Collaborative Research Center 1270 “Electrically Active Implants - ELAINE” at the University of Rostock will be extended for four years

05/27/2021

A second funding period for the development of novel, electrically active implants is financed by the German Research Foundation (Deutsche Forschungsgemeinschaft - DFG).

Researchers from 14 participating institutions of the University and University Medical Centre Rostock and of four other universities receive 12.4 million euros for the second funding period from 2021 to 2025. In particular, positions for 28 young scientists are funded.

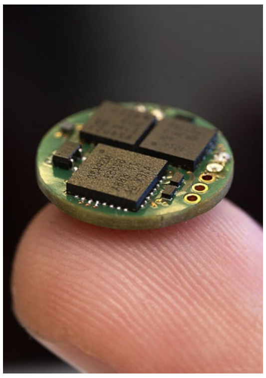
In an aging population, medical implants for maintaining or restoring various functions are becoming increasingly important. The research vision of the interdisciplinary SFB 1270 focuses on novel, electrically active implants for the regeneration of bones and cartilage and on deep brain stimulation to treat movement disorders. SFB 1270 ELAINE develops long-term stimulators that are particularly energy-efficient or even completely energy self-sufficient. At the same time, these devices remain extremely lightweight and small in order to be fully implantable, are able to send data and can be programmed flexibly at the same time. This paves the way for new long-term medical applications and patient-specific treatment. With experimental support, the SFB develops so-called multi-scale models, i.e. mathematical models that cover large temporal and spatial areas. In the future, these will allow more robust and safer individual therapy planning.

SFB 1270 is a strongly interdisciplinary research network that combines electrical engineering, computer science, mathematics, mechanical engineering, materials science, physics, biology and medicine. ELAINE’s speaker is Professor Ursula van Rienen, who holds the Chair of Theoretical Electrical Engineering at the University of Rostock. In addition to scientists from Rostock University and University Medical Center, researchers from Friedrich-Alexander University Erlangen-Nuremberg, Greifswald University, Leipzig University and Johannes-Gutenberg University Mainz are involved.

The funding mainly benefits young scientists who will be researching these issues for four years from July 2021. Professor Wolfgang Schareck, Rector of the University of Rostock, is pleased about the continuation of the ELAINE Collaborative Research Center: "I warmly congratulate Professor van Rienen and her colleagues on this great success."

In the first funding period from 2017 to 2021, decisive innovation have already been achieved. This resulted in new concepts for electrically active implant materials, mechanically more reliable implant structures and first prototypes that gain sufficient energy from the movement of the patient to be operated independently. In addition, a new, fully implantable electrical stimulation system with miniaturized electronics and significantly reduced energy requirements was developed for use in the brain and the musculoskeletal system. For deep brain stimulation in dystonia and Parkinson's disease, new insights into the mode of action were achieved. For the treatment of osteoarthritis, the differentiation capacity of human cartilage cells was examined with innovative stimulation chambers. The first multi-scale models of the effect of electrical stimulation are already available.

In the second funding period, the aim is to develop feedback-controlled electrical stimulation of bone and cartilage defects as well as of deeper brain regions, including integrated data acquisition, processing and energy supply. The stimulators should not only be energy self-sufficient, but should also record and adapt to the individual disease process. Prof. Dr. Ursula van Rienen, spokesperson for the SFB 1270: "Our interdisciplinary consortium allows scientifically sound validation of newly derived theoretical models, numerical methods and technical solutions through experiments in both engineering and life sciences." Overall, the interdisciplinary research program aims to increase the chances for overcoming health problems of the aging population.

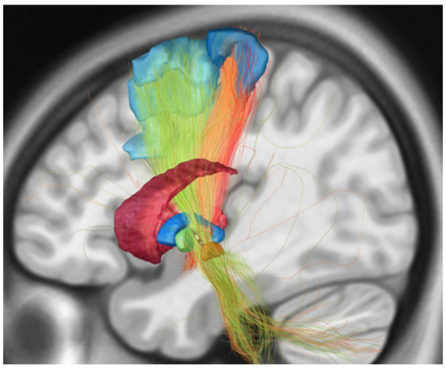


STELLA, the smallest and longest-running neurostimulators for research into neurodegenerative diseases, have been developed in ELAINE. (Photo: University of Rostock / Julia Tetzke).

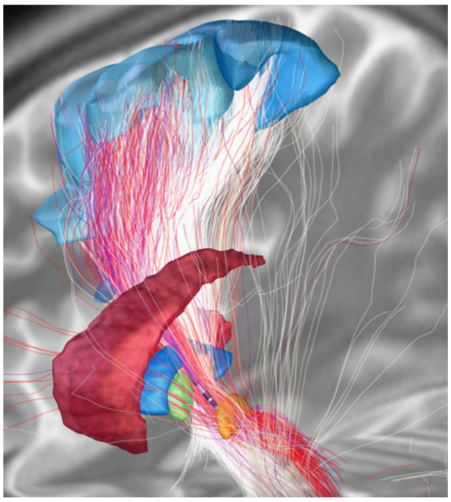
Electrical engineer Christoph Niemann is a member of the research team, with STELLA. (Photo: University of Rostock / Julia Tetzke).

Group picture of SFB 1270/1 ELAINE at the retreat 2019 in Hasenwinkel. Front: Speaker Prof. Dr. Ursula van Rienen, Deputy Speaker Prof. Dr. med. Rainer Bader. (Photo: University of Rostock / Julia Tetzke).

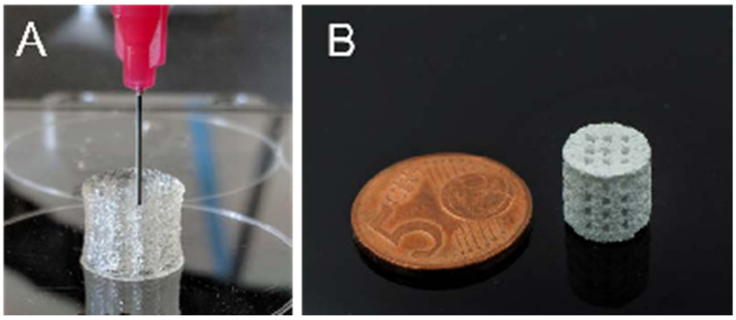
Professor Ursula van Rienen is the speaker for the Collaborative Research Center. (Photo: University of Rostock / Thomas Rahr).



Modeling of deep brain stimulation of the subthalamic nucleus. A portion of the white matter nerve fibers of the motor and premotor cortical areas that project to the basal ganglia structures. (Simulated with the OSS-DBS / Lead-DBS software environment. Created by Konstantin Butenko).



Modeling of deep brain stimulation of the subthalamic nucleus. Numerical prediction of the immediate stimulation on the fibers (red - activated, purple - injured). (Simulated with the OSS-DBS / Lead-DBS software environment. Created by Konstantin Butenko.).



A) 3D-printable, long-term stable (> 30 days) cross-linked alginate gelatin (ADA-GEL) hydrogel for the development of scaffolds that offer a profound cell-material interaction for the tissue engineering of cartilage. (Photo: Thomas Distler).

B) 3D printed and piezoelectric barium titanate-hydroxyapatite scaffold with macro and micro porosity for tissue engineering of bones. (Photo: Christian Polley).

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