An executive summary of the activities carried out during the implementation period

Regarding the implementation of the research project with the title: ***Xeno nucleic acids-mediated, real-time multiplexed detection of disease relevant miRNAs, with single molecule sensitivity and selectivity***, acronym RNANANODETECT, code PN-III-P4-ID-PCE-2020-0011, for all execution periods (2021-2023).

In this project we aimed to use specific xeno-nucleic acids, namely peptido-nucleic acids (PNA) conjugated with poly(Arg) arginine amino acid sequences of variable sizes, with the role of probe molecules in the multiplex detection of DNA sequences similar to target miRNAs of biological interest, using protein nanopores as transducers. The single-molecule detection method using α-hemolysin (α-HL) protein nanopore does not require labeling or amplification and is based on the complementarity between the target nucleic acid sequence and the synthesized probe nucleic acid sequence.

We were able to demonstrate the possibility of multiplex analysis of the profiles of different DNA molecules similar to miRNA, in electrolytic solutions and solutions similar to biological samples using the detection method based on protein nanopores and the hybridization process between DNA target molecules and PNA probe molecules functionalized with polyarginine sequences of various lengths. We were also able to obtain with this method a DNA similar to miRNA detection limit in the micromolar order. The presented results demonstrate the usefulness and feasibility of methods for detecting molecules of biological interest using protein nanopores and underline the importance of bionanotechnologies in the development of modern diagnostic and treatment methods.

Date

15.11.2023

Project Director,

Prof. Univ. Dr. Tudor LUCHIAN