Chapter 1 | Targeting Metabolic Pathways for Disease Therapy

J. Laskar, S. Nath, S.K. Ghosh, M. Sengupta and Y. Choudhury

INTRODUCTION

The gradual sequence of organized biochemical reactions catalyzed enzymes that convert preliminary substrate molecule or molecules to a final product or products through a series of metabolic intermediates is referred to as a metabolic pathway. Metabolism is the sum total of biochemical processes in living organisms that either produce or consume energy. These essential metabolic pathways are divided into three classes:

- Anabolic pathways involved in the synthesis and polymerization of simple molecules into complex macromolecules,
- Catabolic pathways involved in degradation of molecules to release energy, and
- Waste disposal pathways which govern elimination of toxic waste.

Core metabolism includes pathways for the synthesis and breakdown of carbohydrates, fatty acids, and amino acids, which are the most vital processes for energy homeostasis and macromolecular synthesis in humans.

Illustrating these pathways and understanding their physiological roles have been among the most fruitful pursuits in biological research. The "Golden Age of Biochemistry" between the 1920s and 1960s defined almost all the metabolic processes responsible for nutrient consumption and energy production in humans as well as in other organisms. These included glycolysis, respiration, the tricarboxylic acid (TCA), urea cycle, glycogen catabolism, oxidative phosphorylation, and the supremacy of ATP in energy transfer reactions and many more. Biochemistry and the analysis of metabolic pathways dominated basic and medically oriented research during these decades, with some 15 Nobel Prizes in either Physiology/Medicine or Chemistry awarded for work related to energy balance or basic metabolic pathways. The driving force behind metabolic research was the realization that metabolic perturbations-often genetically programmed-accompany several