Surface modification for enhancing HaCaT cells response on collagen films by using plasma treatment

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Tissue engineering is a multidisciplinary and emerging field focused on providing substitutes that replace tissue and restore functions. There are three basic tools for the creation of a new tissue; cells, scaffold and growth factor. Cells synthesise matrices of the new tissue, while the scaffold provides the appropriate environment for cells and growth factor assists and promotes cells to regenerate new tissue. Hence, this substrate-cells interaction is ubiquitous in clinical trials such as skin transplants for patients who have burns, skin ulcers, corneas, cartilage, bone, liver and other tissues [1].

Collagen is an abundant mammalian protein which is involved in many important biological functions such as tissue formation, cell attachment and proliferation. That is why this protein affords extensive possibilities in the design of materials with medical application, being widely used in tissue engineering [2].

In this regard, plasma treatment is an effective tool, which is of growing interest in biomedical engineering, since it is able to enhance surface properties and biocompatibility without affecting bulk characteristic [3, 4].

In this contribution, air, argon and nitrogen plasma treatment were used to modify the surface of atelocollagen films. In order to evaluate the effects of the treatment, both the untreated and treated samples were characterised by using X-ray Photoelectron Spectroscopy (XPS) and Scanning Electron Microscopy (SEM) imaging. Cell growth was carried out by culturing human immortalised keratinocyte (HaCaT) cells and proliferation was measured by MTT assay.

It was observed that cell growth was significantly enhanced after using plasma treatment. It may be ascribed to the favourable role of plasma treatment in inducing surface oxygen-containing entities together with increasing surface roughness.

The aim of this study is to assess the HaCaT keratinocyte cell response on collagen plasma-treated films trying to accomplish a novel material potentially suitable for tissue engineering applications.