

Title: Why are poly(A)-tails so important?

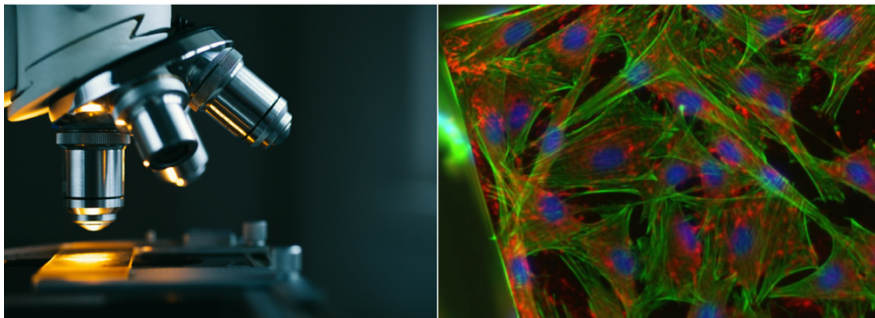
Department: Biophysical Chemistry

Internship Type: Master

Supervision: Dr. Maike Hansen (maike.hansen@ru.nl)

Main aim: To elucidate the effect of non-A nucleotides in the poly(A)-tail on translation and degradation

Website: <https://www.thehansenlab.com>



Background:

Classically poly(A)-tails are simply seen as a number of A's attached to the mRNA in order to provide stability and allow its translation. However, in recent years it has become evident that not only the length but also the composition of poly(A)-tails can differ drastically depending on the gene, or the cell type. Nevertheless, to date the detailed function of a poly(A)-tail is still unclear. Understanding the role of poly(A)-tails is critical not only for our fundamental understanding of gene expression, but also from a therapeutic perspective since mRNA therapies are becoming increasingly common. In our lab we have recently described the influence of poly(A)-tail length on mRNA degradation and translation modulation. Now, we aim to broaden this research by studying the effect of non-A nucleotides in the poly(A)-tail on mRNA kinetics.

Research plan:

To quantify the effect of alternative nucleotides in the poly(A)-tail on protein abundance, we transfect cells using synthetic mRNA molecules with poly(A)-tails containing mutations in specific locations. By using single-cell techniques we then aim to quantify the impact of these non-A nucleotides on the degradation and translation rates of the transfected mRNAs.

Techniques used:

Molecular biology techniques (in-vitro transcription, RT-PCR, qPCR, gel electrophoresis, capillary electrophoresis, RNA purification/extraction), *cell biology techniques* (cell culture, mRNA cell transfection, confocal microscopy, single molecule imaging), *computational* (image analysis with Fiji/Python, data analysis with Python/R).

Lab environment:

We are part of the Biomolecular and Biophysical Chemistry department in the Institute for Molecules and Materials (IMM) with a focus on single-cell biology. We are an international group who fosters a supportive, dynamic, and open atmosphere, and values fun and interactive research.