Upconversion-based nanosensor developed for chemotherapy drug detection

May 30 2022, by Zhang Nannan

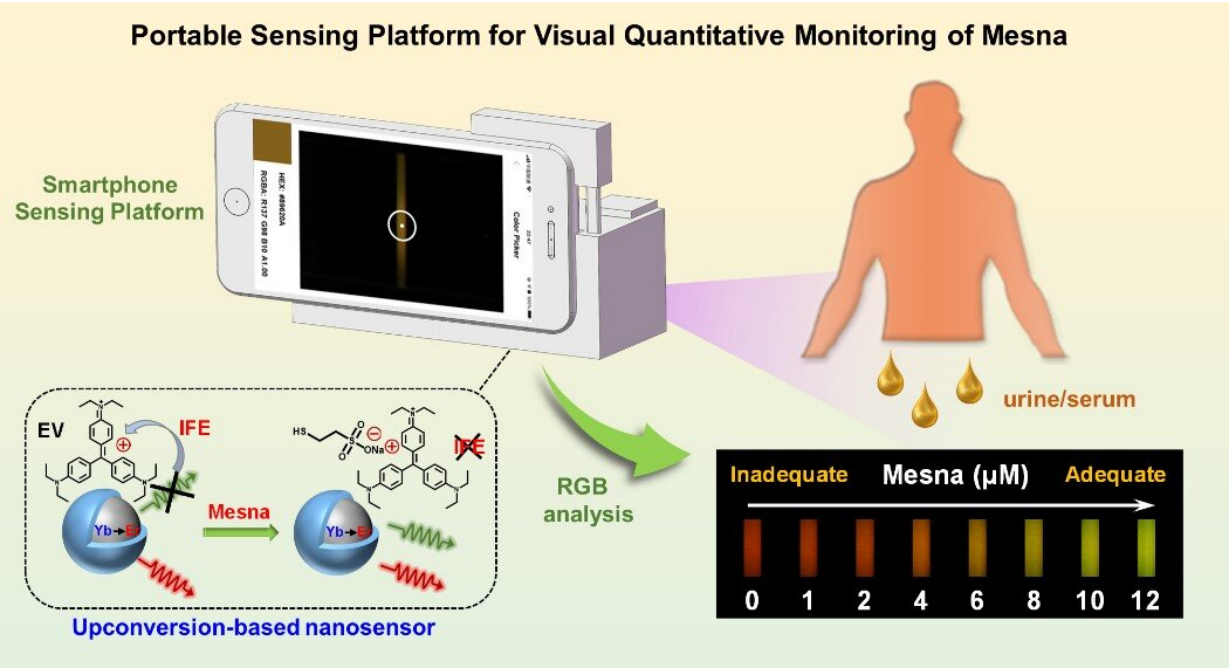

Figure 1. Portable sensing platform for visual quantitative monitoring of mesna. Credit: Hu Bin

As an important regional antidote for protecting the urinary system of chemotherapy patients, mesna (a drug given with chemotherapy to reduce bleeding in the bladder) needs to be monitored in real-time to ensure a curative effect. The fluorescence method is a powerful tool in real-time detection, with the advantages of fast response and

visualization. However, background interference limits its application in biological sensing.

To solve this problem, a research team led by Prof. Jiang Changlong from the Hefei Institutes of Physical Science (HFIPS) of the Chinese Academy of Sciences (CAS) has recently proposed a new method for the visual detection of mesna. Results were published in *Analytical Chemistry*.

In this study, the researchers monitored quantitative mesna visually in real-time conditions with a newly-developed portable sensing platform featuring an upconversion-based nanosensor.

The nanosensor was constructed by upconversion nanoparticles (UCNPs) and ethyl violet (EV), in which the UCNPs acted as donors and EV as the quencher.

The addition of mesna caused the variations of fluorescent and colorimetric chromaticity, realizing the dual-readout function of the nanosensor. Benefiting from the near infrared ray excited upconversion luminescence, the background interference of biological samples was eliminated and effectively improved the sensitivity of the detection. The low limit of detection (LOD) of the nanosensor was as low as 26 and 48 nM for the fluorescence and colorimetric signals, respectively.

