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Tiny magnets offer breakthrough in gene therapy for cancer

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A revolutionary cancer treatment using microscopic magnets to enable 'armed' human cells to target tumours has been developed by researchers funded by the Biotechnology and Biological Sciences Research Council (BBSRC). Research published online today in the journal, *Gene Therapy*, shows that inserting these nanomagnets into cells carrying genes to fight tumours, results in many more cells successfully reaching and invading malignant tumours.

Using human cells as delivery vehicles for anti-cancer gene therapy has long been an attractive approach for treating tumours, but these cells usually reach tumours in insufficient numbers to effectively attack them. Now, a new 'magnetic targeting' method has been developed to overcome this problem by Professor Claire Lewis at the University of Sheffield, Professor Jon Dobson at the University of Keele, and Professor Helen Byrne and Dr. Giles Richardson at the University of Nottingham.

The technique involves inserting nanomagnets into monocytes - a type of white blood cell used to carry gene therapy - and injecting the cells into the bloodstream. The researchers then placed a small magnet over the tumour to create a magnetic field and found that this attracted many more monocytes into the tumour.

The head of the laboratory in which the work was done, Professor Lewis, explains: "The use of nanoparticles to enhance the uptake of therapeutically armed cells by tumours could herald a new era in gene

therapy - one in which delivery of the gene therapy vector to the diseased site is much more effective. This new technique could also be used to help deliver therapeutic genes in other diseases like arthritic joints or ischemic heart tissue."

Professor Jon Dobson from the University of Keele, said: “Though the concept of magnetic targeting for drug and gene delivery has been around for decades, major technical hurdles have prevented its translation into a clinical therapy. By harnessing and enhancing the monocytes' innate targeting abilities, this technique offers great potential to overcome some of these barriers and bring the technology closer to the clinic.”

Professor Nigel Brown, BBSRC Director of Science and Technology, said: "This exciting work could have huge implications in healthcare. Fundamental bioscience research may sometimes seem to have little relevance to everyday life, but understanding the basic workings of the human body and harnessing nanoscale technology has resulted in a process of great potential in tumour therapy."

The team are now looking at how effective magnetic targeting is at delivering a variety of different cancer-fighting genes, including ones which could stop the spread of tumours to other parts of the body.

Source: Biotechnology and Biological Sciences Research Council