

# Chemotherapy breakthrough could dramatically reduce side-effects

Scientists have developed 'smart-bomb chemotherapy' which can isolate and destroy tumours without damaging healthy cells

Cancer researchers have developed a "smart bomb" treatment that can target tumours with drugs while leaving healthy body cells intact. The technique means that patients will suffer fewer side-effects from the toxic drugs used in chemotherapy.

The side-effects of cancer therapy – including hair loss, nausea and suppression of the immune system – can be debilitating. In many cases, the effects of the drugs can contribute to the ultimate cause of death.

In experiments on mice, Laurence Patterson of the University of Bradford found that he could localise a cancer drug to the site of tumours and thereby limit its toxic impact in the body. All the animals, which had been implanted with human cancer cells responded to the targeted treatment and saw their tumours shrink. In half the animals, the tumours disappeared altogether. Professor Patterson will present his work at the British Science Festival in Bradford on Monday.

"We've got a sort of smart bomb that will only be active in the tumour and will not cause damage to normal tissue," he said. "It's a new cancer treatment that could be effective against pretty much all types of tumour – we've looked at colon, prostate, breast, lung and sarcoma so far, and all have responded very well to this treatment."

The drug is based on a modified version of an existing drug called colchicine [see footnote]. In normal situations, this drug can kill healthy cells, too. "There are many agents currently used in the clinic for the treatment of cancer that are essentially poisons," said Patterson.

"Normal chemotherapy can often be the cause of death of the patient as opposed to dying from the tumour growth itself. Any treatment that is a poison that can be retained and is only active in the tumour is clearly very attractive." Patterson's team has designed a way to make the colchicine active only when it comes into contact with a tumour. They did this by attaching a string of specific amino acids to the colchicine, which made the drug inert. In this state, it can wander through the body freely and will not kill any cells it comes into contact with. But when the drug reaches the site of a solid tumour, the chain of amino acids is removed by an enzyme present on the surface of the cancer, called MMP-1. At this point, the colchicine becomes active and can do its work in killing nearby cells.

MMP1 is used by tumours to break down the cellular environment around itself and to enable the tumour to dig a path through normal tissue. It also gives the tumour access to nutrients and oxygen by encouraging the normal blood supply of a person to grow towards it. "If you can starve that tumour of that blood supply, then you shut off its ability to grow and move around the body," said Patterson.

In the experiments, he said, all the mice responded to the treatment. "Sometimes, the treatment is so effective, you remove the ability of that tumour to grow – you appear to cure the mouse. In some studies, we were able to cure half the mice: these animals no longer had any tumour growing in them and they appeared healthy for the 60 or so days of the trial."

An important use of the technique is that it can reach tumours that have spread throughout the body.

Paul Workman, head of cancer therapeutics at the Institute of Cancer Research, said: "This is an interesting new approach to targeting tumour blood vessels that solid cancers need for their growth. The project is still at quite an early stage, but the results so far look promising in the laboratory models that have been studied. If confirmed in more extensive laboratory studies, drugs based on this approach could be very useful as part of combination treatments for various cancers."

The Bradford scientists hope that, with adequate funding, their drug delivery system could enter phase 1 clinical trials on people within 18 months.

- This article was amended on 12 September 2011 to correct the original statement that the drug is based on a modified version of an existing cancer drug called coltrazine, and which in normal situations is administered as part of chemotherapy. To clarify: the drug is based on colchicine, which is used in the treatment of gout and although it has been used in cancer research, it is not licenced or approved for cancer treatment.

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