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オリゴ(デオキシ)ヌクレオチド分解における RecJ 様 5'-3' エキソヌクレアーゼの役割

Role of RecJ-like 5'-3' exonuclease in oligo(deoxy)nucleotide degradation

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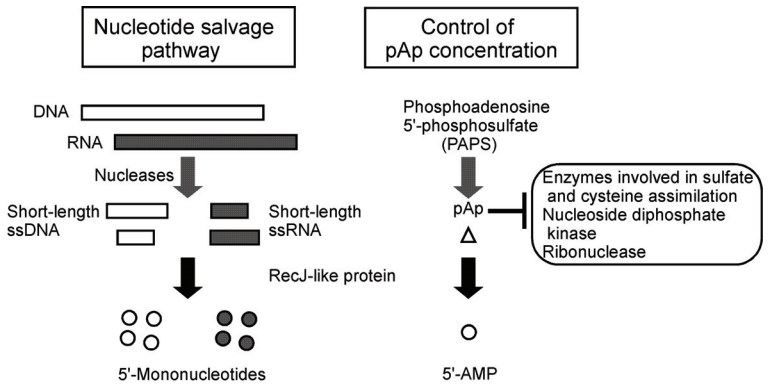
RecJ-like proteins belonging to the DHH family have been proposed to function as oligoribonucleases and 3'-phosphoadenosine 5'-phosphate (pAp) phosphatases in bacteria and archaea, which do not have Orn (oligoribonuclease) and CysQ (pAp phosphatase) homologs. In this study, we analyzed the biochemical and physiological characterization of the RecJ-like protein TTHA0118 from *Thermus thermophilus* HB8. TTHA0118 had high enzymatic activity as an oligodeoxyribonucleotide- and oligoribonucleotide-specific exonuclease and as pAp phosphatase. The polarity of degradation was 5' to 3', in contrast to previous reports about *Bacillus subtilis* NrnA, a RecJ-like protein. TTHA0118 preferentially hydrolyzed short oligodeoxyribonucleotides and oligoribonucleotides, whereas the RecJ exonuclease from *T. thermophilus* HB8 showed no such length dependence on oligodeoxyribonucleotide substrates. An insertion mutation of the *ttha0118* gene led to growth reduction in minimum essential medium. DNA microarray analysis showed up-regulation of stress response proteins in the *ttha0118* mutant. Added 5'-mononucleotides, nucleosides, and cysteine increased growth of the *ttha0118* mutant in minimum essential medium. The RecJ-like protein Mpn140 from *Mycoplasma pneumoniae* M129, which cannot synthesize nucleic acid precursors *de novo*, showed similar biochemical features to TTHA0118. Furthermore, *B. subtilis* NrnA also hydrolyzed oligo(deoxy)ribonucleotides in a 5'-3' direction. These results suggested that these RecJ-like proteins act in recycling short oligonucleotides to mononucleotides and in controlling pAp concentrations *in vivo*.



Overview of RecJ-like protein functions