

Guest Editorial

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Highlight: how to synthesize, assemble and regulate ribonucleoprotein-complexes

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Proteins and ribonucleic acids associate to form macromolecular ribonucleoprotein complexes (RNPs) in all living cells. Many of them are acting together as crucial players in numerous biological networks. Formation of RNPs depend on the interplay of factors involved in RNA production, RNA processing, and RNA assembly with proteins. Furthermore, interaction between different RNPs may be functionally relevant. First, the regulated synthesis of the RNA component is critical for RNP formation and may influence RNA maturation steps. Second, a functional network of many RNA-binding, RNA-modifying and RNA-folding complexes participates to mature emerging RNPs. Third, the interplay of different RNPs is essential for RNP activity.

The DFG-funded Collaborative Research Center CRC960 at the University of Regensburg, Germany, aimed at shedding light on principles of RNP formation and the control of their function. The CRC emerged from the DFG-funded Research Unit FOR1065 “From Chromatin to Ribosome” in which the pathway of ribosome maturation was investigated, starting with the regulation of ribosomal (r)RNA synthesis in the context of rDNA chromatin in the nucleolus, including co-transcriptional assembly of ribosomal precursors, followed by nuclear pre-ribosomal maturation steps and export into the cytosol. These investigations of processes leading to mature ribosomes served then as a trailhead for the expanded research scope of the CRC to derive an understanding of common principles of RNP biogenesis. The broader concept of the CRC included analysis of RNPs containing RNA species derived from different nuclear transcription machineries, formation of micro(mi)RNA-containing RNPs, functions of small and long non-coding (lnc)RNA containing RNPs or the regulation of ribosome activity. This was reflected in the title of the CRC960 “RNP biogenesis: assembly of ribosomes and non-ribosomal RNPs

and control of their function”. The collaborative efforts were organized in two major research branches: (i) to investigate the interplay between RNP formation and the RNA-synthesizing transcription machineries in the native chromatin context, and (ii) to analyze the assembly, function, and regulation of post-transcriptional RNPs.

The first branch comprised projects studying yeast, archaeal, and mammalian rRNA-synthesizing machineries and their interaction with chromatin, as well as co-transcriptional assembly of RNPs and the interplay with RNP export complexes in plants. The second branch focused on the assembly of ribosomes in yeast and archaea, the control of ribosome function and the nucleo- or cytoplasmic formation and regulation of other RNPs. The RNPs studied were either related to ribosome formation and/or ribosome activity or were involved in miRNA- and lncRNA-dependent gene silencing, including mRNA degradation. Investigations of RNP assembly events influencing the transcription process closed the circle back to the first branch of investigations, the structure and function of transcribing polymerases. This all allowed to compare regulation and assembly of RNPs as well as their respective function in the context of diverse important cellular processes.

Fifteen years of DFG-supported collaborative research (FOR1068 and CRC960) at the University of Regensburg ended in June 2023 with the final funding period of the CRC960. The CRC served as a crystallization point to establish the main research focus “RNA biology” at the University of Regensburg which will be hopefully the basis for competitive and successful research in the future. Some highlights of the results obtained within the CRC960 are summarized in this Highlight Issue of *Biological Chemistry* as reviews, whereas original research articles reflect ongoing work. Overall, this should give an impression about the achievements and experimental approaches of the collaborative effort for the interested reader.

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