



Irma
Querques
Vienna, Austria

2024 Finalist

**How do bacteria transfer genetic information using transposons?
How to utilize this knowledge to enhance gene transfer technologies?**

»During my postdoctoral work, we employed an integrative structure-function approach to investigate type V CRISPR-associated transposons (CASTs), renowned for their RNA-guided DNA integration and potential for programmable gene insertion in genome editing. Focusing on the CRISPR-Cas12k complex and the TnsC protein filament, we examined guide RNA organization, DNA targeting, and strategies for RNA minimization.

Building upon these insights, we further delved into the structural mechanisms underlying RNA-mediated DNA insertion in type V CASTs. Our investigations revealed an unprecedented interaction between the CRISPR machinery and the ribosomal protein S15. We identified a novel moonlighting role of S15 in prokaryotic biology, beyond its traditional involvement in ribosome assembly, establishing it as an essential regulatory component of type V CASTs. This discovery had significant implications for genome editing, culminating in the successful reconstitution of these systems in human cells, marking a revolutionary advancement toward next-generation tools for targeted DNA integration.«

Dr. Irma Querques

Assistant Professor and Group Leader
Max Perutz Labs, University of Vienna
Department of Structural and
Computational Biology
Campus Vienna Biocenter 5, 1030 Vienna
E-Mail: irma.querques@maxperutzlabs.ac.at

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Dr. Irma Querques



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