

## James & Esther King Biomedical Research Program

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

**Project Title:** Catalytic Enantioselective Synthesis of Anti-Cancer Natural Products

**Project Summary:** Is it possible to develop a drug that can cure a cancer without any side effects? Many chemotherapeutic agents are effective at killing cancerous cells that are rapidly dividing. However, those anti-cancer drugs in general also act on non-cancerous cells causing many serious side effects.

Discovery of better chemotherapeutic agents is limited by our ability to make diverse candidate molecules used in biological testing. Organic synthesis is the foundation for the drug development process because systematic variation of the structure of promising lead compounds is a key to finding more potent and less toxic medicine. Biological systems are three-dimensional objects so a subtle difference in the three-dimensional structure of the drug can cause unexpected outcomes as witnessed by the thalidomide tragedy. Controlling three-dimensional structure of the complex molecule (asymmetric synthesis) is highly necessary to access a pool of new candidate molecules that are currently unavailable. This research project is aimed at developing new catalysts that allow us to efficiently create challenging three-dimensional structures often found in naturally occurring anti-cancer agents. Highly concise and flexible syntheses of anti-cancer natural products will be developed using new methodology. This research will not only pave the way to analog compounds to those important targets but also advance the synthetic chemist's toolbox to access more sophisticated chemotherapeutic agents.