PRESS RELEASE

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Research on carbon nanotube sponges advances towards spinal reconnection

The new 3D material is perfectly biocompatible with cerebral cortex tissue and capable of connecting two spinal cord segments

This is the conclusion of the research conducted by an international team of scientists led by Maurizio Prato from CIC biomaGUNE

The work has been published in the prestigious scientific journal *Science Advances*, though its application in clinical practice will require a long maturation period

(Donostia-San Sebastián, 15 July 2016). A carbon nanotube sponge is biocompatible with cerebral cortex tissue and, furthermore, capable of connecting two spinal segments, according to the findings of research conducted by groups led by Professor Maurizio Prato in CIC biomaGUNE and in the University of Trieste, Professor Laura Ballerini and Professor Maurizio De Crescenzi.

The work, published in the prestigious scientific journal *Science Advances*, is a further step towards connecting lesioned spinal cord segments. "The research uses a new type of 3D material made from carbon nanotubes with the appearance of a black sponge. The most important property of this material is that the carbon nanotubes act as miniscule electrical wires to conduct electricity, so our group has spent many years looking into its interactions with nervous tissues", explains Maurizio Prato, Ikerbasque Professor and leader of the Carbon Nanobiotechnology Group in CIC biomaGUNE.

Research shows how the sponge is biocompatible with cerebral cortex tissue, enabling nerve fibres to grow correctly on its surface with minimal scar formation as a reaction to the implant. The work of the teams led by Maurizio Prato in CIC biomaGUNE and the University of Trieste, Laura Ballerini in the *Scuola Internazionale Superiore di Studi Avanzati* (International School for Advanced Studies) in Trieste and Maurizio De Crecenzi in the Universidad of Rome *Tor Vergata*, shows that carbon nanotube sponges are capable of connecting two spinal cord segments, thereby opening up a new path in the field of research focused on spinal cord repair.

Under the title *"3D meshes of carbon nanotubes guide functional reconnection of segregated spinal explants"*, the article is the result of the ten years spent by Professor Maurizio Prato researching into the compatibility of carbon nanotubes with nervous tissue.

Preliminary studies

"This basic research is at a very preliminary stage and still requires a lot more in-depth study and considerable time before it can potentially be applied in clinical practice. We do not want to raise false expectations: the research being conducted and the progress being made is significant but will require a long maturation period", stresses Prof. Maurizio Prato.

For the team that has conducted this research, progress along this long path has involved numerous in vitro experiments with cells. As Prof. Prato explains: "We began by depositing cells on a bed of carbon nanotubes to observe their behaviour. What we've seen is that when neuronal cells are deposited on this material, communication across the cells increases. The carbon nanotubes provide a very efficient connection milieu for the neurons, and spontaneous electrical activity is much greater than in the absence of nanotubes".

"Initial experiments revealed that the carbon nanotubes integrate very well with the neurons. We later graduated from simple cells to more complex systems such as spinal cord sections to observe the behaviour of more complex tissue with carbon nanotubes. The last step has been to position the sponge as a scaffold between two segments of spinal cord, and we are now experimenting with sponges implanted in the lesioned spinal cord of mice", the CIC biomaGUNE researcher added.

About CIC biomaGUNE

The Centre for Cooperative Research in Biomaterials (CIC biomaGUNE), located in the Donostia-San Sebastián Technology Park, conducts cutting-edge research at the interface between Chemistry, Biology and Physics, and particularly on the properties of molecular level biological nanostructures and their biomedical applications.