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Transdermal Drug Delivery System

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Abstract: A various non-invasive administration have recently emerged as an alternative toconventional needles. Transdermal drug delivery system is most attractive method.
The transdermal as route has numerous advantages over the more traditional drug delivery system and they include high bioavailability, absence of first pass hepatic metabolism, steady drug plasma concentration. and the fact that therapy is non-invasive. TDDS could be applicable in not only
Pharmaceuticals but also in the skin industry, including cosmetics. Transdermal drug delivery has made an important contribution to medical practice such as diabetes, hemo rrhoids arthritis, migraine and Schizophrenia treatment, but yet to fully achieve it's potential in the treatment of Obesity. The adhesive of the transdermal drug delivery system is critical to the safety, efficacy and quality of product.
Keywords: Transdermal delivery, Skin Penetration, enhancer, evaluation and application.

I. INTRODUCTION

Transdermal drug delivery is defined as Self contained. discrete dosage forms, which when applied to the intact skin deliver the drug Through the skin at controlled rate to the systemic circulation TDDS are also known as patches are dosage forms. designed to deliver a therapeutically effective amount of drug across a patients skin. deliver the therapeutic agents through the human skin for systemiceffects, the comprehensive morphological, biophysical and physicochemical properties of the skin are to be of considered.
Transdermal drug delivery is defined as self contained, discrete dosage forms which,when applied to the intact skin, deliver the drug, through the skin at controlled rate to the systemic circulation. Transdermal drug delivery system (TDDS) established itself as an integral part of novel drug delivery systems.

A. Advantages of Transdermal drug Delivery System

1) Improved the therapeutic bioavailability.
2) Lower risk of abuse addiction or accidental Overdose.
3) Controlled and Steady delivery.
4) Avoidance of first pass metabolism of drug.
5) No intereference with gastric and intestinal fluids.
6) Comparable Characteristics with intravenous infusion.
7) Self administration Is possible with these system.
8) The drug can be terminated at any point of time by removing transdermal patch.
9) The simplified medication regimen leads to improved patient compliance andreduced inter & intra – patient variability.
10) At times the maintenance of the drug concentration within the diphase is not desired. Application and removal of transdermal patch produce the optimal sequenceof pharmacological effect.

B. Disadvantage of Transdermal drug Delivery System

1) TDDS (Transdermal drug delivery system) cannot achieve high drug levels. inblood plasma.
2) The barrier function of the skin changes from one side to another on the SamePerson.
3) Possibility of local imitation at the site of application.
4) Skin imitation or contact dermatitis due to drug or excipients.
5) The molecular size of the drug should be reasonable to be absorbedPercutaneously.
6) Only relatively potent drug are suitable candidates for TDDS.

