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Cheap, simple tests could improve Alzheimer's disease management at the bedside

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A portable biosensor that could show how disease is progressing in patients with Alzheimer's could greatly improve people's quality of life in the future, according to a new review published in *Biosensors and Bioelectronics*.

The authors of the review, from the Florida International University, are taking a new approach to diagnosing the disease: measuring the amount of a peptide called beta-amyloid in the blood with a cheap, quick, accurate point-of-care test. They hope their new approach will help patients, including those in developing countries, benefit from personalized treatment for Alzheimer's disease.

Alzheimer's disease is caused by high levels of beta-amyloid in the brain, which leads to the degeneration of brain cells. Doctors can use various types of scans and immunoassays, such as MRI and ELISA to estimate the amount of beta-amyloid in the brain, giving them an indication of how the disease is progressing. But the protein can also be found in lower levels in blood, making it a useful biomarker to diagnose and monitor disease progression..

Currently there is no sensitive or inexpensive way to measure beta-amyloid levels in the blood. The team behind the new review plans to change that.

"We want to develop a point of care system, where a small drop of blood plasma can reveal their beta-amyloid level immediately so that a doctor can tailor a patient's therapy immediately," explained Dr. Ajeet Kaushik, lead author of the review from the University of Florida. "The drugs used to treat Alzheimer's disease can have side effects, so it's better for patients not to overdose. With the right data, doctors can respond quickly to changes in a patient's brain by reducing or increasing their dose."

In the review, Dr. Kaushik and his colleagues looked at each of the methods available to measure beta-amyloid concentration in brain tissue and in blood. None of the existing tests can be done at the bedside and all need special expertise and large samples. They also take a long time to generate a useful result – the main existing test, called ELISA, takes six to eight hours.

In comparison, the cheap, simple biosensor Dr. Kaushik and colleagues describe can measure beta-amyloid in the blood at tiny concentrations in just half an hour.

"Even though existing technologies are well established, we need to move towards small sample, high accuracy tests that can be used in all environments, from developed countries to rural settings. Our goal is to develop a test that's sensitive, small and affordable," said Dr. Kaushik.

To develop the new biosensor the team will need lots of bio-fluid samples taken at different stages of the disease. Finding all the samples they need will be challenging, but the review demonstrates a biosensor is achievable in the future.

Dr. Kaushik concluded: "A quick biosensor test will enable a clinician to collect information on the progression of disease and see what's happening to a patient over time. It will also show if and when the

disease reaches an untreatable level. In the future we hope a rapid biosensor test for Alzheimer's disease will help scientists study disease progression and help clinicians deliver personalized therapy to patients."

More information: Ajeet Kaushik et al. Nano-biosensors to detect beta-amyloid for Alzheimer's disease management, *Biosensors and Bioelectronics* (2016). DOI: 10.1016/j.bios.2016.01.065

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