Hyperthermia has been reported to be an effective cancer treatment modality, as tumor cells are more temperature-sensitive than their normal counterparts. Since the ambient temperature can be increased by placing magnetic nanoparticles in an alternating magnetic field it has become of interest to incorporate these magnetic nanoparticles into biodegradable nanofibers for possible endoscopic hyperthermia treatment of malignant tumors. In this preliminary investigation we have explored various characteristics of biodegradable electrospun chitosan nanofibers containing magnetic nanoparticles prepared by different methods. These methods included: (1) E-CHS-Fe₃O₄, with electrospun chitosan nanofibers directly immersed in a magnetic nanoparticle solution; (2) E-CHS-Fe⁵⁺, with the electrospun chitosan nanofibers initially immersed in Fe²⁺/Fe³⁺ solution, followed by chemical co-precipitation of the magnetic nanoparticles. The morphology and crystalline phase of the magnetic electrospun nanofiber matrices were determined by scanning electron microscopy, transmission electron microscopy, selected area electron diffraction, and X-ray diffraction spectroscopy. The magnetic characteristics were measured using a superconducting quantum interference device. The heating properties of these magnetic electrospun nanofiber matrices in an alternating magnetic field were investigated at a frequency of 750 kHz and magnetic intensity of 6.4 kW. In vitro cell incubation experiments indicated that these magnetic electrospun nanofiber matrices are non-cytotoxic and can effectively reduce tumor cell proliferation upon application of a magnetic field.

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