Curriculum Vitae

Name
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Current Position
Research Fellow and Professor
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Education & Professional Experiences

1992	B.S.	Department of Chemistry, National Taiwan University, Taiwan
1996	M.S.	Department of Chemistry, University of Pennsylvania, USA
2000	Ph.D.	Department of Chemistry, University of Pennsylvania, USA
2001 – 2004		Postdoctoral Fellow, The Scripps Research Institute, USA
2004 – 2010		Assistant Professor, Academia Sinica
2010 – 2019		Associate Professor, Academia Sinica
2014 – 2019		Visiting Scientist, RIKEN SPring-8 Center, Japan
2019 –		Professor, Academia Sinica

Research Interests
Structure and function of membrane glycoproteins and drug discovery

Selected Publications

1. Altering the carbohydrate-binding specificity of the legume lectin FRIL through structure-guided engineering. YM Liu, HTV Nguyen, X Chen, M Shahed-Al-Mahmud, TH Chen, KS Liao, JM Lo, TC Kan, CT Ren, **C Ma***. *Nat Commun* **(2026)**. doi: 10.1038/s41467-026-70188-7.
2. Expression of Human β3GalT5–1 in Insect Cells as Active Glycoforms for the Efficient Synthesis of Cancer-Associated Globo-Series Glycans. CC Kung, JM Lo, KS Liao, CY Wu, LC Cheng, C Chung, TL Hsu, **C Ma***, CH Wong*. *Journal of the American Chemical Society* 147(13), 10864-10874 **(2025)**.
3. Structure-Based Mechanism and Specificity of Human Galactosyltransferase β3GalT5. Lo JM., Kung CC, Cheng TJR, Wong CH*, **Ma C***. *Journal of the American Chemical Society* 147(13), 10875-10885 **(2025)**.

Lecture Title
Altering the carbohydrate-binding specificity of the legume lectin FRIL through structure-guided engineering

Abstract (500 words maximum)

FRIL is a legume lectin from the hyacinth bean that has broad-spectrum antiviral activity. A distinctive trait of FRIL among similar mannose/glucose-specific legume lectins is that FRIL shows specificity for complex type N-glycans. We postulate that an extended binding site on FRIL facilitates this ligand selectivity. Here, we show legume lectin carbohydrate recognition domain (CRD) loop B is the main determinant of complex versus high-mannose N-glycan

specificity in FRIL and Concanavalin A (ConA), respectively. First, we find that the inactive precursors of recombinant FRIL (rFRIL) and proConA (rproConA) can be activated via deglycosylation. Secondly, the cryo-EM structures of inactive apo rFRIL, active FRIL in complex with Galβ1,4-(Fucα1,3-)GlcNAcβ1,2-Man tetrasaccharide, and active rFRIL in complex with $Mannose_9GlcNAc_2$ (Man9) N-glycan are determined, and residues H102 and Y101 on loop B are identified as crucial for complex glycan recognition. Finally, we swapped loop B residues 101 and 102 alongside loop C residue 145 on FRIL to their structural equivalent on ConA, resulting in a FRIL mutant that binds exclusively to high mannose N-glycans. Taken together, we have established a process of activating recombinant FRIL and related lectins through deglycosylation, and demonstrated the crucial role that loop B residues play in establishing oligosaccharide specificity.