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## Enhancement of the cytotoxic and chemosensitizing effects of small gold nanoparticles by DNA conjugation

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During the last decade, gold nanoparticles (GNPs) have drawn immense attention in cancer diagnosis and therapy. Nanoparticles preferably leak and accumulate inside the tumor due to many reasons including high vascular density, increased vessel permeability, and defective lymphatic draining of tumors via a process called the enhanced permeability and retention (EPR) effect. Very small particles (<30 nm), although can enter the tumor tissue by the EPR effect, they also may leave it again by passive diffusion. This size-dependent cellular uptake thus limits the use of very small nanoparticles in cancer therapy. This study was conducted to improve the retention of small nanoparticles by linking a DNA fragment to 10 nm GNPs and transferring it to MCF-7 cells. Treatment with GNP-DNA conjugate resulted in a significant reduction in cell viability when compared to both control and unmodified GNP groups. The cell toxicity tests revealed that the conjugation of GNP with DNA lead to a 69.4-fold decrease in the  $IC_{50}$  of GNP in MCF-7 cells. Furthermore, GNP-DNA conjugate showed a synergetic effect with doxorubicin leading to a significant reduction in cell viability at concentrations as low as 70  $\mu$ M GNP-DNA and 1.6  $\mu$ M doxorubicin. The results of this study shed light on the marked effect of the modification of small GNP with DNA fragments on the effect of GNP in cancer cells and hence, enables studying the effects of GNP size on cellular chemosensitivity without being restricted by GNP size-related differences in uptake efficiency.

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