Joanne L. Turnbull

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Biochemistry

Research Interests

Mechanistic enzymology of aromatic amino acid pathways

As a mechanistic enzymology lab, we are interested in understanding how enzymes bring about huge rate accelerations over uncatalyzed reactions. What roles are played by the proper positioning and ionization state of key amino acid residues in the enzyme active site? If the enzyme has more than one activity, what is the nature of the active site(s)? We have studied the mechanism of action of several different proteins, but our current focus is on enzymes in the shikimate pathway which are responsible for the biosynthesis of the essential aromatic amino acids. As such, these enzymes are potential targets for the development of inhibitors that can act as antimicrobial agents and herbicides. Our studies also involve comparative enzymology between enzymes derived from bacteria that thrive in extremely hot environments (thermophiles) and also those that prefer moderate temperatures (mesophiles). We use the techniques of protein chemistry, mass spectrometry, site-directed mutagenesis, kinetic analysis and biophysical spectroscopy in order to understand the catalytic mechanism of these enzymes and how the structures of the proteins relate to their function and mode of regulation. Our structural studies also involve protein crystallography which is done as a collaborative effort.

Selected Publications

Julie Bonvin, Raphael Aponte, Maria Marcantonio, Sasha Singh, Dinesh Christendat and Joanne L. Turnbull (2006) "Biochemical Characterization of Prephenate Dehydrogenase from the Hyperthermophilic Bacterium Aquifex aeolicus" Protein Science 15, 1417-1432

Warren Sun, Sasha Singh, Rongguang Zhang, Joanne L. Turnbull, Dinesh Christendat (2006) "Crystal Structure of Prephenate Dehydrogenase from Aquifex aeolicus: Insights into the Catalytic Mechanism" Journal of Biological Chemistry 281, 12919-12928.

Gopal Devanathan, Joanne L. Turnbull, Edmund Ziomek, Enrico O. Purisima, Robert Ménard & Traian Sulea (2005) "Carboxy-Monopeptidase Substrate Specificity of Human Cathepsin X" Biochemical and Biophysical Research Communications 329, 445-452.

John Lee, Serena Filosi, Julie Bonvin, Sebastien Guyon, Raphael Aponte & Joanne L. Turnbull (2001) "Expression, Purification and Characterization of Recombinant Purine Nucleoside Phosphorylase from E. coli" Protein Expression and Purification 22, 180-188.