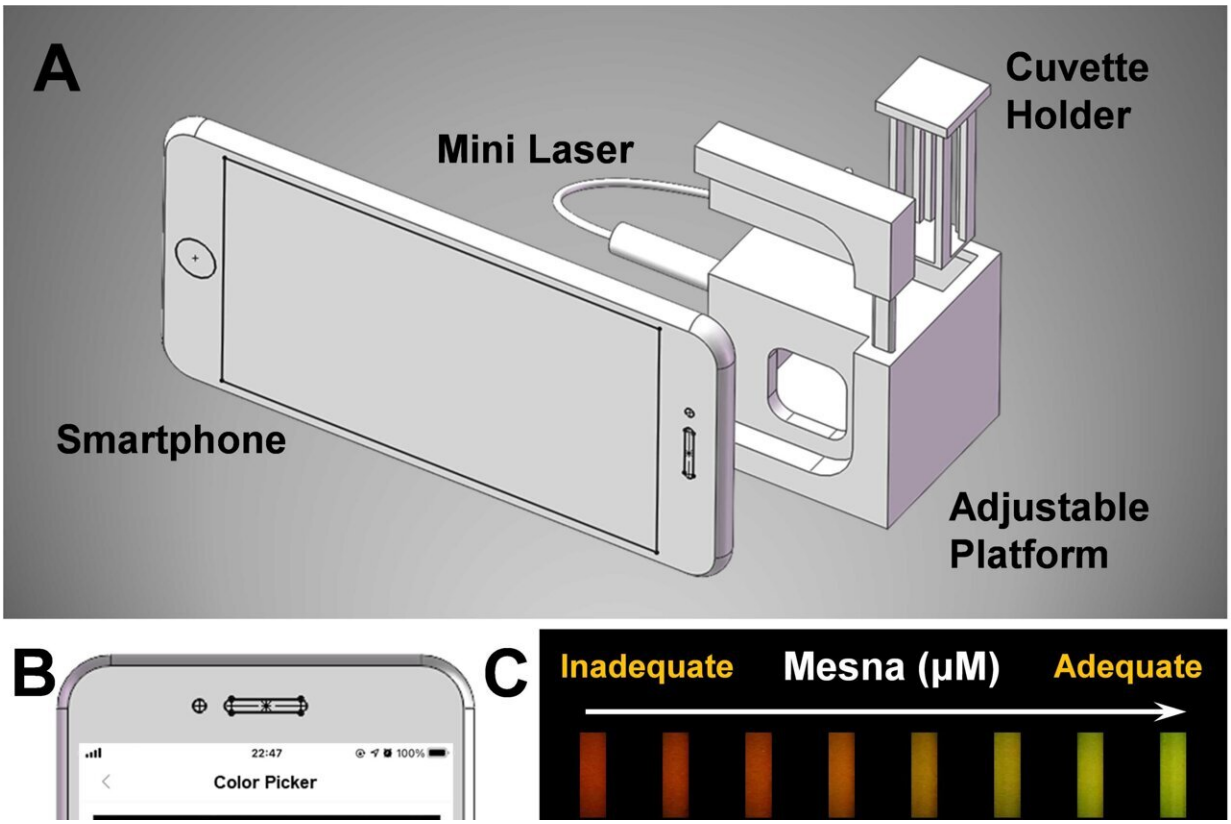

Figure 2. RGB analysis of upconversion luminescence using a smartphone. Credit: Hu Bin

In addition, a highly compatible portable sensing platform was designed for facile detection of mesna with the LOD of 56 nM.

The nanosensor has good selectivity and anti-interference ability and shows good reliability in actual sample detection.

The platform can be developed as point-of-care testing application for real-time monitoring of mesna levels to guide dose adjustments and therapeutic efficacy. It provides a simple and reliable strategy for clinical drug monitoring and exhibits potential application prospect.

More information: Bin Hu et al, A Portable Sensing Platform Using an Upconversion-Based Nanosensor for Visual Quantitative Monitoring of Mesna, *Analytical Chemistry* (2022). DOI: 10.1021/acs.analchem.2c00380

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