

Yongku Cho

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EDUCATION

B.S., Chemical Engineering, 2001, Seoul National University, Seoul, Korea

Ph.D., Chemical Engineering, 2010, University of Wisconsin-Madison, Madison, WI

Thesis: "Antibody-based Membrane Proteomics of the Blood-Brain Barrier"

Advisor: Eric V. Shusta

Postdoctoral Associate, 2010-2013, Massachusetts Institute of Technology, Cambridge, MA

Engineering Light-gated Ion Channels

Advisor: Edward S. Boyden

PROFESSIONAL EXPERIENCE

Assistant Professor, Chemical and Biomolecular Engineering, University of Connecticut (2014-2020)

Associate Professor (tenured), Chemical and Biomolecular Engineering, University of Connecticut (Fall 2020 -)

Affiliations at UConn: Graduate Advisor for Physiology and Neurobiology, Biomedical Engineering

(2014-Present), Member of the Institute for Systems Genomics (2014-Present)

HONORS AND AWARDS

2019 Alzheimer's Association – New to the Field Grant

2019 Research Excellence Award, University of Connecticut

2016 American Chemical Society (ACS), Best of BIOT award

2014 NARSAD Young Investigator Grant, Brain and Behavior Research Foundation

2008 Vilas Travel Grant, University of Wisconsin-Madison

2008 Poster Presentation Scholarship, 19th Annual Antibody Engineering Conference

2007-2010 NIH Genomic Sciences Training Program Fellow

2007 Roland A. Ragatz Teaching Assistant Award, 1st place

2007 Polygon Engineering Council Outstanding Teaching Assistant Award

2004-2006 Samsung Scholarship

2000 Gold Medal in Biochemical Engineering Competition sponsored by Korean Institute of Chemical Engineers (KIChE)

PUBLICATIONS

(*Corresponding author; †Equal contribution)

1. Wang, X.X., Cho, Y.K., Shusta, E.V.*, Mining a yeast library for brain endothelial cell-binding antibodies. *Nature Methods*, 4, 143-145 (2007).
2. Pepper L.R.†, Cho, Y.K.†, Boder, E.T., Shusta, E.V.*, A decade of yeast surface display technology: where are we now? *Combinatorial Chemistry and High Throughput Screening*, 11, 127-134 (2008).
3. Cho, Y.K., Chen, I., Wei, X., Li, L., Shusta, E.V.*, A yeast display immunoprecipitation method for efficient isolation and characterization of antigens, *Journal of Immunological Methods*, 341, 117-126 (2009).
4. Pavoov, T., Cho, Y.K., Shusta, E.V.*, Development of GFP-based biosensors possessing the binding properties of antibodies, *Proceedings of the National Academy of Sciences*, 106, 11895-11900 (2009).
5. Cho, Y.K., Shusta, E.V.*, Antibody library screens using detergent-solubilized mammalian cell lysates as antigen sources, *Protein Engineering Design and Selection*, 23, 567-577 (2010).
6. Tillotson, B.T., Cho, Y.K., Shusta, E.V.*, Cells and cell lysates: A direct approach for engineering antibodies against membrane proteins using yeast surface display, *Methods*, 60, 27-37 (2013).
7. Klapoetke, N.C., Murata, Y., Kim, S.S., Pulver, S.R., Birdsey-Benson, A., Cho, Y.K., Morimoto, T.K., Chuong, A.S., Chow, B.Y., Surek, B., Melkonian, M., Jayaraman, V., Constantine-Paton, M., Wong, G.K.*,

