
CURRICULUM VITAE

NAME

Wu, Chung-Yi

**POSITION TITLE**Associate Research Fellow
The Genomics Research Center, Academia Sinica,
Taiwan

EDUCATION/TRAINING (Begin with bachelor education and include all higher education and postdoctoral training.)

INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
National Chiao-Tung University, Taiwan	B.S.	1994	Chemistry
National Chiao-Tung University, Taiwan	M.S.	1996	Organic Synthesis
National Chiao-Tung University, Taiwan	Ph.D	2000	Organic Synthesis
Institute of Chemistry, Academia Sinica, Taiwan	Postdoctoral	2001-2004	Carbohydrate Chemistry
Department of Chemistry, The Scripps Research Institute, USA	Postdoctoral	2004-2006	Carbohydrate Chemistry

A. Positions and Honors.

Positions and Employment

2011- Associate Research Fellow, Genomics Research Center, Academia Sinica
2006-2011 Assistant Research Fellow, Genomics Research Center, Academia Sinica
2004-2006 Postdoctoral Fellow, Genomics Research Center, Academia Sinica, Taiwan
2004-2006 Associated Research Fellow, Department of Chemistry, The Scripps Research Institute, USA.
2001-2004 Postdoctoral Fellow, Institute of Chemistry, Academia Sinica. Taiwan

Other Experience and Professional Memberships

2012 Organizing Committee member, Sialoglyco 2012, Taipei, Taiwan, Sep. 9-12.
2011~ Editorial Board Member, Journal of Glycobiology.
2010 Steering Committee, International Symposium of Glycosciences, Taipei, Taiwan, July 29-30.
2009 Steering Committee, Taiwan-Canada Bilateral Workshop: Glycoscience Workshop, Taipei, Taiwan, November 9-10,.

Honors

2014 The David Y. Gin New Investigator Award, American Chemical Society.
2012 Academia Sinica Research Award for Junior Research Investigators.
2012 Career Development Award, Academia Sinica, Taiwan.
2012 Project for Excellent Junior Research Investigators Award, National Science Council, Taiwan

2004-2006	Cooperative Postdoctoral Research Visit Program of National Science Council, Taiwan and Designated Collaborative Academic Institutes in the United States
2000-2004	Postdoctoral Fellowship of Academia Sinica, Taiwan. (2000-2004)
1997-2000	Predoctoral Fellowship of National Science Council, Taiwan (1997-2000)
1994-1996	Fellowship of Educational Ministry, Taiwan (1994-1997)
1994	Bronze Medal, Spring Prize of NCTU

B. Principal areas of research interest

My research program is focused on elucidating the role of complex oligosaccharides involved in a host of biological processes of medical relevance by employing glycan array created by synthetic chemistry. We are particularly interested in understanding the recognition events responsible for the interactions of oligosaccharides with pathogens and antibodies. To address these questions we are developing and applying techniques traditionally associated with the areas of organic synthesis, solid-phase chemistry, combinatorial chemistry, engineering and automation, analytical chemistry, biochemistry, enzymology, molecular biology, neurobiology, immunology and drug design. The core interests our research program currently address the following areas:

Total Synthesis of Biologically Important Oligosaccharides

- Tumor-associated antigens
- HIV-related oligosaccharides
- Bacterial cell-surface antigens

Development of Carbohydrate-based Vaccines

- A fully synthetic *N. meningitidis* vaccine
- Synthetic cancer vaccines
- Synthetic HIV vaccine

Carbohydrate Microarrays

- For influenza virus and cancer detection

C. Peer-reviewed publications (in reverse chronological order).

a. Independent Research works since 2006 at Genomics Research Center, Academia Sinica.

