

'Stem cell' test could identify most aggressive breast cancers

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Mammograms showing a normal breast (left) and a breast with cancer (right).
Credit: Public Domain

Testing breast cancer cells for how closely they resemble stem cells could identify women with the most aggressive disease, a new study suggests.

Researchers found that breast cancers with a similar pattern of gene activity to that of [adult stem cells](#) had a high chance of spreading to

other parts of the body.

Assessing a breast cancer's pattern of activity in these stem cell genes has the potential to identify women who might need intensive treatment to prevent their disease recurring or spreading, the researchers said.

Adult stem cells are healthy cells within the body which have not specialised into any particular type, and so retain the ability to keep on dividing and replacing worn out cells in parts of the body such as the gut, skin or breast.

A research team from The Institute of Cancer Research, London, King's College London and Cardiff University's European Cancer Stem Cell Research Institute identified a set of 323 genes whose activity was turned up to high levels in normal breast stem cells in mice.

The study is published today (Wednesday) in the journal *Breast Cancer Research*, and was funded by a range of organisations including the Medical Research Council, The Institute of Cancer Research (ICR), Breakthrough Breast Cancer and Cancer Research UK.

The scientists cross-referenced their panel of normal stem cell genes against the genetic profiles of tumours from 579 women with triple-negative breast cancer - a form of the disease which is particularly difficult to treat.

They split the tumour samples into two categories based on their 'score' for the activity of the stem cell genes.

Women with triple-negative tumours in the highest-scoring category were much less likely to stay free of breast cancer than those with the lowest-scoring tumours. Women with tumours from the higher-scoring group had around a 10 per cent chance of avoiding relapse after 10

years, while women from the low-scoring group had a chance of around 60 per cent of avoiding relapse.

The results show that the cells of aggressive triple-negative breast cancers are particularly 'stem-cell-like', taking on properties of stem cells such as self-renewal to help them grow and spread. They also suggest that some of the 323 genes could be promising targets for potential cancer drugs.

Study leader Dr Matthew Smalley, Deputy Director of the European Cancer Stem Cell Research Institute and Reader within Cardiff University's School of Biosciences, said: "Triple negative breast cancer accounts for around 15 per cent of breast cancers, but is more difficult to treat than other cancer types as it is not suitable for treatments such as anti-hormonal therapy. It's particularly important to understand the genetic factors that help it to spread around the body - and we were excited to find that a key factor seems to be the degree to which gene activity resembles that of stem cells.

"Although our work is not yet ready for clinical use, our next step will be to explore which of these 323 genes are the most important drivers of the disease and to use these to develop a new genetic test."

Study co-author Professor Clare Isacke, Professor of Molecular Cell Biology at The Institute of Cancer Research, London, said:

"Cancer cells can behave very much like stem cells - but stem cells gone bad. They find a way to activate genes which are usually only turned up in normal stem cells, giving them characteristics - such as self-renewal and immortality - that make them more difficult to treat.

"Our study could ultimately help lead to a genetic test assessing [breast cancer cells](#) for how closely they resemble [stem cells](#). Picking out

women with this type of aggressive disease could give us new ways of personalising treatment."

Dr Matthew Lam, Senior Research Officer at Breakthrough Breast Cancer, said: "Women with triple negative breast cancer tend to have higher rates of recurrence than those with other types of breast cancer.

"There is so much more to learn about this particularly aggressive form of the disease which is why this type of research is so important. If we can develop ways to predict who is most likely to relapse, more can be done to protect high-risk patients, such as closer monitoring or extended treatment, to help reduce the chance of their cancer coming back."

Dr Nathan Richardson, Head of Molecular and Cellular Medicine at the Medical Research Council, said: "Triple negative breast cancers are a particularly challenging form of the disease to treat. Casting a light on to the genetic factors that are behind the recurrence and spread of cancer is crucial to understanding more about the biology of this aggressive disease.

"This study could be hugely important to find ways to identify those patients who are at risk of the most aggressive forms of the disease, improving the way they are monitored and cared for. Crucially, this research could lead to new treatments with the potential to make a real difference for women with this type of [breast cancer](#)."

Provided by Institute of Cancer Research

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