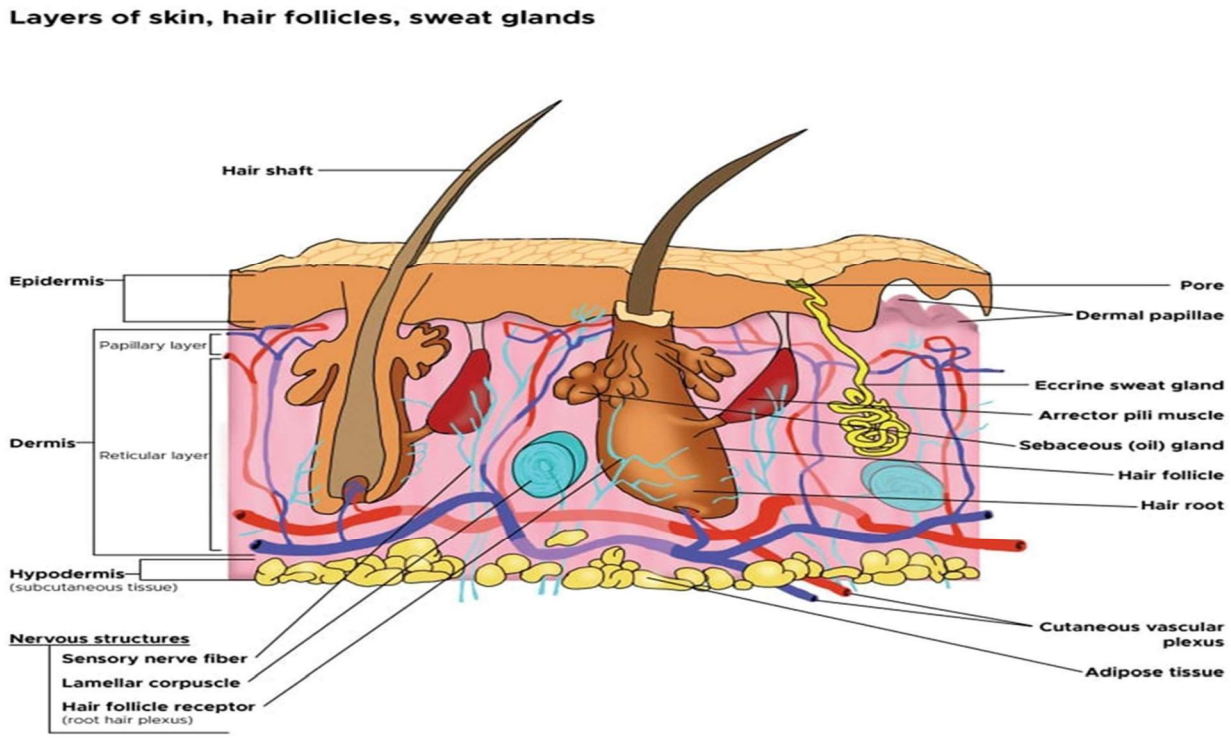
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II. SKIN AS A SITE FOR DRUG INFUSION

The skin of an average adult body covers a surface area of approximately two square meters and receives about one-third of the blood circulating through the body. The skin is a multilayered organ composed of many histological layers. It isgenerally described in terms of three major tissue layers: the epidermis, the dermis, and the hypodermis (Fig 1). Microscopically, the epidermis further divided into five anatomical layers with stratum corneum forming the outer most layer of the epidermis, exposing to the external environment.

An average human skin surface is known to contain, on the average, 40-70 hair follicles and 200-250 sweat ducts on each square centimeter of skin area. These skin appendages, however, a ctually occupy, grossly, only 0.1% of the total humanskin surface

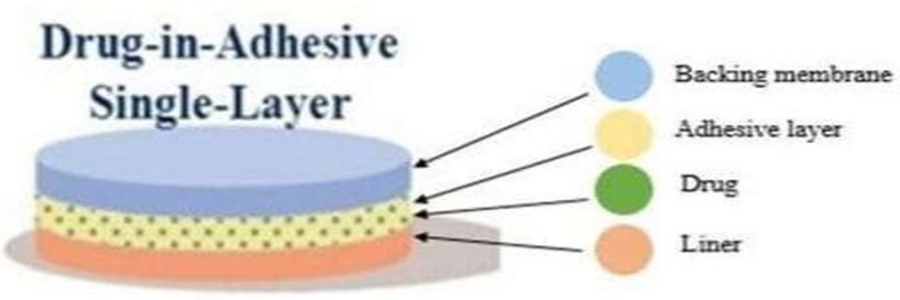


III. TYPES OF TRANSDERMAL PATCHES

There are four types of transdermal patches:

