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Transcripts to cleave transcripts: Structure and function of RNA-based ribonucleases P and MRP

Andrey S Krasilnikov
Penn State University, USA

RNA-based enzymes of the Ribonuclease (RNase) P/MRP family are large catalytic ribonucleoprotein complexes. These enzymes are highly unusual as they do not use proteins as their catalytic moiety, but rely on RNA for catalysis. The best known enzyme of the family, RNase P, is found in all three domains of life and is primarily responsible for the maturation of the 5'-end of tRNAs. Bacterial RNase P consists of an RNA component that is capable of cleaving substrates *in vitro* without any protein participation, and a small protein that is required for activity under physiological conditions. Archaeal and eukaryal RNases P have RNA components that are similar to that in the bacterial enzyme, although the catalytic ability of their RNA is severely diminished. At the same time, the essential auxiliary protein part of the archaeal and eukaryal RNases P grew considerably. The reasons for the increased reliance on proteins in the more evolutionarily advanced RNases P are not well understood. The other, much less studied enzyme of the RNase P/MRP family is RNase MRP. RNase MRP is universally found in all eukaryotes. It is an essential enzyme that participates in the metabolism of a wide range of transcripts, from rRNA to some mRNAs. Mutations in RNase MRP result in a range of developmental disorders in humans. Structurally RNase MRP resembles eukaryotic RNase P, but it has evolved to have distinct specificity. The presentation will discuss the recent advances in understanding of the structure, function, and evolution of RNases P and MRP.

Biography

Andrey S Krasilnikov has received his PhD degree from the Institute of Chemical Physics (Moscow, Russia) in 1995. During his Postdoctoral training at the UIC and Northwestern University (Chicago, USA) he became interested in enzymes that rely on their RNA moiety for catalysis. He is currently an Associate Professor of Biochemistry and Molecular Biology at the Penn State University. The main focus of his research is the structure and function of the multicomponent eukaryotic catalytic ribonucleoproteins of the RNase P/MRP family. He has authored more than 30 publications in the fields of biochemistry, molecular and structural biology, and physics.

ask11@psu.edu

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