CHAPTER 7

Recent Progress of Transdermal Drug Delivery Systems for Biomedical Applications

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1. INTRODUCTION

Before 1980, TDDS was constrained to very only some drug molecules prepared in simple conventional formulations. The typical drug delivery carriers were inefficient and practised poor patient compliance. The transdermal therapeutic system is known to be self-sustaining unit dosage forms, which on application to the surface of the skin, carry the active pharmaceutical ingredient(s), across the layers of the skin, at a regulated rate to the blood circulation and subsequently to the site of action [1]. Transdermal Drug Delivery Systems (TDDS) are additionally called "patches," square measure formulations intended to carry a therapeutically required measure of active ingredient across the skin of the patient concerned. It is another approach for reducing and avoiding the limits associated with orally administered dosage form and drug administered by parenteral route [2]. The drug diffusion takes place via the skin into the systemic circulation, thereby avoiding the first-pass metabolism, which is usually observed in oral dosage forms [3]. Additionally, it avoids the need for frequent administration of drugs. When the controlled dose of the drug has to be delivered through the skin for a more extended period, TDDS or skin patches are preferred.

Subsequently, the main advantage of the transdermal therapeutic system was the option for an extended period of action, during which concentration of drug would be kept up inside the therapeutic window which in turn diminished recurrence of dosing and improve the patient compliance. The delivery of drugs through transdermal route can be discontinued by taking away of the patch (drug input termination). Aside from intravenous infusion, there is no other course of medication conveyance for which this is quickly conceivable. The physicochemical properties of the drug, dose, and lipophilicity are the major limiting factors in the transdermal therapeutic system. Since skin sensitivity changes from person to person, all the developed transdermal patches must undergo skin irritation studies to fulfill the tolerability profile [4]. TDDS is composed of several components they are, drug release membrane, liners, adherents, etc. these components have an influence to a greater extent in the process of drug release through the skin. Different TDDS have been explored for improving drug penetration through the skin like microneedles, iontophoresis. The TDDS market is expected to reach USD 7.1 billion by 2023 from an expected USD 5.7 billion out of 2018, at a CAGR of 4.5% during the estimate time frame. The development of this market is principally determined by variables, for example, the expansion in the predominance of ceaseless ailments and innovative progressions in transdermal medication delivery frameworks [5].

In this chapter, the morphology of the skin, components and approaches in the development of TDDS, evaluation techniques and transdermal drug delivery systems in the management of diseases have been updated.

2. SKIN MORPHOLOGY

The skin is a vital organ system of the human body which covers an area of. This multi-level organ receives one three of the blood that passes through the body. The skin has several layers but generally divided as the epidermis and the dermis. The former is the outmost layer of the skin that contains the stratum corneum and stratum germinativum. Even though it is structurally incessant all through the body; the skin has variation in its thickness concerning the age of the person and the anatomical location. There are two types of human skin; one that is hair-less, parts such as soles of foot and palms of the hand, while the other bear's hair and sebaceous glands, usually present on the arms and face [6].

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