

# MENGCHAO SHI, Ph.D.

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- **Personal Information**

- Citizenship: P. R. China
- Visa Status: H-1B visa (sponsored by University of Toledo)
- I-140 approved (US Permanent Resident petition in process)

- **Research and Professional Experience**

**Postdoctoral Research Associate | University of Toledo | 07/2019-present**

- Chemical synthesis of natural occurring carbohydrate antigens.
- Discovery of glycol-conjugates as candidate for vaccine development.
- Animal study and immunological evaluation of vaccine candidate.
- Medicinal chemistry, SAR study and Optimization of leading compounds

**Research Fellow | Harvard Medical School, Brigham and Women's Hospital | 11/2016-06/2019**

- Computer-assisted Ligand-Protein Docking study for protein phosphorylation drug discovery.
- Design and perform organic synthesis of organic molecules.
- Contribute to design of biochemistry and cellular biology tests and data interpretation.
- Designed and synthesis of probes for the Mode-of-Action study.

**Visiting Postdoctoral Scholar | Broad Institute of MIT and Harvard | 11/2016-03/2019**

- Design and perform organic synthesis of small molecule library.
- Medicinal chemistry and SAR study of the leading compound for CRISPR-Cas9 inhibitor discovery.
- Designed and chemical synthesis of probes for the CRISPR-Cas9 inhibitor Mode-of-Action study.
- Contribute to the progress of DARPA Safe Gene Program.

**Graduate Research Assistant | University of Toledo | 08/2012-08/2016**

- Investigation on the chemical synthesis of complex carbohydrate molecules.
- Design and synthesis of carbohydrate immunogen: Sialyl-Tn Polysaccharide A1 (STn-PS A1).
- Immunological study on STn-PS A1 as potential candidate of cancer vaccine on rodents.
- Study of bacterial capsular polysaccharides as carrier for vaccine development.

- **Scientific Skills and Expertise**

**Organic Synthesis**

- Design of synthetic route; Design of small molecule library, investigation of reaction mechanisms, asymmetric catalysis, reaction optimization and compound characterization. Competent for small molecule, peptide, nucleoside and carbohydrate synthesis.

**Medicinal Chemistry**

- SAR study; Ligand-protein docking; Biorthogonal probes; High-Throughput Screening.

## Instrumental Analysis

- Automated chromatography (ISCO, Biotage); Nuclear Magnetic Resonance (NMR); FPLC; HPLC; LC/MS; MALDI-TOF; IR/Raman; UV/Vis; Dynamic light scattering analysis (DLS).

## Software

- Microsoft Office; ChemDraw; TopSpin; Mestrenova; ACDlab; Schrödinger; Adobe Illustrator; FlowJo; GraphPad Prism; Sybyl-X.

- **Education**

### Ph.D | 08/2016 | University of Toledo, Toledo, OH, USA

- Major: Chemistry

### Master of Science | 06/2011 | Tianjin Normal University, Tianjin, China

- Major: Organic Chemistry

### Bachelor of Science | 06/2008 | Tianjin Normal University, Tianjin, China

- Major: Chemical Biology

- **Publication**

- Kleski, K. A.; **Shi, M.**; Lohman, M.; Hymel, G. T.; Gattoji, V. K.; Andreana, P. R.\* (2020) Synthesis of an aminoxy derivative of the GM3 antigen and its application in oxime ligation. *The Journal of Organic Chemistry* (accepted).
- Trabbic, K. R.; Kleski, K. A.; **Shi, M.**; Bourgault, J.-P.; Andreana, P. R.\* (2020) Enhanced Immune Response against the Thomsen Friedenreich Tumor Antigen Using a Bivalent Entirely Carbohydrate Conjugate. *Molecules*, 25(6), 1319.
- Maji, B.; Gangopadhyay, S.†; Lee, M. †; **Shi, M.** †; Wu, P. †; Heler, R.; Mok, B.; Lim, D.; Paul, B.; Dancik, V.; Vetere, A.; Mesleh, M. F.; Marraffini, L. A.; Liu, D. R.; Clemons, P. A.; Wagner, B. K.; Choudhary, A.\* (2019) A high-throughput platform to identify small-molecule inhibitors of CRISPR-Cas9. *Cell*, 177 (4), 1067-1079 († equally contribution).
- Trabbic, K. R.; Kleski, K. A.; **Shi, M.**; Bourgault, J.-P.; Andreana, P. R.\* (2018) Production of a Mouse Monoclonal IgM Antibody that Targets the Carbohydrate Thomsen-nouveau Cancer Antigen Resulting in in vivo and in vitro Tumor Killing. *Cancer Immunology, Immunotherapy*, 67, 1437-1447.
- Shi, M.**; Kleski, K. A.; Trabbic, K. R.; Bourgault, J.-P.; Andreana, P. R.\* (2016) STn-PS A1 as an Entirely Carbohydrate Immunogen: Synthesis and Immunological Evaluation. *Journal of the American Chemical Society* 138: 14264-14272.
- Trabbic, K. R.; Bourgault, J.-P.; **Shi, M.**; Clark, M.; Andreana, P. R.\* (2016) Immunological Evaluation of the Entirely Carbohydrate-based Thomsen-Friedenreich - PS B Conjugate. *Organic and Biomolecular Chemistry* 14: 3350-3355.
- Bourgault, J. -P.; Trabbic, K. R.; **Shi, M.**; Andreana, P. R. \* (2014) Synthesis of the Tumor Associative  $\alpha$ -Aminoxy Disaccharide of the TF Antigen and its Conjugation to a Polysaccharide Immune Stimulant. *Organic and Biomolecular Chemistry* 12: 1699-1702.
- Liu, Q. -X.\*; Zhang, W.; Zhao, X.-J.; Zhao, Z.-X.; **Shi, M.**; Wang, X.-G. (2013) NHC PdII Complex Bearing 1,6-Hexylene Linker: Synthesis and Catalytic Activity in the Suzuki-Miyaura and Heck-Mizoroki Reactions. *European Journal of Organic Chemistry* 2013, 1253-1261.

9. Liu, Q.-X.\*; Li, H.-L.; Zhao, X.-J.; Ge, S.-S.; **Shi, M.**; Shen, G.; Zang, Y.; Wang, X.-G. (2011) Silver(I), mercury(II) and palladium(II) complexes of functionalized N-heterocyclic carbenes: Synthesis, structural studies and catalytic activity. *Inorganica Chimica Acta* 376, 437-445.
10. Liu, Q.-X.\*; **Shi, M.**; Wang, Z.-Q.; Liu, S.-W.; Ge, S.-S.; Zang, Y.; Wang, X.-G.; Guo, J.-H. (2010) 1D coordination polymers of silver (I) and copper (II) based on bis-(N-heterocyclic carbene) ligands: Synthesis and structural studies. *Polyhedron* 29, 2121-2126.

- **Patent**

1. Andreana, P. R.; Trabbic, K. R.; **Shi, M.**; Bourgault, J.-P.; “Monoclonal IgM Antibodies from Entirely Carbohydrate Constructs”, WO2018/053468 A1, March 22, 2018.
2. Choudhary, A; **Shi, M.**; Maji, B; Gangopadhyay, S. A.; Lee, M.; “Inhibitors of RNA guided nucleases and uses thereof”, U.S. Provisional Patent Application Nos. 62/765,357; 62/774,012 and 62/784,268, filed by Broad Institute