APN1 and APN2 encode multi-functional enzymes involved in the repair of damaged bases in DNA. Both Apn1p and Apn2p possess an apurinic/apyrimidinicendonuclease activity, a 3'-diesterase activity, and a 3' to 5' exonuclease activity. However, Apn1p constitutes the major apurinic/apyrimidinicendonuclease and 3'-phosphodiesterase in vivo, constituting close to 97% of these activities. During base excision repair, the AP-endonuclease activity nicks the 5' side of abasic sites that are generated by the removal of oxidized and alkylated bases. This creates a single-strand break that contains a 3' hydroxyl group in preparation for DNA synthesis. The 3'-phosphodiesterase activity is able to remove a wide range of 3' moieties at end of single-strand breaks in order to generate a 3' hydroxyl group. The 3' to 5' exonuclease activity removes single nucleotides at a nick, such as 8oxodGMP that is mispaired with adenine/cytosine, leaving a single-nucleotide gap.Apn1p has functions not shared with Apn2p. Apn1p also catalyzes the cleavage of a tyrosyl-DNA phosphodiester bond, suggesting that it could have a role in the removal of topoisomerase I covalently bound to DNA in an alternate pathway to that mediated by Tdp1p. In addition, Apn1p is involved in the repair of mitochondrial DNA. apn1 mutant strains are sensitive to DNA damaging agents such as methyl-methane sulfonateand hydrogen peroxide, have an increase in single base pair mutations in the nuclear and mitochondrial genome, and are extremely sensitive to thymidine deprivation.Apn1p has sequence similarity to E. coli endonuclease IV. Homologs have also been identified in S. pombe and C. elegans.