Research creates nanoparticles perfectly formed to tackle cancer

June 6 2011

Researchers from the University of Hull have discovered a way to load up nanoparticles with large numbers of light-sensitive molecules to create a more effective form of photodynamic therapy (PDT) for treating cancer.

Photodynamic therapy uses molecules which, when irradiated with light, cause irreparable damage to cells by creating toxic forms of oxygen, called reactive oxygen species. Most PDT works with individual light-sensitive molecules – but the new nanoparticles could each carry hundreds of molecules to a cancer site.

A number of different light-sensitive molecules – collectively known as photosensitisers – are used in PDT and each absorbs a very specific part of the light spectrum. The research team – from the University of Hull's Department of Chemistry - placed one kind of photosensitiser inside each nanoparticle and another on the outside, which meant that far more reactive oxygen species could be created from the same amount of light. The findings are published in the current issue of *Molecular Pharmaceutics*.

The nanoparticles have also been designed to be the perfect size and shape to penetrate easily into the tumour, as lead researcher, Dr Ross Boyle, explains.

"Small cancer tumours get nutrients and oxygen by diffusion, but once tumours reach a certain size, they need to create blood vessels to continue growing, " he says. "These new blood vessels, or neovasculature, are 'leaky' because the vessel walls are not as tightly knit as normal blood vessels. Our nanoparticles have been designed so the pressure in the blood vessels will push them through the space between the cells to get into the tumour tissue."

The nanoparticles are made from a material that limits the leaching of its contents while in the bloodstream, but when activated with light, at the tumour, the toxic reactive oxygen species can diffuse freely out of the particles; meaning that damage is confined to the area of the cancer.

The researchers tested the nanoparticles on colon cancer cells, and while they were able to penetrate the cells, they also found that the nanoparticles could still be effective when near – rather than inside – the cancer cells.

"Some types of cancer cell are able to expel conventional drugs, so if we can make this kind of therapy work simply by getting the nanoparticles between the cancer cells, rather than inside them, it could be very beneficial," says Dr Boyle.

Provided by University of Hull