New studies demonstrate advancements in nanotechnology and their impact across multiple areas of human health

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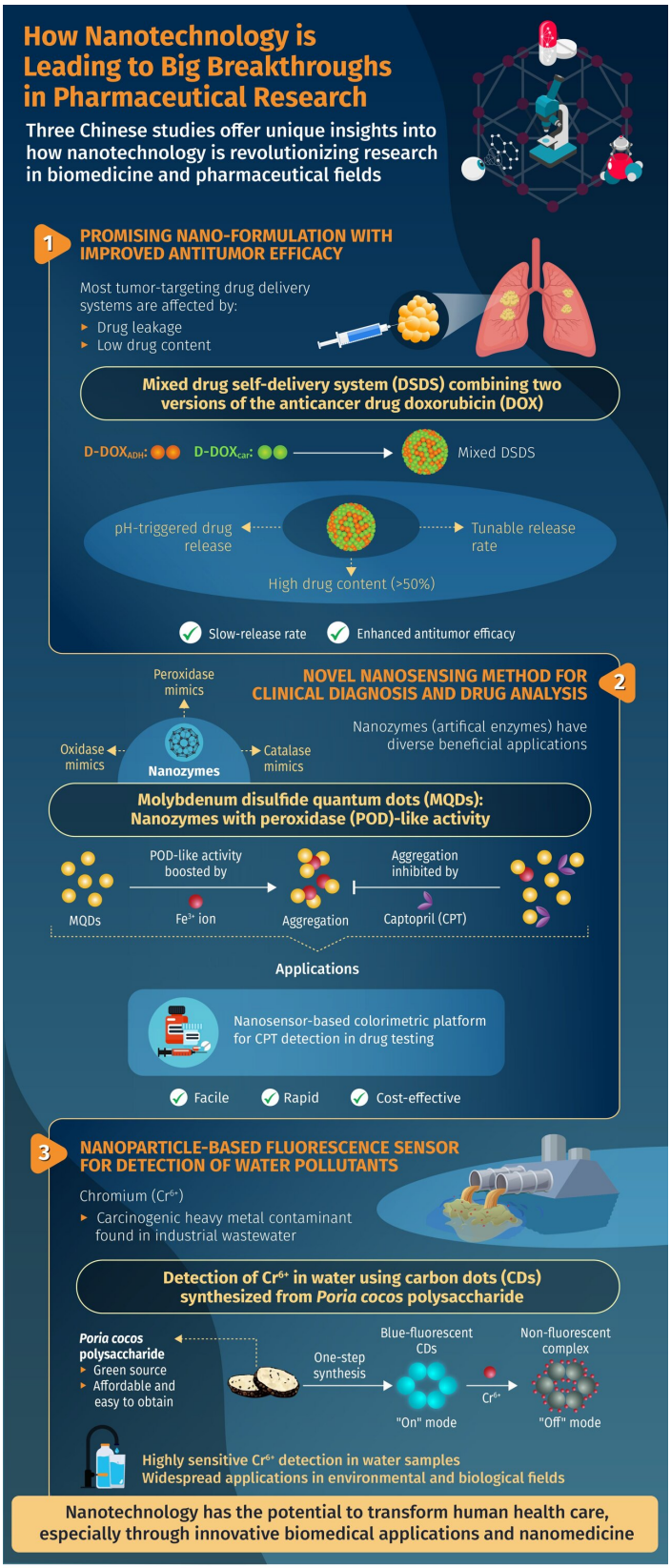

Regulation of drug release performance using mixed doxorubicin-doxorubicin dimer nanoparticles as a pH-triggered drug self-delivery system | **Li *et al.* (2022)** | 10.1016/j.jpha.2021.03.001

Reversible regulation of enzyme-like activity of molybdenum disulfide quantum dots for colorimetric pharmaceutical analysis | **Tan *et al.* (2021)** | 10.1016/j.jpha.2021.03.010

