Scientists make leap forward in early detection for Alzheimer's and cancer

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Scientists at the UK's National Physical Laboratory have developed a new strategy for quicker and more precise detection of biomarkers - proteins which indicate disease. The work could pave the way for new tools to detect early stages of Alzheimer's and cancer at the molecular level.

All diseases have proteins specifically linked to them called biomarkers. Identifying these in body fluid such as blood can be a powerful tool in identifying diseases in their early stages. This would help doctors increase the success rate of treatment through early intervention and help drug companies develop more effective drugs for these diseases.

The search for new diagnostic and prognostic biomarkers to underpin targeted medicines is of growing priority. However the potential of biomarkers is currently hampered by technical difficulties in detecting them. They are often present at very low levels, in amongst many other different proteins. Reducing a sample down to a concentration where they could be identified is difficult and time-consuming.

"This new strategy, developed by NPL, uses a probe to 'fish' for likely proteins, selecting them from a crowded blood sample," says Dr Max Ryadnov, Principle Research Scientist in the group. "A microgel on the probe works like a sponge, picking up proteins which have a charge or mass within a certain range." Whether or not the biomarker is present in this more select sample can then be determined using mass spectrometry - a technique where the molecules are charged and identified from their

mass-to-charge ratio.

The team tested the probe on fluids containing human growth hormone - a protein which is used therapeutically and is also banned in competitive sports. It's typically found in blood at very low frequencies, at around 100 nanograms per millilitre. However the probe was able to pick up the hormone even when only 40 nanograms per millilitre were present.

Another problem with current biomarker detection is speed. This new strategy could greatly cut the time needed to search for a biomarker in a fluid. "You can do it in one day instead of a few days or even a week," says Dr Ryadnov.

The Biotechnology Group want to develop biomarker detection techniques further, and are already working on a probe which can select one specific protein, rather than ranges of size or charge. They also want to see tests that can quantify levels of a protein, rather than just detecting if it is present or not.

"What we want to do is something simple," says Dr Paulina Rakowska, Senior Research Scientist in the group. "These types of probe would in theory be suitable for different classes of diseases, mainly Alzheimer's and the like, but I also hope they would have applications for cancer."

More information: The research was the subject of a paper 'MiS-MALDI: microgel-selected detection of protein biomarkers by MALDI-ToF mass spectrometry' published in the Royal Society of Chemistry journal *Molecular BioSystems*.

Provided by National Physical Laboratory