CRYSTAL STRUCTURE OF EXONUCLEASE RECJ BOUND TO MANGANESE ION
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RecJ is a 5-prime to 3-prime exonuclease specific for ssDNA and is involved in homologous recombination, base excision repair, and mismatch repair. RecJ is also known to be a key enzyme for recombination-dependent replication. RecJ has five characteristic motifs in its sequence; the proteins having these motifs are ubiquitous in archaea, prokaryotes, and higher eukaryotes and they form a large family of the predicted phosphoesterases (DHH family). But the structure of neither RecJ protein nor the homologue in the DHH family was available. We crystallized RecJ from Thermus thermophilus HB8 bound to manganese ion essential for its activity and determined its crystal structure by SAD method. RecJ has a novel fold, in which two domains are interconnected with a long helix to form a central groove. This groove is composed of conserved residues and positively charged, which may be involved in DNA binding. The width of the groove is too narrow (11 Å) to bind to double-stranded DNA (20 Å width), indicating the specificity for ssDNA. Manganese is coordinated by amino acid residues in the motifs characteristic to the DHH family. The structure of RecJ suggested the putative catalytic residues for its nuclelease activity. Based on these results, we proposed the mechanism of the nuclelease reaction by RecJ.

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