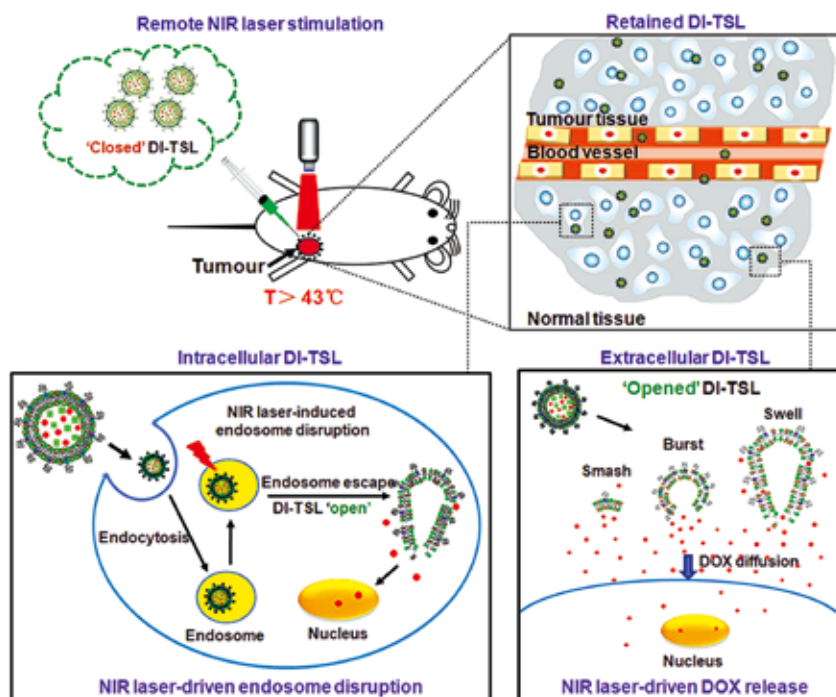


# Smart Nanomedicine for On-demand Drug Release and Synergistic Antitumor Therapy

Smart nanoparticles (NPs) that respond to external and internal stimulations have been developing to achieve optimal drug release in tumor. However, applying these smart NPs to attain high antitumor performance is hampered by limited drug carriers and inefficient spatiotemporal control. Recently, a research team led by CAI Lintao from the Institute of Biomedicine and Biotechnology, Shenzhen Institutes of Advanced Technology (SIAT) achieved a breakthrough in smart nanomedicine for imaging-guided precision cancer therapy, and their study was published in *Scientific Reports* with the title of “NIR-driven Smart Theranostic Nanomedicine for On-demand Drug Release and Synergistic Antitumor Therapy”.

Based on the team's previous works, Prof. CAI

presented a “nano-cocktail therapy” which combines multiple drugs and mechanisms for a combination therapy, and shed light on a new perspective for highly-effective and multidisciplinary-integrated cancer therapy. In *Scientific Reports*, Dr. ZHAO Pengfei and Dr. ZHENG Mingbin from CAI's group adopted temperature-sensitive lipids to co-encapsulate chemo-therapeutic drug doxorubicin (DOX) and photosensitizer indocyanine green (ICG), and successfully synthesized a temperature-sensitive and smart nanocarrier system for imaging-guided precise cancer therapy. The system significantly increased drug stability and retention in tumor region, and prohibited quick drug metabolism *in vivo*. Near-infrared (NIR) fluorescence could real-time trace the accumulation and metabolism of DOX and ICG in tumor region. With the guidance of fluorescence imaging



A scheme showing the mechanism of remote NIR-triggered DOX release and further cytotoxicity in tumor.

and activation of NIR laser, the local temperature was raised to “open” the temperature-sensitive system, and to precisely control the release of DOX and the temperature of tumor region. Finally, tumors were eradicated by the precise chemo-photothermal combination therapy.

“Precision therapy is an irreversible trend of clinical cancer therapy. By the control of NIR laser, smart nano-encapsulation can implement space, time, and dose-controllable drug release and temperature increase in tumor region, which is substantially a precise personalized medicine to achieve accurate drug delivery and enhanced anticancer effect,” said Prof. CAI.