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A Comprehensive Review Article on Transdermal Patch

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Abstract

Transdermal drug delivery system (TDDS) established itself as an integral part of novel drug delivery systems. In a broad sense, the term transdermal delivery system includes all topically administered drug formulations intended to deliver the active ingredient into the general circulation. Transdermal drug delivery systems are polymeric formulations which when applied to skin deliver the drug at a predetermined rate across dermis to achieve systemic effects. A transdermal patch is medicated adhesive patch that is placed on the skin to deliver a specific dose of medication through the skin and into the bloodstream. Often, this promotes healing to an injured area of the body. An advantage of a transdermal drug delivery route over other types of medication delivery such as oral, topical, intravenous, intramuscular, etc. is that the patch provides a controlled release of the medication into the patient, usually through either a porous membrane covering a reservoir of medication or through body heat melting thin layers of medication embedded in the adhesive. The main disadvantage to transdermal delivery systems stems from the fact that the skin is a very effective barrier; as a result, only medications whose molecules are small enough to penetrate the skin can be delivered in this method.

Keywords: TDDS, Patch, blood circulation.

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INTRODUCTION

A transdermal patch is used to deliver a specific dose of medication through the skin and into bloodstream. Transdermal patches products were first approved in 1981 by FDA. Transdermal delivery systems are currently available for motion sickness, cardiovascular disease, fentanyl for chronic pain, nicotine to aid smoking cessation. Transdermal delivery provides controlled, constant administration of the drug, and allows continuous input of drugs with short biological half-lives and eliminates pulsed entry into systemic circulation. TDDS offers many advantages over conventional injection and oral methods. It reduces the load that the oral route commonly places on the digestive tract and liver.

Main component of Transdermal Patch

1. Drug
2. Polymer matrix
3. Permeation enhancers
4. Adhesive layer
5. Backing laminates
6. Release laminates

Route of drug delivery of patch in body

1. Sweat glands
2. Hair follicles
3. Sebaceous glands

Advantages

1. It is convenient method and requires only once weekly application. Such a simple dosing regimen can aid in patient adherence to drug therapy.

2. Transdermal drug delivery can be used as an alternative route of administration to accommodate patients who cannot tolerate oral dosage forms.

3. It is of great advantage in patients who are nauseated or unconscious.

4. Drugs that cause gastrointestinal upset can be good candidates for transdermal delivery because this method avoids direct effects on the stomach and intestine.

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5. Drugs that are degraded by the enzymes and acids in the gastrointestinal system may also be good targets.

6. First pass metabolism, an additional limitation to oral drug delivery, can be avoided with transdermal administration.

Dis-Advantages

1. Possibility of local irritation at the site of application.

2. Erythema, itching, and local edema can be caused by the drug, the adhesive, or other excipients in the patch formulation.

3. May cause allergic reactions.

4. A molecular weight less than 500 Da is essential.

5. Sufficient aqueous and lipid solubility, a log P (octanol/water) between 1 and 3 is required for permeate to transverse SC and underlying aqueous

Ideal properties of transdermal drug delivery system

1. Shelf life Should be up to 2.5 years

2. Patch size Should be less than 40 cm

3. Dose frequency Once a daily - once a week

4. Appearance Should be clear or white color

5. Packaging properties Should be easily removable of release liner

6. Skin reaction Should be non-irritating

7. Release Properties Should have consistent pharmacokinetic and pharmacodynamic profiles over time

8. Packaging properties Should be easily removable of release liner

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Ideal properties of drug for TDDS

1.Dose Should be low
2. Half-life in hr Should be 10 or less
3. Molecular weight Should be less than 500
4. Partition coefficient Log P (octanol-water) between –1 and 3
5. Skin permeability coefficient Should be less than 0.5 x10-3cm/hr
6. Skin reaction Should be non-irritating
7. Oral bioavailability Should be low
8. Therapeutic index Should be low
9. Concentration Minute
10. pH of saturated aqueous solubility 5-9
11. Dose deliverable

Types of Transdermal Patches

- Single layer
- Multiple layer
- Reservoir
- Matrix
- Vapor

Evaluation Parameters

1. Thickness of the patch
2. Weight uniformity
3. Folding endurance
4. Content uniformity test
5. Moisture Uptake
6. Drug content
7. Shear Adhesion test
8. Peel Adhesion test
9. Water vapor transmission studies (WVT)
10. Rolling ball tack test
11. Quick Stick (peel-tack) test
12. Probe Tack test

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13. In vitro drug release studies
14. In vitro skin permeation studies
15. Skin Irritation study
16. Stability study

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