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Mucosal Drug Delivery System

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I. INTRODUCTION:

Since the first Nineteen Eighties, the thought of mucoadhesion has gained extended interest in pharmaceutical technology.[1] Adhesion may be outlined because the bond created by contact between a pressure sensitive adhesive and a surface. The yank Society of Testing and Materials has outlined it because the state within which 2 surfaces ar command along by surface forces, which can incorporates valence forces, interlocking action or each. Mucoadhesive drug delivery systems prolong the duration of the indefinite quantity type at the positioning of application or absorption. They facilitate an intimate contact of the indefinite quantity type with the underlying absorption surface and therefore improve the therapeutic performance of the drug. In recent years, several such mucoadhesive drug delivery systems are developed for oral, buccal, nasal, body part and duct routes for each general and native effects.[2]

Dosage forms designed for mucoadhesive drug delivery ought to be tiny and versatile enough to be acceptable for patients and may not cause irritation. different desired characteristics of a mucoadhesive indefinite quantity type embody high drug loading capability, controlled
drug unleash (preferably unifacial release), smart mucoadhesive properties, swish surface, tastelessness, and convenient application. Erodible formulations may be helpful as a result of they are doing not need system retrieval at the top of desired dosing interval. variety of relevant mucoadhesive indefinite quantity forms are developed for a spread of medicine. many peptides, as well as protirelin (TRH), insulin, octreotide, leuprolide,
and internal secretion, are delivered via the tissue layer route, albeit with comparatively low bioavailability (0.1–5%),[3] due to their hydrophilicity and enormous relative molecular mass, still because the inherent permeation and catalyst barriers of the mucous membrane.

The development of sustain unleash indefinite quantity type are able to do the aim of cathartic the drug slowly for an extended amount however this is often not decent to induce sustained therapeutic result. they will be cleared from the positioning of absorptionbefore evacuation the drug content. Instead, the mucoadhesive indefinite quantity type can serve each the needs of sustain unleash and presence of indefinite quantity type at the positioning of absorption. during this regard, our review is high lighting few aspects of mucoadhesive drug delivery systems

Bioadhesion and Mucoadhesion:

The term bioadhesion will be outlined because the state within which 2 materials, a minimum of one biological in nature, square measure control along for AN extended amount of your time by surface forces.[4] In biological systems, bioadhesion will be classified into three types:

- Type 1,adhesion between 2 biological phases, as an example, protoplasm aggregation and wound healing.
- Type 2, adhesion of a biological part to a synthetic substrate, as an example, cell adhesion to culture dishes and biofilm formation on prosthetic devices and inserts.
- Type 3, adhesion of a synthetic material to a biological substrate, as an example, adhesionof artificial hydrogels to soft tissues[5] and adhesion of sealants to dental enamel.

For drug delivery functions, the term bioadhesion implies attachment of a drug carrier system to a nominative biological location. The biological surface will be animal tissue or
the secretion coat on the surface of a tissue. If adhesive attachment is to a secretion coat, the development is noted as mucoadhesion. Leung and Robinson[6] delineate mucoadhesion because the interaction between a glycoprotein surface and an artificial or natural chemical compound. Mucoadhesion mustn't be confused with bioadhesion; in bioadhesion, the chemical compound is connected to the biological membrane and if the substrate is secretion membrane the term mucoadhesion is employed.

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ORAL MUCOSA:

Structure:

The oral mucosa is comprised of squamous stratified (layered) epithelium, basement membrane, the lamina propria and submucosa. It also contains many sensory receptors including the taste receptorsof the tongue. The epithelium of the buccal mucosa is about 40-50 cell layers thick, while that of the sublingual epithelium contains somewhat fewer.

Permeability:

The oral mucosa in general is somewhat leaky epithelia intermediate between that of the epidermis and intestinal mucosa. It is estimated that the permeability of the buccal mucosa is 4-4000 times greater than that of the skin. In general, the permeabilities of the oral mucosae decrease in the order of sublingual greater than buccal and buccal greater than palatal. This rank order is based on the relative thickness and degree of keratinization of these tissues, with the sublingual mucosa being relatively thin and non-keratinized, the buccal thicker and non- keratinized, and the palatal intermediate in thickness but keratinized.

