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REVIEW ARTICLE

Dendrimer as a Recent Drug Delivery System: An Overview

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Abstract

Dendrimers, their production, characterization, and use in drug delivery are briefly covered in this article. Dendrimers are classically symmetric nanoscale molecules with an inner core and an outer shell that have well defined, homogeneous, and monodisperse structures. Dendrimers have a unique potential for encasing or entrapping bioactive substances because of their tree-like structure. As a result, they could win a prestigious statue in the fields of pharmaceutical, medical, and nutraceutical sciences. Numerous advantageous biological characteristics exist in them, including polyvalency, self-assembly, electrostatic interactions, best chemical stability, and minimal cell toxicity. While problems with solubility, stability, and bioavailability are limiting concerns for their implementation.

Keywords: Nanoparticles, Convergent, Divergent, Diagnostic Agent, Polymers

1 Introduction

Dendrimers are defined as homogenous, monodisperse molecules with nanoscale dimensions and radial symmetry that have arms or branches that resemble trees [1]. The Greek word dendron, that means "branching of a tree," is the source of the English word "dendrimer." Dendrimers are composed from polymeric globular branching and regular configurations that have specified forms and sizes ranging from 1 to 15 nanometers (nm), and they are utilized to enhance certain properties of a substance [2]. Physicochemical or biological properties of dendrimers can be changed through the functionalization of the end-groups (i.e., the groups reaching the outer periphery) [60, 61]. Divergent synthesis was founded by Fritz Vogtle in 1978, R.G. Denkewalter at Allied Corporation in 1981 [3], Donald Tomalia at Dow Chemical in 1983 and 1985, and George Newkome in 1985 [4]. Jean Fréchet introduced a convergent synthetic approach in 1990 [5]. Dendrimers are easily taken up by cells due to their nano size range [6]. Because of their unique characteristics dendrimers consider as promising candidates for a variety of applications [7]. Dendrimers can be functionalized through introduction of special functional groups on to their outer surface, such as COOH, COONa, NH2, or OH [8]. Dendrimers have many desired properties unlike traditional polymers that make them applicable in biological field, these properties include good water solubility [9], compatibility with biological systems [10], polyvalency and defined molecular weight [11]. Three different components make up a typical dendrimer: (a) a central core that is either a single atom or an atomic group with at least two identical chemical functions; (b) building blocks with multiple

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