

# SFB 960-/BZR – Kolloquium

Donnerstag, 28. September 2023 14.00 Uhr  
Neubau Biologie H 53



## Prof. Dr. Sabine Müller

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*Engineering of hairpin ribozyme variants:  
activity in vitro and in vesicles*

During the origin of life, encapsulation of RNA inside vesicles is believed to have been a defining feature of the earliest cells (protocells). The confined biophysical environment provided by membrane encapsulation differs from that of bulk solution and has been shown to increase activity of functional RNA. We have studied how encapsulation of the hairpin ribozyme inside model protocells affects ribozyme folding into the active conformation, and cleavage and ligation activities. The results indicate that encapsulation stabilizes the docked conformation characteristic of the active hairpin ribozyme and rescues the activity of folding-deficient mutants. For further characterisation in vesicles, we have engineered hairpin ribozyme variants that support RNA recombination. This includes the rational design of a hairpin ribozyme variant, capable of independently binding and cleaving two different RNA substrates, followed by ligation of recombined fragments. Thus, an evolutionary process is demonstrated by recombining non-functional RNAs to a functional hammerhead ribozyme, and the functional hammerhead ribozyme further on to an effector responsive aptazyme. Furthermore, we have engineered hairpin ribozyme variants, which as self-splicing introns are removed from their parent RNA. In the process, two cleavage reactions are supported at the two intron-exon junctions, followed by ligation of the two generated exon fragments as well as of the intron termini. As a result, exons are ligated and the intron is circularized.

The lecture will introduce the different engineered ribozymes and discuss the effects of encapsulation on ribozyme activity.

Host: Prof. Reinhard Sterner  
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