Environment:

The cells of the oral epithelia are surrounded by an intercellular ground substance, mucus, the principle components of which are complexes made up of proteins and carbohydrates. These complexes may be free of association or some maybe attached to certain regions on the cell surfaces. This matrix may actually play a role in cell-cell adhesion, as well as acting as a lubricant, allowing cells to move relative to one another. Along the same lines, the mucus is also believed to play a role in bioadhesion of mucoadhesive drug delivery systems.

Composition of Mucus Layer:

Mucus is a translucent and viscid secretion which forms a thin, contentious gel, mean thickness of this layer varies from about 50-450 μm in humans secreted by the globet cells lining the epithelia. It has the following general composition.

- Water -95%
- Glycoprotein and lipids – 0.5-3.00%
- Mineral salts – 1%
- Free proteins – 0.5-1.0% [7] Functions of Mucus Layer:

1. Protective: resulting particularly from its hydrophobicity.
2. Barrier: The role of the mucus layer as a barrier in tissue absorption of the drugs and influence the bioavailability.
3. Adhesion: Mucus has strong adhesion properties.
4. Lubrication: It is to keep the mucus from the goblet cell is necessary to compensate for the removal of the mucus layer due to digestion, bacterial degradation and solubilisation of mucin molecules. [7]

Role of Saliva:

Saliva is composed of 99% water and is complex fluid containing organic and inorganic material. Secretion of saliva is highest during working hours.

1. Protective fluid for all tissues of the oral cavity.
2. Continuous mineralization / demineralization of the tooth enamel.
3. Moisten the oral cavity.[8]

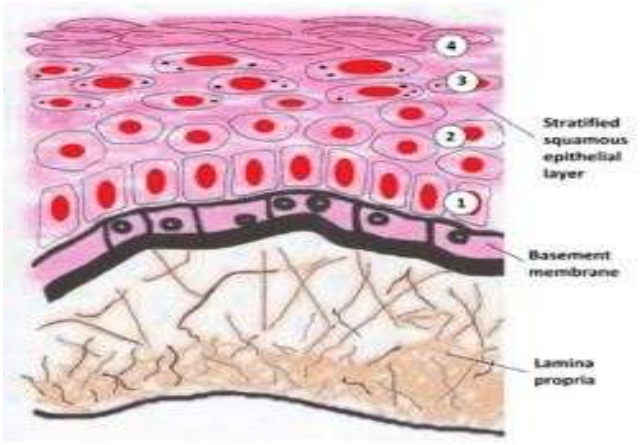

Fig:-mucus membrane

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ADVANTAGES :

Mucoadhesive drug delivery systems offer several advantages over other oral controlled release systems by virtue of prolongation of residence time of drug in gastrointestinal tract(GIT).

Targeting and localization of the dosage form at a specific site.

Also, the mucoadhesive systems are known to provide intimate contact between dosage form and the absorptive mucosa, resulting in high drug flux at the absorbing tissue.[9]

Prolongs the residence time of the dosage form at the site of absorption, hence increases the bioavailability.

Excellent accessibility, rapid onset of action.

Rapid absorption because of enormous blood supply and good blood flow rates.Drug is protected from degradation in the acidic environment in the git.

Improved patient compliance. [10]

DISADVANTAGES:

- Occurrence of local ulcerous effects due to prolonged contact of the drug possessing ulcerogenic property.
- One of the major limitations in the development of oral mucosal delivery is the lack of a good model for in vitro screening to identify drugs suitable for such administration.
- Patient acceptability in terms to taste and irritancy.
- Eating and Drinking is prohibited. [10]

Mechanisms of Mucoadhesion:

The mechanism of adhesion of certain macromolecules to the surface of a mucous tissue is not well understood yet. The mucoadhesive must spread over the substrate to initiate close contact and increase surface contact, promoting the diffusion of its chains within the mucus.Attraction and repulsion forces arise and, for a mucoadhesive to be successful, the attraction forces must dominate.

The mechanism of mucoadhesion is generally divided into two steps:

1.contact stage 2.consolidation stage ration of their chains and the building of secondary bonds [11]. of the mucus mutually interact by means of interpenet For this to take place the mucoadhesive device has features favouringboth chemical and mechanical interactions. The contact stage: is characterized by the contact between the mucoadhesive and the mucus membrane, with spreading and swelling of the formulation, initiating its deep contact with the mucus layer.Beginningits deep contact with the mucus layer [12].In some cases, such as for ocular or vaginal formulations, the delivery system is mechanically attached over the membrane. In other cases, the deposition is promoted by the aerodynamics of the organ to which the system is administered, such as for the nasal route. If the particle approaches the mucous surface, it will come into contact with repulsive forces (osmotic pressure, electrostatic repulsion, etc.) and attractive forces (van der Waals forces and electrostatic attraction). Therefore, the particle must overcome this repulsive barrier[11].