1. Shivatare, S. S., Chang, S.-H., Tsai, T.-I., Ren, C.-T., Chuang, H.-g.-Y., Hsu, L., Wu, C.-Y.,* Wong, C.-H.* “Efficient Convergent Synthesis of Bi-, Tri-, and Tetraantennary Complex Type N-Glycans and Their HIV-1 Antigenicity.” *J. Am. Chem. Soc.* **2013**, online.
2. Tsai, T.-I., Lee, H.-Y., Chang, S.-H., Wang, C.-H., Tu, Y.-C., Lin, Y.-C., Hwang, D.-R., Wu, C.-Y., Wong, C.-H.* “Effective Sugar Nucleotide Regeneration for the Large-scale Enzymatic Synthesis of Globo H and SSEA4”, *J. Am. Chem. Soc.* **2013**, online.
3. Chuang, H.-Y., Ren, C.-T., Chao, C.-A., Wu, C.-Y., Shivatare, S. S., Cheng, T.-J. R., Wu, C.-Y.*, Wong, C.-H.* “Synthesis and Vaccine Evaluation of the Tumor Associated Carbohydrate Antigen RM2 from Prostate Cancer.” *J. Am. Chem. Soc.* **2013**, *155*, 11140-11150.
4. Wang, C.-H., Li, S.-T., Lin, T.-L., Cheng, Y.-Y., Wang, J.-T. Wang, Cheng, T.-J. R., Wong, C.-H., Wu, C.-Y.*, “Synthesis of *Neisseria meningitidis* serogroup W135 capsular oligosaccharide with various lengths for immunogenicity comparison and vaccine development.” *Angew. Chem. Int. Ed.* **2013**, *52*, 9157-9161.
5. Huang, Y.-L., Hung, J.-T., Cheung, S. K. C., Lee, H.-Y., Chu, K.-C., Li, S.-T., Lin, Y.-C., Ren, C.-T., Cheng, T.-J. R., Hsu, T.-L., Yu, A. L., Wu, C.-Y.*, Wong, C.-H.*, “Carbohydrate-based vaccines with a glycolipid adjuvant for breast cancer”, *Proc. Nat. Acad. Sci. U.S.A.*, **2013**, *110*, 2517-22.
6. Liao, S.-F., Liang, C.-H., Ho, M.-Y., Hsu, T.-L., Tsai, T.-I., Hsieh, Y.S.-Y., Li, S.-T., Cheng, Y.-Y., Tsao, S.-M., Lin, T.-Y., Lin, Z.-Y., Yang, W.-B., Ren, C.-T., Lin, K.-I., Khoo, K.-H., Lin, C.-H., Hsu, H.-Y.,* Wu, C.-Y.* Wong, C.-H.* “Immunization of fucosucosucose-containing polysaccharides from Reishi mushroom induced antibodies against tumor-associated Globo H-series epitopes.” *Proc. Nat. Acad. Sci. U.S.A.*, **2013**, *110*, 13809-13814.
7. Hung, T.-C., Lin, C.-W., Hsu, T.-L., Wu, C.-Y., Wong, C.-H.*, “Investigation of SSEA-4 Binding Protein in Breast Cancer Cells”, *J. Am. Chem. Soc.*, **2013**, *135*, 5934-5937.
8. Cheng, T.-J. R., Wang, S.-Y., Wen, W.-H., Su, C.-Y., Lin, M., Huang, W.-I., Liu, M.-T., Wu, H.-S., Wang, N.-S., Cheng, C.-K., Chen, C.-L., Ren, C.-T., Wu, C.-Y., Fang, J.-M.,* Cheng, Y.-S. E.,* Wong, C.-H.* “Chemical probes for drug resistance assessment by binding competition (RABC) oseltamivir susceptibility evaluation”, *Angew. Chem. Int. Ed.*, **2013**, *52*, 366–370.
9. Tsai, C.-C., Lin, C.-R., Tsai, H.-Y., Chen, C.-J., Li, W.-T., Yu, H.-M., Ke, Y.-Y., Hsieh, W.-Y., Chang, C.-Y., Wu, C.-Y., Chen, S.-T.,* Wong, C.-H. “The immunologically active oligosaccharides isolated from wheatgrass modulate monocytes via Toll-like receptor-2 signaling.” *J. Biol. Chem.* **2013**, *288*, 17689-17697.
10. Lin, S.-C., Jan, J.-T., Dionne, B., Butler, M., Huang, M.-H., Wu, C.-Y., Wong, C.-H., Wu, S.-C. Wu.* “Different Immunity Elicited by Recombinant H5N1 Hemagglutinin Proteins Containing Pauci-mannose, High-mannose, or Complex type N-Glycans.” *PLoS One* **2013**, *8*, e66719.
11. Liang, C.-H.; Hsu, C.-H.; Wu, C.-Y.* "Sialosides Array: New Synthetic Strategies and Applications." *Topics Curr. Chem.* **2013**, in press.
12. Wu, C.-S., Yen, C.-J., Chou, R.-H., Wu, C.-Y.*, Yu, Y.-L.* “Downregulation of MicroRNA-15b by Hepatitis B Virus X Enhances Hepatocellular Carcinoma Proliferation via Fucosyltransferase 2-Induced carbohydrates Expression.” *Int. J. Cancer.* **2013**, in press.
13. Yang, C.-Y., Chen, J.-B., Tsai, T.-F., Tsai, Y.-C., Tsai, C.-Y., Liang, P.-H., Hsu, T.-L., Wu, C.-Y., Netea, M. G., Wong, C.-H., Hsieh, S.-L.* "CLEC4F is an inducible C-type lectin in F4/80-positive Cell and is involved in alpha-galactosylceramide presentation in liver." *PLoS One* **2013**, *8*, e65070.
14. Wu, C.-S., Yen, C.-J., Chou, R.-H., Li, S.-T., Huang, W.-C., Ren, C.-T., Wu, C.-Y.*, Yu, Y.-L.* “Cancer-Associated Carbohydrate Antigens as Potential Biomarkers for Hepatocellular Carcinoma.” *PLoS One* **2012**, *7*, e39466.

