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Transdermal Drug Delivery - Advancement to Reduce Side Effects of Drugs

Pratibha Muntha*

Department of Pharmaceutics, Vignan Institute of pharmaceutical Sciences, Jawaharlal Nehru
technological University, Deshmukhi, Nalgonda, Telangana, India, E-mail: pratibha.muntha@gmail.com

Short Commentary

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*For Correspondence

Department of Pharmaceutics,
Vignan Institute of
pharmaceutical Sciences,
Jawaharlal Nehru technological
University, Deshmukhi, Nalgonda
Telangana, India, E-mail:
pratibha.muntha@gmail.com

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ABSTRACT

The advancement in the field of formulation pharmaceuticals lead to the discovery of many advanced dosage forms that aid in maintaining desired levels of active substance at the predetermined target site with a release rate desired to treat the diseases in the patient. Transdermal drug delivery is one such advancement as a good alternative to conventional pharmaceutical dosage form

Transdermal drug delivery has several advantages over conventional dosage forms of avoiding first pass metabolism with increased patient compliance maintaining the release of the drug at a constant rate in a controlled fashion which is advantageous for drugs with narrow therapeutic window resulting in reduced side effects of the drugs

It is not suitable for high molecular weight compounds as it becomes difficult to prepare the formulation and even not suitable for water soluble drugs

INTRODUCTION

The advancement in the field of formulation pharmaceuticals lead to the discovery of many advanced dosage forms that aid in maintaining desired levels of active substance at the predetermined target site with a release rate desired to treat the diseases in the patient [1]. Transdermal drug delivery is one such advancement as a good alternative to conventional pharmaceutical dosage forms [2].

ADVANTAGES

Transdermal drug delivery has several advantages over conventional dosage forms [3]

- Transdermal systems avoid first pass metabolism and so it is very much suitable for drugs with low bioavailability such as Fenoterol [4].
- Increased patient compliance [5]
- TDDS also helps in maintaining the release of the drug at a constant rate in a controlled fashion which is advantageous for drugs with narrow therapeutic window.
- The above effect results in reduced side effects of the drugs [6]

DISADVANTAGES

The major drawback of transdermal systems is chances of skin irritation or allergy which reduces patient compliance. Absorption diversity is caused due to different skin structures and thickness in different

patients. It is not suitable for high molecular weight compounds as it becomes difficult to prepare the formulation and even not suitable for water soluble drugs [7].

FACTORS AFFECTING THE DRUG PENETRATION

Skin factors [8]

- Condition of the skin – oily/dry
- Thickness of the skin layers

Drug factors

- Molecular size of the drug
- Solubility
- Dissociation constant

The polymers play a very key role in achieving the aim with which the dosage form is designed and help in obtaining the desired release at the desired target at a predetermined rate [9]

PENETRATION ENHANCERS

There are several categories of penetration enhancers used in the formulation of transdermal systems

1. Surfactants - anionic, cationic, non-ionic, amphoteric
2. Terpenes - nerolidol, linalool, carvone, farnesol, limonene, geraniol, fenchone, menthol [10]

There are several forms of transdermal systems such as transdermal patches, transdermal implants, gels etc [11]

Transdermal delivery is very advantageous in the case of pain killers employing NSAIDS and opioids which have side effects of gastric irritation, GI bleeding, ulcerations and inflammatory bowel disease and so employing them as patches and other TDDS can help in reducing the side effects [12-15].

SEVERAL APPROACHES EMPLOYING TRANSDERMAL SYSTEMS

1. Transdermal systems for pain relief after orthopedic surgery [16].
2. Nicotine patches for cessation of smoke is a form of TDDS [17].
3. A great milestone was the discovery of micro needles for the delivery of insulin in the form of transdermal delivery [18].
4. The delivery of steroids to asthmatic patients using transdermal systems has achieved importance since delivery through inhalation and systemic delivery was not of patient compliance [19].
5. Donepezil hydrochloride patches in the treatment of Alzheimer's [20].
6. Transdermal creams of progesterone have shown increased patient compliance when compared to oral pills [21].
7. Transdermal patches in patients who suffer with unpredictable, recurrent, intense, and frequently persistent nature of pain associated with sickle cell disease was found to be very useful which avoided frequent oral administration of opioids [22]

EVALUATION PARAMETERS OF TRANSDERMAL SYSTEMS

The various evaluation parameters carried out on transdermal systems include [23]

- Thickness test
- Weight variation
- Folding endurance [24]
- Skin penetration studies [25]
- Drug content

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