

James & Esther King Biomedical Research Program

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*2008 Program
New Investigator (3-year project)*

Project Title: Development of Sensitive Fluorescent Probes for Physiological Zn²⁺ Over Large Dynamic Ranges

Project Summary: The research goals of this grant are to develop fluorescent probes for imaging biological zinc ions with both high sensitivity and large dynamic ranges. Zinc is known to play many important roles in human physiology. Tobacco smoking has been found to alter the activities of zinc-containing enzymes such as superoxide dismutase, which is linked to degenerative diseases. Development of prevention and treatment for such diseases has been hampered due to poor understanding of the physiological functions of zinc. This deficiency in knowledge is due to a lack of tools to determine the distribution of zinc in biological systems.

Our strategy is to develop fluorescent probes for zinc with both high sensitivity and large dynamic ranges. Success of this project will provide tools for gaining understanding of the physiological functions of zinc thus aiding the prevention and treatment of related diseases. Built upon a molecular system established in our laboratory, there are four Specific Aims for developing molecular probes targeting zinc under physiological conditions:

- 1) Preparation of probes to achieve sub-nanomolar sensitivity of zinc detection while maintaining a large dynamic range.
- 2) Optimization of the fluorescence and coordination properties of the probes for achieving suitable sensitivity and high selectivity.
- 3) Development of probes for zinc detection in deep tissues.
- 4) Application of our probes in biological imaging using fluorescence microscopy.