15. Chu, K.-C.; Wu, C.-Y.* "Carbohydrate-based synthetic vaccines: synthesis of longer chains of carbohydrates makes this a step ever closer?" *Future Med. Chem.* **2012**, *4*, 1767-1770.
16. Wu, C.-Y.; Lin, H.-C.; Wu, H.-J.* "Synthesis of New Acetal Aza-Cage Compounds via Ozonolysis of Bis-endo-diol- and Diacylnornornese Derivatives", *Tetrahedron*, **2012**, *68*, 2100-2106.
17. Chu, K.-C.; Ren, C.-T.; Liu, C.-P.; Hsu, C.-H.; Chao, T.-A.; Wu, S.-H.; Wong, C.-H.*; Wu, C.-Y.* "Efficient and Stereoselective Synthesis of alpha(2→9) Oligosialic Acids: From Monomers to Dodecamers", *Angew. Chem. Int. Ed.* **2011**, *50*, 9391-9395.
18. Liang, C.-H.; Wang, S.-K.; Lin, C.-W.; Wang, C.-C.; Wong, C.-H.*; Wu, C.-Y.* "Effects of Neighboring Glycans on Antibody–Carbohydrate Interaction." *Angew. Chem. Int. Ed.* **2011**, *50*, 1608-1612.
19. Hsu, C.-H.; Hung, S.-C.*; Wu, C.-Y.*; Wong, C.-H.* "Efficient Approaches toward Automated Oligosaccharide Synthesis: Applications and Limitations" (Invited review) *Angew. Chem. Int. Ed.* **2011**, *50*, 11872-11923.
20. Punyadarsaniya, D.; Liang, C.-H.; Winter, C.; Petersen, H.; Rautenschlein, S.; Hennig-Pauka, I.; Schwegmann-Wessels, C.; Wu, C.-Y.; Wong, C.-H.; Herrler, G.* "Infection of differentiated porcine airway epithelial cells by influenza virus: differential susceptibility to infection by porcine and avian viruses", *PLoS One* **2011**, *6*, e28429..
21. Tsai, B.-L.; Han, J.-L.; Ren, C.-T.; Wu, C.-Y.*; Wong, C.-H.* "Programmable One-Pot Synthesis of Tumor-Associated Carbohydrate Antigens Lewis X dimer and KH-1 epitopes", *Tetrahedron Letts.* **2011**, *52*, 2132-2135.
22. Yen, H.-L.; Liang, C.-H.; Wu, C.-Y.; Forret, H.; Ferguson, A.; Choy, K.T.; Jones, J.; Wong, D.D.Y.; Cheung, P.P.H.; Hsu, C.-H.; Li, O.T.; Yuen, K.M.; Chan, R.W.Y.; Poon, L.L.M.; Chan, M.C.W.; Nicholls, J.; Krauss, S.; Wong, C.-H.; Guan, Y, Webster, R.G.; Webby, R.J.; Peiris, J.S.M.* " Hemagglutinin-neuraminidase balance confers respiratory droplet transmissibility of the pandemic H1N1 influenza virus in ferrets." *Proc. Nat. Acad. Sci. U.S.A.* **2011**, *108*, 14264-14269.
23. Wu, C.-Y.*; Wong, C.-H.* "Programmable One-Pot Glycosylation", *Topics Curr. Chem.* **2011**, *301*, 223-252.
24. Wu, C.-Y.*; Wong, C.-H.* "Chemistry and Glycobiology", *Chem. Commum.* **2011**, *47*, 6201-6207.
25. Chen, M. W.; Liao, H.-Y.; Huang, Y.; Jan, J.-T.; Huang, C.-C.; Ren, C.-T.; Wu, C.-Y.; Cheng, T.-J.; Ho, D.*; Wong, C.-H.* "Broadly neutralizing DNA vaccine with specific mutation alters the antigenicity and sugar binding activities of influenza hemagglutinin", *Proc. Nat. Acad. Sci. U.S.A.* **2011**, *108*, 3510-1515.
26. Chang, S.-H.; Han, J.-L.; Tseng, S.Y.; Lin, C.-W.; Lin, Y.-C.; Jeng, W.-Y.; Wang, A.H.-J.; Wu, C.-Y.*; Wong, C.-H.* "Glycan Array on Teflon-like Aluminum Coated Glass Slides: Study of Cellulase Activity and Specificity Using Mass Spectrometry", *J. Am. Chem. Soc.* **2010**, *132*, 13371-13380.
27. Liao, H.-Y.; Hsu, C.-H.; Wang, S.-C.; Liang, C.-H.; Yen, H.-Y.; Su, C.-Y.; Chen, C.-H.; Jan, J.-T.; Ren, C.-T.; Chen, C.-H.; Cheng, T.-J, R.; Wu, C.-Y.*; Wong, C.-H.* "Differential Receptor Binding Affinities of Influenza Hemagglutinins on Glycan Arrays", *J. Am. Chem. Soc.* **2010**, *132*, 14849-14856.
28. Hung, Y.-L.; Wu, C.-Y.* "Carbohydrate-Based Vaccines: Challenges and Opportunities", *Expert review of vaccines.* **2010**, *9*, 1257-1274.
29. Hsu, C.-H.; Chu, K.-C.; Lin, Y.-S.; Han, J.-L.; Peng, Y.-S.; Ren, C.-T.; Wu, C.-Y.*; Wong, C.-H.* "Highly Alpha-Selective Sialyl Phosphate Donors for Efficient Preparation of Natural Sialosides." *Chem. Eur. J.*, **2010**, *16*, 1754-1760.
30. Liang, C.-H.; Wu, C.-Y.* "Glycomics: Relevance for Personalized Medicine" **2010**, *8*, 49-63.
31. Wu, C.-I.; Wang, Y.-S.; Chen, N. G.; Wu, C.-Y. Chen, C.-H., "Ultrasound-Induced Ionization of Biomolecules." *Rapid Commun. Mass. Spect.* **2010**, *24*, 2569-2574.
32. Liang, C.-H.; Wang, C.-C.; Lin, Y.C.; Chen, C.-H.; Wong, C.-H.*; Wu, C.-Y.* "Ion Oxide/Gold Core/Shell Nanoparticle for Ultrasensitive Detection of Carbohydrate-Protein Interactions." *Anal. Chem.* **2009**, *81*, 7750-7756.
33. Wang, C.-C.; Chen, J.-R.; Tseng, Y.-C.; Hsu, C.-H.; Hung, Y.-F.; Chen, S.-W.; Chen, C.-M.; Khoo, K.-H.; Cheng, T.-J.; Cheng, Y.-S.; Jan, J.-T.; Wu, C.-Y.; Ma, A. C.*; Wong, C.-H.* "Glycans on influenza

