Title: Dynamics of RNA-degrading complexes in bacteria. (NCN/SONATA)

Promotor: Marcin Nowotny, Professor, **Supervisor:** Ewelina Małecka, PhD
Institute: International Institute of Molecular and Cell Biology in Warsaw
Laboratory: Laboratory of Single-Molecule Biophysics
www: https://shorturl.at/lUIuS

Project description:

Hundreds of bacterial mRNAs undergo posttranscriptional regulation by small RNAs (sRNAs), which play a crucial role in adapting to stress responses and in the virulence of pathogenic strains. This process is facilitated by the chaperone protein Hfq, which assists sRNAs in locating their target mRNAs and catalyzing the formation of base pairs between them. As a result, sRNA-mRNA pairing often leads to the degradation of both molecules. The degradation of most bacterial RNAs, including those paired with the help of Hfq, is carried out by the degradosome—a protein complex that includes ribonuclease E (RNase E). RNase E has the ability to bind both sRNAs and Hfq, raising the question of whether the RNase E-sRNA-Hfq complex is more effective in regulating mRNA than the simpler sRNA-Hfq complex. Additionally, the RhlB helicase, which is part of the degradosome, might potentially unwind the secondary structures of mRNA, thereby influencing the efficiency of target regulation. It also remains unclear whether the formation of a stable mRNA-degrading complex depends on the assembly sequence of its components.

Aim:

The main goal of the project is to investigate the complex mechanisms underlying the interplay of complexes involved in mRNA targeting and degradation. To achieve this, advanced techniques such as single-molecule TIRF microscopy and biochemical methods will be employed, enabling real-time monitoring of the assembly of these complexes. These tools will allow simultaneous observation of sRNA-mRNA pairing and degradosome association. The results obtained will provide a detailed understanding of the mechanisms underlying the coordinated regulation of mRNA in cells.

Requirements:

- Master's degree in biology, biochemistry, or related fields.
- Solid knowledge of fundamental molecular biology and biochemistry.
- Hands-on laboratory experience and familiarity with basic molecular biology techniques.
- Previous experience in recombinant protein purification and microscopy is a plus.
- Proficiency in spoken and written English.
- Strong interpersonal skills, initiative, and good organizational abilities.
- Willingness to learn and take on new challenges, ability to work independently, and analytical thinking skills.

Number of positions available: 1

Contact: emalecka@iimcb.gov.pl