- Boyden, E.S.*, Independent optical excitation of distinct neural populations, *Nature Methods*, 11, 338-346 (2014).
8. Hochbaum, D.R., Zhao, Y., Farhi, S., Klapoetke, N.C., Werley, C.A., Kapoor, V., Zou, P., Kralj, J.M., Maclaurin, D., Smedemark-Margulies, N., Saulnier, J., Boulting, G.L., Cho, Y.K., Melkonian, M., Wong, G.K., Harrison, D.J., Murthy, V., Sabatini, B., Campbell, R.E., Boyden, E.S., Cohen, A.E. *, Engineered microbial rhodopsins for all optical electrophysiology in mammalian neurons, *Nature Methods*, 11, 825-833 (2014).
 9. Schmidt, D. *, Cho, Y.K. *, Natural photoreceptors and their application to synthetic biology, *Trends in Biotechnology*, **33**, 80-91 (2015). PMID: 25466878
 10. Cho, Y.K. *, Genetically Encoded Tools: Bridging the Gap between Neuronal Identity and Function, *ACS Chemical Neuroscience*, **6**, 14-15 (2015). PMID: 25574970
 11. Wang, S., Cho, Y.K. *, An Optimized Calcium-Phosphate Transfection Method for Characterizing Genetically Encoded Tools in Primary Neurons, *Methods in Molecular Biology: Optogenetics-Methods and Protocols* (2016). PMID: 26965127
 12. Cho, Y. K. *, Li, D., Optogenetics: Basic Concepts and Their Development, *Methods in Molecular Biology: Optogenetics-Methods and Protocols* (2016). PMID: 26965112
 13. Knowlton, S., Li, D., Ersoy, F., Cho, Y.K., Tasoglu, S., Building Blocks for Bottom-Up Neural Tissue Engineering: Tools for In Vitro Assembly and Interrogation of Neural Circuits, *Neural Engineering* (Ed. Lijie Zhang, David Kaplan) pp. 123-144 (2016).
 14. Knowlton, S., Cho, Y.K., Li, X.J., Khademhosseini, A., Tasoglu, S. *, Utilizing stem cells for three-dimensional neural tissue engineering, *Biomaterials Science*, **4**, 768-784 (2016). PMID: 26890524
 15. Ma, X., Hargrove, D., Dong, Q., Song, D., Chen, J., Wang, S., Lu, X., Cho, Y.K., Fan, T.H., Lei, Y. *, Novel green and red autofluorescent protein nanoparticles for cell imaging and in vivo biodegradation imaging and modeling, *RSC Advances*, **6**, 50091-50099 (2016).
 16. Cho, Y.K. *, Zheng, G. *, Augustine, G., Hochbaum, D., Cohen, A. E., Knopf, T., Pisanello, F., Pavone, F., Vellekoop, I., Booth, M., Hu, S., Zhu, J., Chen, Z., Hoshi, Y., Roadmap on neurophotonics. *Journal of Optics*, **18**(9), 1-26 (2016).
 17. Cruz, B.C., Furrer, J.M., Guo, Y.S., Dougherty, D., Hinestroza, H.F., Hernandez, J.S., Gage, D.J., Cho, Y.K., Shor, L.M. *, Pore-scale water dynamics during drying and the impacts of structure and surface wettability. *Water Resources Research*, **53**, 5585-5600 (2017).
 18. Liao, J., Jiang Y., Bian, Z., Mahrou, B., Nambiar, A., Magsam, A.W., Guo, K., Wang, S., Cho, Y.K., and Zheng, G. *, Rapid focus map surveying for whole slide imaging with continuous sample motion, *Optics Letters*, **42**(17), 3379-3382 (2017).
 19. Zorniak, M., Clark, P.A., Umlauf, B.J., Cho, Y.K., Shusta, E.V. *, Kuo, J.S. *, Yeast display biopanning identifies human antibodies targeting glioblastoma stem-like cells, *Scientific Reports*. **7**(1):15840 (2017). PubMed PMID: 29158489
 20. Li, D., Wang, L., Maziuk, B.F., Yao, X., Wolozin, B., Cho, Y.K. *, Directed evolution of a picomolar affinity, high-specificity antibody targeting phosphorylated tau, *Journal of Biological Chemistry*. **293**(31), 12081-12094 (2018). PMID: 29899114
 21. Guo, Y.-S., Furrer, J.M., Kadilak, A., Hinestroza, H.F., Gage, D.J., Cho, Y.K., Shor, L.M. *, Bacterial Extracellular Polymeric Substances Amplify Water Content Variability at the Pore Scale, *Frontiers in Environmental Science*, **6**, 93 (2018).
 22. Cho, Y.K., Park, D., Yang, A., Chen, F., Chuong, A.S., Klapoetke, N.C., Boyden, E.S. *, Multidimensional screening yields channelrhodopsin variants having improved photocurrent and order-of-magnitude reductions in calcium and proton currents, *Journal of Biological Chemistry*. **294**(11), 3806-3821 (2019). PMID: 30610117

