**New insights into DNA repair systems in Archaea from the discovery of novel endonucleases**

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DNA is always under threat of change or loss of genetic information by endogenous or exogenous influences. To maintain genome integrity for their offspring, and to prevent disorder of a cell system, all living organisms have evolved DNA repair mechanisms. Especially, the organisms thriving in extreme environments are expected to have developed efficient repair systems. Extensive studies on the molecular mechanisms of DNA repair systems, including nucleotide excision repair (NER), base excision repair (BER), mismatch repair (MMR), homologous recombination repair (HR), and non-homologous end joining (NHEJ), have been performed, and these functions are basically conserved from prokaryotes to eukaryotes. However, the DNA repair mechanism in Archaea remains largely unknown. The MMR system in Archaea is especially mysterious, because the MutS/MutL proteins, which process the common MMR system, was identified in Bacteria and Eukarya, but no evidence of a functional MutS/L homolog has been reported for archaea. I will mainly talk about two endonucleases, which were originally identified from *P. furiosus* in our lab recently. Endonuclease Q, which cleaves the 5′ side of the deaminated bases, is probably involved in damaged base repair in Archaea. Endonuclease MS (the NucS homolog), which is a mismatch-specific endonuclease, may be the key enzyme for the novel MMR process initiated by the double-strand break in Archaea. I would like to discuss DNA repair systems in Archaea based on distribution of their related genes in the archaeal genomes.

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