

***In vitro* studies of multiwalled carbon nanotube/ultrahigh molecular weight polyethylene nanocomposites with osteoblast-like MG63 cells**

Abstract

Carbon nanotubes are highly versatile materials; new applications using them are continuously being developed. Special attention is being dedicated to the possible use of multiwalled carbon nanotubes in biomaterials contacting with bone. However, carbon nanotubes are also controversial in regards to effects exerted on living organisms. Carbon nanotubes can be used to improve the tribological properties of polymer/composite materials. Ultrahigh molecular weight polyethylene (UHMWPE) is a polymer widely used in orthopedic applications that imply wear and particle generation. We describe here the response of human osteoblast-like MG63 cells after 6 days of culture in contact with artificially generated particles from both UHMWPE polymer and multiwalled carbon nanotubes (MWCNT)/UHMWPE nanocomposites. This novel composite has superior wear behavior, having thus the potential to reduce the number of revision hip arthroplasty surgeries required by wear failure of acetabular cups and diminish particle-induced osteolysis. The results of an *in vitro* study of viability and proliferation and interleukin-6 (IL-6) production suggest good cytocompatibility, similar to that of conventional UHMWPE (WST-1 assay results are reported as percentage of control \pm SD: UHMWPE = 96.19 ± 7.92 , MWCNT/UHMWPE = $97.92 \pm 8.29\%$; total protein: control = 139.73 ± 10.78 , UHMWPE = 137.07 ± 6.17 , MWCNT/UHMWPE = 163.29 ± 11.81 $\mu\text{g/mL}$; IL-6: control = 90.93 ± 10.30 , UHMWPE = 92.52 ± 11.02 , MWCNT/UHMWPE = 108.99 ± 9.90 pg/mL). Standard cell culture conditions were considered as control. These results, especially the absence of significant elevation in the osteolysis inductor IL-6 values, reinforce the potential of this superior wear-resistant composite for future orthopedic applications, when compared to traditional UHMWPE.