- hemagglutinin affect receptor binding and immune response ", *Proc. Nat. Acad. Sci. U.S.A.* **2009**, *106*, 18137-18142.
34. Liang, C.-H.; Wu, C.-Y.*, "Glycan Array: A Powerful Tool for Glycomics Studies", *Expert. Rev. Proteomics.* **2009**, *6*, 631-645.
 35. Wu, C.-Y.*; Liang, P.-H.*; Wong, C.-H.*, New Development of Glycan Arrays. *Org. Biomol. Chem.* **2009**, *7*, 2247-2254.
 36. Wang, S.-Y.; Su, C.-Y.; Lin, M.; Huang, S.-Y.; Huang, W.-I.; Wang, C.-C.; Wu, Y.-T.; Cheng, T. J. R.; Yu, H.-M.; Ren, C.-T.; Wu, C.-Y.; Wong, C.-H.; Cheng, Y. S. E.*, HA-pseudotyped retroviral vector for influenza antagonist screening. *J. Biomol. Screening.* **2009**, *14*, 294-302.
 37. Wang, C.-C.; Huang, Y.-L.; Ren, C.-T.; Lin, C.-W.; Hung, J.-T.; Yu, J.-C.; Yu, A. L.*; Wu, C.-Y.*; Wong, C.-H.*, Glycan Microarray of Globo H and Related Structures for Quantitative Analysis of Breast Cancer. *Proc. Nat. Acad. Sci. U.S.A.* **2008**, *105*, 11661-11666.
 38. Tseng, S.-Y.; Wang, C.-C.; Lin, C.-W.; Chen, C.-L.; Yu, W.-Y.; Chen, C.-H.; Wu, C.-Y.*; Wong, C.-H.*, Glycan Arrays on Aluminum Coated Glass Slides. *Chem. Asian J.* **2008**, *3*, 1395-1405.
 39. Hsu, N.-Y.; Tseng, S.-T.; Wu, C.-Y.; Ren, C.-T.; Lee, Y.-C.; Wong, C.-H.; Chen, C.-H.*, Desorption Ionization of Biomolecules on Metals. *Anal. Chem.* **2008**, *80*, 5203-5210.
 40. Liang, P. H.; Wu, C.-Y.; Greenberg, W. A.; Wong, C.-H.*, Glycan Arrays: Biological and Medical Applications. *Curr. Opin. Chem. Biol.* **2008**, *12*, 86-92.

