

Simple blood test can predict which breast cancer treatment will work best, study finds

Exclusive: DNA test means patients could be offered most effective treatment first, boosting their chances of beating the disease

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📷 More than 2 million people globally each year are diagnosed with breast cancer. Photograph: Marina Krasnokutska/Alamy

Scientists have developed a simple DNA blood test that can predict how well patients with breast cancer will respond to treatment.

More than 2 million people globally each year are diagnosed with the disease, which is the world's most prevalent cancer. Although treatments have improved in recent decades, it is not easy to know which ones will work best for which patients.

Now researchers have designed a liquid biopsy that tells doctors how likely a patient is to respond to a specific treatment, even before it begins. The test has the potential to be gamechanging because it means patients could be offered alternative options, and avoid treatments that won't help them, boosting their chances of beating the disease.

The test, developed by a team at the Institute of **Cancer** Research, London (ICR), analyses circulating tumour DNA (ctDNA), which is released into the blood of patients by cancer cells.

Researchers measured these microscopic levels of cancer DNA in blood samples from 167 patients. The test was trialled before treatment began and again four weeks later, after a single treatment cycle.

There was a strong association between low levels of ctDNA at the start of treatment, and treatment response, according to the team. A similar association was seen with the results taken at four weeks.

Dr Iseult Browne, a clinical research fellow at the ICR and first author of a study detailing the test, said: "Our study shows that a simple blood test measuring circulating tumour DNA can provide an early prediction of whether a patients' breast cancer will respond to treatment.

"Knowing this at the earliest stage - in this case, at the start of treatment, or after just four weeks - means that we can avoid giving patients drugs that won't work and provide them with alternatives before their cancer has a chance to grow.

"For example, they could be given an alternative targeted therapy, a combination of drugs, or even enrolled into a clinical trial to test a novel drug. Trials are now under way to see if adapting a patient's treatment based on these early blood tests does indeed improve their outcome - giving them more time of living well with their cancer kept at bay."

In the study, funded by Breast Cancer Now, Cancer Research UK, the NIHR Biomedical Research Centre at the Royal Marsden NHS foundation trust and the ICR, the team analysed blood samples from 167 people with advanced breast cancer.

The patients were split into two groups based on the type of breast cancer and mutations they had. The first group included patients whose cancers had an ESR1, HER2, AKT1, AKT or PTEN mutation, and who received targeted treatments matched to those mutations.

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The second group consisted of people with triple negative breast cancer, an aggressive form of the disease that constitutes 10-15% of cases globally and has no targetable mutation. They received a combination of the PARP inhibitor olaparib, and the ATR inhibitor ceralasertib.

For patients in the second group, low ctDNA levels before treatment began were associated with longer progression-free survival - 10.2 months, compared with 4.4 months. The percentage of patients who responded to treatment - seeing their tumours shrink or disappear - was 40% for those with low ctDNA levels, compared with 9.7% for those with higher levels.

A similar, although weaker, association was observed between pre-treatment ctDNA levels and clinical outcomes in the first group.

After just four weeks of treatment, patients in the first group with undetectable ctDNA went on to have particularly good outcomes. Their cancer was kept at bay for 10.6 months, compared with 3.5 months for those whose ctDNA was still detectable.

In the second group, the blood test after four weeks of treatment also showed a strong link between ctDNA levels and patient outcomes. Patients whose ctDNA was no longer detectable had their cancer kept at bay for 12 months, compared with 4.3 months in patients who still had detectable ctDNA.

“By analysing circulating tumour DNA in blood samples from patients with advanced breast cancer, we identified a clear link between these levels, both at the start and after one cycle of treatment, and how well patients responded to therapy,” Browne said. “These findings support the use of ctDNA as a non-invasive biomarker for predicting outcomes and monitoring treatment response.”

Prof Nicholas Turner, a professor of molecular oncology at the ICR and a consultant medical oncologist at the Royal Marsden, said: “This research looked at advanced breast cancer, but these tests could also work for early-stage breast cancers.”

The liquid biopsy “has the potential to make treatment decisions faster, more personalised and ultimately more effective,” he said.