The consolidation stage: the mucoadhesive materials are activated by the presence of moisture. Moisture plasticizes the system, allowing the mucoadhesive molecules to break free and to link up by weak van der Waalsand hydrogen bonds.[10]. Essentially, there are two theories explaining the consolidation step: the diffusion theory and the dehydration theory. According to diffusion theory, the mucoadhesive molecules and the glycoproteins

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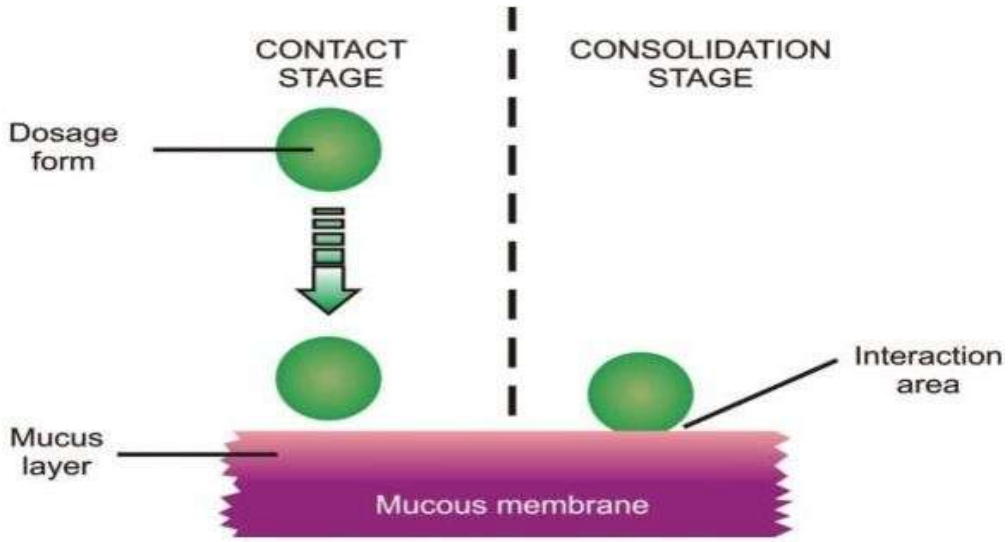

Figure 1: The two steps of the mucoadhesion process

Review of literature:

1) Chinna Reddy P et.al (2011)

This presents a brief description of advantages and limitations of buccal drug delivery and the anatomical structure of oral mucosa, mechanisms of drug permeation followed by current formulation design in line with developments in buccal delivery systems and methodology in evaluating buccal formulations.

2) Rahamatullah Shaikh et.al (2011)
Mucoadhesive drug delivery systems

Mucoadhesive dosage forms may be designed to enable prolonged retention at the site of application, providing a controlled rate of drug release for improved therapeutic outcome.

3) Sanket D. Gandhi et.al (2011)
MUCOADHESIVE DRUG DELIVERY SYSTEMS-AN UNUSUAL MANEUVER FOR SITE SPECIFIC DRUG DELIVERY SYSTEM

Mucoadhesion is a field of current interest in the design of drug delivery systems. Mucoadhesive drug delivery system prolong the residence time of the dosage form at the site of application or absorption and facilitate an intimate contact of the dosage form with the underline absorption surface and thus contribute to improved and / or better therapeutic performance of the drug.

Theories of Mucoadhesion:

Various theories exist to explain at least some of the experimental observations made during the bioadhesion process. Unfortunately, each theoretical model can only explain a limited number of the diverse range of interactions that constitute the bioadhesive bond.[13] However, four main theories can be distinguished.

1) Wetting Theory of Mucoadhesion:

The wetting theory is perhaps the oldest established theory of adhesion. It is best applied to liquid or low-viscosity bioadhesives. It explains adhesion as an embedding process, whereby adhesive agents penetrate into surface irregularities of the substrate and ultimately harden, producing many adhesive anchors. Free movement of the adhesive on the surface of the substrate means that it must overcome any surface tension effects present at the interface.[14]The wetting theory calculates the contact angle and the thermodynamic work ofadhesion.

