Theme 1: RNA- and Oligonucleotide-based Therapeutics

1. ‘Center for Optimized Oligo Escape and Control of Disease’, DKK 59,987,498 over 6 years

Main applicant: Nikos Hatzakis, Department of Chemistry, University of Copenhagen

Co-applicants:
Maria Carmo-Fonseca, Instituto de Medicina Molecular Joao Lobo Antunes, University of Lisbon

Tom Kirchhausen, Program in Cellular and Molecular Medicine, Boston Children's Hospital

Knud Jørgen Jensen, Department of Chemistry, University of Copenhagen

Brief description:
Oligonucleotide pharmaceutics are becoming excellent tools for targeting cancer, muscular and neurological diseases as well as for vaccine production. A major problem that limits their application is that while we have good tools to deliver them to cells only ~5% of the material manages to be released in the cells, the rest remains trapped in endosomes. The scope of the Center for Optimized Oligo Escape and Control of Disease is to firstly understand the mechanism of oligo endosomal escape, and secondly to use this information to increase delivery and consequently target cardiovascular and metabolic diseases. We will use sophisticated microscopes to measure their interaction will live cells, AI tools to analyse the data and design and synthesize better DNA and RNA pharmaceutics that escape endosome. The Centre will form a bridge between University of Copenhagen, Harvard Medical School & Boston Children’s Hospital, and Instituto de Medicina Molecular, University of Lisbon.

2. 'Center for RNA Therapeutics towards Metabolic Disease (RNA-META)', DKK 59,999,374 over 6 years

Main applicant: Jørgen Kjems, Department of Molecular Biology and Genetics, Aarhus University

Co-applicants:
Louise Dalgaard, Department of Science and Environment, Roskilde University

Kurt Vesterager Gothelf, iNANO and Department of Chemistry, Aarhus University

Markus Stoffel, Department of Biology, ETH Zurich

Brief description:
Today, nearly all drugs are small molecules or protein but recently it has become evident that RNA, the molecule serving as messenger from DNA code to protein production, can target gene expression in our cells and correct disease associated imbalances. By using RNA itself as a drug, it is possible to inhibit unfavorable gene expression, substitute for expression of non-functional genes or enhance their expression. However, the large size and instability of current RNA drugs call for improved RNA synthesis and delivery methods. With an initial focus on metabolic diseases like diabetes, RNAMETA will solve this challenge by inventing RNA drugs protected from degradation inside our body and equipped with a capacity to reach diseased cells in a targeted fashion. Solving these obstacles can pave the way for applying RNA drugs to essentially any human disease. We will conduct proof-of-concept experiments in animals and collaborate with pharma industry to bring new RNA drugs into human use.