Nanotechnology: Implications in Cancer theranostics

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Cancer imposes a heavy burden on public health as it is one of the leading causes of mortality. Conventional methods of cancer treatment that include chemotherapy as well as radiotherapy are associated with severe side effects since the normal cells are also killed along with the cancerous cells. Thus a major challenge in cancer treatment involves development of new drugs and methodologies that have higher drug selectivity for cancer and reduced toxicity to healthy tissues. This is one of the rising interests in nanotechnology research. Nanotechnology has been used in cancer theranostics (therapy as well as diagnosis) wherein the nanoparticles are synthesized having imaging as well as therapeutic agents all-in-one system to detect as well as treat cancer. Some of the examples include magnetic nanoparticles (MNPs) and gold nanoparticles (GNPs), which can be conjugated with imaging and therapeutic drugs and explored for multimodal applications. MNPs can be guided under an external magnetic field and used for imaging, targeted drug delivery as well as hyperthermia. GNPs can be synthesized either chemically or biologically and used for imaging, drug delivery as well as photodynamic therapy. Our recent studies with magnetic nanoparticles include their applications for drug delivery in cancer. We aim to make them targeted as well as fluorescent, thereby enabling them to have theranostic applications. We also synthesize gold nanoparticles by green technology method and aim to make their use for drug delivery in cancer.