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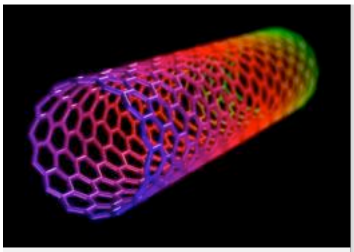
News

Nanotube 'shortcut ' boosts brain signals

But a second study finds that solutions of the tiny tubes may block neuronal activity.

Kerri Smith



Nanotube scaffolds can boost the activity of brain cells.

Alamy

Growing brain cells on scaffolds made from carbon nanotubes can boost their activity because the electrical signals they use to communicate can speed through the material, scientists have found.

The work could one day lead to nanotube scaffolds being used as 'bridges' for spinal cord injury, or as highly conductive coatings for electrodes implanted into the brain for deep brain stimulation, the researchers say.

"Neurons love to grow on this carbon nanotube substrate," says co-author Michele Giugliano of the Swiss Federal Institute of Technology (EPFL) in Lausanne.

Research published last year by Giugliano and his colleagues showed that the electrical activity of neurons was greater when they were grown on a network of the tubes[1]. In the new work, which the researchers presented on 15 November as a poster at the Society for Neuroscience annual meeting in Washington DC, they found that this increased activity results from the electrical signals travelling through the nanotubes as well as through the neurons themselves[2].

"This kind of substrate can actually work as a kind of shortcut between two points of a network of neurons, or two points of the same cell," says Giugliano.

The team next plan to investigate whether these effects are still present *in vivo*, by trying to repair a rat spinal cord with the nanotube scaffold.

Brain blockade

But another poster on Sunday drew attention to some of the unwanted effects carbon nanotubes could have on neurons. Diane Lipscombe and her colleagues at Brown University in Providence, Rhode Island, have been testing out the effects of two commercial nanotube solutions on brain-cell activity.

Many of these nanotube solutions contain metal catalysts involved in their manufacture that are not removed by the purification process. Some of these, such as yttrium, are known to inhibit the function of ion channels in brain cells.

"Most of the time people assume that they're not present in concentrations that are biologically relevant," says Lorin Jakubek, co-presenter of the poster, "but what we're saying is, they are".

The team found that one nanotube solution that contained a nickel–yttrium catalyst decreased electrical signalling in the neurons tested[3]. In a network of neurons, this could prevent cells from releasing the chemicals they use to communicate.

The team's cautionary message is clear. "Before you can hop right in and start using these things actively, you need to be aware that there are inherent things in these tubes that need to be taken care of," says Jakubek.

These concerns, and recent alerts that carbon nanotubes may pose a health risk (see Carbon nanotubes: the new asbestos?), apply less to Giugliano's work because his team uses nanotubes in fixed scaffolds, rather than in solution, he says. "It's a very exciting field, scaffolds and neuronal growth," Jakubek says.

References

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