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Synergistic effect of magnetic nanoparticles and chemotherapeutic drugs in cancer

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Magnetic nanoparticles (MNPs) are a clinically available biomedical tool and have been approved to serve as magnetic resonance contrast agents. MNPs are of great interest in a wide range of applications due to their unique physical properties. High surface to volume ratio allows MNPs functionalization with different ligands and coatings for various biomedical applications. Due to their magnetic properties, MNPs can be used as magnetic-guided drug delivery carriers. Conventional chemotherapeutics suffer several drawbacks such as nonspecific targeting, toxicity to the healthy cells, reduced stability, and drug resistance by the cancer cells. To overcome these limitations, MNPs with attached specific ligands (markers or molecules with tumour binding capacity) are used for targeted delivery of chemotherapy drugs to the cancer cells keeping the healthy cells unaffected. Moreover, nanocarriers have the potential to overcome chemotherapy drug resistance by bypassing the ABC-transporter mediated drug efflux mechanisms. Another promising application of MNPs in cancer therapy is via magnetic hyperthermia. Tumour cells are known to be more sensitive to temperature increase than normal cells. When used in conjunction with chemotherapy, magnetic hyperthermia offers substantial synergistic effects. Recent publications in the field reveal that combined chemo-phototherapy based on NIR laser irradiation using MNPs results in lower tumour growth and cancer regression due to efficient drug penetration in the tumour tissue.

References:

Kumar, P.; Srivastava, R. *Nanomedicine for Cancer Therapy* (2017)

Hervaultab, A.; Thanh, N.T.K. *Nanoscale*, 6, 11553-11573 (2014)

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