Lab-grown cancer tumours could personalise treatment

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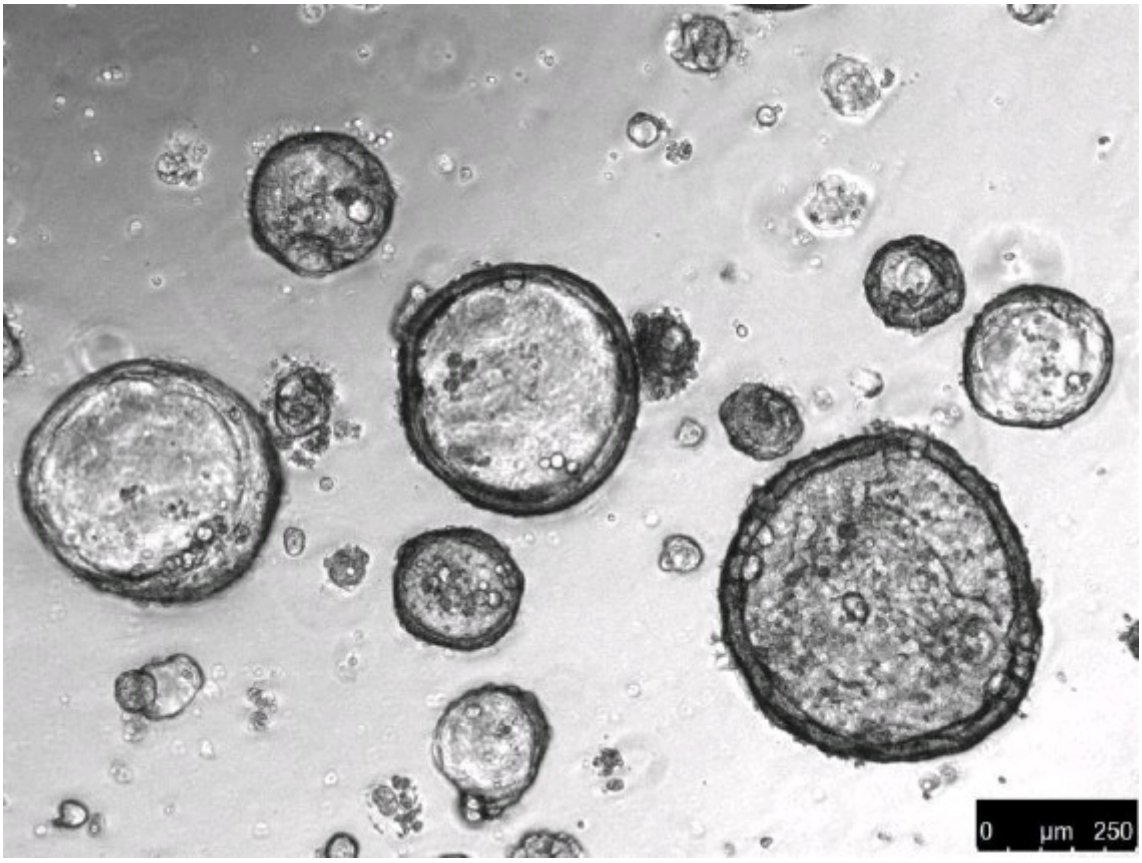
Growing replica tumours, biopsied from cancer patients and grown in a lab, could help personalise treatments and ensure toxic chemotherapy drugs aren't given when they stand no chance of working. Researchers and doctors in the UK have pioneered the new technique to give doctors an alternative to the current trial and error treatment and prolong patients' lives.



Using mini tumours, grown from patients with advanced cancers that have spread to other parts of their bodies, the scientists were able to see which drugs will work and which drugs won't, before they're given

to patients. "At the moment, what we do in the clinic is put patients on treatment, then two months later we do a scan to see whether it's working or not," the study's leader, Dr Nicola Valeri from the Institute of Cancer Research and a consultant medical oncologist at The Royal Marsden NHS Foundation Trust, told The Independent.

While the mini tumour test predicts what drugs will have a positive effective with 88 per cent accuracy, there are a number of factors – such as the cells it has surrounded itself with – which could impact how well drugs respond in the body. But the team said that knowing a drug has no effect is even more important, and that's where the new system is 100 per cent accurate.

"Having 100 per cent negative predictive value is the major breakthrough," Dr Valeri said. This negative value means that any drugs that didn't work in the mini tumour also proved to be useless in the patient it was grown from. "So if this organoid [mini tumour] test tells me that the patient is un-

likely to benefit from this treatment, I can avoid toxicity from the chemotherapy treatment and even save money to the system," he added.

Chemotherapy involves giving patients a cocktail of potent drugs that work in tandem to kill cancer's main tumour or, in more advanced cancers, to eradicate new tumours that may have spread elsewhere – known as metastases. Later stage patients will often have endured years of chemotherapy and the tumours that remain have adapted to withstand most conventional treatments.

The patients in the trial by Dr Valeri's team, published yesterday in the journal Science, all had cancers of the digestive tract, bowel, gastro-oesophageal (stomach and throat) or bile ducts – which had spread. They were now going into clinical trials to test experimental drugs to prolong their life, as they had run out of other options. Dr Valeri's team took biopsy samples from these new metasteses in 71 patients and grew them in a gel that allowed them to develop in a 3D shape with the structures that tumours use to protect themselves in the body.

The whole process takes around six to eight weeks, from biopsy to results of drug testing, and this could be done in tandem with other tests the patient is having. The cloned tumour "organoids" were then given a barrage of 55 new or common chemotherapy drugs, and their effects were compared with how patients responded to treatment in the clinic. They found that the responses matched almost identically, and were much more accurate than using DNA sampling of the patient's tumour alone to choose drugs.

"Tumours tend to evolve as treatment goes on," Dr Valeri said. "In bowel cancers, there are differences but they're not huge. But in stomach (gastric) cancer, and in pancreatic cancer, they are massively different." But the study found that the mini tumours' cells, grown entirely separately from their original tumour, developed almost identically and had 96 per cent genetic similarity. This is crucial because as organiod tumour cells replicate and grow, if they develop differently or have more DNA mutations than the tumours in patients being treated, they wouldn't be useful for choosing a treatment.

Co-author of the study Professor Paul Workman, chief executive of the Institute of Cancer Research, said the "constant adapting and evolving" makes it extremely hard for doctors to know which drugs will work. "This study has shown that testing drugs on replica tumours before they are given to patients is not only possible, but predicts how a patient will respond more accurately than simply looking at the cancer's DNA. "It could predict whether a cancer will be drug resistant before a person ever receives the treatment – which is especially important for those with advanced cancers where time is so precious."

The method could work for all sorts of rapidly evolving cancers, such as breast and prostate, and the researchers say the next steps are to test this method in more patients and other cancer types. They also want to test whether it is possible to grow mini tumours from cancer cells floating in the patient's blood. This would avoid the need to identify each new site where the cancers had spread and started growing.

Professor Charles Swanton, chief clinician at Cancer Research UK, which part funded the study, said the findings could also "help guide the development of new drugs". "This new approach could help us test future targetted therapies before trialling them in the clinic," he said.