23. Lajoie, J., Cho, Y.K., Frost, D., Bremner, S., Li, L., Shusta, E.V.*, A yeast display immunoprecipitation screen for targeted discovery of antibodies against membrane protein complexes, *Protein Engineering Design and Selection*. 32(5), 219-230 (2019). PMID: 31769480
24. Li, D., Cho, Y.K.*, High specificity of widely used phospho-tau antibodies validated using a quantitative whole-cell based assay, *Journal of Neurochemistry*. 152(1), 122-135 (2020). PMID: 31325178
25. Wang, S., Cho, Y.K.*, Yeast surface display of full-length human microtubule-associated protein tau, *Biotechnology Progress*. 36(1), 1-11 (2020). PMID: 31581367

PATENTS

1. Boyden, E. S., Cho, Y. K., Klapoetke, N. C., Chuong, A. S., Chen, F., 'Mutant channelrhodopsins with altered ion selectivity', US Patent No. 10,590,181.
2. Klapoetke, N. C., Chow, B. Y., Boyden, E. S., Wong, G. K., Cho, Y. K., 'Channelrhodopsins for optical control of cells', US Patent No. 10,472,398.
3. Klapoetke, N. C., Boyden, E. S., Cho, Y. K., Chow, B. Y., Wong, G. K. S., Cohen, A. E., Hochbaum, D. R., 'Blue-light-activated ion channel polypeptides and uses thereof', US patent No. 10,392,426.
4. Zorniak, M., Clark, P. A., Cho, Y. K., Umlauf, B. J., Shusta E. V., Kuo J., 'Antibodies targeting glioblastoma stem-like cells and methods of use thereof', US62/569,834.
5. Shusta, E. V., Wang, X. X., Cho, Y. K., 'Blood-brain barrier targeting antibodies', U.S. Patent No. 7,744,879.

INVITED SEMINARS

(*Presenting author)

1. Cho, Y. K., Department of Chemical and Biological Engineering Student Seminar, University of Wisconsin-Madison, Spring 2009.
2. Cho, Y. K. and Boyden, E. S., Optogenetics: Tools for controlling neural circuits, Korean Institute of Science and Technology, Seoul, Korea, May 2012.
3. Cho, Y. K. and Boyden, E. S., Optogenetics: Tools for controlling neural circuits, American Society of Photobiology, Montreal, Canada, June 2012.
4. Cho, Y. K., Engineering molecular tools to modulate and access brain activity, April 2013, University of Connecticut, Department of Chemical and Biomolecular Engineering, Storrs, CT.
5. Cho, Y. K., Engineering molecular tools to modulate and access brain activity, April 2013, Cornell University, Department of Chemical and Biomolecular Engineering, Ithaca, NY.
6. Cho, Y. K., Engineered light-activated ion channels for controlling biological processes in the brain, Department of Physiology and Neurobiology Seminar Series, University of Connecticut, February 2014.
7. Cho, Y. K., Principles of Engineering Light-Activated Proteins, Department of Biomedical Engineering Seminar Series, University of Connecticut, October 2014.
8. Cho, Y. K., Engineered Proteins as Genetically Encoded Tools for Neurobiology, Department of Neuroscience Seminar, University of Connecticut Health Center, April 2015.
9. Cho, Y. K., Engineered proteins for detecting and controlling biological processes, Department of Chemical and Biological Engineering Seminar Series, Seoul National University, May 2015.
10. Cho, Y. K., Engineering light-activated proteins for controlling biological processes, July 2015, US-Korea Conference 2015, Atlanta, GA.
11. Cho, Y. K., How to control biology using multiple colors of light: Analogies to multi-color imaging, September 2015, World Molecular Imaging Congress 2015, Honolulu, HI.
12. Cho, Y. K., Engineered light-activated proteins for neurobiological applications, October 2015, Department of Biomedical Engineering, Worcester Polytechnic Institute, Worcester, MA.
13. Cho, Y. K.*, Furrer, J. M.*, Gage, D., Shor, L. M., Multiscale Dynamics of Water Regulation by Bacteria in Synthetic Soil Microsystems, DOE Bioimaging Science Program Annual PI meeting, August 2016, Gaithersburg, MD.
14. Gage, D.* , Cho, Y. K., Furrer, J. M., Shor, L. M., Optogenetic Tools to Modulate Microbial System Functions in Emulated Soil Microenvironments, DOE Genome Sciences PI Meeting, February 6 2017, Arlington, VA.

