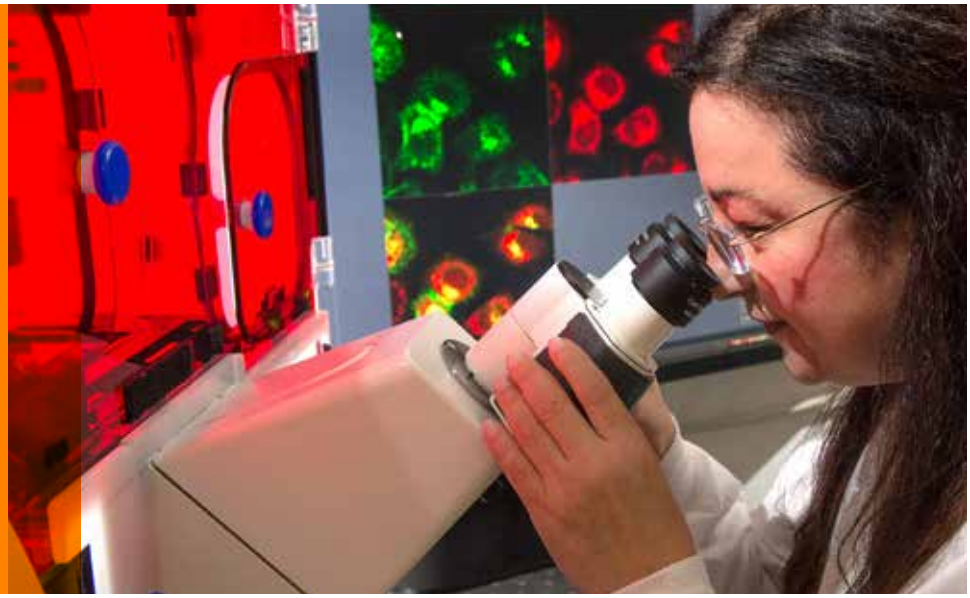
NANO DESIGN WORKS

Argonne NATIONAL LABORATORY

HARNESSING LIGHT IN THE FIGHT AGAINST CANCER

Bioluminescence more accurate, forgiving than typical targeting methods



Tijana Rajh examines innovative materials with the potential to improve targeted therapies in certain types of cancers.

CHALLENGE

Medical researchers are looking to target diseases such as cancer at increasingly precise levels, down to the nanoscale. Recent advances in this effort have revealed that molecules triggered by the diseases themselves may well provide the signals necessary to achieve this refinement. However, despite the fact that these targeted therapies have progressed over time, they still lack the accuracy and effectiveness desired by researchers.

The answer, at least as it pertains to certain types of cancers (such as colorectal and glioblastoma), may well come in the form of "cold light," or bioluminescence, the same property exhibited by fireflies. Although light has long been known to be an effective treatment for certain types of surface cancers, it cannot penetrate the body and is therefore ineffective against internal varieties.

SOLUTION

Argonne researcher Tijana Rajh has demonstrated that a new semiconductor bioluminescent nanoparticle can be injected, then activated via the excessive ATP molecules emitted by cancer cells to target the disease with unparalleled precision. Known as luciferin, the "cold light" agent brings the healing power of photons to internal cancers and only attacks cells with specific ATP levels, sparing healthy tissue.

BENEFITS

This revolutionary delivery mechanism promises several benefits beyond the reach of traditional therapies, including:

- The sparing of healthy tissues thanks to the ATP safeguard.
- Enhanced efficacy of treatment with fewer side effects.
- The ability for "cold light" to reach deep into the body.

APPLICATIONS

This research will further bolster the use of semiconductors in medicine, and it will also test the effectiveness of bioluminescence as a treatment regime and prove a boon to the increasingly promising field of targeted therapies.

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U.S. DEPARTMENT OF ENERGY

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