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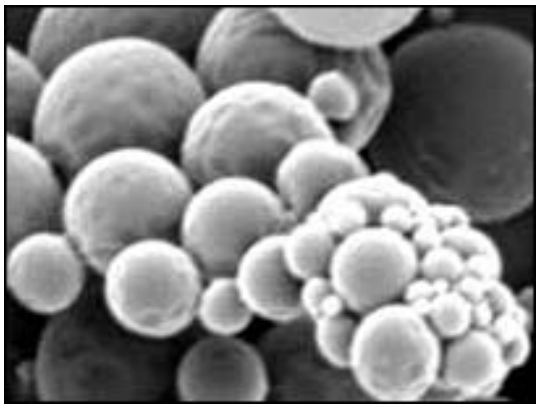
Nanocell's double hit on cancer



A nanocell that can burrow into a tumour, cut off its blood supply and detonate a lethal dose of anti-cancer toxins has been developed.

The double-action therapy, which comes packed in a tiny double chamber, leaves healthy cells unscathed.

It has proved safe and effective against melanoma and a form of lung cancer in mice.

Details of the technique, developed at Massachusetts Institute of Technology, are published in Nature.

"*The idea of using nanoparticles as a sort of therapeutic 'Trojan horse' is entirely new*"
Henry Scowcroft

The technique combines two methods of combating cancer - poisoning tumour cells and cutting off the blood supply to the tumour.

Previously, the dual strategy has proved difficult as chemotherapy could not be delivered to tumours if the supply line - the blood vessels - had been cut.

Also, the drugs required are delivered on different schedules - blood vessel-destroying anti-angiogenics over a prolonged period, and chemotherapy in cycles.

Double balloon

The MIT team tackled the problem by creating a structure for the nanocell that resembled a balloon within a balloon.

The researchers loaded the outer membrane of the nanocell with an anti-angiogenic drug and the inner balloon with chemotherapy agents.

They also created a surface chemistry which allowed the nanocell to evade detection by the immune system.

The nanocell was made small enough to pass through tumour vessels, but too large for the pores of normal vessels.

Once inside the tumour, the nanocell's outer membrane disintegrates, rapidly deploying the anti-angiogenic drug.

The blood vessels feeding the tumor then collapse, trapping the loaded nanoparticle in the tumor, where it slowly releases the chemotherapy.

Tests in mice showed the nanocell shrank the tumour, stopped angiogenesis (new vessel growth) and avoided damage to surrounding healthy tissue much more effectively than other cancer treatments.

Eight out of 10 mice treated with the nanocells survived for more than 65 days.

Mice treated with the best current therapy survived for just 30 days, while untreated animals died at 20 days.

The nanocell worked better against melanoma than lung cancer - indicating the need to tweak the design for different cancers.

Elegant system

Lead researcher Professor Ram Sasisekharan said: "This model enables us to rationally and systematically evaluate drug combinations and loading mechanisms.

"It's not going to stop here. We want to build on this concept."

Dr Judah Folkman, of Children's Hospital Boston, said: "It's an

elegant technique for attacking the two compartments of a tumor, its vascular system and the cancer cells."

Henry Scowcroft, of Cancer Research UK, said: "This is a fascinating approach to cancer therapy that seems to be paying off in animal models of the disease.

"The idea of using nanoparticles as a sort of therapeutic 'Trojan horse', attacking the cancer cell by stealth from within, is entirely new.

"Although this concept is only starting out on the long road to becoming a treatment for cancer patients, these preliminary results look very promising indeed."