



Feasibility Assessment of Transdermal Drug Delivery Systems for Treatment of Parkinson's Disease

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Abstract

Parkinson's disease (PD) is defined as the second most prevalent neurodegenerative disorder that has been characterized with a loss of dopaminergic neurons severely in cytoplasmic inclusions and substantia nigra. To treat both early and advanced stages of PD several therapeutic agents are available. However, the transport of therapeutic actives in to the brain has been a consistent challenge for researchers, because of the presence of blood-brain barrier (BBB). Various novel delivery carriers have been designed to deliver the drugs across BBB and the systems have been designed with an object to effectively target the drugs and overcoming the BBB. In some last decades, transdermal delivery carriers have gained extensive deliberations across the globe. These transdermal systems are depicted to be the most recent modalities in treating PD as they offer constant drug delivery, immediate effect as intestinal absorption in unneeded, and ease of application being a non-invasive technique. The present review explores the potential of transdermal delivery systems in order to deliver numerous therapeutic actives researched for PD therapy via transdermal route. Various trans-carriers such as patches, oil-based nanocarriers, nanoemulsions have been observed for the treatment of PD. The write up traces the reports on transdermal delivery carriers in PD and clinical study data to define the feasibility transdermal carriers.

Keywords: Transcarriers; Transdermal delivery; Parkinson's disease; Drug delivery systems; Clinical status

Introduction

Parkinson's disease (PD) is defined as a chronic and progressive neurological disease that has been characterized with the symptoms of stiffness, tremors, and slow or hesitant speech. Though the disease is most commonly related and seen in old aged people, it has been reported that around one in ten people are diagnosed with the disease before the age of 50. Parkinson's disease is depicted by striatal dopamine depletion as a result of dopaminergic neurons degeneration in the substantia nigra pars compacta. Besides the lack of dopamine at the cellular level the formation of Lewy bodies in the substantia nigra, which are cytoplasmic inclusions composed of fibrils, ubiquitin, and alpha-synuclein may appear [1,2]. Medication employed for the treatment of PD only provides patients with temporary symptomatic relief, where access to care and treatment differs widely depending on where the patients live [3]. Pharmaceutical agents that are used to treat PD include levodopa, entacapone, pramipexole, ropinrole, benserazide, carbidopa, tolcapone, entacapone, selegiline, rasagiline, and safinamide [4]. However, several drugs among these are not able to reach the brain completely and can undergo metabolism instead, partially or completely by liver. This inefficient utilization of drug may require ingestions of higher drug concentrations that can produce toxic effects in the heart, liver, or kidney. Also, many therapeutic agents are poorly soluble or insoluble in aqueous solutions. These drugs provide challenges to deliver them orally or parentally, however, these compounds can have significant benefits when formulated through other delivery systems like transdermal systems [5].

Transport of therapeutic actives via transdermal route is a well established route of administration valued by patients as well as physicians for comfort and convenience [6]. Drug transport via transdermal route has been approved and widely accepted for the systemic drug delivery. This non-invasive approach avoids the hepatic first-pass metabolism, maintains a steady drug concentration (extremely important both in the case of drugs with a short half-life and in the case of chronic therapy), allows the use of drugs with a low therapeutic index, and improves patient compliance. However, the outermost layer of the skin, stratum corneum prevents transdermal permeation of most drugs at clinically useful rates. To facilitate this transdermal transport of drugs, numerous

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