2) Electrostatic Theory of Mucoadhesion:

According to electrostatic theory, transfer of electrons occurs across the adhesive interface and adhering surface. This results in the establishment of the electrical double layer at the interface and a series of attractive forces responsible for maintaining contact between the twolayers.[15]

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3) Diffusion theory of mucoadhesion:

Diffusion theory describes that polymeric chains from the bioadhesive interpenetrate into glycoprotein mucin chains and reach a sufficient depth within the opposite matrix to allowformation of a semipermanent bond.[16]The process can be visualized from the point of initial contact. The existence of concentration gradients will drive the polymer chains of the bioadhesive into the mucus network and the glycoprotein mucin chains into the bioadhesive matrix until an equilibrium penetration depth is achieved.

4) Adsorption Theory of Mucoadhesion:

According to the adsorption theory, after an initial contact between two surfaces, the materials adhere because of surface forces acting between the chemical structures at the two surfaces.[17] When polar molecules or groups are present, they reorientate at the interface.[18] Chemisorption can occur when adhesion is particularly strong. The theory maintains that adherence to tissue is due to the net result of one or more secondary forces (van der Waal's forces, hydrogen bonding, and hydrophobic bonding).[19–20]

5) Fracture Theory of mucoadhesion:

This theory describes the force required for the separation of two surfaces after adhesion. Thefracture strength is equivalent adhesive strength through the following equation. This theory is useful for the study of bioadhesion by tensile apparatus. [21]

Factors Affecting of Mucoadhesion:

Molecular weight:

The mucoadhesive strength of a polymer increases with molecular weights above 100,000. Direct correlation between the mucoadhesive strength of polyoxyethylene polymers and their molecular weights lies in the range of 200,000–7,000,000.[22]

Flexibility:

Mucoadhesion starts with the diffusion of the polymer chains in the interfacial region. Therefore, it is important that the polymer chains contain a substantial degree of flexibility inorder to achieve the desired entanglement with the mucus.[23] The increased chain interpenetration was attributed to the increased structural flexibility of the polymer upon incorporation of polyethylene glycol. In general, mobility and flexibility of polymers can be related to their viscosities and diffusion coefficients, as higher flexibility of a polymer causes greater diffusion into the mucus network.[24]

Cross-linking density:

The average pore size, the number and average molecular weight of the cross-linked polymers, and the density of cross-linking are three important and inter-related structural parameters of a polymer network. Therefore, it seems reasonable that with increasing density of cross-linking, diffusion of water into the polymer network occurs at a lower rate which, inturn, causes an insufficient swelling of the polymer and a decreased rate of interpenetration between polymer and mucin.[24]

Hydrogen bonding capacity :

Hydrogen bonding is another important factor in mucoadhesion of a polymer. Desired polymers must have functional groups that are able to form hydrogen bonds, and flexibility of the polymer is important to improve this hydrogen bonding potential.[24] Polymers such as poly(vinyl alcohol), hydroxylated methacrylate, and poly(methacrylic acid), as well as all their copolymers, have good hydrogen bonding capacity.[25]

Hydration :

macromolecular mes of sufficient size, and also to induce mobility in the polymer chains in order to enhance the interpenetration process between polymer and mucin. Polymer swelling permits a mechanical entanglement by exposing the bioadhesive sites for hydrogen bonding and/or electrostatic interaction between the polymer and the mucus network.[24] However, a critical degree of hydration of the mucoadhesive polymer exists where optimum swelling and mucoadhesion occurs.[25]

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. Strong anionic charge on the polymer is one of the required characteristics for mucoadhesion.[25] Some cationic polymers are likely to demonstrate superior mucoadhesive properties, especially in a neutral or slightly alkaline medium.[26] Additionally, some cationic high–molecular-weight polymers, such as chitosan,

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have shown to possess good adhesive properties.[27] There is no significant literature about the influence of the charge of the membrane on the mucoadhesion but the pH of the membrane affects the mucoadhesion as it can influence the ionized or un-ionized forms of the polymers.[28]

Concentration :

