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Cytotoxicity evaluation in vitro of MG-63 cell diamond-like carbon films containing titanium dioxide nanoparticles

C.C. Wachesk[1,3*], L. P. Pinto[1], M. M. Costa[2], R. Ricci[2], V.J. Trava-Airoldi[3], A.O. Lobo[4,5,6,7,], F.R. Marciano[4,5,7]

[1] Laboratory of Nanotechnology and Taxiology - Department of Science and Technology, Federal University of São Paulo (UNIFESP), SJCampos, SP, Brazil.

[2] Laboratory of Intracellular Compartment Dynamics - University of Vale do Paraiba

[3] Laboratory Associated of Sensors and Materials - INPE - SJCampos, SP, Brazil.

[4] Laboratory of Biomedical Nanotechnology, University of Vale do Paraiba

[5] Laboratory of Biomedical Nanotechnology, Brasil University

[6] Biomaterials Innovation Research Center, Harvard Medical School

[7] Nanomedicine Lab, Northeastern University

***cris_cw@hotmail.com**

Abstract: Coatings of diamond-like carbon (DLC) are characterized by their corrosion resistance, chemical inertness and wear resistance [1]. Some studies in the literature show the biocompatibility of the DLC films and their electrochemical behavior, indicating no toxic response of metal parts coated with these films and also increased its corrosion resistance [2]. DLC films with TiO_2 nanoparticles have been extensively studied as regards the electronic applications using the photocatalytic nature conductivity and transparency, which rely heavily on morphological and crystal structure [3]. Surfaces play a vital role in biology and medicine, with more biological reactions which occur on surfaces and in Interfaces [4]. Cell viability increases with increasing TiO_2 concentration of the film [5]. The first test level, within the evaluation of biocompatibility is to determine in vitro cytotoxicity. In comparison with the in vivo investigations, in vitro studies are more easily controlled and provide better reproducibility [6]. Cytotoxicity test aims to detect the potential of a material or device, to produce lethal or sublethal effects in biological systems at the

cellular level. This test should be applied to all categories of biomaterials [7]. **Results and Discussion**: Using the MTT test to evaluate mitochondrial activity and LDH test to evaluate cellular damage, the results suggest that the addition of TiO_2 in DLC films is effective in increasing the cellular viability. These characteristics indicate the potential use of TiO_2-DLC films in biomedical applications. This study reports the investigation of cell viability on TiO_2-DLC films deposited on 316 L stainless steel using plasma enhanced chemical vapor deposition. Cell viability and proliferation were evaluated by two in vitro tests: (Figure 3) 2-(4,5-dimethyl-2-thiazolyl)-3,5-diphenyl-2H-tetrazolium bromide (MTT), and (Figure 4) lactate dehydrogenase (LDH) assays. The exceptional cell viability and adhesion findings will be helpful to indicate the potential applications of TiO_2-DLC films in biomedical field. **Conclusions**: In this paper, the biocompatibillity of DLC and TiO_2-DLC films with Osteoblasts cells MG-63 was studied. The fibroblast mitochondrial activity increases with the presence of TiO_2 particles. Using the MTT test to evaluate mitochondrial activity, and LDH test to evaluate cellular damage, the results suggest that the addition of TiO_2 in DLC films is effective in increasing the cellular viability. These characteristics indicate the potential use of TiO_2-DLC films in biomedical applications

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