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*Analysis of Aldehyde Dehydrogenase Functionality and Evolutionary History*

Aldehyde dehydrogenases (ALDH) are a family of enzymes which primarily catalyze the oxidation of aldehydes. The purpose of this research is to compare certain ALDH genes in various organisms to already known ALDH genes, specifically using the ALDH genes of humans, *Rattus norvegicus*, and *arhobacter* as the basis of comparison. It is through these comparisons that the evolutionary history of the ALDH genes being analyzed can be effectively mapped out on a phylogenetic tree diagram, and in addition these comparisons also shed light on the role of the ALDH genes within the organisms chosen. Using the UNIPROT database, the reference sequences of each the ALDH genes of each organism were recorded; they were then compiled into a phylogenetic tree building program. By analyzing the proximity of ALDH genes to the reference genes on the tree, the function and evolutionary history for the genes can be predicted. For example, if a certain ALDH gene of *E. coli* strain K12 is directly adjacent to a human ALDH gene of which the function is known, it is predicted that the two genes would perform similar functions and have followed a similar evolutionary path. Through these analytical comparisons, this research attempted to better understand the evolutionary history of the ALDH family of genes. An increased understanding of this gene family not only allows for the functions of the enzymes themselves to be further distinguished, but also as a tool to help classify newly discovered organisms based on the ALDH proteins found and their observed functions.