Carbon nanotubes: Bullets in the fight against cancer

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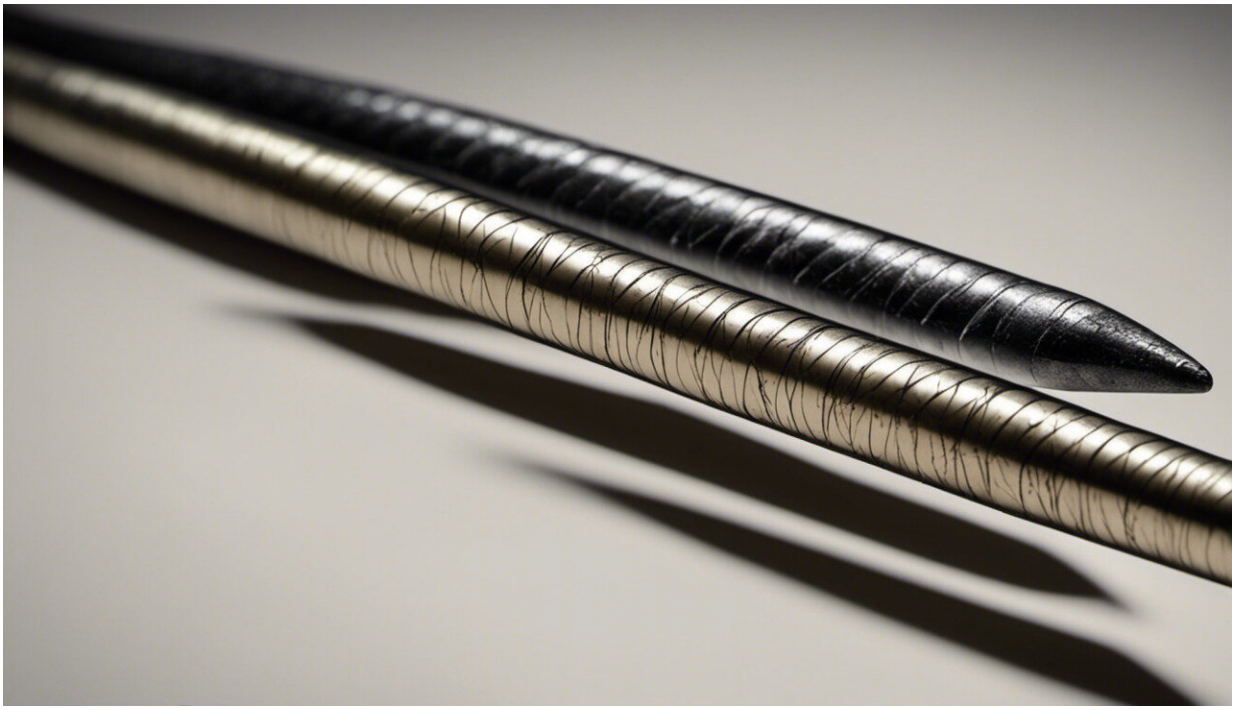

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Carbon nanotubes, tiny tubes of rolled-up carbon sheets, hold great potential for delivering therapeutic heat, drugs and medical sensors directly to where they are needed to attack cancerous cells.

Carbon nanotubes (CNTs) are just a few nanometres in diameter and

some microns long. Their potential as drug-carrier systems and sensors for diagnosis and therapy at a cellular level was the focus of the EU project CARBIO ('Multi-functional carbon nanotubes for biomedical applications').

The project partners identified CNTs' potential to act as drug-carrier systems and sensors for both diagnosis and treatment at the cellular level. Once rolled into tubes, CNTs can accommodate drugs, sensors or heating elements.

The drugs are encapsulated by protective carbon shells that prevent contact between the drugs and other tissues. The contents can thus be safely transferred to specific locations in the human body, effectively targeting cells.

The team had a particularly interesting breakthrough with the development of a method using CNTs to transport and release the anti-cancer drugs carboplatin and doxorubicin, which are used in chemotherapy for a wide range of cancers.

The way in which CNTs can be chemically altered makes them particularly interesting for scientists. The CARBIO team was able to manipulate their solubility, making it easy to control whether the drug contained within the tube is released slowly or quickly. Whatever the solubility, the initial physical and chemical properties of the encapsulated material are never modified.

And the advantages do not end there. In addition to targeting cells, CNTs can also act as antennae that absorb electromagnetic radiation, the project partners found. So heat enables the destruction of tumours from within.

CARBIO's project partners even found a way to avoid the degradation of

the materials being transported, and thus any potential toxicity. The result? CNTs that provide smart carrier systems on a nano-scale.

One other important component of this project was the development of a new European research structure that fostered strong collaboration between young scientists from across the EU. By working together, they constructed nanomedicine devices that are both safe and effective. CARBIO also piqued interest internationally, drawing scientists to European laboratories.

The CARBIO project, which began in 2006 and ended in 2010, has been the catalyst for more than 10 other project proposals at national and European levels. Led by the Leibniz Institute for Solid State and Materials Research in Germany, the project brought together researchers from Austria, Germany, the Netherlands, France, Poland and the United Kingdom. Patents are pending and the researchers have made it clear that they wish to continue their work.

CARBIO received around EUR 3 million in EU funding.

More information: www.carbio.eu/

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