Under the influence of magnetic drugs

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Dr Nial Wheate: "This discovery means we can potentially direct where in the body a drug goes."

(Phys.org) -- For more than three decades scientists have been investigating magnetic nanoparticles as a method of drug delivery. Now by combining three metals - iron, gold and platinum - pharmacists at the University of Sydney believe they have discovered a method for magnetically directing drugs through the body.

The discovery has been published online today in the international journal *Inorganica Chimica Acta*.

Led by Dr. Nial Wheate, a team of scientists from the Faculty of Pharmacy, along with collaborators in Scotland, have developed a new anticancer drug that has an iron oxide core as small as 5 nanometres in size (1/1000th the width of a human hair).

"We coated this iron oxide core in a protective layer of gold before cisplatin, a platinum drug that revolutionised the treatment of testicular cancer, was attached to the gold coating using spaghetti-like strings of polymer."

The important thing about this new drug, says Dr. Wheate, is the ability of its iron core to move under the influence of a magnet; similar to the iron filing experiments many people have performed in science classes.

"When we take regular medication it is difficult to manage where it goes. But this discovery means we can potentially direct exactly where in the human body a drug goes. We can move it to the desired cancer tumour site using powerful magnetic fields. Otherwise, a strong magnet could be implanted into a tumor, and draw the drug into the cancer cells that way."

The technology was demonstrated when the team grew cancer cells in plates in the lab. When they placed a magnet under the plates, the drug affected and killed only those cells growing near the magnet, leaving the others unharmed, says Dr. Wheate.

"Many of the side-effects associated with chemotherapy occur because the drugs spread throughout the body, killing healthy organs as well as cancers.

"Ultimately, this technology could greatly reduce or even eliminate the severe side-effects that people associate with chemotherapy such as hair loss, nausea, vomiting, low red blood cells and an increased risk of infection."

This new drug technology could also be used to treat a range of cancers that have not been treatable with conventional platinum drugs, like prostate cancer.

Platinum drugs are one of the most regularly used family of agents in chemotherapy and include cisplatin, carboplatin and oxaliplatin.

Provided by University of Sydney