Diagnosing disease before it reveals its presence

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A vast class of incurable neurodegenerative disorders are characterized by the aggregation and deposition of aberrant proteins like the amyloid b peptide or a-synuclein, considered to be factors behind the development of Alzheimer's and Parkinson's diseases, respectively. A preclinical test may open new perspectives in the diagnosis of such neurological disorders, as reported by a group of researchers from the University of Milan, who just published a study in *Physical Review Applied*.

Detecting the onset of such aggregations before the appearance of the symptoms of the disease is currently almost impossible, but some solutions have been proposed. One of the most promising is to take advantage of the same process that determines the spread of the diseases to amplify minute quantities of protein aggregates. This would enable screening small biological samples for the presence of very low concentrations of aberrant aggregates, thus allowing preclinical diagnosis of neurodegenerative diseases.

Recent advances in microfluidic technology allow analysis of protein aggregation in very small samples, but in order to enable such diagnostic approaches, it is necessary to find a way to minimize the risk of false positive or negative detections, which may easily occur when analysing small quantities of biological material.

And here is where the group of researchers from the Center of Complexity and Biosystems comes into play.

The authors of the study addressed the problem with a computational approach. Basically, they simulated the onset of protein aggregations in small samples, in order to study how this process fluctuates depending on the volume of the samples. By doing that, they managed to design and validate a preclinical screening test that could determine the exact number of aggregates within the analysed sample. Such a result will improve the precision and quality of protein aggregation detection, thus representing a first step towards the realization of in vitro tests for early diagnosis of neurodegenerative diseases.

"This is the first proof of concept in silico that could guide the development of a test in vitro to identify neurodegenerative disease before symptoms appear," said Caterina la Porta, biologist and leader of the research group.

Provided by Università degli Studi di Milano

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