

Genetic screening could improve breast cancer prevention

Thursday April 9, 2015 - A test for a wide range of genetic risk factors could improve doctors' ability to work out which women are at increased risk of developing breast cancer; a major study of more than 65,000 women has shown.

Improving the accuracy of risk analysis using genetic screening could guide breast cancer prevention in several ways – for instance by offering high-risk women increased monitoring, personalised advice and preventative therapies.

The research, a collaboration of hundreds of research institutions led by The Institute of Cancer Research, London, and The University of Cambridge, showed that a test for differences in 77 separate letters of DNA code could indicate a woman's risk of developing breast cancer.

The study, the most definitive of its type conducted so far, was funded by a range of organisations including Cancer Research UK and Breakthrough Breast Cancer, and was published on April 9 in the *Journal of the National Cancer Institute*.

The researchers came up with a 'score' for each woman based on the letters they had in each of the 77 positions of their DNA code, using one of the world's biggest databases of genetic information – called the Collaborative Oncological Gene-Environment Study (COGS).

They found a significant link between the score – called a 'polygenic risk score' – and a woman's breast cancer risk. For example, a woman in the top 20 per cent for polygenic risk score was 1.8 times more likely to develop breast cancer than the average woman.

A woman in the top 1 per cent for the polygenic risk score was more than three times more likely to develop breast cancer than average – corresponding to a risk for these women of around one in three.

The researchers also delved into a range of other elements of each woman's cancer – such as its type, and the age it was diagnosed. The genetic score was particularly good at predicting risk in women who developed oestrogen receptor positive disease, the type of disease most responsive to hormonal treatments like tamoxifen.

Analysing this panel of 77 genetic markers – all of which had previously been linked with slight increases in breast cancer risk on their own – was much more accurate in defining risk than previous tests that used fewer markers.

Importantly, the study also suggests that using this genetic testing alongside current measures would make current risk screening methods more accurate. For example, the researchers showed that the risk score could predict breast cancer risk both in women with and without a family history of the disease.

Lifetime risk of breast cancer for women with a history of breast cancer in their close family was 24.4 per cent if they were in the highest-scoring fifth – compared with 8.6 per cent if they were in the lowest fifth.

But for women without a history of breast cancer in their close family, the risks were 16.6 and 5.2 per cent respectively.

Study co-leader Professor Montserrat Garcia-Closas, Professor of Epidemiology at The Institute of Cancer Research, London, said: "Our study is the most definitive so far to show the clear benefits of using genetic testing for a large number of genetic risk factors in identifying women at elevated risk of developing breast cancer. This type of testing could fit alongside other standard risk measures, such as family history and body mass index, to improve our ability to target the best preventive treatments and advice to those women most likely to benefit from them."

“It’s now important to work out how this sort of test could be used widely in a healthcare, rather than in a research setting. Currently available tests can analyse a handful of high-risk genes, but outside of looking for changes to these genes in women with a history of breast cancer in their close family, genetic testing is not widely offered to women.”

Study co-leader Professor Douglas Easton, Director of the Centre for Cancer Genetic Epidemiology at the University of Cambridge, said: “Breast cancer genes are rarely out of the news, but we’ve now reached a crucial stage at which all this research can be combined to help target screening and advice to those women who need them the most. There’s still work to be done to determine how tests like this could complement other risk factors, such as age, lifestyle and family history, but it’s a major step in the right direction that will hopefully see genetic risk prediction become part of routine breast screening in the years to come.”

Nell Barrie, Senior Science Communications Manager at Cancer Research UK said: “This study shows how the genetic map of breast cancer that scientists have been building up over the years might be used to identify women most at risk, so we can take steps to reduce their chances of developing the disease or catch it at the earliest possible stage.”

Dr Matthew Lam, Senior Research Officer at Breakthrough Breast Cancer, said: “In recent years we’ve learnt so much about genetic risk factors of breast cancer – in fact Breakthrough researchers had a hand in discovering over 60 of the genetic markers associated with the disease. What’s great to see now is that these findings are starting to be translated into practical methods to predict risk on an individual basis.”

