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In vitro study of UHMWPE/MWCNT – Preliminary results

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INTRODUCTION: Reinforcement of ultra high molecular weight polyethylene (UHMWPE) by adding multiwalled carbon nanotubes (MWCNT) allows improvement of mechanical characteristics for biomedical applications. However, there is controversy when it comes to carbon nanotubes toxicity [1-4].

METHODS: Osteoblast-like MG63cells were seeded on 12-well plates (7600 cells/well). Polyethylene particles and polyethylene with carbon nanotube reinforcement particles were suspended in growth medium in a concentration of 500µg/mL and added in triplicate to cells. The control group was cultured in growth medium only. These were cultured for 6 days, renewing medium and suspensions every 48 hours. All experiments were run three times, at least in triplicate. After 144 hours, the culture supernatant was removed and WST-1 reagent (BioVision) in medium added and cells incubated. Supernatants were centrifuged, transferred to 96-well plate and read at 450 nm and at 655nm. Cell lysates were obtained by use of Triton 0,1% and sonication and total protein measured using the BCA method (Calbiochem). For statistical analysis, because data were not normal, the Kruskal-Wallis test was used.

RESULTS: The microscopic observation of cultured cells shown morphological changes in the cells cultured with polyethylene particles: supranuclear vacuolization, a more spindle-like shape and suggestion of engulfed particles, at times. However, at 144 hours all groups had reached confluence.

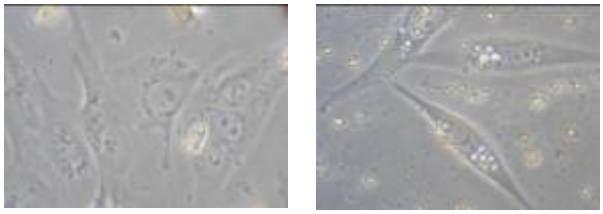

Fig. 1: Cells after 24 h in contact with composite nanoparticles (left) (400X) and polyethylene particles (right) (200X).

According to the WST-1 results there was no significant loss in viability.

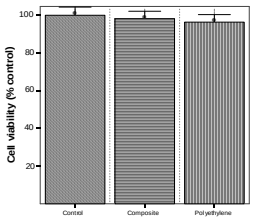

Fig. 2: Cell viability measured by the WST-1 assay (n=6). Results are expressed in percent related to untreated controls.

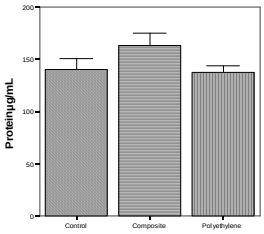

Fig. 3: Protein measured using BCA assay (n=92). Mean ± SEM.

Total protein values also failed to show significant differences between groups. However, protein measured was higher in the nanocomposite wells.

DISCUSSION & CONCLUSIONS: Although further studies are necessary and are being undertaken, the present results show good biocompatibility of the nanocomposite, comparable to results obtained by other authors. [2, 4]

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