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Mucoadhesive Drug Delivery System : Overview

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ABSTRACT:

A new drug delivery system was developed utilizing both the concept of controlled release and mucoadhediveness,so as to get unique drug delivery system which could remains in close contact with the absorption the mucus membrane,releasing the drug at the positioning resulting in improvement in both local and systemic effect and controlled the drug release for extended period of your time.like different route of mucoadhesive drug delivery,the oral route is most desired by patient.Although ,preoral administration of drug shows various disadvantages like hepatic first - pass metabolism and enzymatic degradation within alimentary canal,that prohibit oral administration of certain classes of medication especially protein and peptides.

KEYWORDS: Mucoadhesion, Bioadhesion, Theories, Mechanism.

Introduction

In the year 1980s the term mucoadhesion are come in existence in pharmaceutical technology .The American society of testing and material has defined as is at state in which two surfaces are held together by interfacial forces,which may consist of valence forces,interlocking action or both.MDDS have been developed for Buccal,Nasal,Rectal,Ocular,vaginal,Gastrointestinal route.

Adhesion it can be defined as the bond form by creating contact between a pressure - sensitive adhesive and a surface. Mucoadhesion it can be defined as the Adhesion form betwaeen two materials, at leat one of the always is mucosal surface and another is biological membrane .Different theories of mucoadhesion or bioadhesionElectronic theory Absorption theory Wetting theoryDiffusion theoryFracture theory Mechanical theory.

Bioadhesion is a state which show two state one is biological in nature it control together forlonger period of time .

ADVANTAGES:

Mucoadhesive drug delivery system gives several advantages on the controlled oral controlled release system by virtue of increases of residence of drug in gastrointestinal tract.

- targeting and localization of the dosage form at a specific site
- high drug flux on the absorbing tissue
- it show excellent accessibility
- it show painless administration
- it show low enzymatic activity and avoid of first-pass metabolism7)improved patient compliance

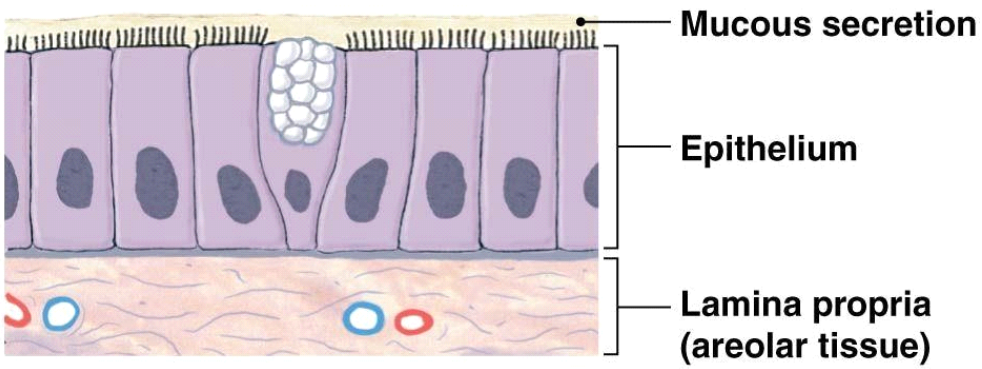
DISADVANTAGES:

- it produce local ulcerous effect because longer contact of drug create ulcerogenic property
- some cases of mucosal route,the non uniform distribution of drugs within mucin or saliva on release form a solid or semisolid delivery system could mean that some areas of the oral cavitymay not receive effective levels
- both local and systamic action ,patients acceptability in terms of taste,irritancy and mouthfee is an issue.
- eating and drinking is prohibited in case of Buccal route

MUCUS MEMBRANE:

The mucus membrane are linings of ectodermal origin.it consists of epiyhelium layer and an underlying lamina propria of lose connective tissue .Linings of cavities that are exposed to the external environment and to internal organs .the mucus membrane are involved in absorption and secretions. Some mucus membrane secrete mucus ,mucus is a thick protective fluid.one of the major function of mucus provides protection and

lubrication. Mucus membrane is also stop entry of pathogens and dirt into the body. Mucus is translucent and viscid secretion which form a thin continuous gel adherent to mucusoal epithelial surfaces composition of mucus ,water 95 %,glycoproteins and lipids 0.5 -5%,mineral salts 1%,free proteins 0.5-1 %.