15. Cho, Y. K., High quality antibodies targeting protein post-translational modification sites through affinity and specificity engineering, 18th Annual Peptalk 2018, January 12 2018, San Diego, CA.
16. Shor, L. *, Cho, Y. K. *, Furrer, J. M., Gage, D., Multiscale Dynamics of Water Regulation by Bacteria in Synthetic Soil Microsystems, March 1 2018, Tysons, VA.
17. Cho, Y. K., Engineered proteins for probing and controlling complex biological processes, New York University Department Seminar, April, 2018, Brooklyn, NY.
18. Cho, Y. K., Recognizing protein phosphorylation: Antibodies with high affinity and specificity, New England Structure Symposium, October 20 2018, Farmington, CT.
19. Cho, Y.K. *, Tools for Developing a Mechanistic Understanding of Specificity in Post-Translational Modification Targeting Antibodies, PEGS Boston, April 2019, Boston, MA.
20. Cho, Y. K. *, Engineered proteins for probing and controlling complex biological processes, Vanderbilt University Department Seminar, October 2019, Nashville, TN.
21. Cho, Y. K. *, Engineered proteins for probing and controlling complex biological processes, University of Wisconsin-Madison Department Seminar, October 2019, Madison, WI.
22. Cho, Y. K. *, Antibody Specificity Measurement and Scoring for Targeting Protein Post-Translational Modification Sites, Peptalk 2020, January 2020, San Diego, CA.
23. Cho, Y. K. *, Phi – a parameter for quantifying the specificity of post-translational modification site targeting antibodies, Festival of Biologics USA, March 2020, San Diego, CA.

PRESENTATIONS

(*Presenting author)

1. Cho, Y. K. *, Kim, J. K., Miniaturized immunosensor based on surface plasmon resonance, BioMEMS and Biomedical Nanotechnology world, Columbus, OH, September 2001.
2. Cho, Y. K. *, Kim, H.-J., Quantitation of biomolecules using miniaturized surface plasmon resonance sensor, Korean Institute of Chemical Engineers 2003 Fall meeting, *Theories and Applications of Chem. Eng.*, Vol. 9, No. 1, pp. 498-451, (2003).
3. Cho, Y. K. *, Wang, X. X., Shusta, E. V. An antibody selection and antigen identification strategy for membrane protein analyses, 2nd Annual Human Proteomics Symposium, Madison, WI, June 2007.
4. Cho, Y. K. *, Wang, X. X., Shusta, E. V., Yeast antibody display technology for efficient targeting and isolation of BBB biomarkers, 7th Cerebral Vascular Biology International Conference, Ottawa, Canada, June 2007.
5. Cho, Y. K. *, Chen, I., Wei, X., Li, L., Shusta, E. V., Antibody library selection and characterization in detergent-solubilized whole-cell lysates using yeast display, 19th Annual Antibody Engineering Conference, San Diego, CA, December 2008.
6. Cho, Y. K. * and Shusta, E. V., Yeast display-based screening of a human antibody library for generating affinity reagents against whole cell lysates, *The Biology of Genomes*, Cold Spring Harbor Laboratory, NY, May 2009.
7. Cho, Y. K. *, Chen, F., Chuong, A.S., Klapoetke, N.C., and Boyden, E. S., Engineering light-activated proteins to control biological processes in the brain, American Institute of Chemical Engineers annual meeting, San Francisco, CA, November 2013.
8. Cho, Y. K., Yang, A., Chen, F., Chuong, A.S., Klapoetke, N.C., and Boyden, E. S., Optogenetic tool operation with extracellular vs. intracellular ionic sources, Society for Neuroscience annual meeting, November 2014, Washington, DC.
9. Li, D., Cho, Y. K. *, Engineering antibody specificity through multi-dimensional high-throughput screens, American Chemical Society annual meeting BIOT, March 2016, San Diego, CA.
10. Cho, Y. K. *, Engineering antibody specificity: towards obtaining high quality antibodies against protein post-translational modifications, ACS Best of BIOT webinar, September 21 2016.
11. Li, D., Wang, L., Yao, X., Cho, Y. K. *, Directed Evolution of a High Affinity and Specificity Antibody Targeting Phosphorylated Tau, International Conference on Biomolecular Engineering (ICBE), January 2017, San Diego, CA.
12. Li, D., Wang, L., Yao, X., Cho, Y. K. *, Directed Evolution of a High Affinity and Specificity Antibody Targeting Phosphorylated Tau, Northeast Bioengineering Conference (NEBEC), March 31 2017, Newark, NJ.