Carbon dots derived from *Poria cocos* polysaccharide as an effective "on-off" fluorescence sensor for chromium (VI) detection | **Huang *et al.* (2021)** | 10.1016/j.jpha.2021.04.004

Recent progress in nanotechnology paves the way for improved drug delivery, clinical diagnosis, and even environmental protection against toxic pollutants. Credit: *Journal of Pharmaceutical Analysis*

Active nanotech-based research from China has yielded several new advancements with wide-ranging applications. Newly developed nanosensors can be used to detect toxic environmental pollutants, such as chromium; novel medical technologies can be leveraged to allow point-of-care testing for clinical diagnosis and drug analysis; and they can even provide sustained and controlled drug release. Accordingly, these new technologies are expected to usher in an era of improved healthcare at the levels of prevention, diagnosis, and treatment.

Nanotechnology research has found applications in many fields, from medicine and drug research to aeronautics and automobiles. A series of recent studies from Chinese researchers, which were published in the *Journal of Pharmaceutical Analysis*, have contributed further to nanotechnology research.

The first study, made available online on May 1, 2021 and published in Volume 12 Issue 1 February 2022 of the journal, was published by researchers from Anhui University of Chinese Medicine. These researchers set out to solve the problems caused by environmental contamination with chromium, a carcinogen. They developed nanodots made of carbon using natural polysaccharides from Poria mushrooms, which have no pharmacological activity. These nanodots functioned as an "on-off" fluorescent probe with the ability to detect environmental chromium.

Speaking about the applications, the researchers say, "With their inexpensive source material, these nanodots allow for cost-effective and quick chromium detection, and their efficacy has been proven using actual water samples. They also represent a new avenue for the non-pharmacological application of traditional Chinese medicines and could help prevent serious health problems."

In another study, made available online on March 31, 2021 and published in Volume 12 Issue 1 February 2022 of the journal, researchers from Chongqing Medical University and Chongqing Normal University found a way to regulate the peroxidase activity of molybdenum-based quantum dots that acted as "nanozymes" (small artificial enzymes). These nanozymes caused a color change in the presence of a particular drug, and the intensity of the color change reflected the concentration of the drug.

The researchers state, "These nanosensors could be used to detect drug concentrations depending on the intensity of the color change. Therefore, they could be used to develop robust pharmaceutical detection platforms to make drug assays and diagnosis easier, improving the standard of healthcare."

In the final study, made available online on March 9, 2021 and published in Volume 12 Issue 1 February 2022 of the journal, researchers from Lanzhou University used nanotechnology to develop better drug formulations. Controlled drug release helps in targeting tumors and cancer more effectively, but there are few approaches that allow controlled drug release in a tumor's intracellular microenvironment. Therefore, researchers developed a mixed drug self-delivery system (DSDS) with a high drug content that contained two forms of the chemotherapy drug doxorubicin. This system provided sustained pH-triggered drug release, which could be adjusted by manipulating the ratio of the two forms of the drug.

Interestingly, laboratory tests showed that the slow-release mixed DSDS nanoparticles were highly effective in killing cancer cells. "Therefore, this platform could serve as a suitable treatment system, providing improved patient outcomes in the future," the researchers conclude.

More information: Qianqian Huang et al, Carbon dots derived from Poria cocos polysaccharide as an effective "on-off" fluorescence sensor for chromium (VI) detection, *Journal of Pharmaceutical Analysis* (2021). DOI: 10.1016/j.jpha.2021.04.004

Juan Tan et al, Reversible regulation of enzyme-like activity of molybdenum disulfide quantum dots for colorimetric pharmaceutical analysis, *Journal of Pharmaceutical Analysis* (2021). DOI: 10.1016/j.jpha.2021.03.010

Jiagen Li et al, Regulation of drug release performance using mixed doxorubicin-doxorubicin dimer nanoparticles as a pH-triggered drug self-delivery system, *Journal of Pharmaceutical Analysis* (2021). DOI: 10.1016/j.jpha.2021.03.001

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