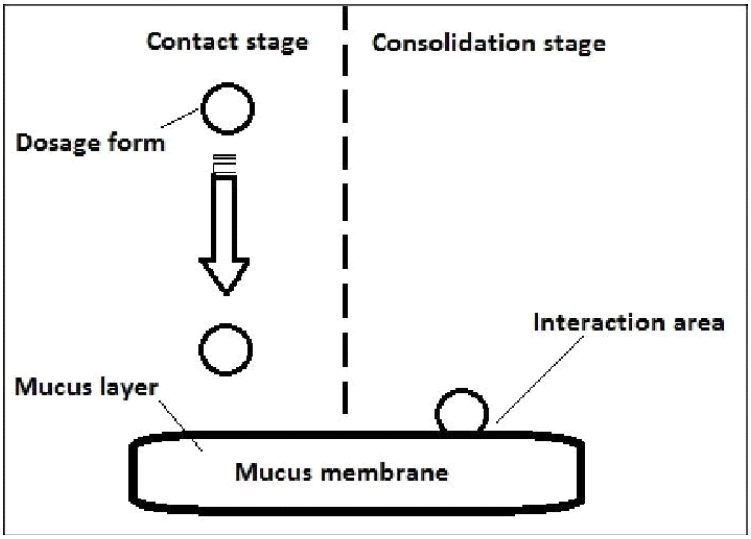


a **Mucous membranes are coated with the secretions of mucous glands. These membranes line the digestive, respiratory, urinary, and reproductive tracts.**

MECHANISM OF MUCOADHESION:

The mechanism of mucoadhesion is generally divided into two steps wich are follows-A)contact stage B) consolidation stage

Step one is contact stage in which intimate contact is formed between the mucoadhesive and mucus membrane. Within the buccal cavity the formulation can be placed in contact with mucosa with spreading and swelling of formulation, and then formulation form deep contact with mucus layer.

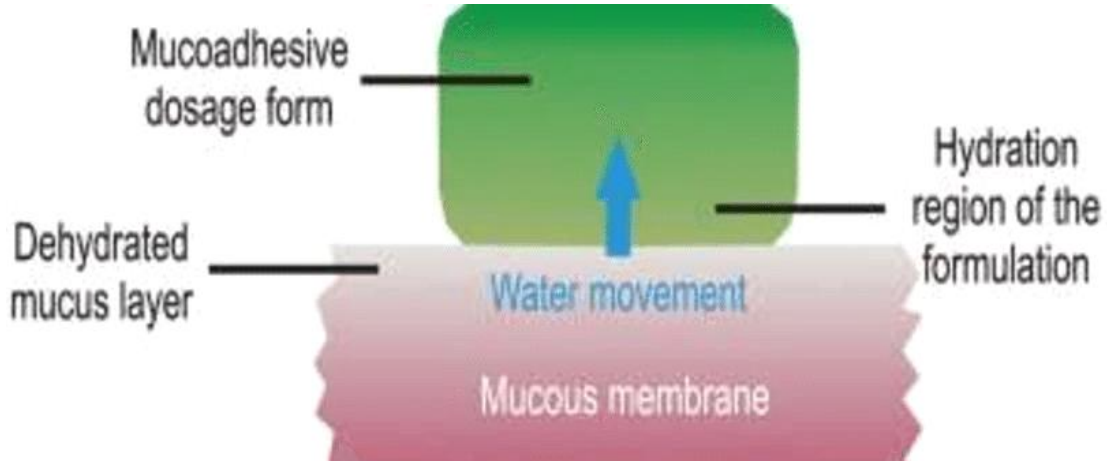


Consolidation stage in which mucoadhesive materials are activated by the presence of moisture. There are two theories explaining the consolidation steps-

- Diffusion theory
- Dehydration theory

According to Diffusion theory glycoproteins and mucoadhesive molecules are get combine with each other and they form contact betwwin their chains and structures of its secondary bonds.This results both chemical and mechanical interactions by mucoadhesive device.

