Mødedato: 30. marts 2022 kl. 13:00-14:30
Mødested: 1520-731 (Sea View)
Mødeemne: Møde i Nat Forskningsudvalg

Deltagere: David Lundbek Egholm/DLE (NAT), Anders Møller/AM (CS), Kurt Vesterager Gothelf/KVG (iNANO), Michael Møller Hansen/MMH (BIO), Ove Christiansen/OC (CHEM), Steen Hannestad/SH (PHYS), Søren Munch Kristiansen/SMK (GEO), Søren Fournais/SF (MATH), Astrid Klingen/ARK (NAT, referent)
Afbud: Torben Heick Jensen/THJ (MBG)
Gæst: Anne Færch Nielsen/AFN (MBG)

Referat (opfølgningspunkter markeret med gul)

12:30 – 12:25 (5 min.)

1. Velkomst og godkendelse af dagsorden

Bilag 1: Referat fra 1. februar 2022 (godkendt)

DLE bød velkommen, særligt til AFN, ny Videnskabelig Koordinator på MBG, som deltog i stedet for THJ, der var forhindret.

12:25 – 12:45 (10 min.)

2. Ny forskning fra iNANO v/KVG

KVG præsenterede iNANOs historie, organisering og forskningsaktiviteter. Præsentationen er vedhæftet.

12:45 – 13:30

3. Full-cost budgettering af forskningsprojekter

DLE præsenterede status for arbejdet med full cost. Udvalget drøftede

- problematikken med EU- og IFD-bevillinger, der ikke dækker ph.d.-studerendes løn til den del af arbejdstiden, der bruges til undervisning. Nat vil ikke umiddelbart forfølge strategien at søge fuld løn i bytte for at vedkommendes undervisning er udelukkende projektrelateret, da Nat ikke vil skabe A- og B-hold ift. undervisning blandt de ph.d.-studerende. Men som led i GSNS ph.d.-handleplan skal der køres proces om ph.d.-undervisning i fakultetsledelsen i 2022, og her vil de økonomiske aspekter også blive inddraget.
- tilgang for at integreret full cost i den nye økonomimodel.

DLE inviterede til at drøfte omkostninger, der medfølger køb af et instrument, i de lokale forskningsudvalg, for at kunne samle op senere i processen.

Udvalget ønskede sig en slide deck til præsentation i de lokale forskningsudvalg (DLE og ARK følger op).

13:30 – 13:50

4. Horizon Europe Søjle 2

DLE gjorde opmærksom på en seminarrække udviklet af FSE på vegne af AU's forskningsudvalg, som har til formål at udbrede kendskab til, og mindske berøringsangst med, Horizon Europe søjle 2. Tilbuddet skal reklameres for på institutterne.
Parallelt med dette tiltag, fortsætter FSE med institutbesøg, gerne med tydelig ledelsesopbakning og på invitation af det respektive forskningsudvalg.

13:50 – 13:55

5. Nyt fra medlemmerne

a. Status på forfremmelsesprogram

Fakultetsledelsen er i gang med at definere rammesætningen på Nat, vha. en arbejdsgruppe med bred repræsentation fra de forskellige råd og udvalg. Resultatet forventes at foreligge til sommer. Det vil kræve flere år (tre til fem) at gennemføre programmet og rykke op fra lektor til professor igennem programmet. Blandt de vigtigste mål med programmet er at sikre øget gennemsigtighed omkring karrieremuligheder for lektorer.

b. Status på karriereudvikling for yngre forskere

Punktet udgik pga. tidspres.

c. MSCA master class 2022 – status efter fakultetets deadline

DLE oplyste, at alle kandidater indstillet af Nat-institutterne kan tilbydes en plads, takket være de lokale forskningsudvalgenes grundige arbejde. Udvalget foreslog at revurdere modellen fremover, p.t. bruges der fx meget tid på gennemlæsning uden at udbyttet altid fremstår særlig klart.

d. Data management – ny organisering på AU, og fremtidig implementering på Nat

DLE orienterede om et forslag om en ny organisering af datamanagement på AU, der blev godkendt i universitetsledelsen d. 22. marts. Ifølge beslutningen skal fakulteterne spille en større rolle, med et "servicecenter" forskere kan henvende sig til. DLE er nu ved at undersøge behov og kompetencer på tværs af institutterne. En gruppe af "ildsjæle" er indkaldt og mødes igen i april-måned, indtil videre til organiseringen på Nat er faldet på plads.

