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Calcium Alginate-Nanographene Oxide hybrid hydrogel for improved biomedical applications

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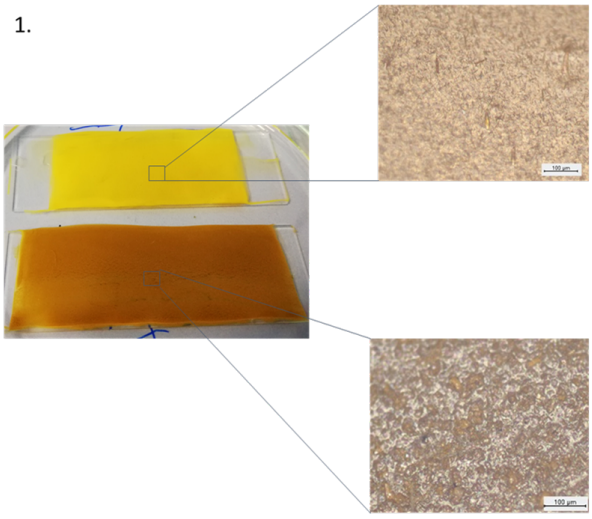
Due to its high surface-volume ratio and the presence of both hydrophilic and hydrophobic portions in its structure, in recent years, graphene oxide sparkled interest for its biomedical applications [1]. In this work, graphene oxide nanosheets (NGO) without any previous modification has been blended into alginate polymer with a straightforward approach, resulting in a homogeneous dispersion. Alginate has been widely used in biomedicine, mostly because of its biocompatibility [2]. Here, the capacity of alginate to form physical hydrogels in the presence of divalent ions (e.g. calcium ions), through ionotropic gelation [3], has been exploited to achieve a flexible and mechanically stable hydrogel film. Such system has been loaded (before and after gelation) with curcumin, as natural bioactive compound, in order to evaluate its ability to synergize the biological activity of the loaded therapeutic. Preliminary *in vitro* analyses showed promising results: compared to blank hydrogel synthesized in the absence of NGO, hybrid hydrogel was found to show selective toxicity towards Squamous Cell Carcinoma (*SCC*), with reduced toxicity towards healthy Primary Human Bronchial Epithelial Cells (*HBEpC*). This effect was ascribed to the ability of synthesized hybrid material to control the curcumin release over time: after 6 h, release amounts (%) of 60 and 100 were reached for hybrid and blank hydrogel, respectively.

References

[1] C. McCallion, J. Burthem, K. Rees-Unwin, A. Golovanov, A. Pluen, European Journal of Pharmaceutics and Biopharmaceutics, 104 (2016), 235–250.
[2] K.Y. Lee, D. J. Mooney, Progress in Polymer Science, 37, 106–126.
[3] O. Smidsrød, K. I. Draget, Food Colloids, Woodhead Publishing (2004) 279-293.

Figures

1.



2.

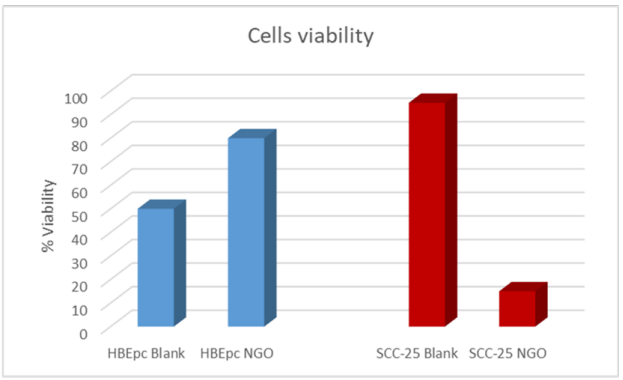


Figure 1. Blank and hybrid hydrogel films loaded with curcumin. Aside, their optical microscope images.
Figure 2. Biological activity of blank and hybrid hydrogels towards healthy and cancer cells.