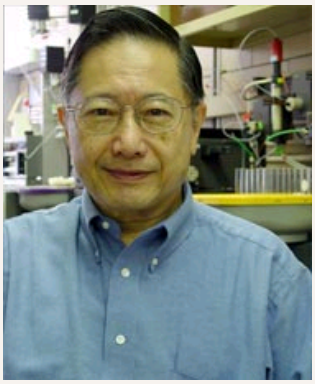
Department of Biological Sciences

Undergraduate
Graduate
Faculty
Chien Ho
Research
Centers & Facilities
Courses
Seminars & Events

Alumni



Chien Ho

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The research goal in this laboratory is to understand the relationships between structure and function in biological systems by correlating information obtained from biochemical, biophysical, and molecular biological techniques. Two major research projects are currently under way.

The first research area centers on a study of human normal and mutant hemoglobins in order to understand the molecular mechanism of transport of oxygen from the lungs to the tissues. We have constructed an expression plasmid to produce authentic human normal adult hemoglobin in Escherichia coli. With this expression system, we can design and express any mutant hemoglobins needed for our research on the structure-function relationship in hemoglobin. Some of our designed recombinant hemoglobins are potential candidates for hemoglobin-based oxygen carriers and/or hemoglobin therapeutics. Our hemoglobin research is an excellent illustration of the power of combining information obtained from x-ray crystallography, NMR spectroscopy, computer modeling, molecular genetics, and functional studies to correlate the structure-function relationship of an allosteric protein under physiological conditions at atomic resolution.

The second research area centers on the application of NMR to living systems, both by imaging (MRI) and by spectroscopic (MRS) methods. Currently, we are developing techniques to monitor the migration of immune cells in vivo by magnetic MRI using dextran-coated superparamagnetic iron oxide particles as contrast agents. This work may offer a new non-invasive approach to detecting early signs of organ rejection after transplantation. Our approach can readily be adapted to track cell movement of other cell types, provided that an MRI contrast agent can be non-invasively incorporated into the cells and that there is sufficient sensitivity for MRI detection.

Selected Publications

Maillett DH, Simplaceanu V, Shen T-J, Ho NT, Olson JS and Ho C. Interfacial and Distal-Heme Pocket Mutations Exhibit Additive Effects on the Structure and Function of Hemologbin. Biochemistry 47(40):10551-10563, 2008.

Ye Q, Wu Y-JL, Foley LM, Hitchens TK, Eytan DF, Shirwan H and Ho C. Longitudinal Tracking of Recipient Macrophages in a Rat Chronic Cardiac Allograft Rejection Model with Noninvasive Magnetic Resonance Imaging Using Micrometer-Sized Paramagnetic Iron Oxide Particles. Circulation 118:149-156, 2008.

Song XJ, Simplaceanu V, Ho NT and Ho C. Effector-Induced Structure Fluctuation Regulates the Ligand Affinity of an Allosteric Protein: Binding of Inositol Hexaphosphate Has Distinct Dynamic Consequences for the T and R States of Hemoglobin. Biochemistry 47:4907-4915, 2008.

Song XJ, Yuan Y, Simplaceanu V, Sahu SC, Ho NT and Ho C. A Comparative NMR Study of the Polypeptide Backbone Dynamics of Hemoglobin in the Deoxy and Carbonmonoxy Forms. Biochemistry 46:6795-6803, 2007.

Shen TJ, Rogers H, Yu X, Lin F, Noguchi CT and Ho C. Modification of Globin Gene Expression by RNA Targeting Strategies. Experimental Hematology 35:1209-1218, 2007.

Sahu SC, Simplaceanu V, Gong Q, Ho NT, Tian F, Prestegard JH and Ho C. Insights into the Solution Structure of Human Deoxyhemoglobin in Absence and Presence of an Allosteric Effector. Biochemistry 46:9973-9980, 2007.

Wu YL, Ye Q, Foley LM, Hitchens TK, Sato K, Williams JB and Ho C. In Situ Labeling of Immune Cells with Iron Oxide Particles: An Approach to Detect Organ Rejection by Cellular MRI. Proceedings of National Academy Sciences USA 103:1852-1857, 2006.

Gong Q, Simplaceanu V, Lukin JA, Giovannelli JL, Ho NT and Ho C. Quaternary Structure of Carbonmonoxyhemoglobins in Solution: Structural Changes Induced by the Allosteric Effector, Inositol Hexaphosphate. Biochemistry 45:5140-5148, 2006.

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