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Magnetic Carbon nanoparticles enabled efficient photothermal alteration of mammalian cells L. GU, V. VARDARAJAN, A. KANNEGANTI, A. KOYMEN, S.K. MOHANTY, UT Arlington — While cw near-infrared (NIR) laser beams have been finding widespread application in photothermal therapy of cancer and pulsed NIR laser microbeams are recently being used for optoporation of exogeneous impermeable materials into cells. Since, carbon nanomaterials are very good in photothermal conversion, we utilized carbon nanoparticles (CNP) doped with Fe, so that they can be localized in a defined area by two fold selectivity, (i) external magnetic field for retention of the CNP in targeted area and (ii) surface functionalization for binding the targeted cells. Here, we report efficient photothermal therapy as well as poration of cells using magnetic CNPs with very low power continuous wave laser beam. Localization of CNPs on cell membrane under application of magnetic field was confirmed by scanning electron microscopy. At different power levels, cells could be damaged or microinjected with fluorescence protein-encoding plasmids or impermeable dyes. Monte Carlo simulation showed that the dose of NIR laser beam is sufficient to elicit response for magnetic CNP based photothermal treatment at significant depth. The results of our study suggest that magnetic CNP based photothermal alteration is a viable approach to remotely guide treatments offering high efficiency with significantly reduced cytotoxicity.

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