Dendrimers created individually and then linked together inwards

Design, Fashion

DendrimersDendrimers are highly branched multivalent nanostructureusuallyabout 1–10 nm in size. They have unique surface functionality, versatility andemerged as an important biomedical drug delivery molecule in past decade. Itdrives its name from Greek works ‘ Dendron’ (tree) and meros (part). It is made upof three components: a) central hydrophobic core; b) an interior branched dendritic structure (generations) radically attached to central core; c) hydrophilic exterior surface withfunctional groups (Liu M, Fréchet JMJ. Designing dendrimers for drug delivery.

Pharm Sci Technolo Today. 1999; 2(10): 393–401). Thereare two methods for dendrimer synthesis: a) divergent method where dendrongrowth starts from the core site and it grows towards outside diverging intospace; b) convergent methods where surface units are created individually andthen linked together inwards (Fig.)Dendrimers have core-shell nanostructures architect and synthesized in layer-by-layerfashion around a hydrophobic central core, hence the size of dendrimer andsurface functionality can be controlled precisely. There is linear increase in diameterand with increased dendrimer generation, it adopts a more bulbous shape withclosed packed surface groups on the periphery and inner voids and channels arealso formed due to this structural arrangement.

Drug molecules can be conjugated either on thesurface or occluded within enclosed cavities of dendrimer. With increase ingeneration (layer) physical properties of dendrimer also changes e. g.

viscosity, flexibility, density, size and shape and terminal surface. Viscosityof dendrimers increases up to 4th generation and declinesthereafter. Hence the properties of dendrimers can be modified according totheir therapeutic application which makes them ideal molecules for drugdelivery. They offer many advantagese. g.

1) encapsulation of drug in voidspace decreases the toxicity of the drug and also facilitates controlled drugdelivery 2) Surface available for conjugation (adsorption/attachment) of drugcan be modified with functional groups to augment or resist bio-permeability attranscellular, epithelial or vascular level; 3) low generation anionic orneutral polar terminal surface groups are more biocompatible as compared tohigh generation neutral nonpolar and cationic surface groups; 4) PEGylated orsmall functional group conjugated dendrimer show low or none immunogenicity; 5)modified surfaces with receptors can be optimized for better biodistributionand therapeutic dosing; 6) dendrimer can arrange excretion mode from body, owing to their nanoscale diameter .