Combinatorial analysis of marine based biomaterials: High-throughput analysis of the effect of nanostructured multillayers on cell behaviour.

Ana I. Neto[1,2*], Natália L. Vasconcelos[1,2], Sara M. Oliveira[1,2], João F. Mano[1,2]

[1]3B´s Research Group – Biomaterials, Biodegradables and Biomimetics, University of Minho, Headquarters of the European Institute of Excellence on Tissue Engineering and Regenerative Medicine. AvePark, 4806-909, Caldas das Taipas, Guimarães, Portugal. [2]ICVS/3B´s PT Government Associate Laboratory, Braga/Guimarães, Portugal.

*email: isabel.neto@dep.uminho.pt

In a marine environment, specific proteins are secreted by mussels and used as a bioglue to stick to a surface allowing generate irreversible bonding. Adhesive secreted proteins of mussels present an unusual amino acid 3,4-dihydroxyphenylalanine (DOPA). Inspired by the structure and properties of mussel adhesive proteins, layer-by-layer (LbL) coatings based on polymers that contain catechol groups were developed. We used dopamine-modified hyaluronic acid (HA-DN) prepared by carbodiimide chemistry to form thin and surface-adherent dopamine films. The multilayer films were developed by electrostatic interactions using chitosan (CHT) as polycation and HA-DN as polyanion. Multilayers films of CHT and HA were used as control. The formation of these films was investigated *in-situ* by quartz crystal microbalance with dissipation monitoring (QCM-D). Afterwards, many combinations of the marine inspired biomaterials were analysed in a high-throughput (HTS) way. Such multilayers were constructed and individually disposed on isolated transparent spots, patterned onto biomimetic superhydrophobic substrates. The adhesion properties of the coatings in the chips were also analyzed. *In vitro* tests using two distinct cell sources were carried out to evaluate the biological performance of the different combinations of multilayers that could be useful in different biomedical applications, including tissue engineering.