Fishing rod reels brain tumour cells to their death

- 18:00 16 February 2014 by Helen Thomson
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Video: Fishing rod reels brain tumour cells to their death

Let's go fishing… for cancer cells. A tiny rod has been developed that reels in brain tumour cells and guides them out of the brain to their death.

Glioblastoma is the most common and aggressive type of adult brain cancer. It is lethal and very difficult to operate on because of the large size and inaccessible location of the tumours.

Rather than engineer ever more toxic drugs to kill glioblastoma cells deep in the brain, Ravi Bellamkonda at Emory University School of Medicine in Atlanta, Georgia, and his team wondered if they could move the tumours to a more accessible location.

Glioblastoma cells normally move around the brain by latching on to nerves and blood vessels. To divert their path, Bellamkonda and his team created a polymer rod 6 millimetres long. Inside the rod, they placed a thin film – 10 micrometres thick – that mimics the shape of nerves and blood vessels. The cells seem to like a convex or concave shape, he says, so you don't need any additional chemicals or proteins.

At the top end of the rod is a blob of gel containing a drug that kills glioblastoma cells. The idea is simple: tumour cells mistake the rod for a nerve or blood vessel, travel up it and meet their death at the end. "In a crazy way this is a case where the tumour comes to the drug rather than the drug going to the tumour," says Bellamkonda.

Walking the plank

To test their design, Bellamkonda's team grafted human glioblastoma tumours into rat brains. They then inserted the nanofibre into the tumour, with the gel sitting just above the surface of the skull. After 15 days, the majority of the tumour cells had migrated along the nanofibre to meet their doom.

"The residual tumour that didn't enter the nanofibre shrank by almost 90 per cent," says Bellamkonda. "We did a careful analysis to make sure that we weren't just giving another route for the tumour to grow into, but it showed that essentially we displaced the tumour from one location to another."

The technique will not completely rid the patient of cancer, but Bellamkonda suggests that it might be used to move an inoperable tumour to an area closer to the surface of the brain where it can be surgically removed, or it could shrink and maintain tumours at a size at which they do no damage. Because the rods are so thin, they should be able to be inserted into a person's brain without causing disruption.

The team has also tested the technique on isolated breast cancer cells and prostate cancer in the lab. They hope that it could be used to manage many other kinds of slow-growing tumours by
giving them a similar fatal path to migrate along.

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Cancer: 'Tumour monorail' can lead cancers to their doom

By James Gallagher Health and science reporter, BBC News

Cancer "monorails" can be used to kill tumours by luring them into toxic pits or areas of the body that are safer to operate on, say US researchers.

A team at the Georgia Institute of Technology designed nanofibres thinner than a human hair which cancers "choose" to travel down.

Animal studies showed brain tumours could be shrunk by tricking cancer cells into migrating down the fibres.

Cancer Research UK said it was a fascinating idea, but early days.

The team were working with difficult-to-treat brain cancers - glioblastomas, which have a tendency to spread inside the brain.

The cancerous cells travel down nerves and blood vessels as they invade the brain.

The nanofibre technology, reported in Nature Materials, mimics the channels cancerous cells use to move.

One of the researchers Prof Ravi Bellamkonda said: "The cancer cells normally latch on to
these natural structures and ride them like a monorail to other parts of the brain.

"By providing an attractive alternative fibre, we can efficiently move the tumours along a different path to a destination that we choose."

Deadly brain tumours

A variety of different types of cancer were able to ride the monorail in tests in a Petri dish.

Animal studies showed that tumours could be drawn out of the brain and into an implanted toxic gel.

"It's a way of bringing the tumour to the drug, not the drug to the tumour"

Prof Ravi Bellamkonda Georgia Institute of Technology
The size of the tumour was 93% smaller in animals fitted with the cancer monorail than in rats in which the tumour was untreated.

Prof Bellamkonda told the BBC: "It's a way of bringing the tumour to the drug, not the drug to the tumour.

"You can move a tumour along a path you specify and then kill it, it's not creating extra tumour and the primary tumour actually shrinks."

He suggested that controlling the growth of a tumour might be able to make cancer something people live with, like diabetes, if it cannot be cured.

Another idea is to make cancer surgery easier.

Normally the tumour and the surrounding tissue are removed, but this is a challenge in the brain where removing any unnecessary tissue could have dire consequences.

Prof Bellamkonda suggested doctors might be able to move a tumour to an area more easily
operated on.

However, the research is still at a very early stage and there will be far more animal studies before it is considered in people.

Dr Emma Smith, senior science information officer at Cancer Research UK, said: "This fascinating, cutting-edge approach could lead to new ways of stopping tumours growing without damaging healthy tissue, which is particularly important for people with brain tumours.

"But it's still in its infancy and so far has only been tested in rats, so there is a long way to go before we know if it will be safe and effective as a cancer treatment."