13. Wang, S., Cho, Y. K.*, Nuclear Translocation and Degradation of Target Proteins Using Engineered Intracellular Antibodies, Northeast Bioengineering Conference (NEBEC), March 31 2017, Newark, NJ.
14. Li, D., Wang, L., Yao, X., Cho, Y. K.*, Impact of affinity maturation on the specificity of antibodies targeting protein post-translational modification sites, American Chemical Society annual meeting BIOT, April 2 2017, San Francisco, CA.
15. Li, D.*, Wang, L., Maziuk, B., Yao, X., Wolozin, B., Cho, Y. K., Engineering binding affinity and specificity: application to antibodies targeting phospho- and acetyl-tau, American Chemical Society annual meeting BIOT, March 19 2018, New Orleans, LA.
16. Wang, S., Cho, Y. K.*, Deciphering structural and chemical determinants of pathological tau conformation using yeast surface display, American Chemical Society annual meeting BIOT, March 18 2018, New Orleans, LA.
17. Wang, S.*, Cho, Y. K., Probing the Conformation and Phospho-Specificity of Anti-Tau Antibodies Using Yeast Surface Display, American Institute of Chemical Engineers annual meeting, October 31 2018, Pittsburgh, PA.
18. Cho, Y. K., Development of phospho-specific antibodies: Characterizing and improving binding specificity, American Chemical Society annual meeting BIOT, March 31 2019, Orlando, FL.
19. Pirhanov, A., Goodwin, R., Guo, Y.-S., Bridges, C., Furrer, J.M., Gage, D.J., Shor, L.M., Cho, Y.K., Optical control of exopolysaccharide production in *Sinorhizobium meliloti* in a synthetic soil microsystem, American Chemical Society annual meeting BIOT, March 2019, Orlando, FL.
20. Li, D., Cho, Y.K.*, Development of Phospho-Tau Specific Antibodies: Validation and Engineering of Specificity, Engineering Conferences International (ECI) Biochemical and Molecular Engineering XXI, July 2019, Quebec, Canada.

TEACHING – UConn

1. CHEG 5315 – Transfer Operations (Transport Phenomena) (Fall 2014, 2015, 2016, 2017, 2018)
2. CHEG 4995 – Molecular Engineering for Biotechnology and Health (Spring 2014)
3. CHEG 3173/5373 – Introduction to Biochemical Engineering (Spring 2016, 2017, 2018, 2019, 2020)
4. CHEG 3112 – Introduction to Chemical Engineering Thermodynamics 2 (Fall 2019)

PROPOSAL AND MANUSCRIPT REVIEW

Journal Reviews - ACS Synthetic Biology, AIChE Journal, Applied Biochemistry and Biotechnology, Biochemical Engineering Journal, Biochemistry, Biotechnology and Bioengineering, Biotechnology Progress, Frontiers in Immunology, Journal of Biological Chemistry, Journal of Visualized Experiments, mAbs, Nature Communications, Neuron, Neuromolecular Medicine, PLOS ONE, PNAS, Protein Engineering Design Selection, Scientific Reports, Transactions on Biomedical Engineering (IEEE), Trends in Biotechnology

Proposal Review Panelist - 2 panels in NSF Engineering directorate (2015), 1 panel in NSF Engineering directorate (2016), 1 panel in NSF Engineering directorate (2017), DOE graduate student fellowship (SCGSR, 2017), NIH (2018, 2020).