

TYPE III CRISPR/CAS SYSTEM AND ITS APPLICATION

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The CRISPR-Cas system is an adaptive and heritable immune response that destroys invading foreign nucleic acids. The microbial CRISPR-Cas is currently classified into at least six different types, each with a signature protein including Cas10 of Type III. Cas9 (Type II) and Cpf1 (Type V) are now widely utilized as molecular scissors for targeted editing of genetic information. Recently, a novel signalling pathway was discovered in Type III system in that Cas10 subunit of the effector complex synthesizes cyclic oligoadenylates, which act as second messengers and initiate an RNAase activity of the immunity response.

The hyperthermophilic archaeon, *Thermococcus onnurineus* NA1, has the Csm complex of Type III system with six CRISPR loci in the genome. We were able to reconstitute an effector Csm complex of Type III-A in vitro that showed RNA targeting and RNA-activated single-stranded DNA (ssDNA) targeting activities. In the absence of an RNA transcript, it cleaved ssDNA containing a sequence complementary to the bound crRNA. In this presentation, the functional and molecular mechanism of Crispr-Cas systems is to be summarized with a focus on Type III system. Various potential application of Crispr-Cas system in gene editing, modulation of gene expression and molecular diagnostic is also to be discussed.