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A REVIEW ON TRANSDERMAL PATCHES

Sayali Sunil Jadhav, Bhumika Pravin Patil

Anandi Pharmacy College, Kalambe Tarf Kale, Tal Karveer, Dist Kolhapur, India.

ABSTRACT

Many changes are made in the first metabolic pharmacy that passes into the liver. Marine drug delivery system is underway. Drug control of the local delivery system does not provide continuous administration, but allows continuous input of drugs with short biological half-life. The normal dermal patch uses a special membrane on which fluid-containing patches can pass through the reservoir and into the bloodstream. The first advantages of using this system are such as metabolic testing, targeted delivery in low doses. TDDS consists of several groups in front of membrane permeation controlled TDDS, adhesive diffusion type TDDS, polymer matrix diffusion controlled TDDS, mini reservoir type TDS. In this article we will discuss the Transformal Drag Delivery Patch.

Keywords*:* **-** Transdermal, physiology, advantages, disadvantages, components

INTRODUCTION

The most common form of drug delivery is oral. This route of administration has significant advantages and also significant disadvantages such as first-pass metabolism, drug degradation in the gastrointestinal tract due to enzymes, and pH. A new drug delivery system was developed to overcome these difficulties. The Transdermal Drug Delivery System (TDDS), also called "patches", are dosage forms designed to deliver a therapeutically effective dose of medicine to a patient's skin. Transdermal delivery not only provides controlled, continuous administration of the drug, but also allows continuous input of the drug with a short biological half-life and eliminates pulsed penetration into the systemic circulation. The transdermal patch uses a special membrane on which the patch containing the liquid drug can pass through the reservoir skin and into the bloodstream. Several important benefits of transdermal drug delivery include limiting first-pass metabolism in the liver, increasing therapeutic efficacy, and maintaining stable plasma levels of the drug. These therapeutic benefits reflect the high marketing potential of TDDS. Most drug molecules penetrate the skin through the intracellular microenvironment, and therefore the role of TDDS in enhancing penetration or penetration is important because they reverse the obstruction resistance of the stratum corneum without damaging viable cells. The nicotine patch was the first transdermal breakthrough to take the market value of TDDS in medicine to new heights. Combinations of estradiol, fentanyl, testosterone and some other drugs are TDDS currently available in the pharma market.

ANATOMY AND PHYSIOLOGY OF SKIN

The skin has evolved into a highly functional barrier, which prevents excess water from being lost from the body. This enables us to face a wide range of environmental challenges. The skin, in particular, the stratum corneum, due to its high density (1.4 g / cm2 in dry condition), its 15-20% low hydration hinders drug penetration.

Constant replacement of the stratum corneum facilitates barrier function, limiting local and transdermal bioavailability. Therefore, in recent years, numerous studies have been conducted in the field of increasing access. Limitations include slow entry rates, lack of dose flexibility, and restrictions for relatively low-dose drugs.[1,6]

Epidermis

The epidermis is a layered, squamous, keratinizing epithelium. The complex layer of epidermis varies according to cell size, thickness, and number of cell layers of the epidermis.

About 90% of epidermal cells are keratinocytes or breasts are rated in five layers and make keratin proteins and 8% melanocytes are available.

Dermis

The dermis is a layer 3 to 5 mm thick and is made up of a network of connective tissue, which includes veins, lymphatic vessels, and veins. The skin's blood supply has a fundamental capacity in the direction of body temperature. It also provides skin supplements and oxygen while removing toxins.

Hypodermis

Hypodermis or subcutaneous adipose tissue is located beneath the skin and epidermis. It fills up as a fat storage area. This layer regulates temperature, provides hygienic support and provides mechanical protection.

Various Approaches to Transdermal Devices:-

1) Membrane permeability controlled TDDS:

In this type of TDDS, the drug stock is sandwiched between the drug impermeable backing membrane and the rate controlling membrane. The drug is released only through the rate controlling membrane. It can be micropores or non-porous. The drug can be in the form of a solution, suspension, gel or dispersion in a polymer matrix in a reservoir container. Drug release from this type of system can be controlled by various polymer composition permeability coefficients or rate control membrane thickness. On the outer surface of the polymeric membrane, a thin layer of adhesive polymer is applied. Continuous release rate of the drug.

2) Adhesive dispersion type TDDS:

In this case, the drug stock is made by dispersing the drug directly into the sticky polymer. The drug is then spread on a flat sheet of impermeable backing membrane of adhesive polymer drug. The drug reserve layer is then covered with a non-drug rate controlling polymer of fixed thickness, which creates a sticky diffusion that controls DDS.10.

3) Polymer matrix diffusion controlled TDDS:

Drug stocks are created by uniformly dispersing drugs in hydrophilic and lipophilic polymer matrix. The resulting medicated polymer is then molded to a medicated disc of defined surface area and thickness.10. Drug stocks can also be prepared by dissolving drugs and polymers in a common solvent and then evaporating the solvent at elevated temperatures. This reservoir with polymer disc is then pasted on the base plate with drug impermeable backing membrane.