13:45 – 13:55

6. Skriftlige meddelelser

Bilag 6: Kommende deadlines

13:55 – 14:00

7. Eventuelt

- Næste møde: 1. juni på MBG. SH holder forskningsoplæg.
- Der er midler tilbage i puljen for sabbaticals: https://tech.medarbejdere.au.dk/forskerstoette/stipendier-og-bevillinger/sabbaticalstipendier

INANO
A SHORT RESEARCH STORY

AARHUS UNIVERSITY

KURT GOTHELF
PROFESSOR

iNANO FACTS and NUMBERS

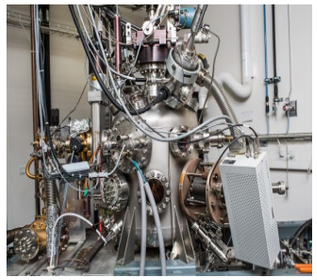
- 43 Professors/Associate Professors (3 NAT departments, 2 TECH department, 1 HEALTH department; 3 faculties)
- Postdocs and assistant professors: ~100
- ~110 nanoscience students incl. 3+5 and 4+4 PhD students
- ~110 PhD students
- DKK ~**2300** MKr in grants (total since start)
- Current centers: 3 DG centres, 1 NNF center, 1 Thematic NAT center, Innovation Fund Denmark, VILLUM, NNF, DFF, DSF, Lundbeck
- Approx. 320 peer-review articles per year
- Cooperation with +100 partners from industry
- Engaged in interdisciplinary centers: ciFOOD, iMAT, WATEC, etc.

