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Type I toxin-antitoxin systems in *Escherichia coli*

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Small regulatory RNAs (sRNAs) play an important role for regulating gene expression via a base-pairing mechanism with target mRNAs. In *Escherichia coli*, most of the sRNAs bind to an RNA chaperon, Hfq that stimulates duplex formation by two complementary RNAs. Some sRNAs, like microRNAs discovered in eukaryotes and viruses, have been characterized to control gene expression via trans-acting means. Such sRNAs are partially complementary to their target RNAs; therefore, they often have multiple targets. In contrast to the trans-encoded sRNAs encoded on the bacterial chromosome, cis-encoded sRNAs are found mainly in plasmids, phages and transposons. They are encoded in the same DNA locus and are therefore completely complementary to their targets. Toxin-antitoxin (TA) systems are categorized into three classes based on the type of antitoxin. In type I TA systems, the antitoxin is a small antisense RNA which inhibits translation of small toxic proteins by binding to the corresponding mRNAs. Those type I TA systems were originally identified as plasmid stabilization modules rendering a post-segregational killing (PSK) effect on the host cells. The Type I TA loci also exist on the *E. coli* chromosome but their biological functions are less clear. Genetic organization and regulatory elements of *hok/sok* and *ldr/rdl* families are very similar and the toxins are predicted to contain a transmembrane domain, but otherwise share no detectable sequence similarity. This talk will give an overview of the type I TA modules of *E. coli* K-12, especially *hok/sok, ldr/rdl*, and SOS-inducible *symE/symR* systems which are regulated by divergently overlapping cis-encoded antisense RNAs.

Biography

Mitsuoki Kawano received PhD from Nara Institute of Science and Technology (NAIST) in 2002. He then pursued Post-doctoral studies as a Visiting Fellow at National Institutes of Health (NIH/NICHD) in the laboratory of Dr. Gisela Storz (2002-2006) where he studied small, noncoding RNAs in E. coli. In 2006, he joined Functional RNA Research Program at RIKEN Omics Science Center in Yokohama Institute as a research scientist (2006-2011). He is currently an Assistant Professor at Niigata University of Pharmacy and Applied Life Sciences, and developing technologies to regulate gene expression using synthetic small antisense RNAs in E. coli.

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