A highly sensitive dual-read assay using nitrogen-doped carbon dots for the quantitation of uric acid in human serum and urine samples.

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Carbon nanodots are the very special type of nano probes which are employed in the detection of hazardous chemical components in the cellular environment which might trigger non trivial behaviors. These carbon nanodots when doped with nitrogen which are synthesized by hydrothermal process with some modifications to that of the previously used methods, shows extensive properties and can be applied as a dual read assay especially for uric acid. They are dependent upon the oxidation of uric acid by uricase to produce H2O2. The N-CDs are colorless in nature and turns to yellow when they sense uric acid, the addition of nitrogen to these CDs has increased its bioimaging property and they show variable florescence intensity at different wavelengths since they are prepared based on combined ratiometric fluorescent and colorimetric strategy. The assay accomplished the quantitation of uric acid from serum and urine sample of humans thus suited for clinical sampling of uric acid.

The nitrogenous waste when kept for a long time in the living systems becomes toxic and they must be expelled out of the body and various life form ranging from aquatic to terrestrial , have evolved different metabolic mechanisms. Uric acid is one of its form which is formed by the final product of the purine metabolism and is unable to undergo further oxidation. It forms a vital component of the urine and its exceeding levels can cause cardiovascular disorders, gout, renal complications, etc. Recent studies have even proven that the UA levels are intricately related in the COVID 19, and can be used as a parameter in screening suspected patients.

Various techniques like HPCL, florescence spectroscopy, electrochemistry, UV – adsorption , Raman spectroscopy etc are formerly been used to quantitate the UA levels , but all were restricted up to the single signal detection, in this scenario, dual signal readouts are considered more beneficial and ratiometric florescence

spectroscopy provides a new paradigm and gives exactly what is needed. This method when coupled with colorimetric methods which shows florescence of different color ranges for the analytes. In this assay, Iodine was used as a replacement for horseradish peroxidase and the human blood and urine samples collected from Nanchang University affiliated hospital were used to analysis the uric acid.

For the measurements, florescence spectrometer was used to obtain the florescence peaks, TEM was used for surface morphology analysis of the NCDs, XPS was used to understand the elemental composition and the biochemical analysis of the UAcontaining samples was conducted with a biochemical analyzer (AU2700, Beckman, Olympus, USA. And ultimately the N-CDs through dual read assay were almost feasible economically as well as qualitatively with high scalability and were helpful in accomplishing the quantitation of UA levels and considered to be the most eligible carbon nanodots for UA detection .