Next-level riboswitch development - Implementation of Capture-SELEX allows fast and easy identification of new synthetic riboswitches

Prof. Beatrix Suess

Department of Biology,

Technical University Darmstadt

Abstract

RNA utilises many different mechanisms to control gene expression. Among the regulatory elements that respond to external stimuli, riboswitches are a prominent and elegant example. Riboswitches consist solely of RNA. They are characterised by binding of a small molecule ligand to the so-called aptamer domain, which results in a conformational change of the downstream expression platform that determines the output of the system. The modular organisation of riboswitches has resulted in the adoption of engineered riboswitches as artificial genetic control devices and a number of exciting proof-of-concept studies have been published. It should be noted that the majority of these studies were performed with the theophylline aptamer. Overall, there is no shortage of small molecule-binding aptamers. However, only a small fraction of them are suitable for RNA engineering since a classical SELEX protocol selects only for high-affinity binding but not for conformational switching. We now implemented RNA Capture-SELEX in our riboswitch developmental pipeline to integrate the required selection for high-affinity binding with the equally necessary RNA conformational switching. We consider this integrated approach a breakthrough in riboswitch development, as suitable sensor domains for RNA-based devices can now be developed quickly and easily against any ligand of choice.

Biography

Beatrix Suess is a Full Professor of Genetics and Synthetic Biology at Technical University Darmstadt. She completed her PhD at Friedrich-Alexander University in Erlangen in 1998 and continued her research as an independent group leader. She was a visiting researcher with Ron Breaker at Yale University. In 2007, she was appointed Associate Professor for Chemical Biology at Goethe-University in Frankfurt. In 2012, she joined TU Darmstadt where she is a founding member of the recently launched Centre for Synthetic Biology. Her research interests include regulatory RNAs with a special focus on synthetic RNA biology.