PERSPECTIVE

Buccal medication delivery using polymeric dosage forms

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Bernardi D, Bottaro S, Buccal medication delivery using polymeric dosage forms. J. Pharmacol. Med. Chem. 2022; 6(2):6-7

ABSTRACT

The oral cavity is a desirable location for drug delivery due to the ease of administration. An efficient physiological removal mechanism of the oral cavity that removes the formulation from the buccal site and reduces the bioavailability of pharmaceuticals is the key challenge for delivery via the buccal route. Although some studies have an in vivo performance, the use of mucoadhesive polymers in buccal medication administration reveals measuring buccal drug penetration and absorption. This review discusses the use of polymers in the production of drug delivery systems (hydrogels, films, and tablets) and presents the outcomes of studies done on how well those systems operate *in vivo*.

INTRODUCTION

Due to the high total blood flow that ensures systemic bioavailability, avoiding first-pass hepatic metabolism and gastrointestinal drug degradation, the buccal route is superior than the oral route in a number of ways. Additionally, it is convenient for patient administration and appropriate for administering and removing dosage forms. However, unintentional ingestion of delivery systems and ongoing saliva dilution could result in a short formulation residence time in the buccal cavity and, as a result, a reduced medication bioavailability. Due to this, different bio(muco)adhesive polymers that can provide a strong adhesive contact with the buccal mucosa have been developed. These polymers allow one to extend the residence time of delivery systems and improve drug bioavailability. Polymers and drug delivery methods have been linked, particularly buccal drug delivery. Strong hydrogen bonding groups, strong anionic or cationic charges, high molecular weight, chain flexibility, and surface energy qualities that encourage spreading on a mucus layer are a few structural traits for polymers. It has been investigated if a wide variety of polymers, both natural and synthetic, could be used as mucoadhesives. It is convenient to classify the polymers that stick to the mucin surface into three general groups: 1) Polymers that are sticky in water and owe their bioadhesion to stickiness; 2) Polymers that adhere through general, noncovalent interactions that are primarily electrostatic in nature (although hydrogen and hydrophobic bonding may be significant); and 3) Polymers that bind to particular receptor sites on the surface of cells. Polymers may have desirable properties that make them suitable for use on buccal mucosa, such as being nontoxic, not irritating to the mucous membrane, allowing for flexibility and comfort in the dosage form, adhering quickly to moist tissue, having some site specificity, and facilitating the easy incorporation of the drug without impeding its release. Drugs administered by the buccal route do not exhibit pre-systemic metabolism; instead, it occurs in the gastrointestinal tract and undergoes first pass metabolism in the liver following absorption into the bloodstream. The release of drugs for the buccal route has attracted significant interest in pharmacy and materials science. This interest has grown because the oral route, compared to oral administration, has more advantages and maximizes the therapeutic potential of drugs. To enable the drugs to act at the buccal site or to be absorbed through the mucosa, the dosage forms must remain in contact with the mucous membrane. The inside of the cheek, as well as the space between the upper and lower lips, are covered by a buccal mucosa. It has a surface area of 100 cm2 on average. The purpose of mucosa is to shield underlying tissues from physical and chemical harm. The mucous membrane lining located outside the oral vestibule, the sublingual region, and the specialized

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Received: 07-March-2022, Manuscript No. puljpmc-22-5764; Editor assigned: 09-March-2022, PreQC No. puljpmc-22-5764 (PQ); Reviewed: 16-March-2022, QC No. puljpmc-22-5764 (Q); Revised: 19-March-2022, Manuscript No. puljpmc-22-5764 (R); Published: 26-March-2022, DOI: 10.37532/ puljpmc.22.6(2).6-7

mucosa make up the three types of mucosa that make up the anatomy of the buccal site. The masticatory mucosa is located on the hard palate and gums, whereas the specialized mucosa is located on the dorsal surface of the tongue. The overall surface area of the oral mucosa of an adult human is made up of the mucous membrane lining, the masticatory mucosa, and about 15% of specialized mucosa. The masticatory mucosa covers tissues that are especially vulnerable to stress from chewing activity. The lamina propria joins the masticatory mucosa to the periosteum, and the cells of the mucosa are keratinized. On the other hand, the mucous membrane lining is less vulnerable to these masticatory shears and as a result possesses a non-keratinized epithelium and a thin, elastic lamina linked to the submucosa. The dorsum of the tongue has a unique type of mucosa that is covered in many taste receptors and papillae. The buccal mucosa has a thickness range of 500 to 800 m, while the sublingual and gingival mucosa have thickness values between 100 and 200 m. The epithelial mucosa's nature varies depending on the tissue's function, but in general, it serves as a barrier to medications that are lipophilic. The parotid, submandibular, and sublingual glands secrete saliva, a fairly viscous aqueous fluid. A salivary film, about 70 to 100m thick, covers the mouth's surfaces, protecting the epithelial cells and tooth enamel. Saliva mostly consists of mucous, proteins, minerals, and enzymes. Saliva is a weak buffer system and has a pH range of 5.5 to 7. Its composition and ionic composition are influenced by the type and intensity of stimulation (smell, taste, and type of food). However, due to constant swallowing, the constant volume of saliva in the mouth is approximately 1 mL. Mucus is primarily composed of glycoproteins known as mucins, which are macromolecules with a molecular weight between 0.5 and 20 MDa. The normal salivary flow rate is approximately 0.5 mL min 1, resulting in daily secretion between 0.5 and 2 L. Drugs may be transported through diffusion to low molecular weight molecules, active transport, also known as facilitated diffusion, to polar or ionic substances, or endocytosis and transcytosis for macromolecules through the transcellular pathway, also known as the intracellular pathway. Compared to the sublingual mucosa, the cheek mucosa is less permeable and unable to provide a rapid commencement of absorption; yet, when medications are applied, it may have local or systemic effects. Compared to the other oral mucosa tissues, the buccal mucosa surface is more porous and less mobile. As a result, it becomes a preferred location for the administration of controlled release systems that require long-term adherence.