

EXECUTIVE SUMMARY [NON-CONFIDENTIAL, NON-TECHNICAL ABSTRACT FOR PUBLIC INFORMATION OR PROGRAM PROMOTION]: State **in layman's terms** the application's broad, long-term objectives and specific aims, making reference to the potential public benefits of the project relevant to California. Do not include proprietary or confidential information. This may be distributed before the funding decision has been finalized.

The broad objective of this research project is to obtain a detailed picture of structure-function relationships among the diverse ADP-glucose pyrophosphorylases, the rate-limiting enzymes in bacterial and plant glycogen and starch biosynthetic pathways. The molecular characterization of these enzymes will include complementary biochemical and modeling studies, performed at CSU Fullerton, CSU Los Angeles, and Molsoft (La Jolla, CA), respectively. The information gained from the elucidation of the structure and function of this important enzyme will have important applications in the field of agricultural and environmental biotechnology. In particular, the rational engineering of a highly active form of this enzyme (expressed in transgenic crops) should lead to increased yields of the renewable and biodegradable carbon source starch. Starches and modified starches serve as starting materials for the synthesis of bio-ethanol and organic acids and in the making of biodegradable plastics, packaging materials, adhesives, and detergents lessening dependence on oil resources. Increased starch synthesis also correlates with enhanced photosynthesis and biomass accumulation. Thus the ability of transgenic plants (or engineered microbes) to more efficiently sequester carbon and remove CO₂ from the atmosphere could be enhanced. Further, this project supports the training of both undergraduate and M.S. students in modern biotechnology that is needed for California's work force. Further, CSU research students will also be able to interact with scientists at Molsoft which exposes them to both high level bioinformatics/molecular modeling and industry work.