New genetic test for predicting cancer recurrence

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Researchers have discovered a new genetic test which could help predict cancer recurrence - paving the way for more precise, personalised treatments.

Mitochondrial genes can be routinely checked in biopsies of patients diagnosed with many different cancer types, including breast, lung, ovarian or gastric cancers. And they prove more accurate than current methods of predicting a patient's response to treatment.

Scientists identified the new measures by looking at the expression levels of mitochondrial genes in samples from post-treatment cancer patients. "Early detection of cancer recurrence is everything; if we have information about a patient's prognosis we can act much more effectively," said Dr Michael P Lisanti, Professor of Translational Medicine at the University of Salford, and a co-author of the study.

"You never know if cancer will return or how to prepare for that, so knowing who will and who won't respond well to treatment offers reassurance to doctors, patients and families, and allows a degree of closer monitoring."

Professor Lisanti, who describes mitochondria as "the engine room of cancer stem cells" – the cells that cause secondary re-growths (metastasis) – looked at more than 400 mitochondrial genes and found many to be more accurate in the prediction of recurrence or metastasis, than standard cell proliferation markers, such as Ki67 or PCNA.

The team used multiple Kaplan-Meier curves to extrapolate how mitochondrial gene levels correlated with recurrence in hundreds of cancer patients. Certain genes predicted up to 5 times higher rates of recurrence or metastasis. One particularly useful biomarker, namely HSPD1, is associated with mitochondrial biogenesis, the process of making of new mitochondria.

The researchers say using mitochondria biomarkers would enable clinicians to predict with far greater accuracy which patients will respond poorly to drug treatments, such as Tamoxifen, which is commonly administered to prevent disease progression in a sub-set of breast cancer patients.

They also hugely increase the number of readily available clues to patient prognosis. "In practical terms, a person in remission could be predicted to be 80% likely to fail treatment," added co-author Dr Federica Sotgia, at the University's biomedical research centre.

"If doctors can predict that a treatment will likely fail, it gives them more positive options; either they can monitor the patient more closely or offer an alternative course of treatment."

The Salford research team recently described how cancer cells exploit the energy of mitochondria to resist drugs like Tamoxifen. Their latest observations are further evidence that mitochondria are both biomarkers and potential drug targets. Ultimately, they say, the generation of new mitochondria could be controlled with novel therapeutics to more effectively prevent treatment failure.

An estimated two-thirds of cancer deaths occur due to recurrence after initial treatment. This research is published online in the journal *Oncotarget*.

More information: Federica Sotgia et al. Mitochondrial markers predict recurrence, metastasis and tamoxifen-resistance in breast cancer patients: Early detection of treatment failure with companion diagnostics, *Oncotarget* (2017). DOI: 10.18632/oncotarget.19612

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