Multimarker Parkinson’s Diagnotic test kit for monitoring disease progression based on electroanalytical detection of protein changes in blood.

https://neurodegenerationresearch.eu/survey/multimarker-parkinsons-diagnotic-test-kit-for-monitoring-disease-progression-based-on-electroanalytical-detection-of-protein-changes-in-blood/

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Title of project or programme

Multimarker Parkinson's Diagnotic test kit for monitoring disease progression based on electroanalytical detection of protein changes in blood.

Source of funding information

EPSRC

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€ 1,161,022

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19/01/2015

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3.5

The project/programme is most relevant to:

Alzheimer's disease & other dementias

Keywords

Parkinson's disease and PD-related disorders|Neurodegenerative disease in general

Research Abstract
In England alone, dementia affects more than 600,000 people with Parkinson’s pathology constituting a significant and growing part of this. These numbers are increasing as the mean population age grows and represent a very substantial burden on the welfare system, the NHS and families. Parkinson’s disease is a heterogeneous disease characterised by progressive neuronal loss, causing a decline in movement and other functions. Up to 80% of long-term survivors with Parkinson’s develop dementia whereas a significant percentage reach early motor disability such as postural instability and falls. Currently there is no disease-modifying therapy, which in part is hindered by the lack of an objective marker that stratifies these patient subgroups and objectively measures their disease progression. Such a biomarker is urgently needed to facilitate the development of clinical trials that aim to slow down neurodegeneration and importantly to also inform prognosis and better plan care. Based on our preliminary work in serum samples, our prediction is that such a biomarker can be developed with technology that enables multiplexed sampling and quantitation of several disease-specific reactive protein changes that are present in low abundance in the peripheral circulation. This approach requires the identification of innovative biomarker-candidates and the availability of ultrasensitive, label-free protein detection methods. The current methods of screening proteins involve expensive and highly specialized pieces of equipment or are prone to low levels of sensitivity and/or complicated analytical procedures associated with significant (up to 200%) analytical error. Electrical detection methodologies are portable, highly sensitive, cheap, high throughput (measurement time of minutes – particularly important if many samples are being screened) and multiplexable (multiple proteins detected simultaneously giving, in relevant cases, a “fingerprint” of health). The interfacing of man-made electronics with biological receptor molecules can enable the specific and calibrated detection of markers of disease. Devices built around these principles have already had a profound impact on clinical diagnostics and the quality of life of those unfortunate enough to live with chronic diseases such as diabetes. An assessment of protein levels in biological fluid (urine, saliva, blood serum, spinal fluid) constitutes a critical reflection of current health and may be reflective of the disease progression. We have already shown that one of the body’s responses to the small protein (alpha-synuclein) that accumulates in the brains of patient with Parkinson’s disease is to generate anti-alpha-synuclein antibodies, which we have measured and correlated with the disease stage using electrochemistry. We have also shown that circulating microvesicles in the serum of patients have distinct bioactivity and protein composition. We propose to measure these microvesicle-associated proteins by integrated microfluidic multiplexed devises and in combination with our earlier data on auto-antibodies develop a multi-parameter kit to monitor disease progression. We are uniquely positioned to develop this technology and provide proof of concept in two extensively characterized longitudinal patient cohorts. Specifically, we will ask whether a combination of protein markers reflect the rate of progression to dementia or severe movement disability in carefully selected patient samples by correlating serial serum levels with detailed clinical assessments. In summary, we are seeking to solve a profound clinical challenge in the area of neurodegeneration by developing a unique multi-parameter receptor chemistry device that we believe will have unprecedented application and potency.

Lay Summary
Further information available at:

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Alzheimer's disease & other dementias

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