New Polymeric Material Developed at UC San Diego Has Potential for Use in Non-Invasive Surgical Procedures

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Previously inaccessible target sites may be reached for diagnosis and treatment using this material

Scientists at the University of California, San Diego have developed what they believe to be the first polymeric material that is sensitive to biologically benign levels of near infrared (NRI) irradiation, enabling the material to disassemble in a highly controlled fashion. The study represents a significant milestone in the area of light-sensitive material for non-invasive medical and biological applications. Their work is published on line this week in the journal *Macromolecules*.

Adah Almutairi, PhD

"To the best of our knowledge, this is the only polymeric material specifically designed to break down in to small fragments in response to very low levels of NIR irradiation," said Adah Almutairi,

PhD, assistant professor at the UCSD Skaggs School of Pharmacy and Pharmaceutical Sciences and director of the Laboratory of Bioresponsive Materials at UC San Diego. "The material was also shown to be well-tolerated in cells before and after irradiation. We think there is great potential for use in human patients, allowing previously inaccessible targets sites to be reached for both treatment and diagnosis."

The properties of so-called "smart" polymeric materials – either synthetic or natural – respond readily to small changes in their environment. They are, therefore, the focus of widespread research to develop tools for such uses as tissue engineering, implants, wound-healing, drug delivery and biosensors.

NIR light can penetrate up to 10 cm into tissue with less damage, absorption and scattering than visible light, and can be remotely applied with high spatial and temporal precision. Most other light-degradable materials that have been developed to date can be difficult to clear from the body, and only a handful of organic materials respond to high-power NIR light. Until now, none were able to respond to low-level, thus safer, NIR light – which causes less photodamage to tissue and cells.

The UC San Diego researchers stated that further studies are warranted to improve the sensitivity of these smart polymeric materials to NIR, and they are currently pursuing several synthetic and engineering strategies to improve design of such biomaterials.

Additional researchers include Nadezda Fomina, Cathryn L. McFearin, Marleen Sermsakdi, and José M. Morachis, Skaggs School of Pharmacy, Department of NanoEngineering at the Jacobs School of Engineering, Materials Science and Engineering and Biomedical Sciences Programs, UC San Diego.

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