4) Micro Reservoir Type TDDS:

Combination of reservoir and matrix diffusion type drug delivery system. Drug stocks are formed by first suspending a solid drug in an aqueous solution of a water-soluble polymer. This drug suspension is uniformly dispersed in lipophilic polymers by high energy dispersion techniques. This drug forms reservoir micro-spores which are supported on occlusive pads and are thermodynamically unstable. It can be coated with a layer of biocompatible polymer to improve drug release.

FACTORS THAT INFLUENCE TRANSDERMAL DRUG DELIVERY[7,8]

Biological Factors Include:

A) Skin condition:

Intact skin itself acts as a barrier but many elements like acids, alkalis cross the barrier cells and penetrate through the skin, many solvents open up a complex dense structure of coarse layers.

B) Age of skin:

It has been shown that the skin of adults and young people penetrates more than the skin of older people but there is no dramatic difference. Children exhibit toxic effects due to excess surface area per unit body weight. Thus, potent steroids, boric acid, hexachlorophene cause serious side effects.

C) Blood supply:

Changes in peripheral circulation can affect transdermal absorption.

D) Regional skin site:

The thickness of the skin, the appearance of the stratum corneum, and the density of the appendages vary from site to site. These factors significantly affect access.

E) Skin metabolism:

The skin metabolizes steroids, hormones, chemical carcinogens and certain drugs. So, the metabolism of the skin determines the effectiveness of the drug penetrated through the skin.

The difference in temperature increases the drug intake tenfold. As the temperature decreases, the diffusion coefficient decreases. Weak acids and weak bases differ depending on the pH and pKa or pKb values. The amount of unionized drug determines the concentration of the drug in the skin. Thus, temperature and pH are important factors that affect drug penetration.

Physiological Factors Include:

a) Temperature and pH:

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b) Drug concentration:

The concentration gradient across the flow barrier is proportional and if the concentration of the drug exceeds the barrier, the concentration gradient will be higher.

c) Partition coefficient:

An optimal partition coefficient (K) is required for good performance. Drugs with high K are not ready to release the lipid portion of the skin. Also, drugs with low K do not leak.

d) Molecular shape and size:

Drug absorption is inversely related to molecular weight, with smaller molecules penetrating faster than larger ones.

e) Diffusion coefficient:

Drug penetration depends on the drug's spread coefficient. The diffusion coefficient of a drug at constant temperature depends on the properties of the drug, the media and their interaction

3 Environmental factors:

A) Sunlight:

Sunlight weakens the walls of blood vessels, causing only minor injuries to areas exposed to sunlight. Also, pigment: The most significant change in sun-induced pigment is freckle or solar lentigo.

B) Winter season:

Often itchy, dry skin. The skin responds by increasing the production of oils to compensate for the effects of climate dryness. A good moisturizer will help reduce the symptoms of dry skin. Also, drinking plenty of water can make your skin look hydrated and radiant.

(C) Air pollution:

Dust can clog pores and grow bacteria on the surface of the face and skin, causing pimples or blemishes. This affects the delivery of the drug through the skin. Invisible chemical pollutants in the air can disrupt the skin's natural defense system, breaking down the skin's natural oils that normally trap moisture in the skin and keep it supple.

(D) Effect of heat on transdermal patches:

Heat-induced high absorption of transdermal distributed drugs. The patient should be notified at the patch application site not to come in contact with external heat source such as hot water bags, hot water bottles. Even high body temperatures can increase transdermally distributed medications. In this case the patch should be removed immediately[7].

Advantages:-

- The transdermal drug delivers a steady infusion of the drug over a long period of time, therefore, therapeutic failure associated with avoiding adverse side effects and intermittent dosing can also be avoided.
- Alternative route of administration for patients who cannot tolerate oral dosage forms such as vomiting.
- Increases the therapeutic value of many drugs by avoiding specific drug-related problems, for example, gastrointestinal irritation, and reduced absorption and drug interactions with food, beverages and other administered drugs.
- Avoid first pass metabolism as it bypasses the liver.
- Self-administration is possible, and they are non-invasive, avoiding the disadvantages of parenteral therapy.
- In emergency situations (e.g., unresponsive, unconscious or comatose patients) they are easily and quickly identified due to their physical presence, features and identification marks.
- It is easy to finish therapy at any time.
- Avoiding gastro-intestinal anomalies.
- Transdermal patches are advantageous

Disadvantages:-

- High plasma drug concentration is difficult to achieve.
- Long-term adherence causes discomfort to patients.
- Drugs with low or high fractional coefficient fail to reach systemic circulation 4

CONCLUSION

Nowadays, TDDS has become the most widely used form of drug administration directly into the bloodstream without any pain and without tearing the skin membrane. TDDS is used for drug therapy for reduced absorption, more uniform plasma levels, improved bioavailability, reduced side effects, efficacy, and product quality. The patch contains some simple ingredients, which play an important role in releasing the drug through the skin.[9]

The future potential of TDDS will be focused on controlled therapeutic use.[10] we can overcome the challenges associated with the current popular drug delivery by formulating the drug as a transdermal patch. TDDS has also developed some advanced techniques, so it could be one of the best drug delivery systems of the future.[8]

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