Primary activities at iNANO

1. Interdisciplinary collaboration
2. iNANO education
3. Research
4. Infrastructure

Thomas Vosegaard
Acting director of iNANO
Professor in NMR spectroscopy

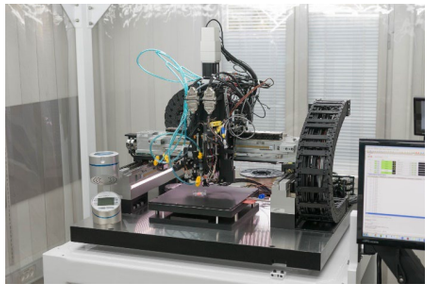
Infrastructure



Aarhus Scanning Tunneling Microscope

X-ray diffraction

Analytic atmomic resolution, TEM
FEI Talos



3D polymer printing in clean room

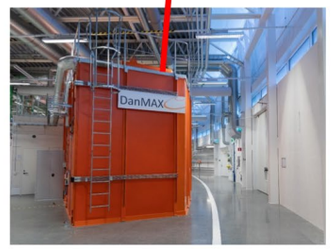
EUROPEAN SPALLATION SOURCE

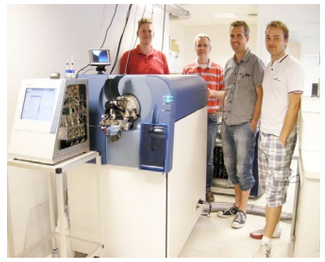
Verdens kraftigste neutronstråle

MAX4 SYNCHROTRON

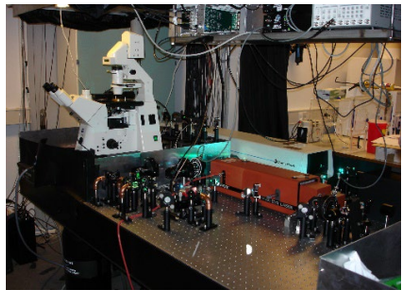
Verdens kraftigste røntgenstråle

iNANO og KEMI bygger to revolutionerende nye instrumenter



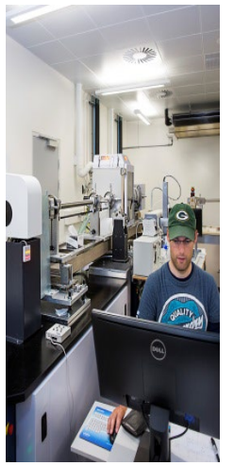


High-sensitivity mass spec



Single Molecule FRET microscopy

Chem/MolBio Synthesis labs



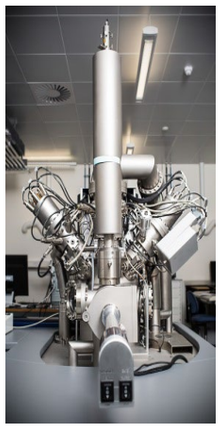
Small-Angle X-ray Scattering

High speed AFM

Krios Transmission electron microscopy

ISO5 (class 100) Clean room:
30 particlers/m³

Ultra high field NMR



TOF-SIMS; XPS

Supercritical synthesis

Organization of iNANO and the institutes

iNANO in three different sizes

iNANO members

In iNANO building

iNANO employees

Organization of iNANO and the institutes

iNANO – in house

Employees & affiliates

Chemistry

Elena Ferapontova
Espen Drath Bøjesen
Frans Mulder
Henrik Birkedal
Jan Skov Pedersen
Kurt Vestager Gothelf
Thomas Vosegaard
Troels Skrydstrup
Victoria Birkedal
Niels Chr Nielsen

Molecular Biology

Brigitte Stadler
Daniel Otzen
Ebbe Sloth Andersen
Ken Howard
Morten Foss
Jørgen Kjems

Biology

Rikke Louise Meyer

Physics

Duncan Sutherland
Flemming Besenbacher
Jeppe Vang Lauritsen
Mingdong Dong
Stefan Wendt
Trolle René Linderoth

iNANO – at departments

Affiliates

Chemistry

Alexander Zelikin
Birgit Schiøtt
Bo Brummersted Iversen
Jørgen Skibsted
Kim Daasbjerg
Marianne Glasius
Martin Bremholm
Merete Bilde
Mogens Christensen
Torben René Jensen

Physics

Brian Julsgaard
Jill Miwa
Liv Hornekær
Peter Balling

Molecular Biology

Birgitta Knudsen
Poul Nissen

Biomedicine

Thomas Vorup-Jensen

Engineering

Jens Vinge Nygaard
Menglin Chen
Nina Lock

Research areas at iNANO

- Nanomaterials
- Interfaces and catalysis
- Nanomedicine
- Synthetic biology
- Nanofood

Research areas at iNANO

Group leaders within Nanomedicine	
Andersen, Ebbe Sloth	Nissen, Poul
Birkedal, Henrik	Nygaard, Jens Vinge
Chen, Menglin	Otzen, Daniel
Dong, Mingdong	Pedersen, Jan Skov
Ferapontova, Elena	Schiøtt, Birgit
Foss, Morten	Skrydstrup, Troels
Gothelf, Kurt Vesterager	Städler, Brigitte
Howard, Ken	Sutherland, Duncan
Kjems, Jørgen	Vorup-Jensen, Thomas
Knudsen, Birgitta R.	Vosegaard, Thomas
Meyer, Rikke Louise	Weidner, Tobias
Mulder, Frans	Zelikin, Alexander

