Immune no longer

Gene therapy has been shown to work on cancer

Two patients out of 17 may not seem very impressive. But their recovery has boosted hopes that we can find ways to teach our immune systems to kill cancer cells.

In the fight against cancer it is necessary to co-opt whatever forces are available. Although traditional methods of treatment – such as surgery, radiation and chemotherapy – still have their place, other weapons are increasingly being used to complement them. One of these is the body's own immune system. And it is in this spirit that a group of researchers have genetically engineered immune-system cells into hunters capable of attacking cancer cells.

In the past five years it has become clear that the immune system often prevents tumours by identifying and eliminating malignant cells at an early stage of development. The process, though, is imperfect. Some tumour cells escape identification and go on to cause cancer. Such renegades are less likely than other tumours to stimulate an immune response, precisely because they escaped the attentions of the immune system in the first place.

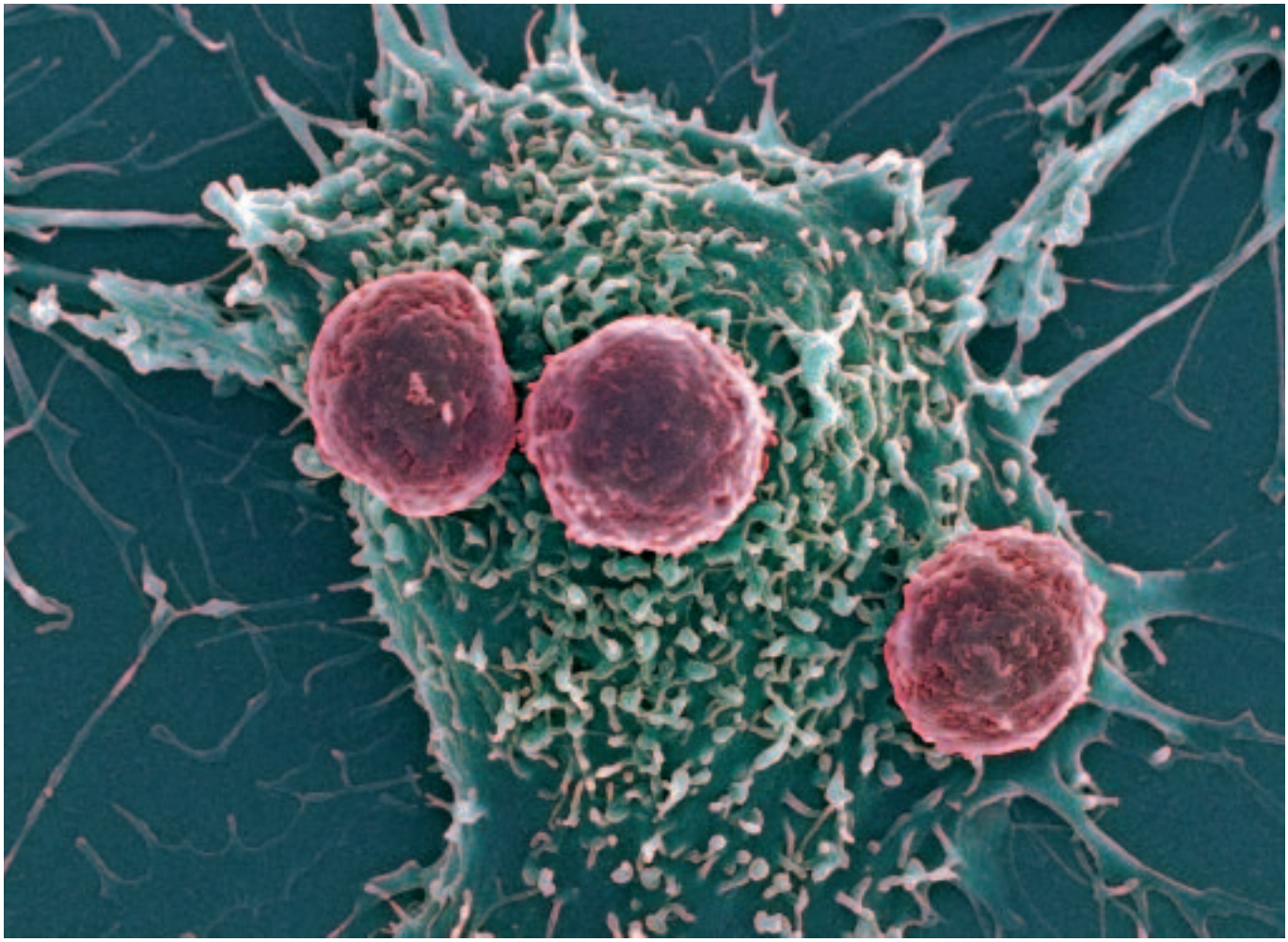
Many people have been working on ways of overcoming the camouflage of these renegades. One group, led by Steven Rosenberg at the National Cancer Institute in Maryland, has been trying to do so by tinkering with the genetics of the immune cells themselves, so as to make them better at their job. Seventeen patients with advanced melanoma – a skin cancer that has spread to other parts of the body – received the experimental treatment. These patients had no other options left and their life expectancies were between three and six months. Following the treatment, two of the 17 saw their tumours shrink and were declared clinically free of the disease a year and a half after the therapy began. Although the experiment had no control group, all the patients would have been expected to die without treatment.

To create their therapy, the researchers drew a sample of each patient's blood in order to extract and modify a type of immune-system cell, called a T-cell, so that it would recognise the molecules found on the outer surface of melanomas. They did this by infecting the T-cells with genetically modified viruses carrying genes that coded for receptors to melanoma molecules. The viruses in question were retroviruses, which work by adding their genes to those of their host's cell nucleus. Thus re-armed, the T-cells were allowed to breed before being put back into the patient from whom they had originally been taken.

The modified T-cells survived in 15 of the patients, although in most of them the degree to which those cells expressed the modified genes waned. But in two patients the cells stuck it out, and in those two the tumours shrank.

Although only two patients survived, the work is a step forward. It is the first time that gene therapy has been used successfully to treat cancer. Furthermore, the therapy could be modified to improve the expression

Researchers have engineered immune-system cells into hunters capable of attacking cancer cells



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and function of the new T-cell genes, as well as making sure that more of the engineered cells survive.

The researchers also believe that the treatment could extend to other cancers. They hope to hear within a month that America's Food and Drug Administration will let them use retroviruses to introduce genes that would treat more common tumours, such as breast, lung and liver cancers. Trials are also under way on the effectiveness of using radiation therapy to deplete a patient's supply of unmodified T-cells before replacing them with engineered cells.

Although the study is bound to attract public attention, caution is needed. This sort of therapy requires that every patient be treated with his own, unique medicine. Commercialising such a therapy depends on the degree to which this process can be simplified and automated.

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