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Glycodendrimers or Janus Glycodendrimersomes: that is the question?

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The modular synthesis of several libraries of self-assembling amphiphilic Janus dendrimers with sugar head groups will be presented in light of the stability, size, and bioactivity of the resulting liposomes formed [1]. These unprecedented sugar-containing dendrimers were denoted as amphiphilic Janus glycodendrimers. Their self-assembly by simple injection of organic solution into water or buffer and by hydration was analyzed by a combination of methods including dynamic light scattering, confocal microscopy, cryogenic transmission electron microscopy (TEM), Fourier transform analysis, and micropipet-aspiration experiments to assess mechanical properties. These libraries revealed a diversity of hard and soft assemblies, including unilamellar spherical, polygonal, and tubular vesicles. These assemblies are stable over time in water and in buffer, exhibit narrow molecular-weight distribution, and display dimensions that are programmable by the concentration of the solution from which they were injected. This study highlighted the molecular principles leading to single-type soft glycodendrimersomes assembled from amphiphilic Janus glycodendrimers. The multivalency of glycodendrimersomes with different sizes and their ligand bioactivity were demonstrated by selective agglutination with a diversity of sugar-binding protein receptors including leguminous, bacterial, and mammalian lectins. This novel approach will be compared to the complex syntheses of glycodendrimers using glyconanosynthons strategy [2].

In addition, an accelerated modular synthesis with three different topologies formed from either two or one carbohydrate head groups or a mixed hybrid thereof with a hydrophilic arm was also achieved to evaluate the effects of the relative sugar densities upon protein binding [3]. The hybrid structures were the most efficient in lectin bindings. These results demonstrated the candidacy of glycodendrimersomes as new mimics of biological membranes with programmable glycan ligand presentations [4] as supramolecular lectin blockers, vaccines, and targeted delivery devices.

References

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