A. Single–layer drug in–Adhesive

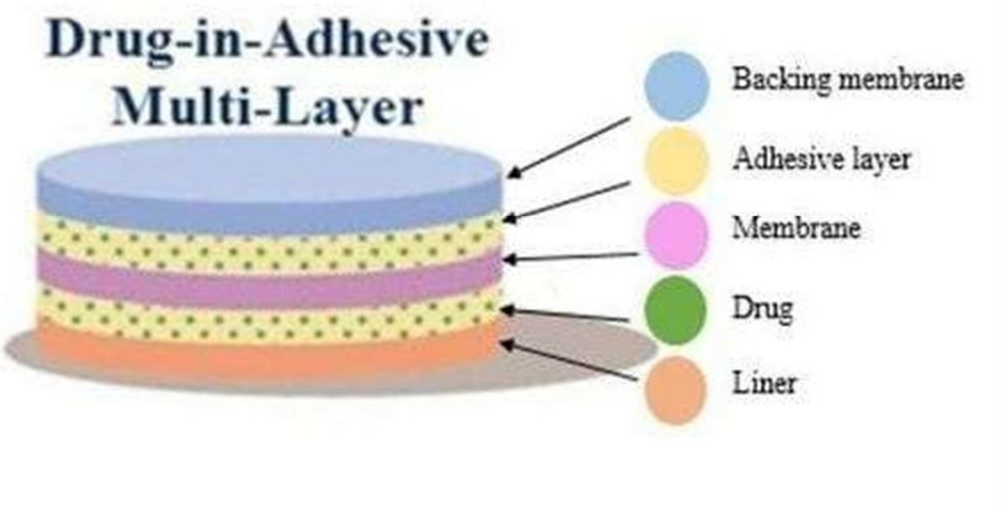
The adhesive layer of this system also contains the drug. In this type patches the adhesive layer not only serves to adhere the various layer together, along with entire system to the skin but is also responsible for the releasing of the drug. The adhesive layer is surrounded by a temporary liner and backing.



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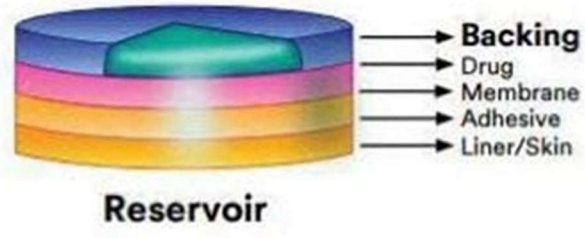
B. Multi-layer Drug in Adhesive

The multi layer drug in adhesive is similar to the single layer system in that both adhesive layer are also responsible for the releasing of the drug. But it is different however that it adds another layer of drug in – adhesive, usually separated by membrane. This patch also has a temporary liner – layer and a permanent backing.



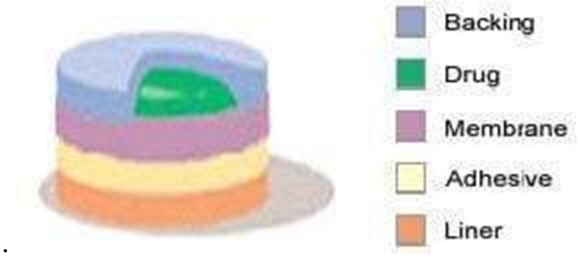
C. Drug reservoir-in-adhesive

Reservoir transdermal system has a separate drug layer. The drug layer is a liquid compartment containing a drug separated by the solution or suspension backing layer. In this type of system the rate of release is zero order.



D. Drug reservoir-in-adhesive:

This matrix system has a drug layer of semisolid matrix containing a drug soln or suspn. The adhesive layer in this patch surrounds the drug layer partially overlaying



