SNAPS

Applied MedTech technologies

Implantable foils for nerve stimulation

The use of metallic electrodes is a common method of artificially stimulating nerves. Researchers are now working on a new method in which stimulation will take place with the help of implantable foils and light pulses. This technology offers new applications for the healthcare system in the future.

Until now, there has been no approach in which implants were able to address and stimulate nerve cells. The innovative implants use colour pigments from the food industry, which are vapour-deposited as a thin layer in the nanometre range and are then able to convert light into electronic charge on the foil. As soon as nerve cells come into contact with the foil, they react to the charge and in turn shoot electrical impulses with which they in turn stimulate other nerve cells.

The theory of this method could already be tested in practice in cell biological experiments. Here, cultured nerve cells grew directly on the pigment-coated foil, which were irradiated with short flashes of light and the nerve cells then displayed the desired action potentials. This trigger enabled the nerve cells to communicate with each other.

But how does the method work in the human body? The wafer-thin foils are supposed to be easy to implant and are accessible so that red light can easily penetrate deep into the body during treatments without causing damage, thus triggering the stimulation. Simply put, light passes through the body to the foil implant, which then triggers the nerve stimulation. The advantage of this method is that in the future one would no longer need complex wiring during examinations and thus the risk of infection after invasive procedures can be reduced enormously. In addition, the pigment foils are very well tolerated by both human and animal cells due to their organic nature, so that rejection can be virtually ruled out.

The possible applications of the implant are seen in the treatment of brain or neurological injuries, as well as in pain therapies. It is assumed that the stimulation can accelerate the healing process and prevent complications.

Exciting research approaches

- **Research institute:**
  TU Graz | Institut für Health Care Engineering mit Europaprüfstelle für Medizinprodukte

  Med Uni Graz | Lehrstuhl für Biophysik
- **Field of application:**
  e.g. for severe brain injuries, neurological injuries or pain therapies, novel retinal implants
- **Advantages:**
  No complex wiring of the patient necessary

  Reduction of the risk of infection

  Easily tolerated due to its organic nature

  Acceleration of the healing process

  Preventing the death of nerve cells
- **Contact persons:**
  Prof. Theresa Rienmüller
  Prof. Rainer Schindl

When can we expect clinical application?

The research team assumes that although the innovative pigment foil still needs further research, the first pigment foils can already be implanted in the next two years. Until then, the research will continue within the framework of the Zukunftskolleg „Logos-TBI: Light-controlled Organic semiconductor implants for improved regeneration after traumatic brain injury“.