

New breast cancer test links immune 'hotspots' to better survival

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Scientists have developed a new test which can predict the survival chances of women with breast cancer by analysing images of 'hotspots' where there has been a fierce immune reaction to a tumour.

Researchers used statistical software previously used in criminology studies of crime hotspots to track the extent to which the immune system was homing in and attacking breast cancer cells.

The test, described today (Friday) in the journal *Modern Pathology*, could assess whether a woman's immune system is holding a cancer at bay - and pick out those who will need intensive treatment to combat their more aggressive disease.

Scientists at The Institute of Cancer Research, London, analysed tumour samples from 245 women with a type of breast cancer called oestrogen receptor negative (ER negative), which is particularly hard to treat.

The research used computerised imaging of tumour samples and statistical analysis to measure the number of immune cell 'hotspots', and was funded by the Engineering and Physical Sciences Research Council (EPSRC), the Wellcome Trust and The Institute of Cancer Research (ICR) itself.

Researchers found that images of hotspots where immune cells were spatially clustered together around [breast cancer cells](#) provided a better measure of [immune response](#) than simply the numbers of immune cells

within a tumour.

They split women with breast cancer into two groups based on the numbers of immune hotspots spots within their tumours. Women whose cancers had a high number of spots lived an average of 91 months before their cancer spread, compared with just 64 months for those with a low number of spots.

The test is the first objective method of measuring the strength of a patient's immune response to their tumour. Its automated analysis could complement existing methods where pathologists examine tumour samples under the microscope to gain a sense of whether there is a strong immune response.

Dr Yinyin Yuan, Team Leader in Computational Pathology and Integrative Genomics at The Institute of Cancer Research, London, said:

"Our research is aiming to develop completely new ways of telling apart more and less aggressive cancers, based on how successful the immune system is in keeping tumours in check.

"We have shown that to measure the strength of an immune response to a cancer, we need to assess not just how many [immune cells](#) there are, but whether these are clustered together into cancer-busting hotspots.

"By analysing the complex ways in which the immune system interacts with cancer cells, we can split women with [breast cancer](#) into two groups, who might need different types of treatment."

Professor Paul Workman, Chief Executive of The Institute of Cancer Research, London, said:

"This study has found an ingenious way to generate and understand data

from images of biopsy samples, which are already taken from patients but not analysed in a mathematical way.

"The interaction between the [immune system](#) and cancer is extraordinarily complex, and something we are only just beginning to understand. But just as there are high hopes for immunotherapy as a future cancer treatment, we also believe that this new way of measuring immune reaction could be used to tailor treatment more effectively to individual patients."

Professor Philip Nelson, EPSRC's Chief Executive, said:

"Cancer remains one of the most challenging diseases affecting the UK population today, and technical innovation is key to improving its diagnosis and an individual's initial prognosis. This novel, multidisciplinary research combines image analysis and spatial statistics to deliver new insights from clinical and pathological cancer data. We are excited by the prospect that such advances in computational methods might one day be used in mainstream healthcare, leading to facilitating improvements in a patient's prognosis. This study demonstrates the importance of Engineering, Physical Sciences and Mathematical Sciences which contribute to our understanding of cancer, its progression and treatment."

Provided by Institute of Cancer Research

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