Hybrid nanomaterials for *in vitro* model fabrication and characterization

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The production of realistic *in vitro* models is of high relevance to understand different unresolved dissease mechanisms and to develop efficient drug testing platforms by reducing animal testing. Hybrid nanostructured materials can be designed to present different properties which can be higly valuable for biomedical applications such as *in vitro* model fabrication. For example, these materials can present stimuli-responsive behaviours, which is of high importance to mimic variable living biological systems. The exact reproduction of the forces and stimuli that occur in the human body is still a challenage in *in vitro* model design, however by the combination of hybrid nanomaterials, similar effects can be achieved. Moreover, understanding what happens in a complex biological system over time, is also of great interest. By including hybrid nanomaterials in such system their evolution can be monitored. Our focus is therefore, on the synthesis of hybrid nanostructured materials, which can used as inks for 3D printing techniques to fabricate responsive in vitro models of pathological interests and to develop nanostructured contrast agents and/or sensors to understand such models.

For example, we have developed different scaffolds to support tumor growth and evaluated their evolution thanks to those hybrid materials.[1,2] We are also working on the fabrication of an artery model, which consists of 3D printed layers including endothelial and smooth muscle cells. In addition, we are working on the fabrication of pulmonary models, specifically on the fabrication of an alveoli wall model representing the air-blood interface. We have included hybrid nanomaterials into the models which can act as contrast agents for correlative imaging techniques.[3–5]

Developing these advanced hybrid nanomaterials implies improvements in cell engineering techniques, in material designs, as well as in advanced imaging tools.

References

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