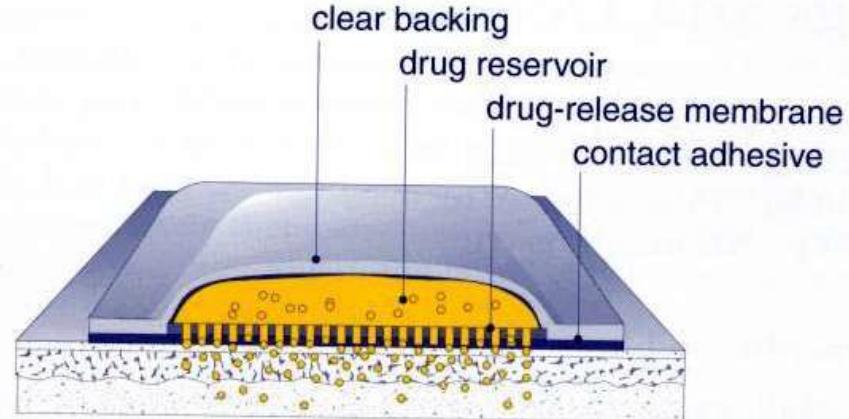


# **TRANSDERMAL DRUG DELIVERY SYSTEM (TDDS) Part-3**

## BASIC COMPONENTS OF TDDS

- Polymer matrix
- The drug
- Permeation enhancers
- Other excipients



### 1. Polymer matrix

#### Ideal polymer

- MWT, and chemical functionality of the polymer should not affect the diffusivity of drug and its release
- Stable
- non reactive
- easily manufactured
- easily fabricated into desired product
- Inexpensive
- degradation product must be non toxic or non antagonistic to the host
- Should retain its mechanical properties when the large amount of drug is loaded in to it.

# **Polymers used in TDDS**

## **Natural polymers**

- Cellulose derivatives
- Zein
- Gelatin
- Shellac
- Waxes
- Proteins
- Gums
- Natural rubbers
- starch

## **Synthetic polymers**

- PVA,
- PVC,
- PE,
- PP,
- Poly amide,
- Polyacrylate,
- Polyurea,
- PVP, PMMA, Epoxy etc.

## **Synthetic elastomers**

- Polybutadiene
- hydrin rubber
- Polysiloxone
- silicone rubber
- Nitrile
- Acrylonitrile
- butyl rubber
- styrene butadiene rubber
- neoprime etc.

## **2. Suitable drug candidate**

### **Physico chemical properties of drug**

- Should have MW less than 1000 daltons(800-1000)
- Should have affinity for both lipophilic and hydrophilic phases
- Should have low melting point

### **Biological properties of drug**

- Should be potent(less than 20mg)
- Half life should be short
- Must not induce a cutaneous irritant or allergic response
- Drugs which degrade in the GI tract or inactivated by hepatic first pass effect are suitable candidate
- Tolerance to the drug must not develop
- Drugs which has to be administered for a longer period of time can be formulated
- Drugs which cause adverse effects to non target tissues can also be formulated

### **3. PERMEATION ENHancers (to enhance stratum corneum permeability)**

#### **Solvents**

Increases penetration by swelling the polar pathway transport or fluidising lipids Eg. water, ethanol, methanol,DMS,homologs of methyl sulphoxide, dimethyl acetamide, and DMF,2-pyrrolidone,N-methyl,2-pyrrolidone,laurocapram,PG, glycerol, silicone fluids, isopropyl palmitate.

#### **Surfactants**

Enhances the polar pathway transport of hydrophilic drugs

#### **Anionic surfactants**

Dioctyl sulpho succinate,SLS,deco decylmethyl sulphoxide etc.

#### **Non ionic surfactants**

Pluronic F127,Pluronic F68,etc.

#### **Bile salts**

Sodium taurocholate,sodium deoxy cholate,sodium tauroglycocholate.

#### **Binary systems**

Propylene glucol-oleic acid and 1,4-butane diol-linoleic acid

#### **Miscellaneous**

Urea-hydrating and keratolytic agent,N,N-dimethyl-m-toluamide,calcium thioglycolate,anti cholinergic agents

#### **Potential permeation enhancers**

Euclyptol,di-o-methyl- $\beta$ -cyclodextrin and soyabean casein

## **Permeability Coefficient Is the Critical Predictor of Transdermal Delivery**

$$\text{Transport} = \text{Flux} = (\text{mg/cm}^2/\text{sec}) = P \times A \times (C_d - C_r)$$

$$\text{Permeability Coefficient} = P = \frac{D \times K}{h} \text{ (cm/sec)}$$

Where A = Surface area of patch

D = Diffusivity of drug in membrane (skin)

K = Partition coefficient (patch/skin)

C = Concentration in donor or receptor  
(patch or skin)

h = Thickness of membrane (skin)

## General Terms

**Backing** - The material, i.e. film, foam, nonwoven, etc. , used as the outermost layer of the transdermal or medical system to protect the product during the wear period.

**Membrane** - A material placed between the drug formulation and the final layer of adhesive. The diffusion properties of the membrane are used to control availability of the drug and/or excipients to the skin.

**Liner** - The film, removed and discarded prior to patch application, that protects the transdermal system by covering the adhesive side.

**Laminate** - Two or more materials combined in layers to form a single substrate.

**Occlusive** - Refers to a material's ability to limit diffusion. Generally used in characterization of backings with respect to moisture vapor and oxygen diffusion. An occlusive backing would have very low diffusion rates.

## **4. OTHER EXCIPIENTS**

### **Adhesives**

- pressure sensitive polymeric adhesive .
- Serves to adhere the components of the patch together along with adhering the patch to the skin.

### **Ideal properties**

- Should not irritate or sensitize the skin or affect normal functions of the skin
- Should adhere to the skin aggressively
- Should be easily removed
- Should not leave an un washable residue on the skin
- Should have an intimate contact with the skin
- Should be compatible with the drug, excipients and permeation enhancers
- Permeation of drug should not be affected