b. Postdoctoral Research Works at the Scripps Research Institute and Academia Sinica:

41. Lee, J.-C.¹; Wu, C.-Y.¹; Apon, J. V.; Siuzdak, G.; Wong, C.-H.* "Reactivity-Based One-Pot Synthesis of Tumor-Associated Antigen N3 Minor Octasaccharide for the Development of a Photocleavable DIOS-MS Sugar Array." *Angew. Chem. Int. Ed.* **2006**, *45*, 2753-2757.
42. Brik, A.; Wu, C.-Y.; Wong, C.-H.* "Microtiter Plate Based Chemistry and In Situ Screening: A Useful Approach for Rapid Inhibitors Discovery." *Org. Biomol. Chem.* **2006**, *4*, 1446-1457.
43. Wu, C.-Y.; King, K.-Y.; Kuo, C.-J.; Fang, J.-M.; Wu, Y.-T.; Ho, M.-Y.; Liao, C.-L.; Shie, J.-J.; Liang, P.-H.; Wong, C.-H.* "Stable Benzotriazole Esters as Mechanism-Based Inactivators of the Severe Acute Respiratory Syndrome 3CL Protease." *Chem. Biol.* **2006**, *13*, 261-268.
44. Ho, C.-W.; Lin, Y.-N.; Chang, C.-F.; Lee, H.-T.; Wu, Y.-T.; Wu, C.-Y.; Chang, C.-F.; Liu, S.-W.; Li, Y.-K.; Lin, C.-H.* "Discovery of Different Types of Inhibition between the Human and *Thermotoga maritima* α -Fucosidases by Fuconojirimycin-Based Derivatives" *Biochemistry* **2006**, *45*, 5695-5702.
45. Wu, C.-Y.; Brik, A.; Wang, S.-K.; Chen, Y.-H.; Wong, C.-H.* "Tetrabutylammonium Fluoride-Mediated Rapid Alkylation Reaction in Microtiter Plates for Discovery of Enzyme Inhibitors in Situ." *Chembiochem* **2005**, *6*, 2176-2180.
46. Brik, A.; Wu, C.-Y.; Best, M. D.; Wong, C.-H.* "Tetrabutylammonium Fluoride-Assisted Rapid N9-Alkylation on Purine Ring: Application to Combinatorial Reactions in Microtiter Plates for the Discovery of Potent Sulfotransferase Inhibitors in Situ." *Bioorg. Med. Chem.* **2005**, *13*, 4622-4626.
47. Chang, C.-F.; Ho, C.-W.; Wu, C.-Y.; Chao, T.-A.; Wong, C.-H.; Lin, C.-H.* "Discovery of picomolar slow-tight binding inhibitors of α -fucosidase" *Chem. Biol.* **2004**, *11*, 1301-1306.
48. Wu, C.-Y.; Jan, J.-T.; Ma, S.-H.; Kuo, C.-J.; Juan, H.-F.; Cheng, Y. H. E.; Hsu, H.-H.; Liu, R.-H.; Fang, J.-M.; Liang, P.-H.*; Wong, C.-H.* "Small molecules targeting Severe Acute Respiratory Syndrome (SARS) human coronavirus." *Proc. Natl. Acad. Sci. U.S.A.* **2004**, *101*, 10012-10017.
49. Wu, C.-Y.; Chang, C.-F.; Chen, J. S.-Y.; Wong, C.-H.*; Lin, C.-H.* "Rapid Diversity-Oriented Synthesis in Microtiter Plates for *in situ* Screening: Discovery of Potent and Selective Fucosidase Inhibitors." *Angew. Chem. Int. Ed.* **2003**, *42*, 4661-4664.
50. Lin, H.-C.; Yang, W.-B.; Gu, Y.-F.; Chen, C.-Y.; Wu, C.-Y.; Lin, C.-H.* "Stereoselective glycosylation of exo-glycals accelerated by Ferrier-type rearrangement." *Org. Lett.* **2003**, *5*, 1087-1089.
51. Yang, W.-B.; Wu, C.-Y.; Chang, C.-C.; Wang, S.-H.; Teo, C.-F.; Lin, C.-H.* "Facial Synthesis of Conjugated Exo-Glycals" *Tetrahedron Lett.* **2001**, *42*, 6907-6910.

