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Neural Prostheses: an external control of the heart

**Dr. Marco Tosato**

Aalborg University - Danimarca

**ABSTRACT OF THE TALK**

Neural Prostheses can help restoring lost functions. Examples are neurally controlled robotic limbs, EEG-based brain computer interfaces and Functional Electrical Stimulation (FES) based systems. Among FES-systems, some can restore or stabilize movement, others can bring back the control over physiological functions. The electrical stimulation of an autonomic nerve, the Vagus, (VNS) can reduce heart rate, blood pressure and cardiac workload in general. A VNS-based device for the heart may help tachycardic and infarcted patients, especially if it could automatically regulate heart rate.

Three experimental studies demonstrated the availability and the efficacy of VNS for controlling and reducing heart rate and blood pressure in an animal model. In the first study a closed loop control system was developed which could maintain heart rate over a target value. The second study showed a successful application of a selective stimulation technique in order to recruit only cardiac vagal fibers during cardiac-VNS. In the third and most ambitious study, the optimization of the control strategy and the reduction of side effects during VNS was sought.

The conclusion of the project is that VNS is a powerful tool for controlling cardiac functions, and a vagal neuroprosthetic device can restore at least part of the autonomic control over the heart.