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# **The Nudix Hydrolase Family: Structural, Functional and Evolutionary Relationships**

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## **Abstract**

The Nudix (Nucleotide diphosphate linked to x) hydrolase family is a broad family of proteins found in viruses, bacteria, archaea and eukaryotes. Over 500 members of this family have been identified so far, with functions ranging from hydrolysis of damaged nucleotide triphosphates in *E. coli* to decapping of mRNA in mammals. The bacterium *Deinococcus radiodurans* contains the most Nudix proteins (24) of any organism known to date. We are conducting structural studies of the *D. radiodurans* Nudix proteins to determine their activities in the remarkable DNA maintenance and repair systems of this organism. In this regard, we have crystallized four proteins and are studying three by NMR methods. Recently we have solved the crystal structure of DR1025 at 1.4Å resolution. DR1025 displays a similar core fold to other proteins in the same family, but the N-terminus is extended away from the main protein structure to form a domain swapped dimer with another molecule. This structure is compared with known Nudix structures from other organisms to determine the common structural scaffold and function specific features and to allow us to develop sequence based profile methods for identifying Nudix proteins in general and specific functions in particular. In addition we are using this data to create phylogenetic trees and evolutionary relationships between the members of this large class of proteins.