Controlled Release | Targeted Delivery | Solubility Enhancement

DENDRITIC POLYESTER SCAFFOLDS:
FUNCTIONAL AND BIOCOMPATIBLE PRECISION POLYMERS FOR DRUG DELIVERY APPLICATIONS


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Introduction

Dendrimers and dendrons are highly branched polymer structures with a precise distribution of functional groups. In contrast to their linear analogs, they are monodisperse in nature and are extremely consistent from batch-to-batch. A broad range of sophisticated applications have capitalized on these dendritic materials including catalysis, optics, and nanomedicine.[1] In nanomedicine, great efforts have been devoted toward the design of selective drug delivery systems and efficient imaging probes.[2] Thus, dendrimers present significant advantages over linear polymers, including the following:

- They are precision nanomedicines carrying an exact number of drugs, all arising from their controlled synthesis and monodisperse nature.
- Their properties can be directly correlated to their structure and present predictable and repeatable pharmacokinetics.
- They can be tuned to present optimal properties such as biodegradability, low toxicity, and water solubility.
- They provide an increased loading capacity, achieved by encapsulation or direct conjugation of drugs with different hydrophilic/hydrophobic properties.
- The drug release profile can selectively be tuned and controlled.
- They are intrinsically highly functional and can be designed to present multipurpose actions (e.g., therapeutic, diagnosis, targeting).

Non-toxic Biodegradable bis-MPA Dendritic Scaffolds

A promising family of dendritic macromolecules is based on the 2,2-bis(methylol)propionic acid (bis-MPA) building block.[3–4] These scaffolds exhibit highly valuable properties for biomedical applications including low or no *in vitro* toxicity, no specific *in vivo* organ accumulation, no immunogenic profile, and biodegradability under physiological conditions.[5–6] Moreover, the use of both the bis-MPA monomer and dendritic macromolecules has increased due to the commercial availability of a wide range of hyperbranched polymers, dendrimers, and dendrons (**Figure 1**). Herein, the most advanced applications of bis-MPA based dendritic materials as drug delivery agents will be summarized.

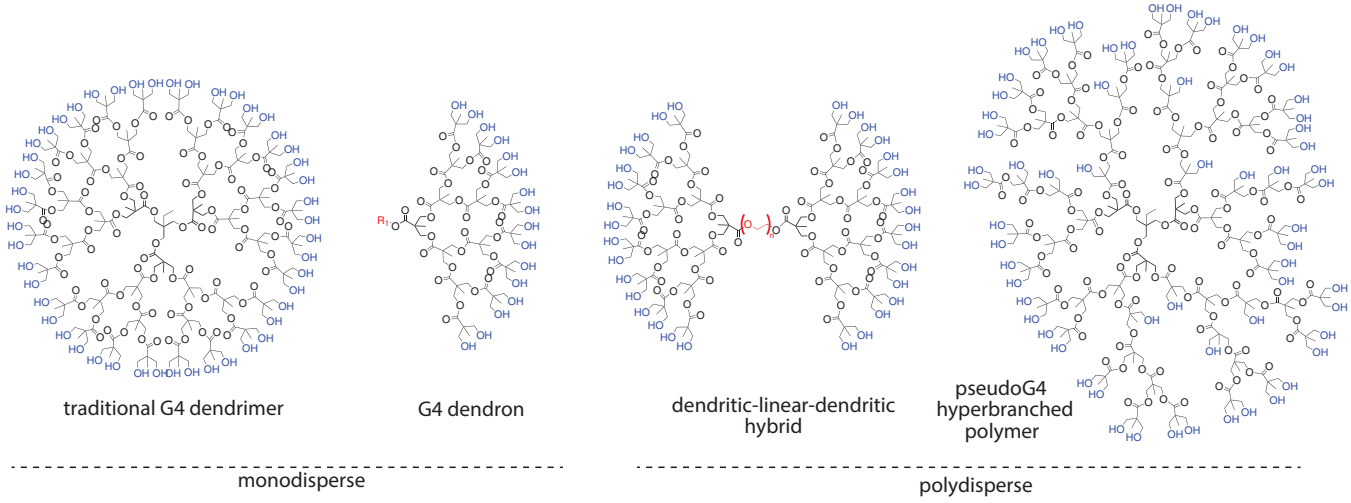

Figure 1. Examples of bis-MPA based dendritic structures of generation 4.