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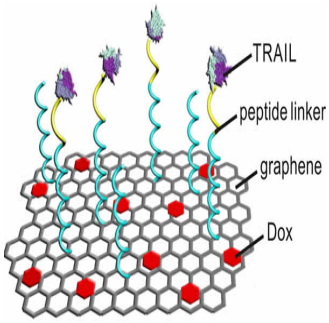
Flying Carpet Technique Delivers Two Anticancer Drugs



A new drug delivery technique has been developed that utilises graphene strips as flying carpets to deliver two anticancer drugs sequentially to cancer cells.

The technique has been developed by researchers at North Carolina State University, the University of North Carolina at Chapel Hill and China Pharmaceutical University. Through this technique, the drugs target the distinct part of the cell where it will be most effective. The researchers tested the technique in a mouse model targeting a human lung cancer tumour and found that it performs better than either drug in isolation.

The research team also found that TRAIL, an anticancer protein, can serve as an active targeting molecule to bind directly to the surface of cancer cells. Two drugs - TRAIL and doxorubicin (Dox) were attached to graphene strips. TRAIL is most effective when it is delivered to the external membrane of a cancer cell and Dox is most effective when delivered to the nucleus of the cell. The goal was to deliver the two drugs sequentially so that they are able to exert the most damage to the cancer cell.

The TRAIL bounds to the service of the graphene while the Dox physically bounds to the graphene. When the graphene strips are introduced into the bloodstream, they travel through like nanoscale flying carpets. Since cancer tumours cause nearby blood vessels to leak, the flying carpets use those leaks to penetrate into the tumour.

As soon as the flying carpet comes into contact with the cancer cell, it latches onto the TRAIL. The enzymes on the surface of the cancer cells sever the peptides that link the TRAIL and the graphene allowing the cell to absorb the Dox-laded graphene. TRAIL is left on the surface and triggers the process of cell death. When the flying carpet is swallowed by the nucleus, Dox is separated from the graphene and is free to attack the nucleus.

According to Dr. Zhen Gu, the senior author of the paper and an assistant professor in the joint biomedical engineering program at NC State and UNC-Chapel Hill, “we’ve demonstrated that TRAIL itself can be used to attach a drug delivery system to a cancer cell, without using intervening material – which is something we didn’t know. And because graphene has a large surface area, this technique enhances our ability to apply TRAIL to its target on cancer cell membranes.”

The research team is looking for funding to support additional preclinical studies with the new technqiue.

Source: North Carolina State University

Image Credit: Zhen Gu,

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