The importance of this factor lies in the development of a strong adhesive bond with the mucus, and can be explained by the polymer chain length available for penetration into the mucus layer. When the concentration of the polymer is too low, the number of penetrating polymer chains per unit volume of the mucus is small and the interaction between polymer and mucus is unstable. In general, the more concentrated polymer would result in a longerpenetrating chain length and better adhesion. However, for each polymer, there is a critical concentration, above which the polymer produces an "unperturbed" state due to a significantly coiled structure. As a result, the accessibility of the solvent to the polymer decreases, and chain penetration of the polymer is drastically reduced. Therefore, higher concentrations of polymers do not necessarily improve and, in some cases, actually diminish mucoadhesive properties. One of the studies addressing this factor demonstrated that high concentrations of flexible polymeric films based on polyvinylpyrrolidone or poly(vinyl alcohol) as film-forming polymers did not further enhance the mucoadhesive properties of thepolymer.[29]

Sites for Mucoadhesive Drug Delivery Systems:

The common sites of application where mucoadhesive polymers have the ability to deliver pharmacologically active agents include oral cavity, eye conjunctiva, vagina, nasal cavity andGIT.

The buccal cavity has a very limited surface area of around 50 cm^2 but the easy access to the site makes it a preferred location for delivering active agents. The site provides an opportunity to deliver pharmacologically active agents systemically by avoiding hepatic first- pass metabolism in addition to the local treatment of the oral lesions.

The sublingual mucosa is relatively more permeable than the buccal mucosa due to the presence of large number of smooth muscle and immobile mucosa. Hence, formulations for sublingual delivery are designed to release the active agent quickly while mucoadhesive formulation is of importance for the delivery of active agents to the buccal mucosa, where theactive agent has to be released in a controlled manner. This makes the buccal cavity more suitable for mucoadhesive drug delivery.[30] The various mucoadhesive polymers used for the development of buccal delivery systems include cyanoacrylates, polyacrylic acid, sodium carboxymethylcellulose, hyaluronic acid, hydroxypropylcellulose, polycarbophil, chitosan and gellan. The delivery systems are generally coated with a drug and water impermeable film so as to prevent the washing of the active agent by the saliva.[31]

Like buccal cavity, nasal cavity also provides a potential site for the development of formulations where mucoadhesive polymers can play an important role. The nasal mucosal layer has a surface area of around 150–200 cm^2. The residence time of a particulate matter in the nasal mucosa varies between 15 and 30 min, which has been attributed to the increased activity of the mucociliary layer in the presence of foreign particulate matter. The polymers used in the development of formulations for the development of nasal delivery system include copolymer of methyl vinyl ether, hydroxypropylmethylcellulose (HPMC), sodium carboxymethylcellulose, carbopol-934P and Eudragit RL-100.[32,33]

Due to the continuous formation of tears and blinking of eye lids, there is a rapid removal of the active medicament from the ocular cavity, which results in the poor bioavailability of the active agents. This can be minimized by delivering the drugs using ocular insert or patches. The mucoadhesive polymers used for the ocular delivery include thiolated poly(acrylic acid), poloxamer, celluloseacetophthalate, methyl cellulose, hydroxy ethyl cellulose, poly(amidoamine) dendrimers, poly(dimethyl siloxane) and poly(vinyl pyrrolidone).[34,35]

The vaginal and the rectal lumen have also been explored for the delivery of the active agents both systemically and locally. The active agents meant for the systemic delivery by this route of administration bypass the hepatic first-pass metabolism. Quite often, the delivery systems suffer from migration within the vaginal/rectal lumen, which might affect the delivery of the active agent to the specific location. The use of mucoadhesive polymers for the development of

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delivery system helps in reducing the migration of the same, thereby promoting better therapeutic efficacy. The polymers used in the development of vaginal and rectal delivery systems include mucin, gelatin, polycarbophil and poloxamer.[36–38]

GIT is also a potential site which has been explored for a long time for the development of mucoadhesive based formulations. The modulation of the transit time of the delivery systems in a particular location of the gastrointestinal system by using mucoadhesive polymers has generated much interest among researchers around the world. The various mucoadhesive polymers which have been used for the development of oral delivery systems include chitosan, poly(acrylic acid), alginate, poly(methacrylic acid) and sodium carboxymethyl cellulose.[39]

Each site of mucoadhesion has its own advantages and disadvantages along with the basic property of prolonged residence of dosage form at that particular site. In buccal and sublingual sites, there is an advantage of fast onset along with bypassing the first-pass metabolism, but these sites suffer from inconvenience because of taste and intake of food. In GIT, there is a chance for improved amount of absorption because of microvilli, but it has a drawback of acid instability and first-pass effects. Rectal and vaginal sites are the best ones for the local action of the drug but they suffer from inconvenience of administration. Nasaland ophthalmic routes have another drawback of mucociliary drainage that would clear thedosage form from the site.

