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Biomarkers for screening and diagnosing lung cancer

In the UK, only 15 per cent of people diagnosed with lung cancer will still be alive 5 years later. This very low survival rate is partly because it's often diagnosed at an advanced stage. There isn't a national screening programme for it, but people at high risk, such as smokers, can be screened using low-dose CT scanning (a special type of sensitive x-ray). This can identify abnormal areas in the lungs that could be cancer. However, it's difficult to tell which small areas of concern are cancerous and which aren't. Biomarkers might be able to help distinguish cancer from normal tissue.

What translational research was done?

Recent research, including our own, has focused on finding blood-based biomarkers that can help diagnose lung cancer earlier and improve screening[1]. A group of biomarkers called DNA methylation has been shown to indicate whether someone is at risk of lung cancer, beyond just taking their smoking history into account[2].

Studies looking at the chemical changes in DNA have identified where DNA methylation marks are found in the genome. Certain marks are strongly associated with risk of lung cancer and risk factors linked to it, such as age and smoking status[2,3].

We have used machine learning to identify a sub-set of DNA methylation biomarkers that can tell the difference between smokers and non-smokers, and between patients diagnosed with lung cancer and those without.

Using this information, we have designed a flexible, low-cost test based on targeted bisulphite sequencing, the gold standard for detecting DNA methylation. We are evaluating this test to see whether it can reliably identify lung cancer early, alongside information on the patient's smoking habits.

Translation into later phase research, clinical practice and patient benefit

Our test is being used in a study evaluating CT screening in high-risk people. Here it is being used to improve the reliability of CT scans in identifying lung cancer, with a **particular focus on people living in more deprived areas of the UK**.

This test could be used between someone's visit to a GP and being referred to a CT scan. We are designing it to be **low-cost and fast** so people can be referred for a CT scan quickly.

References
1. Bojesen et al., Thorax, 2017;DOI:10.1136/thoraxjnl-2016-208789
2. Baglietto et al., International Journal of Cancer, 2016;DOI:10.1002/ijc.30431
3. Sun et al., International Journal of Epidemiology, 2021;DOI:10.1093/ije/dyab044