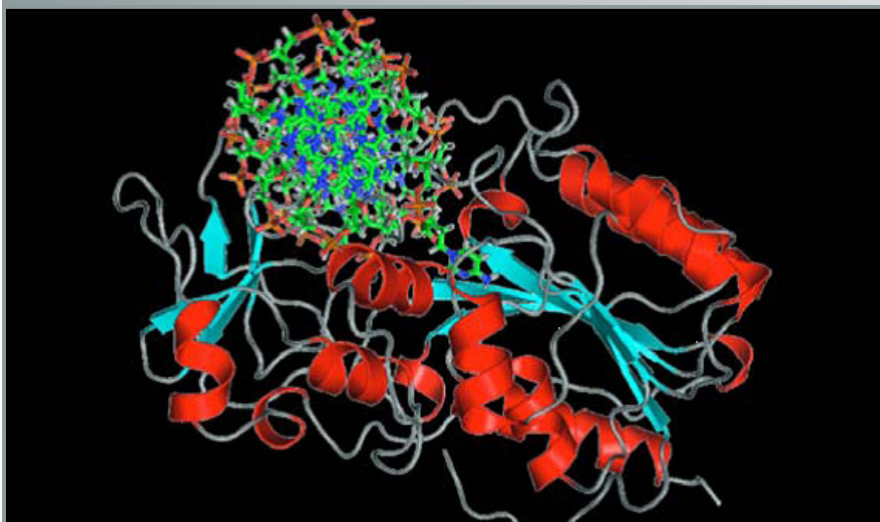


Computational Method for Detecting and Enhancing Protein Dynamics

UT-B ID 200601716



Technology Summary

ORNL researchers have developed a method that uses simulation and experimental data to detect, analyze, and manipulate protein activity. This approach enables enhancement of the chemical reaction rates of enzymes by many orders of magnitude. More efficient enzymes are widely sought for applications in the biochemical industry, pharmaceuticals, and protein engineering.

Theoretical and computational techniques are particularly useful in discovering and characterizing internal protein dynamics at picosecond to millisecond and longer time scales. The ORNL technology identifies the key vibration modes in a protein, analyzes them, and determines those factors that enable enzymes to achieve an enhanced rate of chemical reaction. This inexpensive, efficient method uses computer simulations alongside available experimental data to develop models that will expand understanding of enzyme function and allow rates of reaction to be increased or decreased, as desired.

The method enables identification of the protein motions that are present during a catalytic reaction. A protein vibration is then selected, based on how much overlap there is between a reaction coordinate in each of the motions and a reaction coordinate range for that reaction. The dynamically active residue of the protein molecule is then identified, based on the selected vibrations.

Advantages

- A more efficient, less expensive approach for enhanced chemical reaction rates of enzymes
- A more efficient means of identifying surface or distal regions in the protein that can be targeted for creation of new small molecules and enzymes
- A unique method to identify key protein vibration modes and dynamic regions that can be used to control enzyme function and the rate of protein-mediated reactions

Potential Applications

- Pharmaceutical industry for novel drug design
- Biotechnology, chemical, and biochemical industry, for protein engineering

Patent

Pratul K. Agarwal, *Identification and Modification of Dynamical Regions in Proteins for Alteration of Enzyme Catalytic Effect*, U.S. Patent Application 12/244,977, filed October 3, 2008.

Inventor Point of Contact

Pratul K. Agarwal
Computer Science and Mathematics Division
Oak Ridge National Laboratory

Licensing Contact

David L. Sims
Technology Commercialization Manager,
Building, Computational, and
Transportation Sciences
UT-Battelle, LLC
Oak Ridge National Laboratory
Office Phone: 865. 241.3808
E-mail: simsdl@ornl.gov

