

Project 9.4 Dynamics of RNA degrading complexes in bacteria (NCN/SONATA BIS)

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www: <https://bit.ly/3SZlc9l>

Background:

Hundreds of bacterial mRNAs undergo post-transcriptional regulation by small RNAs (sRNAs) which is crucial to adjust stress responses or virulence in pathogenic strains. RNA chaperone protein, Hfq, facilitates the mRNA target search by sRNA and catalyzes the base pairing between them. sRNA-mRNA pairing often leads to the degradation of both molecules. The degradation of most bacterial RNAs, including those paired by Hfq, is carried out by a degradosome, a protein complex with ribonuclease E (RNase E) carrying both scaffold and catalytic functions.

The scaffold domain of RNase E can associate with sRNA and Hfq raising the question if this assembly is better equipped at targeting mRNAs than a simple sRNA-Hfq complex. It is possible that RhlB helicase associated with the degradosome unwinds secondary structures of mRNAs affecting the efficiency of mRNA regulation. Moreover, it is not known whether the formation of a stable mRNA-degrading complex depends on the order in which the individual components are assembled.

Aim:

The primary aim of this project is to investigate the intricate interplay between the sRNA-targeting and degradosome machineries. In order to accomplish this goal, we will reconstitute the targeting and degradation systems and employ single-molecule TIRF microscopy and biochemical methods to study their assembly in real time. By examining the coordination and dynamics among these molecular components, this project aims to obtain valuable insights into the underlying mechanisms that govern timely mRNA regulation.

Moreover, this project also endeavors to visualize the dynamics of RNA targeting and degradation within the context of actively translating ribosomes. This includes exploring potential competition between the ribosome and the sRNA-Hfq complex, as well as examining how degradosomes synchronize their activities with ribosomes in mRNA coding regions.

Requirements:

- MSc degree in biology, biochemistry or related field,
- solid knowledge of the principles of molecular biology and biochemistry,
- hands-on experience in laboratory work and knowledge of basic molecular biology techniques,
- prior experience in recombinant protein purification or microscopy will be an advantage,
- proficiency in written and spoken English,
- excellent interpersonal skills, initiative, good work organization

Number of positions available: 1

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