

## Scientists at INST use tiny gold particles for early detection of Parkinson's Disease

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**Gold nanocluster-based biosensor distinguishes between physiological and pathological  $\alpha$ -synuclein conformers, enabling early-stage detection of Parkinson's disease**



A group discussion among scientists at Institute of Nano Science and Technology (INST), Mohali, an autonomous institute of the Department of Science and Technology (DST) exploring how proteins behave differently in the brain during disease, sparked a big idea. They started exploring whether they could detect how dangerous a protein is just by sensing its surface charge.

They focused their attention on a protein called  $\alpha$ -synuclein linked to PD. This protein changes shape, starting out harmless, and eventually clumping into toxic forms that damage brain cells. The team started working towards a sensor to tell these protein forms apart, just by how they're charged.

Their solution came in the form of gold nanoclusters (AuNCs), ultrasmall, glowing particles just a few nanometers wide. By coating these nanoclusters with naturally occurring amino acids, the researchers gave them selective "stickiness." Proline-coated clusters were drawn to the normal version of the protein, while histidine-coated ones latched onto the toxic aggregates. This helped distinguish between the harmless monomeric form and the toxic aggregated (amyloid) form.

The research also opens the door to detecting other diseases linked to misfolded proteins, like Alzheimer's, using similar nanotechnology. By making the system label-free, low-cost, and clinically adaptable, the team hopes it can someday be used in point-of-care testing—bringing powerful diagnostics closer to people who need them most. It could contribute to the global effort to prevent and manage non-communicable neurological diseases.