Synthesis and characterization of 79Ni15Fe6Mo magnetic nanoparticles for biomedical applications - a cytotoxic study in Melanoma cell lineage (B16-F10)

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In this work, 79Ni15Fe6Mo (Supermalloy[1]) MNPs were synthesized by the coprecipitation[2]method. The objective was to study the morphological, structural, magnetic characteristics and also the biological behavior of these MNPs when exposed to cancer cells, aiming at potential biomedical applications. The MNPs were characterized by SEM, TEM, X-ray diffractometry, magnetometry and thermogravimetry. From the MET, clusters of nanoparticles were observed, with a spherical shape and an average size of (28 ± 8) nm. Heat treatment at temperatures varying between (400 – 1000) °C promoted growth of these agglomerates reaching (60 ± 20) nm. X-ray diffractometry and SAED techniques confirmed that the particles as synthesized have short-range order (1 nm). It was found that the temperature that promotes the highest crystallinity without increasing the crystal size was 800 °C. Magnetometry revealed that paramagnetic behavior of 79Ni15Fe6Mo particles. The MNPs were submitted to stability and biocompatibility by exposition to fibroblasts, macrophages and to melanoma cells (B16-F10). After 3 days of incubation in biological medium containing water or DMEM + 10% FBS at a final MNPs concentration of 4 µg/mL, at 37°C and 5% CO_2, the MNPs not showed background. Fibroblasts, macrophages and melanoma cells were placed in 8 concentrations of MNPs (0.4 µg/mL to 4 µg/mL) and 0.5% ethanol for 72 h. Concentrations of MNPs up to 0.4 µg/mL do not significantly interfere with cell viability. The NPMs only reduced the macrophage density and the viability of melanoma cells, both by 32. The synthesized NPMs showed to be potential candidates for future biomedical applications.

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References

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