World Academy of Science, Engineering and Technology
International Journal of Materials and Textile Engineering
Vol:9, No:12, 2015

In Vitro Assessment of the Genotoxicity of Composite Obtained by Mixture of Natural Rubber and Leather Residues for Textile Application

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Abstract : In order to minimize environmental impacts, a composite was developed from mixture of leather shavings (LE) with natural rubber (NR), which patent is already deposited. The new material created can be used in applications such as floors e heels for shoes. Besides these applications, the aim is to use this new material for the production of products for the textile industry, such as boots, gloves and bags. But the question arises, as to biocompatibility of this new material. This is justified because the structure of the leather shavings has chrome. The trivalent chromium is usually not toxic, but the hexavalent chromium can be highly toxic and genotoxic for living beings, causing damage to the DNA molecule and contributing to the formation of cancer. Based on this, the objective of this study is evaluate the possible genotoxic effects of the new composite, using as system - test two cell lines (MRC-5 and CHO-K1) by comet assay. For this, the production of the composite was performed in three proportions: for every 100 grams of NR was added 40 (E40), 50 (E50) or 60 (E60) grams of LE. The latex was collected from the rubber tree (Hevea brasiliensis). For vulcanization of the NR, activators and accelerators were used. The two cell lines were exposed to the new composite in its three proportions using elution method, that is, cells exposed to liquid extracts obtained from the composite for 24 hours. For obtaining the liquid extract, each sample of the composite was crushed into pieces and mixed with an extraction solution. The quantification of total chromium and hexavalent chromium in the extracts were performed by Optical Emission Spectrometry by Inductively Coupled Plasma (ICP-OES). The levels of DNA damage in cells exposed to both extracts were monitored by alkaline version of the comet assay. The results of the quantification of metals in ICP-OES indicated the presence of total chromium in different extracts, but were not detected presence of hexavalent chromium in any extract. Through the comet assay were not found DNA damage of the CHO-K1 cells exposed to both extracts. As for MRC-5, was found a significant increase in DNA damage in cells exposed to E50 and E60. Based on the above data, it can be asserted that the extracts obtained from the composite were highly genotoxic for MRC-5 cells. These biological responses do not appear to be related to chromium metal, since there was a predominance of trivalent chromium in the extracts, indicating that during the production process of the new composite, there was no formation of hexavalent chromium. In conclusion it can infer that the leather shavings containing chromium can be reused, thereby reducing the environmental impacts of this waste. Already on the composite indicates to its incorporation in applications that do not aim at direct contact with the human skin, and it is suggested the chain of composite production be studied, in an attempt to make it biocompatible so that it may be safely used by the textile industry.

Keywords : cell line, chrome, genotoxicity, leather, natural rubber
Conference Title : ICTCME 2015 : International Conference on Textile Composites, Materials and Engineering
Conference Location : Sydney, Australia
Conference Dates : December 10-11, 2015