Centers in Nanomedicine

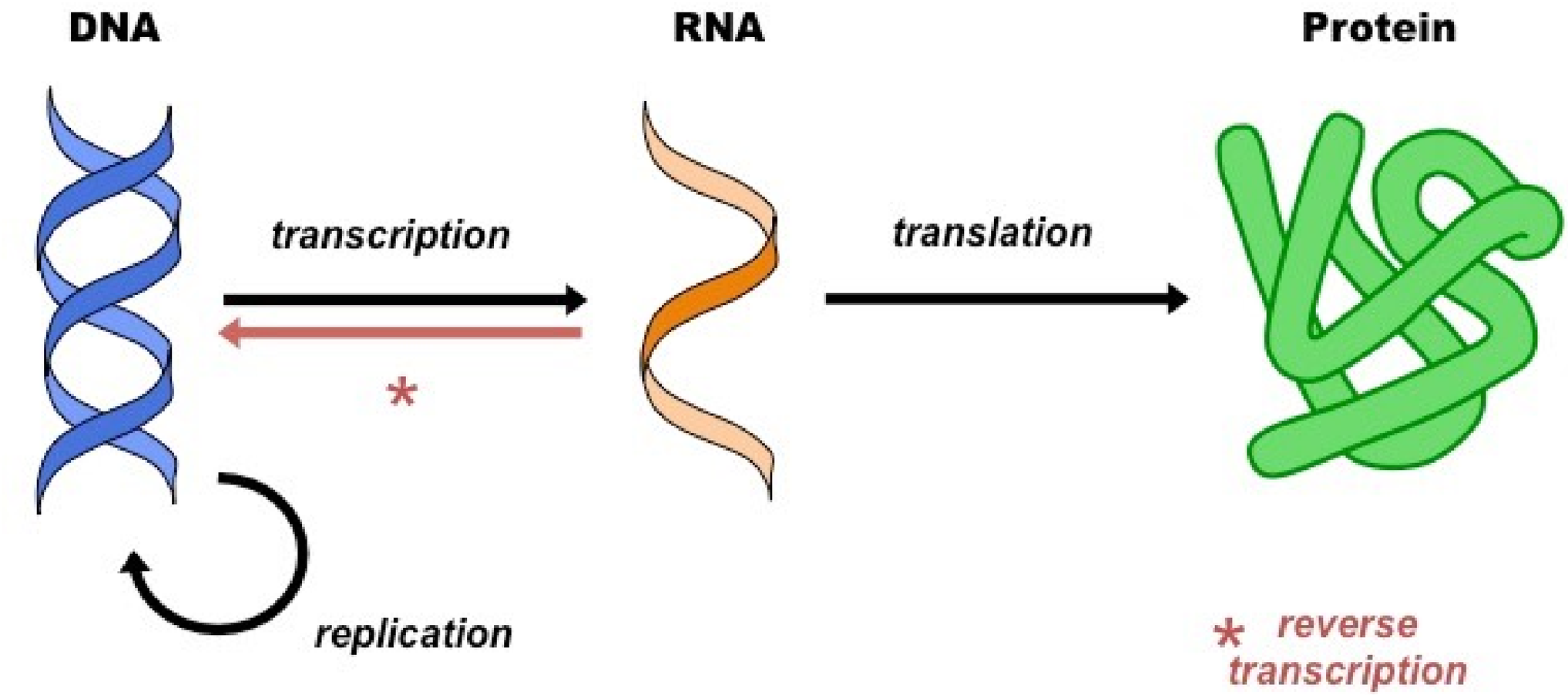
CEMBID
Center for Multifunctional Biomolecular Drug Design

NNF

CELLPAT CENTRE FOR CELLULAR SIGNAL PATTERNS

DNRF

The central dogma and Nucleic acid drugs



Circular RNA

LETTER

doi:10.1038/nature11993

Natural RNA circles function as efficient microRNA sponges

Thomas B. Hansen[1], Trine I. Jensen[1], Bettina H. Clausen[2], Jesper B. Bramsen[1,3], Bente Finsen[2], Christian K. Damgaard[1] & Jørgen Kjems[1,3]

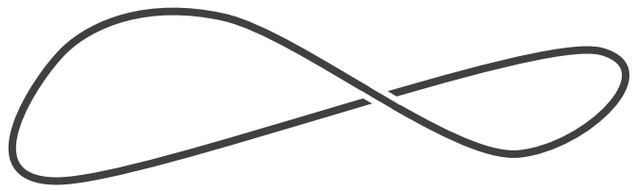
MicroRNAs (miRNAs) are important post-transcriptional regulators of gene expression that act by direct base pairing to target sites within untranslated regions of messenger RNAs[1]. Recently, miRNA activity has been shown to be affected by the presence of miRNA sponge transcripts, the so-called competing endogenous RNA in humans and target mimicry in plants[2–7]. We previously identified a highly expressed circular RNA (circRNA) in human and mouse brain[8]. Here we show that this circRNA acts as a miR-7 sponge; we term this circular transcript ciRS-7 (circular RNA sponge for miR-7). ciRS-7 contains more than 70 selectively conserved miRNA target sites, and it is highly and widely associated with Argonaute (AGO) proteins in a miR-7-dependent manner. Although the circRNA is completely resistant to miRNA-mediated target destabilization, it strongly suppresses miR-7 activity, resulting in increased levels of miR-7 targets. In the mouse brain, we observe overlapping co-expression of ciRS-7 and miR-7, particularly in neocortical and hippocampal neurons, suggesting a high degree of endogenous interaction. We further show that the testis-specific circRNA, sex-determining region Y (*Sry*)[9], serves as a miR-138 sponge, suggesting that miRNA sponge effects achieved by circRNA formation are a general phenomenon. This study serves as the first, to our knowledge, functional analysis of a naturally expressed circRNA.

