Ph.D. projects in progress

1.

Mentor: Antal Kiss

Doctoral school: University of Szeged, Faculty of Science and Informatics, Doctoral School of Biology

Ph.D. student: Pál Albert

Title of the research topic: Engineering DNA methyltransferase variants for targeted DNA methylation

Description of the research topic: Targeted DNA methylation is an approach designed to selectively methylate specific regions of the genome of higher eukaryotes. The available methods share the common principle of linking a CG-specific DNA methyltransferase (MTase) to a targeting domain of programmable DNA binding specificity (e.g. zinc finger proteins, or more recently dCas9), which anchors the MTase to the DNA in the vicinity of the addressed CG site(s). Unfortunately, the specificity of these methods is limited, non-targeted CpG sites also get methylated at variable frquencies.

Goals of the project:

1) Developing strategies that enhance the specificity of targeted DNA methylation

2) Construction of altered specificity mutants of the CG-specific bacterial DNA MTase M.MpeI for targeting methylation to cytosines in non-CG context.

2.

Mentor: Antal Kiss

Doctoral school: University of Szeged, Faculty of Science and Informatics, Doctoral School of Biology

Ph.D. student: Nikolett Zsibrita

Title of the research topic: I-Block, an Escherichia coli-based assay system for studying sequence specific DNA-protein interactions

Description of the research topic: Determination of the sequence specificity of proteins controling gene expression and characterization of their binding affinity in response to different conditions can help understanding the mechanism of gene regulation, and can open ways to design new sequence specific DNA binding proteins. We developed a technique (I-Block assay) to detect sequence-specific DNA binding of proteins in E. coli cells (Szentes

et al., 2020, I-Block: a simple Escherichia coli-based assay for studying sequence-specific DNA binding of proteins, Nucleic Acids Res., 48: e28).

Our goal is to develop the assay into a method, which can be used to determine the target sequence of DNA binding proteins, and to select protein variants that bind to a specific nucleotide sequence with high affinity.