Mucoadhesive Dosage Forms:

Tablets :

Tablets are small, flat, and oval, with a diameter of approximately 5–8 mm.[40] Unlike the conventional tablets, mucoadhesive tablets allow for drinking and speaking without major discomfort. They soften, adhere to the mucosa, and are retained in position until dissolution and/or release is complete. Mucoadhesive tablets, in general, have the potential to be used forcontrolled release drug delivery, but coupling of mucoadhesive properties to tablet has additional advantages, for example, it offers efficient absorption and enhanced bioavailabilityof the drugs due to a high surface to volume ratio and facilitates a much more intimate contact with the mucus layer. Mucoadhesive tablets can be tailored to adhere to any mucosal tissue including those found in stomach, thus offering the possibilities of localized as well as systemic controlled release of drugs. The application of mucoadhesive tablets to the mucosal tissues of gastric epithelium is used for administration of drugs for localized action.

Mucoadhesive tablets are widely used because they release the drug for a prolonged period, reduce frequency of drug administration and improve the patient compliance. The major drawback of mucoadhesive tablets is their lack of physical flexibility, leading to poor patient compliance for long-term and repeated use.[41–43]

Films :

Mucoadhesive films may be preferred over adhesive tablets in terms of flexibility and comfort. In addition, they can circumvent the relatively short residence time of oral gels on the mucosa, which are easily washed away and removed by saliva. Moreover, in the case of local delivery for oral diseases, the films also help protect the wound surface, thus helping to reduce pain, and treat the disease more effectively. An ideal film should be flexible, elastic, and soft, yet adequately strong to withstand breakage due to stress from mouth movements. Itmust also possess good mucoadhesive strength in order to be retained in the mouth for the desired duration of action. Swelling of film, if it occurs, should not be too extensive in order to prevent discomfort.[44]

Patches :

Patches are laminates consisting of an impermeable backing layer, a drug-containing reservoir layer from which the drug is released in a controlled manner, and a mucoadhesive surface for mucosal attachment. Patch systems are similar to those used in transdermal drug delivery. Two methods used to prepare adhesive patches include solvent casting and direct milling. In the solvent casting method, the intermediate sheet from which patches are punched is prepared by casting the solution of the drug and polymer(s) onto a backing layer sheet, and subsequently allowing the solvent(s) to evaporate. In the direct milling method, formulation constituents are homogeneously mixed and compressed to the desired thickness,and patches of predetermined size and shape are then cut or punched out. An impermeable backing layer may also be applied to control the direction of drug release, prevent drug loss, and minimize deformation and disintegration of the device during the application period.[45,46]

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Gels and ointments :

Semisolid dosage forms, such as gels and ointments, have the advantage of easy dispersion throughout the oral mucosa. However, drug dosing from semisolid dosage forms may not beas accurate as from tablets, patches, or films. Poor retention of the gels at the site of application has been overcome by using mucoadhesive formulations. Certain mucoadhesive polymers, for example, sodium carboxymethylcellulose,[47] carbopol,[48] hyaluronic acid,[49] and xanthan gum,[50] undergo a phase change from liquid to semisolid. This change enhances the viscosity, which results in sustained and controlled release of drugs.

Hydrogels are also a promising dosage form for buccal drug delivery. They are formed from polymers that are hydrated in an aqueous environment and physically entrap drug molecules for subsequent slow release by diffusion or erosion.[51] The application of mucoadhesive gels provides an extended retention time in the oral cavity, adequate drug penetration, as well as high efficacy and patient acceptability. A major application of adhesive gels is the local delivery of medicinal agents for the treatment of periodontitis, which is an inflammatory and infectious disease that causes formation of pockets between the gum and the tooth, and can eventually cause loss of teeth. It has been suggested that mucoadhesive polymers might be useful for periodontitis therapy when incorporated in antimicrobial-containing formulations that are easily introduced into the periodontal pocket with a syringe.[52–54] HPMC has been used as an adhesive ointment ingredient. Additionally, a highly viscous gel was developed from carbopal and hydroxypropylcellulose for ointment dosage forms that could be maintained on the tissue for up to 8 hours.[2]

Penetration Enhancers :

In order to design penetration enhancers, with improved efficacy and reduced toxicity profile it is required to understand the relationship between enhancer structure and the effect induced in the membrane and the mechanism of action. However, selection of enhancer and its efficacy depends on the physicochemical properties of the drug, nature of the vehicle and other excipients which are drug specific and should be safe and non-toxic, pharmacologically and chemically inert, non-irritant, and non-allergenic. One of the major disadvantages associated with buccal drug delivery is the low flux which results in low drug bioavailability (55). Hence, various compounds have been investigated for their use as buccal penetration enhancers in order to increase the flux of drugs through the mucosa classified in table 1.