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Notes to editors

For more information contact Henry French on 020 7153 5582 / henry.french@icr.ac.uk. For enquiries out of hours, please call 07595 963 613.

The Institute of Cancer Research, London, is one of the world's most influential cancer research institutes.

Scientists and clinicians at The Institute of Cancer Research (ICR) are working every day to make a real impact on cancer patients' lives. Through its unique partnership with The Royal Marsden NHS Foundation Trust and 'bench-to-bedside' approach, the ICR is able to create and deliver results in a way that other institutions cannot. Together the two organisations are rated in the top four cancer centres globally.

The ICR has an outstanding record of achievement dating back more than 100 years. It provided the first convincing evidence that DNA damage is the basic cause of cancer, laying the foundation for the now universally accepted idea that cancer is a genetic disease. Today it leads the world at isolating cancer-related genes and discovering new targeted drugs for personalised cancer treatment.

As a college of the University of London, the ICR provides postgraduate higher education of international distinction. It has charitable status and relies on support from partner organisations, charities and the general public.

The ICR's mission is to make the discoveries that defeat cancer. For more information visit <http://www.icr.ac.uk>

About the University of Cambridge

The mission of the University of Cambridge is to contribute to society through the pursuit of education, learning and research at the highest international levels of excellence. To date, 90 affiliates of the University have won the Nobel Prize.

Founded in 1209, the University comprises 31 autonomous Colleges, which admit undergraduates and provide small-group tuition, and 150 departments, faculties and institutions.

Cambridge is a global university. Its 19,000 student body includes 3,700 international students from 120 countries. Cambridge researchers collaborate with colleagues worldwide, and the University has established larger-scale partnerships in Asia, Africa and America.

The University sits at the heart of one of the world's largest technology clusters. The 'Cambridge Phenomenon' has created 1,500 hi-tech companies, 14 of them valued at over US\$1 billion and two at over US\$10 billion. Cambridge promotes the interface between academia and business, and has a global reputation for innovation. www.cam.ac.uk

About Cancer Research UK

- Cancer Research UK is the world's leading cancer charity dedicated to saving lives through research.
- Cancer Research UK's pioneering work into the prevention, diagnosis and treatment of cancer has helped save millions of lives.
- Cancer Research UK receives no government funding for its life-saving research. Every step it makes towards beating cancer relies on every pound donated.
- Cancer Research UK has been at the heart of the progress that has already seen survival rates in the UK double in the last forty years.
- Today, 2 in 4 people survive cancer. Cancer Research UK's ambition is to accelerate progress so that 3 in 4 people will survive cancer within the next 20 years.
- Cancer Research UK supports research into all aspects of cancer through the work of over 4,000 scientists, doctors and nurses.
- Together with its partners and supporters, Cancer Research UK's vision is to bring forward the day when all cancers are cured.

For further information about Cancer Research UK's work or to find out how to support the charity, please call 0300 123 1022 or visit www.cancerresearchuk.org. Follow us on [Twitter](#) and [Facebook](#).

Breakthrough Breast Cancer works to stop breast cancer for good by improving early diagnosis, developing new treatments and preventing all types of breast cancer.

Breast cancer is not yesterday's problem; it's a disease that affects more women every year. Breakthrough Breast Cancer is working harder than ever before to stop women getting, and dying from, the disease.

Over the last 15 years, we've invested £100 million into cutting-edge research – research that has resulted in major breakthroughs, some of which are now in clinical trials. We currently fund the work of more than 270 research scientists across the UK, with many based in the ground-breaking Breakthrough Toby Robins Breast Cancer Research Centre in London.

The Breakthrough Generations Study – set up in 2004 – is world's largest and most comprehensive study into the causes of breast cancer and is following more than 113,000 women throughout their lives.

Breakthrough Breast Cancer and Breast Cancer Campaign are joining forces in 2015 to become the UK's largest breast cancer research charity. Our joint ambition is that by 2050, no one will die from breast cancer – find out more.

For more information about Breakthrough Breast Cancer, visit breakthrough.org.uk or follow us on Twitter or on Facebook.