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Remotely triggered drug delivery using nanostructured materials

Nanomedicine is an emerging field that encompasses applications of Nanoscience in a variety of areas of clinical interest. In particular, it is widely expected that Nanomedicine will bring a radical change in the present approaches to diagnosis and therapy. One of the main impacts is expected in controlled drug release, an area in rapid expansion with a market forecast of 43 billion $ for 2015, of which 3.4 billion will be nanotechnology-enabled.

Current medical practice relies heavily in enteral (usually oral) and parenteral drug administration. However, these methods do not afford an easy control of the rate of drug release or of the dose received at a certain location, their ability to target the diseased tissues or organs is limited, and unwanted side effects in healthy tissues often occur. Thus, a controlled drug delivery system is highly desirable to increase the efficiency and selectivity of therapeutic efforts. New nano-structured drug delivery vehicles can be static (e.g., medical devices such as polymer-coated stents; drug-eluting prostheses, skin patches) and mobile (e.g. injectable nanoparticles), and may be capable of passive (e.g. controlled by diffusion or by vector degradation) or active (triggered) drug delivery.

This talk will describe recent research in our laboratory aimed to the creation of temperature- activated drug delivery systems. We use embedded nanoparticles that are sensitive to near-infrared (NIR) radiation or to magnetic fields, as a way to produce a local temperature increase that triggers drug delivery.