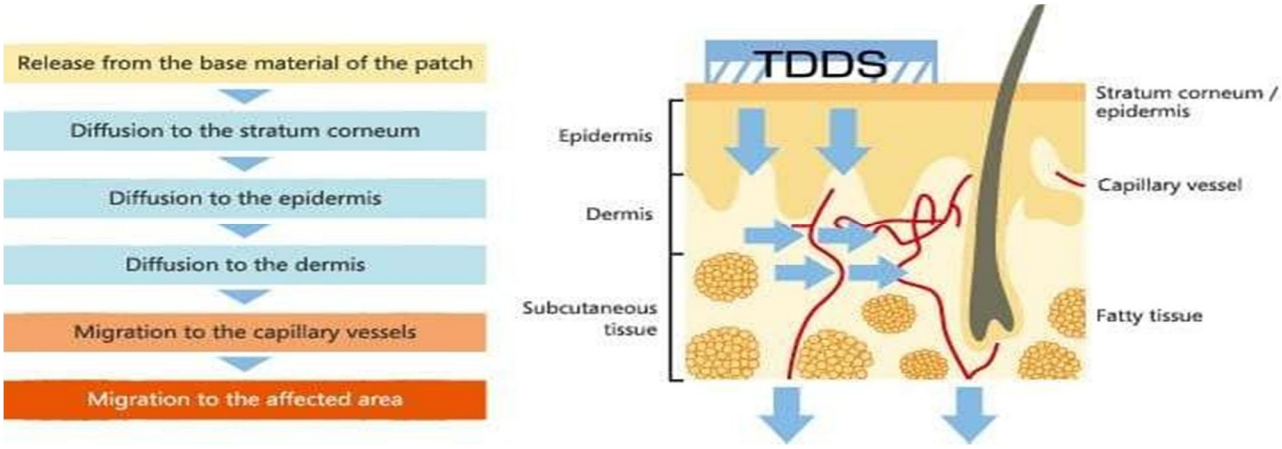
IV. EVALUATION OF TDDS

1) *Thickness:* travelling microscope, dial gauge, screw gauge or micrometer atdifferent points of the film.
2) *Uniformity of Weight:* weighing 10 randomly selected patches andcalculating the average weight.
3) *Drug Content Determination:* An accurately weighed portion of film(about 100 mg) is dissolved in 100 mL of suitable solvent and estimated spectrophotometrically.

4) *Content Uniformity Test:* 10 patches are selected. If 9 out of 10 patcheshave content between 85% to 115% of the specified value and one has content notless than 75% to 125% of the specified value.
5) *Moisture Content:* Films are weighed individually and kept in a desiccators containing calcium chlorideThe films are weighed again after a specifiedinterval until they show a constant weight.

% Moisture content = Initial weight - Final weight X 100

V. MECHANISM OF ACTION OF TRANSDERMAL PATCH



A. *Iontophoresis*

1) Iontophoresis passes a few mili amperes of current through the electrode placedin contact with the formulation, which facilitates drug delivery across the barrier.
2) Mainly used of pilocarpine delivery to induce sweating as part of cystic fibrosisdiagnostic test.
3) Iontophoretic delivery of lidocaine appears to be a promising approach for rapidonset of anesthesia.

B. *Electroporation*

1) Electroporation is a method of application of short, high-voltage electrical pulses tothe skin.
2) After electroporation, the permeability of the skin for diffusion of drugs is increasedby 4 orders of magnitude.
3) The electrical pulses forms transient aqueous pores in the stratum corneum, for drugtransport.
4) It is safe and the electrical pulses can be administered painlessly.

C. *Application by Ultrasound*

Application of ultrasound, particularly lowfrequency ultrasound, has been shown to enhance transdermal transport of various drugs including macromolecules. It is also known as sonophoresis.

D. *Use of Microscopic Projection*

1) Transdermal patches with microscopic projections are called microneedles.Needles ranging from approx. 10-100 μm in length are arranged in arrays.
2) When pressed into the skin, the arrays make microscopic punctures thatare large enough to deliver macromolecules, but small enough that the patient does not feel the penetration or pain.
3) Used in development of cutaneous vaccines for tetanus and influenza.