According to dehydration theory ,materials get gelify in an aqueous environment, when placed in contact with the mucus can cause its dehydration due to the difference of osmotic pressure. Because the difference in concentration gradient it fall water into the formulation up to the osmotic balance is reached.This process form mixture of formulation and mucus and it increasecontact time with the mucus membrane.



- **THEORIES OF MUCOADHESION AND BIOADHESION :**

- Electronic Theory

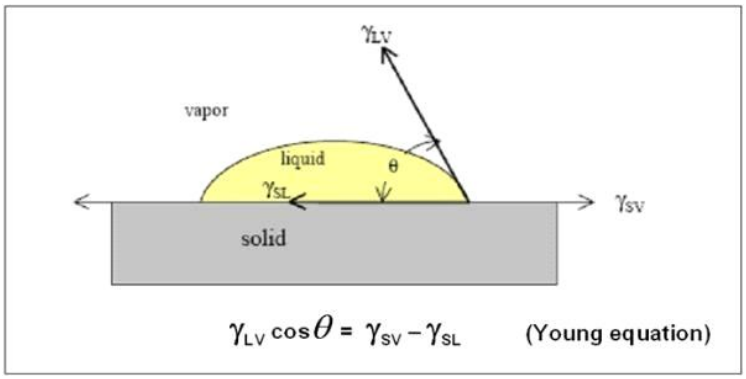
- Electronic theory of mucoadhesion is depends on transferring of electrons between the mucoadhesive and biological materials. When mucus membrane and biological materials possessing opposite electrical charge and then comes in contact with each other they transfer electrons.and hence transformation of electrons and hence transformation of electrons from double elections layer on the interface ,on the site at which attractive forces within the electronic double layer and it can give mucoadhesive strength.

- adsorption theory

-according to this theory the mucoadhesive device is attached to biological membrane or mucus membrane with the help of secondary chemical interactions .this reactionare hydrophobic interactions, electrostatic interactions vander waals and hydrogen bonds.

- wetting theory-

Wetting theory is applied to liquid systems. For example gel,creams,semosolid .which present sympathy to the surface in order to spread over it.This sympathy can be found with the help of contact angle .the contact angle is directy proportional to the affinity.the lower the contact angle,grater is the affinity. Contact angle should be equal or close to zero to provide sufficient spreadibility

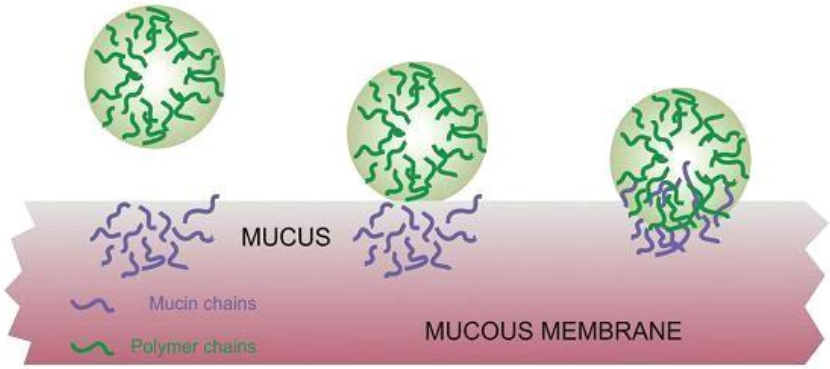


- mechanical theory

- according to mechanical theory considers Adhesion to be due to the fillingof the irregularities on a rough surface by a mucoadhesive liquid.the roughness of surface increases to the interfacial area available to the interactions thereby help dissipating energy and can be considered the most important phenomenon of the process.

- Diffusion Theory-

According to diffusion theory,expounding of both polymer and mucin chains to a sufficient depth to crate a semi-permanat adhesive bond adhesion force increases with the degrees of penetration of the polymer chains.The penetration rate depends on the diffusion coefficient ,felixibility and nature of the mucoadhesive chains,mobility and contact time.



