Fighting cancer with light-activated antibodies

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Scientists at Newcastle University have developed a cancer fighting technology which uses ultra-violet light to activate antibodies which very specifically attack tumours.

Therapeutic antibodies have long been recognised as having excellent potential but getting them to efficiently target tumour cells has proved to be very difficult.

Now, Professor Colin Self and Dr Stephen Thompson from Newcastle University have developed a procedure to cloak antibodies which can then be activated by UV-A light and so can be targeted to a specific area of the body just by shining a probe at the relevant part.

This procedure maximizes the destruction of the tumour while minimising damage to healthy tissue.

Professor Self says, "I would describe this development as the equivalent of ultra-specific magic bullets. This could mean that a patient coming in for treatment of bladder cancer would receive an injection of the cloaked antibodies. She would sit in the waiting room for an hour and then come back in for treatment by light. Just a few minutes of the light therapy directed at the region of the tumour would activate the T-cells causing her body's own immune system to attack the tumour."

The details are contained in two papers published online today in the journal ChemMedChem.

The Newcastle University researchers demonstrate in the first paper the procedure of coating the surface of a protein, such as an antibody, with an organic oil which is photocleavable, a process called "cloaking". This prevents the antibody reacting within the body unless it is illuminated.

When UV-A light is shone onto the cloaked antibody it is activated. The activated antibody binds to T-cells, the body's own defence system, triggering the T-cells to target the surrounding tissue.

In the second paper, they demonstrate that when the cloaked antibodies are activated by light near a tumour, the tumour is killed. This work means that antibodies can be targeted to kill cancer tumours with much greater specificity giving fewer side effects.

These cloaked antibodies can be used alone, or in conjunction with the many antibodies already produced against a wide variety of cancers as bispecific complexes. These complexes are formed from two antibodies, one antibody binds to a tumour marker, the other with a T-cell. The T-cell binding end remains inactive until re-activated by light. This means when the bispecific antibody binds to healthy tissues away from light, it cannot activate T-cells, resulting in far fewer side effects.

Professor Self says, “This opens up so many possible applications for example, for patients who are undergoing surgery for prostate cancer. After the surgeon has removed the bulk of a tumour, the patient could then be injected with bispecific antibodies and a light shone at the affected area which would target the patient’s own immune system to the tumour site.

“This is therefore a very specific treatment and while our work indicates that sunlight doesn’t activate these antibodies, patients may have to be advised to avoid direct sunlight for a short period after treatment.”

BioTransformations Ltd, the company set up by Professor Colin Self to develop the technology, is looking to begin clinical trials on patients with secondary skin cancers in early 2008.

The company has been working with Cels Ltd, an organisation helping drive the growth of North East England’s healthcare economy in the development of its business and strategic plans. Mike Asher, CEO of Cels said “BioTransformations Ltd’s technology represents to us a potential breakthrough in the fight against cancer. Cels will continue to support BioTransformations through to the commercialisation of this technology”.