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2024 Winner of the Eppendorf Award for Young European Investigators

»I am absolutely delighted to receive the 2024 Eppendorf Award for Young European Investigators. This award is a special recognition for our highly motivated research team, whose efforts have made this possible. I am also very thankful for the exceptional support by the IMP and Boehringer Ingelheim, the ERC, our colleagues at the Vienna BioCenter and beyond, as well as my family. The award recognizes our contributions to reveal the structural mechanisms by which a human mRNA is made. Yet many questions remain. In the coming years, we look forward to further understanding the molecular processes that regulate how mRNA is made and destroyed.«

Dr. Clemens Plaschka

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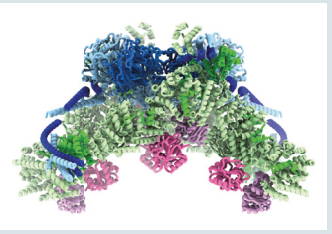
Award-Winning Research

The molecular machines that generate and export messenger RNA



Atomic structure of the human transcription-export complex. The transcription-export complex selects and prepares mRNA for nuclear export, an essential step in the production of human proteins.

Messenger RNA (mRNA) carries genetic information from DNA to protein, a process that is essential for cellular life. Although this pathway has been known for sixty years, the molecular mechanisms that control how a human mRNA is made remain incompletely understood. Each of step in this process requires a dedicated macromolecular 'machine' that acts on the mRNA. Only when all steps are completed, can the mRNA move from the cell's DNA compartment, the nucleus, into the protein production compartment, the cytoplasm. To understand how a healthy human cell functions, our research group aims to unravel the mechanistic steps that govern the production, processing, and nuclear export of human mRNA.

In our recent, work we contributed to a better understanding of how mRNA is modified by one molecular machine, the 'Spliceosome', and how mRNA is recognized and packaged for nuclear export by a second molecular machine, the 'Transcription-Export complex'. This last step requires the precise discrimination of mRNA from its immature precursor forms. In recent work, we used structural techniques to visualize the 'Transcription-Export complex' in complex with human mRNAs at near-atomic detail.
We learned that mRNA recognition and its packaging require many of the same type of molecules to bind special markers on the mRNA's surface. We also observed how human mRNAs are organized in three-dimensions, which gave us insights into how these molecules might be safe-guarded in the cell and directed towards protein production. These findings open up exciting questions for the future about the mechanism by which human mRNAs are made and destroyed in healthy cells.

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