e-ISSN: 2320-1215
p-ISSN: 2322-0112

Research and Reviews: Journal of Pharmacy and Pharmaceutical Sciences

Microspheres - Novel Drug Carriers

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Short Commentary

Received: 05/04/2014
Accepted: 23/05/2014
Published: 28/05/2014

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Keywords: Microspheres, Conventional drug delivery, Drug Carriers, Sol gel, Biodegradable

ABSTRACT

Conventional drug delivery systems have a major disadvantage of frequent dosing to maintain the levels of the drug in the therapeutic region required to treat the disease. Controlled drug delivery systems were introduced to overcome the frequent administrations and increase patient compliance reducing the cost of treatment.

Controlled release systems also helped in achieving the desired feature of delivering the drug at a predetermined rate and at the desired target. Many of these drawbacks can be overcome by the new drug carriers – Microspheres.

Microspheres based drug delivery has gained great importance in recent time. The important feature of controlled release of microspheres comes from its nature of phase separation is the micro phase separation morphology which provides it with the characteristic of controlled rate of degradation and drug release.

INTRODUCTION

Conventional drug delivery systems have a major disadvantage of frequent dosing to maintain the levels of the drug in the therapeutic region required to treat the disease. Controlled drug delivery systems were introduced to overcome the frequent administrations and increase patient compliance reducing the cost of treatment [1].

The Biopharmaceutics Classification System (BCS) classifies class II and III compounds as the most desirable compounds to reduce the dosing frequency and side effects [2].
Controlled release systems also helped in achieving the desired feature of delivering the drug at a predetermined rate and at the desired target. Many of these drawbacks can be overcome by the new drug carriers – Microspheres [3].

Microspheres based drug delivery has gained great importance in recent time. The important feature of controlled release of microspheres comes from its nature of phase separation is the micro phase separation morphology which provides it with the characteristic of controlled rate of degradation and drug release [4].

Microspheres physically appear as small spherical particles with the diameter in micrometers range (1µm to 1000µm) and are also sometimes referred to as micro particles [5]

ADVANTAGES

- It is a very suitable method of delivery for poorly water soluble drugs [6]

• They exhibit the potential of controlled drug delivery which is desired characteristic of ideal dosage form [7]
• Microsphere drug delivery is suitable for drugs with poor bioavailability like that of Neostigmine Bromide and Zaleplon drugs [8,9]
• Radio immobilized microspheres can be used in quality treatment in cancer patients on whom all the other modes of treatment have failed [10]
• Microspheres are also characterized with features of prolonged in vivo half-life, decreased toxicity, improved patient compliance and increased stability [11].

FORMULATION METHODS OF MICROSPHERES

Several methods are employed for the formulation of microspheres
• Emulsion Solvent evaporation method [12]
• Quasi-emulsion solvent diffusion method [13]
• Sol gel method [14]
• Solvo thermal reaction [15]
• Double – emulsion solvent extraction technique [16]
• Vibration technology [17]

POLYMERS

Wide range of polymers is employed in the formulation of microspheres of which some of them are:
• Biodegradable polymers: aliphatic polyesters; poly (lactide), poly (glycolide), poly-ε- caprolactone (PCL) and their copolymers [18].
• Non Biodegradable polymers [19]:
a) Cellulose derivative: Carboxy methyl cellulose, Ethyl cellulose Cellulose acetate hydroxyl propyl methyl cellulose
b) Silicons: Polydimethyl siloxane, Colloidal silica, Polymethacrylate, Polymethyl methacrylate
c) Others: Poly vinyl pyrolidine, Ethyl vinyl acetate, Poloxamine etc…

APPLICATION OF MICROSPHERES

• Targeted Tegaserod Maleate microspheres for Colonic diseases [20]
• Use of Yttrium-90 Microspheres for Treatment of Hepatic Malignancy [21]
• Gastro retentive microspheres for the delivery of Verapamil Hydrochloride [22]
• Magnetic Microspheres are used in evaluating biophysical parameters of human blood [23]
• Discovery of Insulin Loaded Eudrajit Microspheres has been a great milestone for the treatment of diabetis [24]
• Metoclopramide Hydrochloride drug which is characterized with short half life is formulated as Sustained release microsphere and thus extending the release of the drug from the drug delivery system [25]

ACKNOWLEDGEMENT

This content of the article is scrutinized and approved by M. Murali and written by Pratibha Muntha

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