



Biological functionalization of implants

NMI Natural and Medical Sciences Institute at the University of Tübingen

NMI

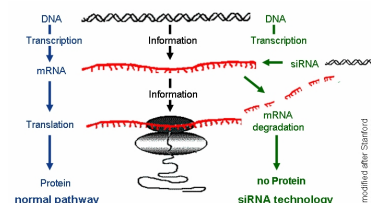
Applied R & D

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BACKGROUND and BASICS

The **aim of our project** is to develop a cross-sectional technology in order to realize bio-functionalization of different implant types with a novel class of biomolecules. Therefore a class of biomolecules shall be employed that allow manipulating every protein-based cellular process in the course of diseases / degeneration.

siRNAs (small interfering RNAs) bind to cellular RNA having the same sequence. As a result, cellular RNA is degraded and protein synthesis is inhibited. This mechanism can be harnessed to specifically inhibit disease-causing or disease-promoting genes, thereby inhibiting synthesis of designated target proteins.



RNA interference: gene silencing induced through sequence-specific cleavage of messenger RNA (mRNA)

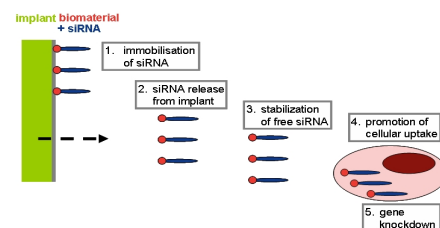
CONCEPT and SOLUTION

Benefits of our siRNA concept:

1. High specificity: siRNAs are highly specific short oligonucleotides, which control via a universal mechanism the synthesis of all proteins.
2. Broad applicability: siRNA knockdown can be a valuable tool in basic research as well as in clinics and industry. siRNA coupled to implants provides an attractive approach for the treatment of various disorders in, e.g. the respiratory system, urogenital tract, cardiovascular system, nervous system, bone and cartilage.

Technical realization:

siRNA handling will be first tested in *in vitro* cultures. To monitor **cellular uptake** of siRNA and **cell viability**, different techniques including microscopy and flow cytometry will be employed. The **knockdown efficiency** will be determined on mRNA and protein level using biomolecular methods like polymerase chain reaction (PCR), Western Blotting and microscopy.



Interaction of implant, biomaterial, siRNA and target cells

our business activities:

- siRNA: biological effects
- siRNA as therapeutic agent
- siRNA for implant processing

STATUS and OUTLOOK

Results:

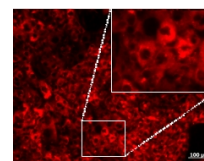
1. Efficient uptake of siRNA in cell culture as shown by microscopy using fluorescently labelled siRNA.
2. High transfection rate by optimal siRNA uptake & no toxic effects as shown by microscopy, flow cytometry & absorbance measurement.
3. Clear knockdown of mRNA (80-89%) as shown by PCR and decreased protein level (Western Blotting, microscopy).

Outlook:

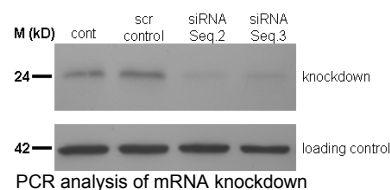
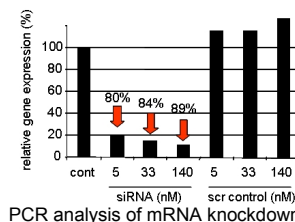
siRNA has to be bound to different implant materials, e.g. as nanoparticles, depending on the application. Therefore, a biomaterial has to be identified for binding, stabilization, & promoting cellular uptake.

We are looking for partners:

- with expertise in the production or interest in the application of: new biomaterials; implants with up-to-date active natural based polymer coatings and drug-eluting surfaces; new assay systems; gene/protein knockdown using siRNA
- who are able to turn our present ideas, competences and concepts in commercial product and to establish it at the market



← Fluorescence microscopy of siRNA transfected cells (red)



Contact:

Dr. Hanna Hartmann, +49 (0) 7121 51530-872, hanna.hartmann@nmi.de

Prof. Dr. Burkhard Schloßhauer, +49 (0) 7121 51530-20, schlosshauer@nmi.de, www.nmi.de