With the help of the literature, the depth of combining required to produce and efficient

bioadhesive bond lies in the range 0.2-0.5um .The depth between the polymer and mucin chaincan be calculated by following equation

L=(tDb)1/2.

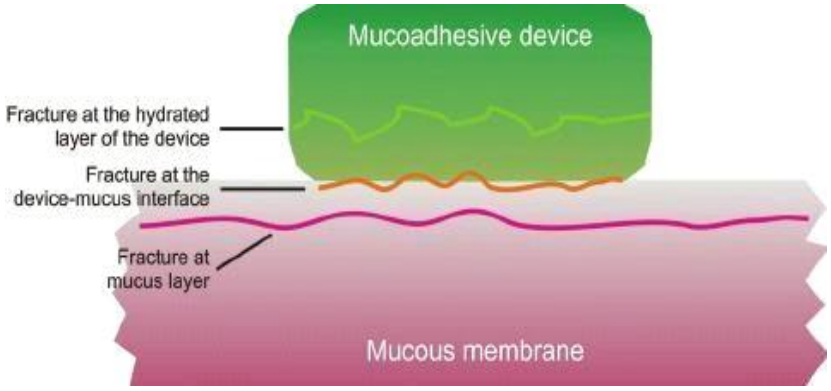
In this equation t is contact time and Db- diffusion coefficient When the structure are similar they create

strong adhesive bond.

- Fracture Theory

-fracture theory is commonly used in mechanical measurement of mucoadhesion. It study the force is require to separate two surfaces after adhesion is accepted.in test of resistance force ,sm is calculated by the ratio of the maximal attachment force ,Fm and total surface area ,A0 are involved in the adhesive interaction

Sm=Fm/A0.



- **Mucoadhesive Dosage Form**

Tablets-

Tablets are a samll ,flat ,oval and solid dosage form .tablet having diameter 5- 8nm(28).Tablets are soften and adhere to the mucosa ,and are retained in site they are located upto dissolution and release is complete. Mucoadhesive tables, commonly used in mucoadhesive drug delivery it offers well absorption and enhanced bioavilabity of the drugs mucoadhesive tabltes can adhere to any mucosal tissue including those found in stomach ,thus offering the possibilities of localized as well as systamic controlled release of drugs mucoadhesive Tablets are widely used because they release the drug for longer period, reducedfrequency of drug administration and imrove patient compliance (29-31).

Films :

mucoadhesive film may be preferred over adhesive tables in terms of flexibility and comfort. Mucoadhesive films which are easily washed and removed by saliva.the pedal mucoadhesive film should be flexible, elastic ,elastic and soft (32)

Patches :

- patches are consisting of an impermeable backing layer,patch system are similar to these uesd in transdermal drug delivery. Two methods are generally used to prepare adhesive patches include solvent clasting and direct milling.impermeable backing layer may aslo be applied to control the direction of drug release,parent drug loss and minimize deformation anddisintegration of the device during the application

Gel and Ointment :

This are solid dosage form .the application of mucoadhesive gel provides an extended retention time in the oral cavity, increase affinity of drug penetration,as well as high efficacy and patients acceptability. A one of the most important application of adhesive gels is an inflammatory and infectous disease (40-42) HPMC has been used as an adhesive Ointments.

PROPERTIES OF MUCOADHESIVE DOSAGE FORM:

-mucoadhesive dosage form include high drug loading capacity.

-controlled drug release .

-it has smooth surface ,tasteless,and convinent to patients.

-increase bioavilabity.

-decrease drug fluctuations.

CONCLUSION:

This overview about the mucoadhesive dosage form might be a useful too for the efficient design of novel mucoadhesive drug delivery systems. Mucoadhesive drug delivery systems have applications from different angle,including permeation enhancement, mechanism of mucoadhesion, design of the device, development of novel mucoadhesive. Will play an even moreimportant role in delivery these molecules.

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