c. Research works carried out as a graduate student:

52. Wu, C.-Y.; Lin, H.-C.; Wang, Z.-Y.; Wu, H.-J.* “Synthesis of Novel Acetal Thia-Cage Compounds” *J. Org. Chem.* **2001**, *66*, 4610-4618.
53. Wu, H.-J.*; Wu, C.-Y. “Synthesis of Pentaoxa[5]peristylanes.” *J. Org. Chem.* **1999**, *64*, 1576-1578.
54. Lin, H.-C.; Wu, C.-Y.; Wu, H.-J.* “Synthesis of 3,11-Dioxatetracyclo-[6.3.0.0^(2,6).0^(5,9)]undecanes and 3,5,7-trioxapentacyclo[7.2.1.0^(2,8).0^(4,11).0^(6,10)]-dodecane.” *J. Chin. Chem. Soc-Taipei* **1997**, *44*, 609-616.
55. Wu, H.-J.*; Wu, C.-Y. “The Pentaoxa[5]peristylanes. A Novel Oxa-Cage System” *Tetrahedron Lett.* **1997**, *38*, 2493-2496.
56. Wu, H.-J.*; Chern, J.-H.; Wu, C.-Y. “Ozonolysis of 2-endo-7-anti-Diaclynorbornenes. A new Entry for The Synthesis of 2,4,6,13-Tetraoxapentacyclo[5.5.1.0^(3,11).0^(5,9).0^(8,12)]tridecanes” *Tetrahedron* **1997**, *53*, 2401-2414.
57. Wu, H.-J.*; Wu, C.-Y.; Lin, C.-C. “Synthesis of Novel triacetal oxa-cage compounds” *Chinese Chem. Lett.* **1996**, *7*, 15-18.
58. Lin, R.-L.; Wu, C.-Y.; Chern, J.-H.; Wu, H.-J.* “Synthesis of Tetraacetal Tetraoxa-Cage Compounds with Alkyl Substituents at Different Sites of The Oxa-Cage Skeleton” *J. Chin. Chem. Soc-Taipei* **1996**, *43*, 289-295.
59. Wu, C.-Y.; Lin, C.-C., Lai, M.-C.; Wu, H.-J.* “Synthesis of Novel Triacetal Trioxa-Cage Compounds by Ozonolysis of Bicyclo[2.2.1]heptenes and Bicycle[2.2.2]octenes” *J. Chin. Chem. Soc-Taipei* **1996**, *43*, 187-194.

