
Definitions:
**Homologous enzymes**: enzymes that come from a common ancestor and are structurally related. In general structure outlives sequence therefore in many cases it is difficult to make connections by sequence comparisons alone.

**Orthologs**: Homologs in different species that catalyze the same reaction. (Ex. All the enzymes in the glycolysis pathway and most enzymes in primary metabolism have been evolutionarily conserved)

**Paralogs**: Homologs in the same species that have diverged from one another by gene duplication. These proteins have different specificity and different catalytic function.

**Family**: Group of homologous enzymes that share the same reaction and specificity. Most of the time these enzymes have > 30% sequence identity in BLAST comparisons.

**Superfamily**: Group of homologous enzymes that catalyze reactions with different substrate specificity and catalyze a different overall reaction. However, they share a common mechanistic attribute. The enolase superfamily members can stabilize and a carbanion adjacent to a carboxylate.

**Suprafamily**: Homologous enzyme that catalyze different overall reactions with no common mechanistic attributes.

**Figure 1** Reactions catalyzed by members of the enolase superfamily.

**Figure 2** The (βα)₈ (TIM) barrel domains of enolase, MR, and MLE, showing the positions of the functional groups in the active site; the identities of the acid/base catalysts are given. β-Sheets are colored blue, α-helices are red.
Figure 8 Structures of crotonase, dehalogenase, Δ¹₃.₅, Δ²₄-dienoyl CoA isomerase, methylmalonyl CoA decarboxylase, and ClpP protease.

Figure 7 Reactions catalyzed by members of the crotonase superfamily. Dihydroxynaphthoate (DHNA); 2-ketocyclohexyl (KCH); carnitinyloxy CoA epimerase (CaiD).
Figure 5  Reactions catalyzed by members of the thyl radical superfamily.

Figure 6  The (βα)$_{10}$ barrel domains of the class I and class III ribonucleotide reductases and PFL. The β-sheets of the two halves of the barrel are colored red and green; the active site cysteines are blue.
Figure 3  Reactions catalyzed by members of the amidohydrolase superfamily.

Figure 4  The (β/α)8 (TIM) barrel domains of urease, phosphotriesterase, and adenosine deaminase.