Glycobiology and Medicinal Chemistry Oriented Synthesis

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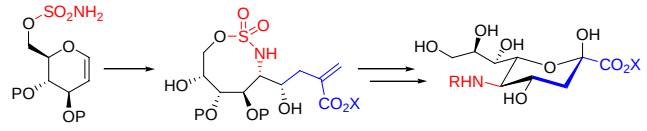
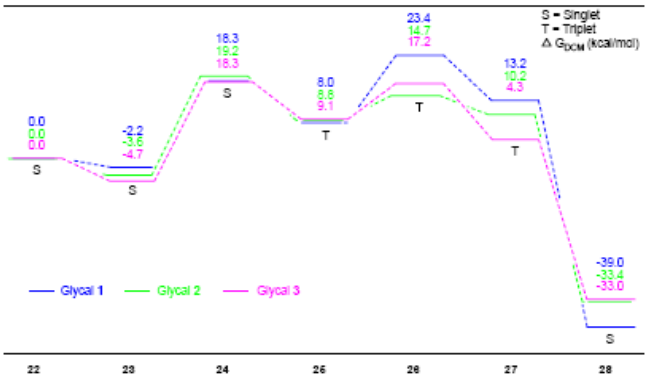
In our laboratory, a special emphasis is placed on organic synthesis and on the utilization of this expertise in addressing problems of medicinal and glycobiological significance.

A. New Methodologies for Carbohydrate Synthesis

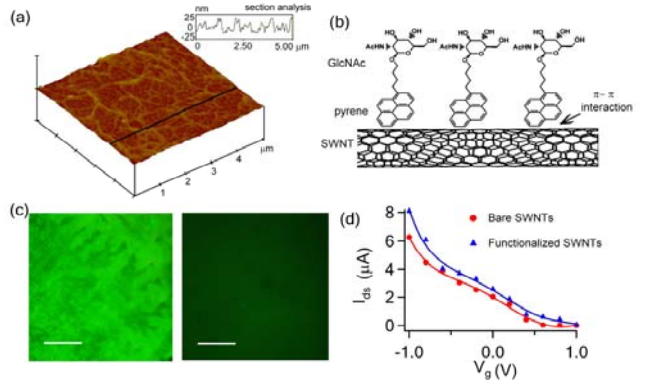
One of the major impediments to the rapidly growing field of molecular glycobiology is the lack of synthetic methods for complex oligosaccharides and glycoconjugates. We intend to solve some if not all the problems by: a) developing new methods to obtain the structurally unique aminosugars with defined amination pattern and stereochemistry; b) developing new O- and C- glycosylation methods; and c) mechanistic study. As exemplified below, sialic acid and analogs were synthesized with high stereocontrol and the pathway was rationalized by DFT.





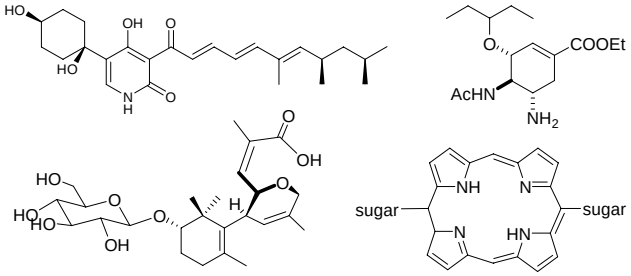
B. Glycobiology-Oriented Synthesis

Carbohydrates on the cell surface interact with protein receptors triggering a variety of cellular responses within a wide range of physiological and pathological processes with exquisitely tuned selectivity, such as cell recognition, inflammation, cancers, viral and bacterial infection, *etc.* Our research is to develop efficient synthetic methods to construct the challenging complex saccharides, display them on carbon nanotubes, chips or polymers, and use them as biosensors to detect cell surface bindings and biomolecular release from living cells.



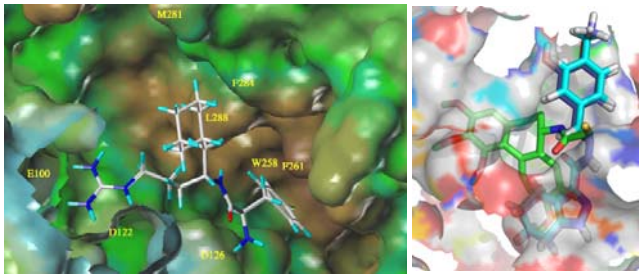
C. Medicinal Chemistry of Natural Products

We are highly interested in natural products, porphyrins and their application in medicinal chemistry. N-Deoxymilitarinone A showed great potential as neuritogenic molecule. Antiviral tamiflu was synthesized with new process starting from sugar starting materials. Sugar-containing porphyrins have designed and synthesized as photodynamic therapy molecules.



D. Structure-based Drug Design and Synthesis

Structure-based Drug Design is based on a firm understanding of molecular recognition between active site groups and interacting molecules and is a strategy that has become an integral part of modern drug discovery. Combining this computational approach, we have developed active inhibitors for melanocortin 4 receptor, a GPCR involved in obesity (left). We have also developed potent tubulin-polymerization inhibitors (68 nM) for promising anticancer therapy (right).



Selected Publications:

1. Rujee Lorpitthaya, *Chem. Eur. J.* **2008**, 14 1561-1570.
2. Le Nguyen Thanh, *Org. Biomol. Chem.* **2008**, 6, 3997 - 4003.
3. Jimei Ma, *Bioorg. Med. Chem. Lett.* **2008**, 18, 1223-1228.
4. Bala Kishan Gorityala, *Tetrahedron Lett.* **2009**, 50, 676-679.
5. Jimei Ma, *Angew. Chem. Int. Ed.* **2009**, DOI: 10.1002/anie.200805514

Dr. LIU Xuewei is an Assistant Professor in the Division of Chemistry and Biological Chemistry. He obtained BSc And MSc from China Agricultural University and PhD from University of Southern California. He did post-doc at CalTech. He also worked with P&G and Chugai as research scientist before joining NTU in Nov 2005.

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