VI. CONCLUSION

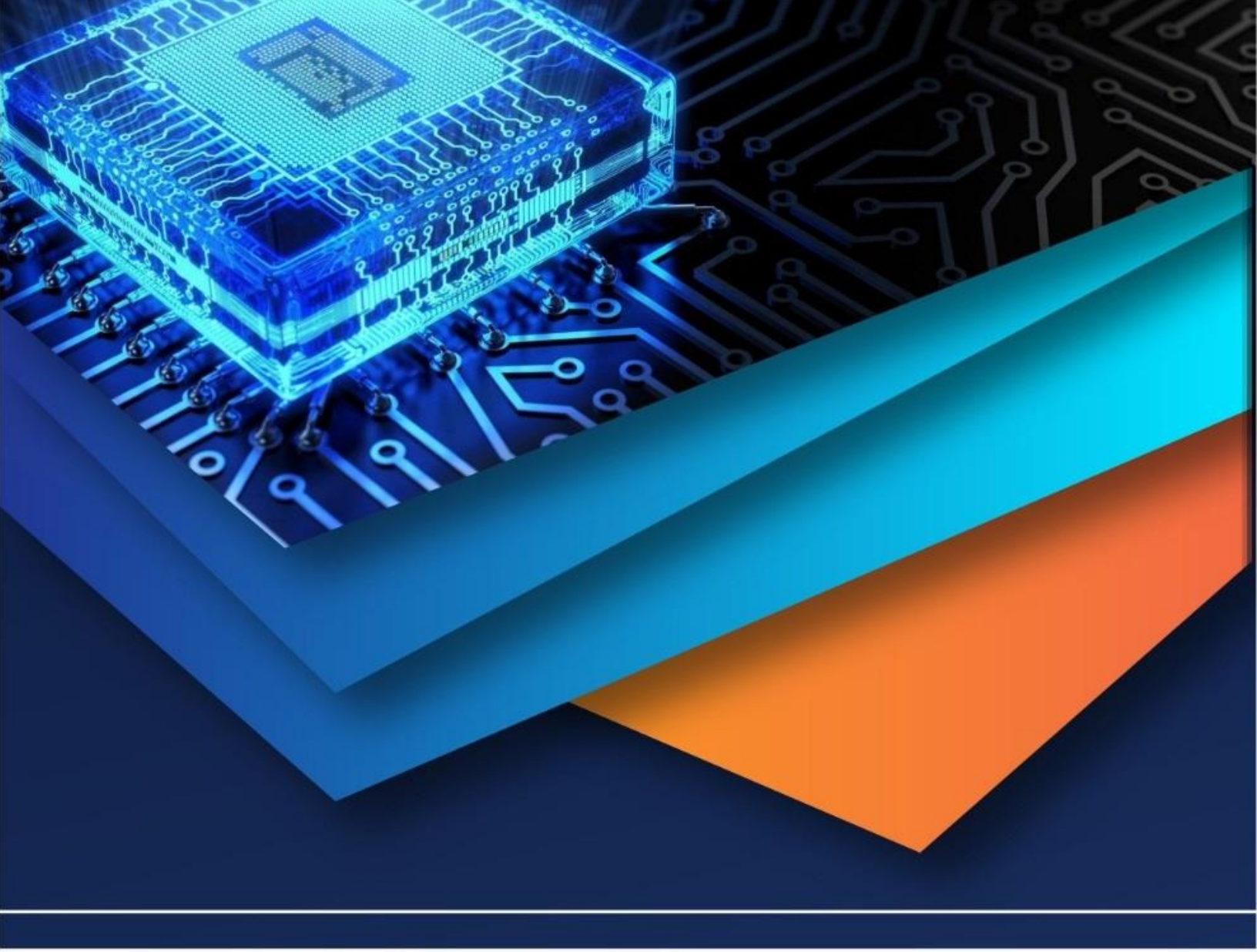
This article provide an valuable information regarding the transdermal drugdelivery systems and its evaluation process details as a ready reference for the research scientist who are involved in TDDS. To optimize this drug delivery system, greater understanding of the different mechanisms of biological interactions, and polymer are required. TDDS a realistic practicalapplication as the next generation of drug delivery system.

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