Characterizing Self-Assembled Nanoparticles of Drug Delivery by use of Solution Scattering Techniques

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The potential of supramolecular self-assembly to produce sophisticated structures and functions has attracted significant attention to the systems The driving forces for such supramolecular self-assembly consist of multiple anisometric inter- and intra-molecular interactions, including hydrophobic, van der Waals, electrostatic, and π-π interactions. Individually, each interaction is subtle and insignificant but their combination and balance essentially determine the assembled structures. This chemistry offers diverse techniques to design nanoparticles employed for drug delivery systems (DDSs). Characterizing the inner structures of such particles is essentially important. This presentation reviews our recent studies on such issue, focusing on polymeric micelles for anti-cancer delivery, cationic micelles for gene delivery, and a polysaccharide carrier for siRNA. One of our final goals is to visualize their inner structures by combining small angle X-ray scattering and light scattering coupled with separation techniques.

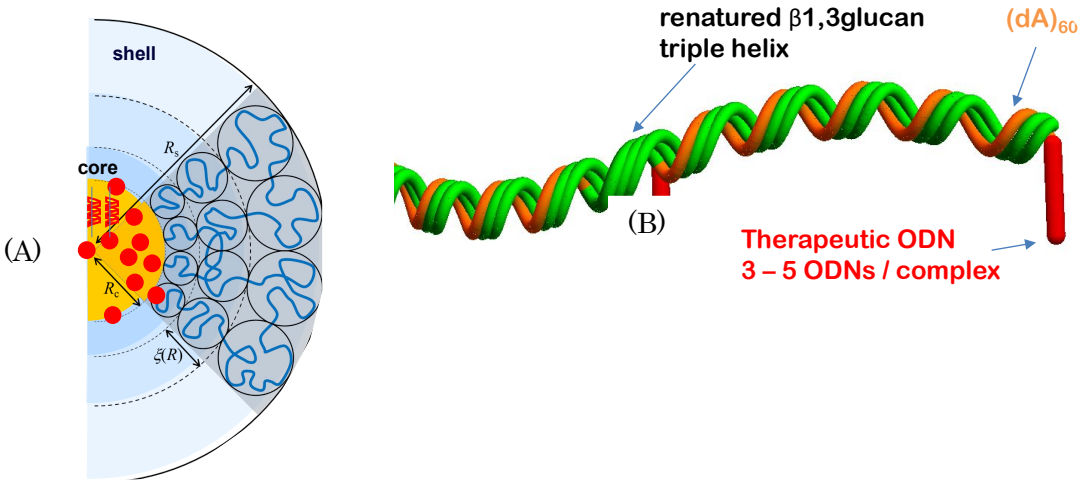

Figure: (A) A schematic drawing of polymeric micellar structure determined by SAXS and (B) a triple helical be-ta1,3 polysaccharide/DNA complex used for Immunocyte targeting delivery of therapeutic DNA.

Representative publications

Polymeric micelles: *J. Am. Chem. Soc*., **135 (7)**, 2574–2582(2013). *Macromolecules,* **45**, 6150-6157, (2012). *J. Phys. Chem. B,* 8241–8250, (2012). *Polymer Journal,* **44**, 240-244 (2012). *Langmuir*, ***26*** (10), pp 7544–7551 (2010). *Journal of Controlled Release* **203**, 77–84,（2015）

Be-ta1,3glucan/DNA complexes: *J. Phys. Chem. B*, ***116*,** 87–94 (2012). *Molecular Therapy (Nature)*, **20**, 1234-1241 (2012). *Journal of Controlled Release*, 155-161 (2011). *Bioconjugate Chemistry* **22** 9-15, (2011). *J. Am. Chem. Soc.* **126**, 8372-8373, (2004). *PNAS,* **111**, 3086-3091, (2014)