Table 1
Penetration enhancers and their mechanism of action.

Category	Examples	Mechanism of action
Surfactants	Anionic: Sodium lauryl sulfate Cationic: Cetyl pyridinium chloride Nonionic: Poloxamer, Brij, Span, Myrj, Tween	Perturbation of intercellular Lipids and protein domain integrity
Bile salts	Sodium glycocholate, Sodium tauro deoxycholate, Sodium tauro cholate	Perturbation of intercellular Lipids and protein domain integrity
Fatty acids	Oleic acid, Caprylic acid, Lauric acid, Lyso phosphatidyl choline, Phosphatidyl choline	Increase fluidity of phospholipid domains
Cyclodextrins	α, β, γ, Cyclodextrin, methylated β –cyclodextrins	Inclusion of membraneCompounds
Chelators	EDTA, Citric acid, Sodium salicylate, Methoxy salicylates	Interfere with Ca^{+}
Positively charged Polymers	Chitosan, Trimethyl chitosan	Ionic interaction with negative charge on the mucosal surface
Cationic Compounds	Poly-L-arginine, L-lysine	Ionic interaction with negative charge on themucosal surface

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Mechanism of permeation enhancers:

(i) Changing mucus rheology

Mucus forms viscoelastic layer of varying thickness that affects drug absorption. Further, saliva covering the mucus layers also hinders the absorption. Some permeation enhancers› act by reducing the viscosity of the mucus and saliva overcomes this barrier.

(ii) Increase in the fluidity of lipid bilayer membrane

The most accepted mechanism for drug absorption through buccal mucosa is intracellular route. Some enhancers disturb the intracellular lipid packing by interaction with either lipid or protein components.

(iii) Action on the components at tight junctions

Some permeation enhancers act on desmosomes by disturbing and or interacting with the components of the desmosomes, a major component at the tight junctions.

(iv) Overcoming the enzymatic barrier

The buccal permeation enhancers act by inhibiting the various peptidases and proteases present within buccal mucosa, thereby overcoming the enzymatic barrier. In addition, changes in membrane fluidity also alter the enzymatic activity indirectly.

(v) Increase in the thermodynamic activity of drugs

Some permeation enhancers alter the partition coefficient of the drug there by increase the solubility. This leads to increased thermodynamic activity resulting better drug absorption.

Scope of present:

Mucoadhesive drug delivery gives rapid absorption and good bioavailability due to its considerable surface area and high blood flow. Drug delivery across the mucosa bypasses the first-pass hepatic metabolism and avoiding the degradation of gastrointestinal enzymes.Drug delivery is the method or process of administering a pharmaceutical compound to achieve a therapeutic effect in humans or animals. The focus of pharmaceutical research is being steadily shifted from the development of new chemical entities to the development of novel drug delivery system (NDDS) of existing drug molecule to maximize their effect in terms of therapeutic action and patient protection. Mucoadhesive systems are known to provide intimate contact between dosage form and the absorptive mucosa, resulting thereby in a high drug flux through the absorbing tissue.

II. CONCLUSION:

This overview about the mucoadhesive dosage forms might be a useful tool for the efficient design of novel mucoadhesive drug delivery systems. Mucoadhesive drug delivery systems have applications from different angles, including development of novel mucoadhesives, design of the device, mechanisms of mucoadhesion and permeation enhancement. With the influx of a large number of new drug molecules due to drug discovery, mucoadhesive drug delivery will play an even more important role in delivering these molecules.

In addition, mucoadhesive dosage forms have been used to target local disorders at the mucosal surface to reduce the overall dosage required and to minimize the side effects that may be caused by the systemic administration of the drugs. The mucoadhesive dosage forms offer prolonged contact at the site of administration, low enzymatic activity, and patient compliance.

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