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Antibody-Conjugated Nontoxic Arginine-Doped Fe3O4 Nanoparticles for Magnetic Circulating Tumor Cells Separation

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Abstract : Nano-sized materials present new opportunities in biology and medicine and they are used as biomedical tools for investigation, separation of molecules and cells. To achieve more effective cancer therapy, it is essential to select cancer cells exactly. This research suggests that using the antibody-functionalized nontoxic Arginine-doped magnetic nanoparticles (A-MNPs), has been prosperous in detection, capture, and magnetic separation of circulating tumor cells (CTCs) in tumor tissue. In this study, A-MNPs were synthesized via a simple precipitation reaction and directly immobilized Ep-CAM EBA-1 antibodies over superparamagnetic A-MNPs for Mucin BCA-225 in breast cancer cell. The samples were characterized by vibrating sample magnetometer (VSM), FT-IR spectroscopy, Tunneling Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM). These antibody-functionalized nontoxic A-MNPs were used to capture breast cancer cell. Through employing a strong permanent magnet, the magnetic separation was achieved within a few seconds. Antibody-Conjugated nontoxic Arginine-doped Fe₃O₄ nanoparticles have the potential for the future study to capture CTCs which are released from tumor tissue and for drug delivery, and these results demonstrate that the antibody-conjugated A-MNPs can be used in magnetic hyperthermia techniques for cancer treatment.

Keywords : tumor tissue, antibody, magnetic nanoparticle, CTCs capturing
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