

Pioneering new 'smart needle' could revolutionize cancer diagnosis

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Prototype Raman 'smart needle' probe. Credit: University of Exeter

Scientists have developed a pioneering new technique that can detect and diagnose one of the most common types of cancer within seconds—using light.

A multidisciplinary team of experts has developed a ground-breaking 'smart needle' probe that uses light to pinpoint cancerous tissues or cells almost instantaneously. This optical biopsy uses a technique called Raman spectroscopy, which measures the light scattered by tissues when a low-power laser is shone onto it. Light is scattered differently from healthy or diseased tissues, meaning that health professionals are able to detect whether there are concerns within seconds. The results show it is possible to show a fingerprint of the disease that can be used to diagnose cancer within a few seconds, producing near instantaneous results for the clinician and reducing [patient anxiety](#).

The team believe that the new technique could significantly improve the rate of detection and diagnosis of cancers, and particularly lymphoma (a cancer of the immune system) – the sixth most common cancer in the UK. Cancer affects around 50 percent of people in their lifetime, while one-in-two will succumb to the disease.

Professor Nick Stone, from the University of Exeter and project lead said: "The Raman smart needle can measure the molecular changes associated with disease in tissues and cells at the end of the needle. Provided we can reach a lump or bump of interest with the needle tip, we should be able to assess if it is healthy or not."

While [early diagnosis](#) can be a key factor in providing effective treatment, current methods can be both invasive and time-consuming, leaving patients anxiously awaiting results.

Patients with lymphoma will often have both a sample of cells taken from a suspected lump, followed by a surgical biopsy of the node, to get a full diagnosis: A process that can often take over two weeks. The team expect this new technique will avoid the need for surgery and provide a less invasive and quicker way to determine whether the patient has lymphoma.

The team has already proved that it is possible to differentiate between healthy and diseased tissue, having demonstrated the accuracy of the probe in 68 patient-sample tests within the laboratory. The team are now embarking on a three-year project to initiate a clinical trial with the device in patients for the first time. The ground-breaking project, funded by the National Institute for Health Research (NIHR) with a grant of around £1million, will see University of Exeter researchers work with the University of Bristol and Gloucestershire Hospitals NHS Foundation Trust, sustaining a successful partnership of many years focusing on the rapid detection of cancer using optical methods.

The "smart needle" probe, is comprised of fibre-optics encased within a fine needle that can look for cancer under the skin's surface—for example, in neck glands. Dr. John Day of the University of Bristol, who built the first prototypes and continues to work on optimising the design, said, "If our probe is successful in [clinical trials](#) for lymphoma, then it opens the door to applying it to many other cancers in the body."

Dr. Alex Dudgeon, a Research Fellow in Biomedical Spectroscopy at the University of Exeter and part of the research team said: "Early detection is a key factor in the successful treatment of cancers. This technique has real potential to increase the speed of lymphoma diagnosis."

"It could potentially bring huge advantages over traditional methods providing an instant diagnosis, reducing patient anxiety and it may eliminate the need for unnecessary diagnostic surgery. As a result, there can be a much-improved patient experience and significant cost and time savings for the NHS."

Mr Charlie Hall, a Head and Neck Consultant at Gloucestershire Hospitals NHS Foundation Trust said: "This is an exciting project that has the potential to revolutionise our diagnostic approach to cancers occurring in the head and neck region. Early and accurate diagnosis is the key to better [cancer](#) treatment outcomes and will also have significant economic benefits to the wider NHS."

Provided by University of Exeter

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