UNIVERSITI TEKNOLOGI MARA

TISSUE BIODISTRIBUTION STUDY OF LEVODOPA LOADED CHITOSAN MICROPARTICLES

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TABLE OF CONTENTS

ABSTRACT

Levodopa is a drug that is used to treat Parkinson's disease. This study was conducted to increase the bioavilability of levodopa with the reduction of particle size and to elucidate the tissue biodistribution profile of levodopa after intranasal administration. Levodopa loaded chitosan microparticles has been formulated via ionic gelation method. The formulated levodopa encapsulated system was characterized by measuring the drug entrapment efficiency, particle size analysis, morphology study, structural and crystallinity analysis. The average size of levodopa loaded chitosan microparticles was 39.9 μm and the highest drug entrapment efficiency was 75.06 %. The morphology study conducted by Scanning Electron Microscopy (SEM) revealed that levodopa was encapsulated within the chitosan carrier system. Structural analysis by Fourier Transfrom Infrared (FT-IR) showed that there was interaction and extension of hydrogen bonding between sodium TPP that was used as a cross-linking agent with the chitosan in order to encapsulate levodopa within the carrier system. X-Ray Diffraction analysis showed that the crystallinity of levodopa changed from crystalline to amorphous state after formulated with chitosan. Furthermore, tissue biodistribution study was conducted in male Sprague Dawley rats to observe the levodopa distribution in brain, heart, kidney, lung and liver. Both unprocessed levodopa and levodopa-loaded chitosan microparticles were administered via intranasal route in order to pass the first pass metabolism. Based on the results, concentration of levodopa was highest in the brain, followed by lung, liver, heart and kidney. This study has shown that the delivery of levodopa microparticles system carrier via intranasal route increased the concentration of levodopa in brain as compared to other organs. This finding showed that the carrier system might improve the delivery of levodopa hence increase its therapeutic effects.

CHAPTER 1

INTRODUCTION

1.1 Background of study

Among the major challenges today in pharmaceutical filed is to develop the effective methods for delivery of drugs into the brain. Many studies have shown that the use of intranasal route as route of administration provide rapid drug delivery to the brain (Saranya & Elango, 2012). Intranasal route also have been reviewed to be a practical and non-invasive route. One of the possibilities to overcome the blood brain barrier is a drug delivery to the brain using encapsulated carrier system (Saranya & Elango, 2012). Microparticles encapsulated system have been significantly contribute to the system of drug delivery. It provides an effective protection to the drug or active pharmaceutical ingredient (API), which is encapsulated in the carrier system, against enzymatic degradation. Chitosan, as the carrier system, lead to the development of controlled release drug system. It enables us to control the release rate of the incorporated drug, and potentially direct the drug to desire target. (Panos et al., 2008) Controlled release delivery systems possess some advantages over conventional dosage forms, which are able to reduce some degree of side effects, and extend the drug's effectiveness (Panos et al., 2008).

Microparticles encapsulation are well known method to improve the drug delivery system. However, most of the drugs are administered orally. The problem arise