation of an oral mucosal drug delivery system [11]

Table l:Formulation considerations

FORMULATION CONSIDERATIONS	IDEAL LIMITS
Aqueous solubility	> 1 mg/ml
Lipophilicity	10 < oil: water partition coefficient <1000
Molecular weight	< 500 Da
Melting point	< 200°C
pH of saturated aqueous solution	pH 5–9
Required dose deliverable	< 10 mg/day
Irritation potential, which is the net effect of many physicochemical properties	No irritation to buccal tissue

Medicated lollipops

Lollipops are solid dosage forms, containing the medicament in a sweetened and flavored base, intended to dissolve slowly in the mouth. in the Lollipops have mainly contained the additives like sweetening agent, flavoring agent, the coloring agent, oacifier and stabilizing agent. Medicated lollipops are slow dissolving delivery system. They dissolve in oral cavity within 1 to 10 minutes. Lollipops are large sugar boiled confectionary of various flavors attached to a plastic stick which can be consumed over a long period of time through licking. The plastic stick is used to hold the confection (medicament) together. Lollipops are solid unit dosage form of medicament which is meant to be dissolved in mouth (or) pharynx. Development of lollipops dates back to 20th century and is still in commercial production.

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Most of the lollipops preparations are available as over the counter medications. Lollipops provide a palatable means of dosage forms administration and enjoy its position in pharmaceutical market owing to its several advantages but it suffers from certaindisadvantages too. They contain one (or) more medicament usually in a flavored, sweetened base. Lollipops are most often used for localized effects in the mouth. They can also be used for systemic effects if the drug is well absorbed through the buccal lining. A small, medicated candy intended to be dissolved slowly in the mouth to lubricant and so that irritated tissues of the throat. A small flavored tablet made sugar (or) syrup and often medicated. A Small medicinal tablet originally in the shape of lollipops, taken for sore throat and dissolved in the mouth. [12]

Advantages of medicated lollipops

- Having formulation which can be smooth to change and can be patient particular.
- Lollipops may be given to those patients who have problem in swallowing.
- It has a pleasant flavour and it extends the time that a quantity of drug stays inside the oral hollow space to elicit a healing effect also, pharmacist can put together lollipops. extemporaneously with minimal device and time.
- It extends the time of drug inside the oral cavity to elicit a particular effect.
- Easy to put together with minimum amount of equipment and time.
- Do no longer require water intake for management method is non-invasive, as is the case with parenteral.

Disadvantages of medicated lollipops

- Heat labile drugs cannot be used in this formulation because of the high temperatures required for preparation.
- Drugs having minimum bitter taste are suitable.
- Heat stable drugs are suitable.
- For properly stabilization and safety of stable product ODT requires special packaging

Types of lollipops

Hard lollipops

Hard lollipops might be considered solid syrups of sugars. These dosage forms are made by heating sugars and other ingredients together and then pouring the mixture into a mold. Hard lollipops are similar to hard candy. In fact, many hard lollipops formulas are modifications of hard candy formulas. The dosage form needs low moisture content. So water is evaporated off by boiling the sugar mixture during the compound process. Hard candy lollipops are mixtures of sugar and other carbohydrates in an amorphous (noncrystalline) (or) glassy condition. These lollipops can be considered solid syrups of sugars and usually have a moisture content of 0.5%-1.5%. Hard lollipops should not disintegrate but instead provide a slow, uniform dissolution (or) erosion over 30 minutes.

Soft lollipops

Soft lollipops have become popular because of ease with they can be extemporaneously prepared and their applicability to a wide variety of drugs. The base usually consists of a mixture of various PEGs, acacia (or) similar materials glycerol gelatin (or) an acacia: sucrose base. These lollipops may be coloured and flavored and they can be either slowly dissolved in the mouth (or) chewed, depending on the intended effect of the incorporated drug.[12]

Lollipops in long medical journey:

Medicated lollipops are a type of confectionery that contain medications or supplements in their formulations. They are often used as a way to administer drugs to people who have difficulty swallowing pills or who prefer a more enjoyable method of taking their medication.

Some common medications that can be found in medicated lollipops include pain relievers such as acetaminophen or ibuprofen, cough suppressants such as dextromethorphan, and anti-nausea medications such as ondansetron. These medications are typically formulated in a way that allows for slow release into the bloodstream over a period of time.

Paracetamol-infused lollipop: These lollipops have a hardness that varies from 8 to 11 kg/cm3, good physical qualities including flavor and color, good stability, and a moisture content that is less than 1%.Because they are simple to swallow, paracetamol-infused lollipops can offer a tempting alternative formulation for the treatment of fever and pain in young patients and elderly patients.[13]

In addition to medications, medicated lollipops can also contain supplements such as vitamins, minerals, and herbal extracts. These supplements can be added to provide additional

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health benefits beyond those provided by the medication itself.

The condition known as oral thrush comes on by an infection of the mouth brought on by the yeast Candida albicans. When treating oral thrush in young patients, lollipops containing antifungal medications can be a tasty alternative formulation. Ginger powder and clove oil are both used as antifungal medications.[14]

It's important to note that medicated lollipops should only be used under the guidance of a healthcare professional, as they can interact with other medications and may have side effects. Additionally, they should be kept out of reach of children to prevent accidental ingestion.

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