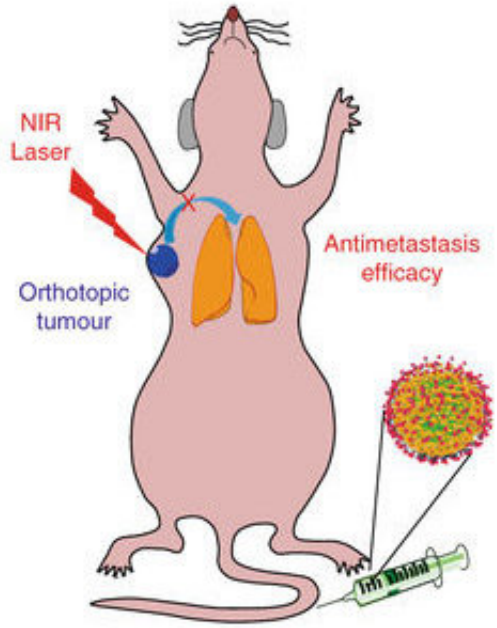
# Thermo-chemotherapy combo eradicates primary and metastatic tumors in mice

April 5 2018




The theranostic particle is injected into the tail vein. When it reaches the breast tumor, near infrared (NIR) laser light is applied to release the chemotherapy. The treatment also killed breast tumor cells in the circulation before they were able to metastasize to the lung. Credit: Guocan Yu, et al. Nat Comm Feb-2018

Bioengineers at the National Institute of Biomedical Imaging and Bioengineering (NIBIB) have developed a smart anti-cancer nanoparticle with precisely targeted tumor-killing activity superior to previous technologies.

The state-of-the-art nanoparticle features an exceptionally sturdy shell capable of carrying large loads of chemotherapeutic drugs through the circulatory system to the tumor without the leakage that can damage healthy tissue.

The nanomedicine is photothermal-responsive, so the cancer-killing load of the particle is released only when it enters the tumor cells and is activated by laser light. The photothermal sensitivity is also used to track the particle as it moves through the mouse circulation. The method is called photoacoustic imaging, as the laser light induces heat that expands the particle, releasing a pulse that can be monitored by ultrasound.

In a mouse breast cancer model the thermo-chemotherapy combo eliminated nearly 100% of breast tumors and also efficiently killed cells attempting to metastasize from the breast to the lung. Systemic toxic effects on the mice were eliminated due to the precise targeting and release of the chemotherapeutic agents.

Reported in the February issue of *Nature Communications*, this cancer-killing technology is the latest and most effective created by members of the Laboratory of Molecular Imaging and Nanomedicine (LOMIN) at NIBIB which is led by Senior Investigator, Xiaoyuan (Shawn) Chen.

The group continues to improve the design and efficiency of what are called theranostics—nanomedicines that combine both therapy and diagnostics. This latest version features favorable biocompatibility, high loading efficiency, excellent stability in the circulation, potent anti-tumor activity, and diagnostic capabilities, all of which Chen sees as critical in moving towards eventual use of nanomedicines in the clinic.

**More information:** Guocan Yu et al. Polyrotaxane-based supramolecular theranostics, *Nature Communications* (2018). DOI: 10.1038/s41467-018-03119-w