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Magneto-optical Nanomaterials as Nanomedicine

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Abstract

Iron oxide nanoparticles (IONPs) have played a pivotal role in the development of nanomedicine owing to their versatile functions at the nanoscale, that facilitates targeted delivery, high contrast imaging, and on-demand therapy. Some biomedical inadequacies of IONPs on its' own, such as poor resolution of IONP-based Magnetic Resonance Imaging (MRI), can be overcome by co-incorporating optical probes onto them, which can be either molecule-based or nanoparticulate. Optical probe-incorporated IONPs, together with two prominent non-ionizing radiation sources (i.e. magnetic field and light), enables a myriad of biomedical applications from early detection to targeted treatment of various diseases. However, selecting right optically active photosensitizer is the key for nanomaterials' function. For example, UV sensitive dye methylene blue has been studied extensively, however, due to the limitation of UV light penetration depth in tissues limit it's use as a photosensitizer. Therefore, we found an alternate photosensitizer, Indocyanine Green (ICG) in connection with Royal Blackburn Teaching Hospital who has been using routinely for Liver cancer surgery due to it's affinity towards Liver tumour and visualisation using Near Infrared (NIR) light. In our hypothesis, ICG incorporated magnetic nanoparticles can be administered and monitored *via* NIR imaging (diagnosis) before applying the combination of AMF+NIR light for localized heating (therapy).

In my talk, I will cover the latest research[1-7] in this topic from the University of Central Lancashire.

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