D. Patents

1. C.-H. Wong, C.-Y. Wu, C.-C. Wang, “Cancer diagnosis based on levels of antibodies against Globo H and its fragments,” US Patent No. 8,158,367 (2012), PCT Patent Application No. PCT/US09/47532, Japanese Patent Application No. 2011-514757, Canadian Patent Application, Australian Patent Application No. 2009271411, European Patent Application No. 09798419.9, India Patent Application No.4966/KOLNP/2010, New Zealand Patent Application No. 590064, China Patent Application No. 200980123715.3, Mexican Patent Application, Korean Patent Application.
2. C.-H. Wong, C.-Y. Wu, A. Yu, J. Yu “Globo H and related anti-cancer vaccines with novel glycolipid adjuvants,” US Patent No. 8,268,969 (2012), US Patent Application No. 13/568,510, Taiwan Patent Application No. 098127948, PCT Patent Application No. PCT/US2009/004519, Japanese Patent Application No. 2011-514633, Canadian Patent Application No. 2728341, Australian Patent Application No. 2009269127, European Patent Application No. 9789075, New Zealand Patent Application No. 590140, China Patent Application No. 200980122743.3, Indian Patent Application No. 5005/KOLNP/2010, Korean Patent Application No. 10-2011-7000382, Mexican Patent Application No. MX/a/2010/013932.
3. C.-H. Wong, C.-Y. Wu, S. Y. Tseng, “Glycan arrays on PTFE-like aluminum coated glass slides and related methods,” PCT Patent Application No. PCT/US09/50754, US Patent Application No. 12/503,797, European Patent Application No. 09798721.8, Japanese Patent Application No. 20110518895.
4. C.-H. Wong, C.-Y. Wu, “Alpha-Selective Sialyl Phosphate Donors For Preparation Of Sialosides And Sialoside Arrays For Influenza Virus,” PCT Patent Application No. PCT/US2010/029058, US Patent Application No. 12/749,118, European Patent Application No. 10756991.5.
5. C.-H. Wong, C.-Y. Wu, “Methods For Modifying Human Antibodies By Glycan Engineering,” US Patent Application No. 12/959,351.
6. C.-H. Wong, C.-Y. Wu, C.-H. Liang, A.-S. Yang, “Glycan Arrays For High Throughput Screening Of Viruses,” PCT Patent Application No. PCT/US2011/32192.
7. C.-H. Wong, T.-I. Tsai, C.-Y. Wu “Large Scale Enzymatic Synthesis of Oligosaccharides” US Provisional Patent Application No. 61/684,974.
8. C.-H. Wong, Y.-S. Cheng, H.-M. Yu, T.-J. Cheng, C.-Y. Wu, J.-M. Fang, “Compositions and methods for treating inflammation and inflammation-related disorders by plectranthus amboinicus extract,” US Patent No. 8,105,636.
9. C.-H. Wong, C.-Y. Wu, “Anti-coronavirus compounds,” Taiwan Patent No. I372048 (2012), China Patent

- No. CN1949977B (2010), NZ Patent No. NZ550945 (2010), Indonesia Patent Application No. W-00200603110, US Patent Application No. 11/121,314, Indian Patent Application No. 1413/MUMNP/2006.
10. C.-H. Wong, **C.-Y. Wu**, C.-H. Wang, S.-T. Li “Glycan conjugates and use thereof” US Provisional Patent Application (2013).
 11. C.-H. Wong, **C.-Y. Wu**, H.-Y. Chuang, C.-T. Ren “RM2 antigens and use thereof” US Provisional Patent Application (2013).
 12. C.-H. Wong, C.-Y. Wu, C.-H. Wang, S.-T. Li
 13. C.-H. Wong, **C.-Y. Wu**, H.-Y. Hsu, S.-F. Liao, C.-H. Liang “Antibody-Mediated Anti-Tumor Activity Induced By Reishi Mushroom Polysaccharides” US Provisional Patent Application (2013).