Researchers propose strategy to evaluate tumor photothermal therapy in real-time

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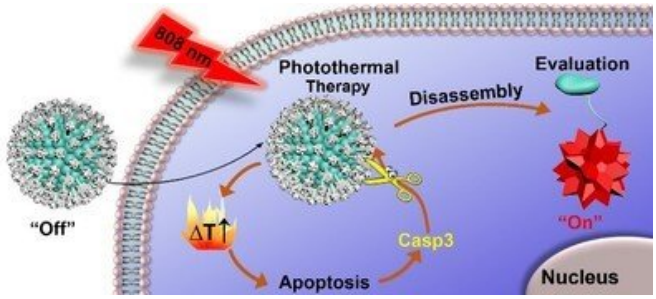

Illustration of the fluorescence "On" process. Credit: WANG Yanfang et al.

Photothermal therapy (PTT) is a promising alternative method for cancer treatment due to advantages of non-invasiveness, precise temporal and spatial control, strong specificity and high tumor destruction efficiency.

At present, the clinical evaluation of cancer treatment mainly relies on cytology, histopathology and imaging. Meanwhile, tumor therapy and its therapeutic efficiency evaluation are conducted separately.

Recently, a research group led by Prof. Liang Gaolin from University of Science and Technology of China (USTC) of Chinese Academy of Science, collaborating with Dr. Wang Longsheng from the Second Affiliated Hospital of Anhui Medical University, reported an 'intelligent' strategy of using organic nanoparticles to evaluate PTT efficiency on tumor in real time.

The study was published online in *ACS Nano* on July 27.

Via a CBT-Cys click condensation reaction, the researchers designed a small molecular near-infrared probe Cys(StBu)-Asp-Glu-Val-Asp-Lys(Cypate)-CBT (Cy-CBT) and prepared an intelligent nanoparticle Cy-CBT-NP, which is a fluorescence-quenched photothermal nanoparticle.

After tumor cells' uptake of Cy-CBT-NP, the tumor was treated with photothermal therapy under 808 nm laser irradiation. During the PTT, the tumor cell eventually died and the Caspase 3 (Casp 3) was activated.

Casp 3 specifically recognized and cleaved DEVD substrates in the Cy-CBT-NP to yield Cy-CBT-NP-Cleaved which was accompanied by near-infrared fluorescence (NIF), turning the fluorescence 'on.'

Because the PTT efficiency, Casp3 activity, and the turned-on NIR fluorescence intensity are positively correlated, this intelligent nanoparticle Cy-CBT-NP can be used to evaluate the tumor photothermal efficiency in real time.

Compared with the traditional tumor efficiency evaluation method, the strategy is real-time and can help doctors adjust the treatment plan in time.

More information: Yanfang Wang et al, A Self-Evaluating Photothermal Therapeutic Nanoparticle, *ACS Nano* (2020). DOI: 10.1021/acsnano.9b10144

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