To regulate mature miRNA activity, conceptual studies overexpressing miRNA target site concatamers, so-called miRNA sponges, were initially performed and shown to result in a loss of miRNA function accompanied with increased levels of endogenous targets[10]. Subsequently, endogenously expressed linear RNAs have been shown to sequester and inhibit miRNA activity in plants (target mimicry)[2] miRNA-mediated endocleavage[12,13] (Supplementary Fig. 1b). The miR-671 target site exhibits near-perfect complementarity and very little variation across species (Supplementary Fig. 1c), as well as high duplex stability compared to miR-7 (Supplementary Fig. 1d). Analysis of available online AGO2 immunoprecipitation followed by high-throughput sequencing (HITS-CLIP) data from mouse brain[14] revealed a high degree of AGO2 occupancy on the mouse variant of ciRS-7, with sequence reads dispersed throughout ciRS-7, and the highest read densities covering the region with the highest 8-nucleotide target site abundance (Supplementary Fig. 2a). Importantly, HITS-CLIP reads proximal to the nonlinear splice sites support the association between AGO2 and ciRS-7 (Supplementary Fig. 2b). This confirms our previous observation showing a high expression of ciRS-7 in human and mouse brain[8] and other studies profiling brain-specific expression of miR-7 (ref. 15).

To study the effect of ciRS-7 expression on miR-7 activity, we established a vector-based system expressing the circRNA. The biogenesis of circRNAs is at present unknown; however, previous studies have shown that exons flanked by inverted repeats induce circRNA formation *in vitro* by nonlinear splicing[16], and this is thought to be essential for production of the circular *Sry* RNA[8,17]. Thus, we inserted the ciRS-7 exon along with the endogenous flanking sequence into pcDNA3 (pcDNA3-ciRS-7-ir; Fig. 1b). Subsequently, we copied part of the upstream flanking sequence and inserted it in an inverted orientation downstream (pcDNA3-ciRS-7; Fig. 1b). Transient expression of pcDNA3-ciRS-7, but not of the construct lacking the downstream inverted sequence (pcDNA3-ciRS-7-ir), resulted in the production of a circRNA species that was indistinguishable from the endogenously expressed circRNA by northern analysis (Fig. 1c) and PCR with

Nature 2013

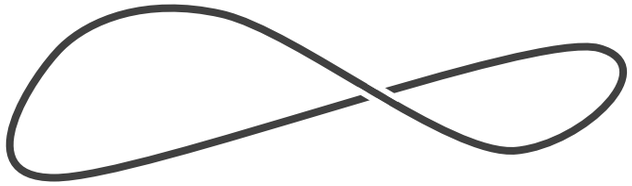
Circular RNA

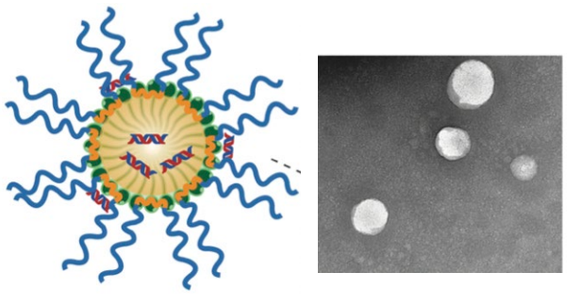


Facts about circular RNA:

- Around 20% of active genes express CircRNA
- They have a long range of regulatory functions in the cell and can express proteins.
- While linear RNA only has a half-life time of 4-9h circular RN has a half-life time of 48h
- CircRNA have great potential for theraphy

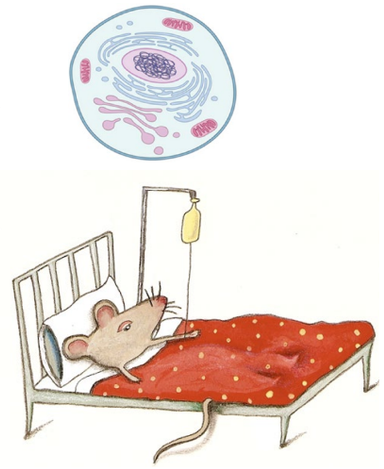
Delivery of circular RNA

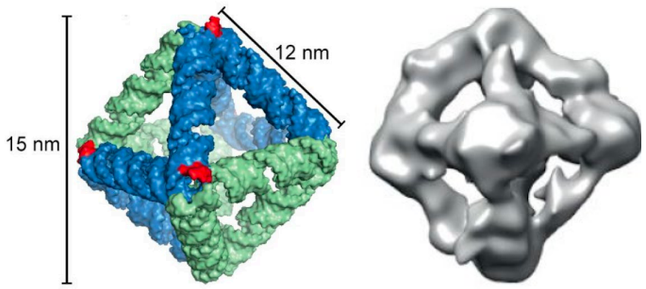




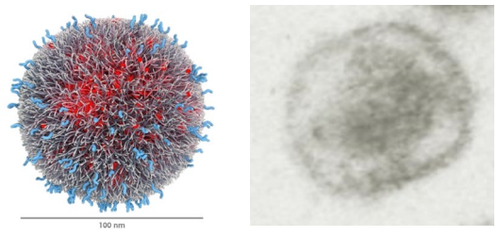
Nanoparticles:
Liver, kidney, BBB and macrophages

Delivery of
- siRNA/antisense
- mRNA
- CRISPR-Cas
- Protein

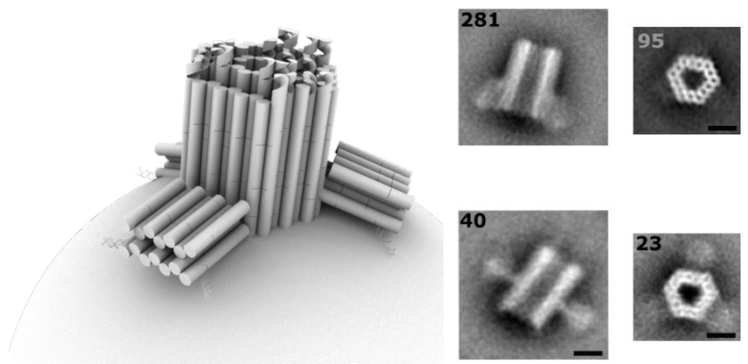




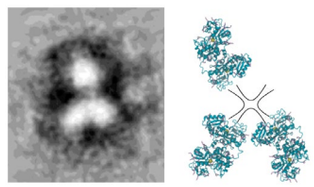
RNA nanostructures:
Cells culture
Blood (F-modified)



Exosomes/
Virus like particles (VLP):
Brain and heart stroke

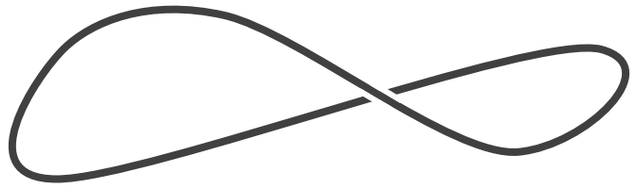


DNA nanostructures:
All cell culture



Small RNA conjugated nanostructures
Liver, lung, brain, tumor

Circular RNA activities



Research and innovation in CircRNA

- Fostered 3 independent groups PI
- >40 circRNA publications
- AU patented technology (microRNA regulation) and RNA delivery systems
- Startup Company

CircMed

circRNA-based therapeutics
NovoSeed company
Founder: Jørgen Kjems
Planned launching April 2022