

Title: RNA biology at the phage–bacteria interface (NCN/OPUS)

Promotor: Dr Ewelina Małecka

Institute: International Institute of Molecular and Cell Biology in Warsaw

Laboratory: Laboratory of Prokaryotic Gene Regulation

www: <https://shorturl.at/IUuS>

Project description:

Acinetobacter baumannii is a pathogen of critical priority according to the WHO—resistant to most available antibiotics and capable of long-term survival in hospital environments. Understanding how bacteriophages overcome this dangerous bacterium may open new therapeutic avenues.

The project focuses on RNA-binding proteins, which are at the center of the battle between the phage and its host. On the bacterial side, the RNA chaperone Hfq coordinates small RNA (sRNA) networks that regulate stress response and virulence. On the phage side, we have identified a Ro60 homolog—a protein that may redirect bacterial RNA toward degradation. The interaction between these two regulatory systems during infection remains largely unexplored.

Aim:

The aim of the project is to elucidate the molecular mechanisms by which RNA-binding proteins modulate phage–host interactions in *A. baumannii*. We will apply transcriptomic, proteomic, biochemical, and biophysical approaches to identify RNAs and proteins interacting with Hfq and phage-encoded Ro60 under both normal conditions and during infection, and to investigate their RNA-binding specificity and functional roles *in vitro*.

What will you do:

- Design and perform phage infection experiments using genetically diverse phages infecting *A. baumannii*
- Conduct time-resolved RNA-seq and map interaction networks (CRAC, RIL-Seq, co-IP/MS)
- Purify recombinant proteins, fluorescently label RNA, and perform biophysical assays (smTIRF – single-molecule total internal reflection microscopy)
- Integrate multi-omics data to build mechanistic models of RBP-dependent regulation during infection
- Present results at international conferences and co-author scientific publications

Requirements:

- Master’s degree in biology, biochemistry, or a related field
- Solid knowledge of the fundamentals of molecular biology and biochemistry
- Practical laboratory experience and familiarity with basic molecular biology techniques
- Proficiency in spoken and written English
- Curiosity, initiative, and the ability to work both independently and as part of a team
- Willingness to learn and take on new challenges; ability to work independently and think analytically
- Additional asset: experience working with bacteriophages, RNA biochemistry, or protein purification
- Additional asset: knowledge of bioinformatics, transcriptomic data analysis, or microscopy

Number of positions available: 1

Contact: emalecka@iimcb.gov.pl