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BIOPRINTING TECHNIQUES FOR SCAFFOLDS MANUFACTURING: THE INTRICATE PROCESS FOR OSTEOCHONDRAL REGENERATION

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It is well known that we are living in a society with ageing population. Additionally, there is a lack of available organs for transplantation and limitations of clinical treatments for tissue regeneration. Thus, it has become essential to develop new medical therapies in this area. A tissue or organ may fail due to trauma, tumour, congenital disease or other pathology. When that occurs, the standard clinical procedure includes transferring healthy tissue to the damaged site in the same patient or transplantation of a functional organ from a donor. For these treatments, there are great inconveniences: the shortage of donors, rejection risk and the diseases broadcast tissue engineering (TE) is an interdisciplinary field which apply the principles of engineering along life sciences to develop biological substitutes that are able to restore, maintain or improve tissue function of their injured or diseased counterparts *in vivo*. However, there are several challenges to overcome: the lack of renewables sources of functional and compatible cells; the lack of biomaterials that provide adequate properties (mechanical, chemical and biological) and the high difficulty in generating high vascularization within the matrix. In the past decade, significant breakthroughs were reported in each of these domains. Therefore, it is essential to gather a deeper knowledge in biology, materials science, chemistry and engineering. With this presentation, we will discuss the effects on boosting an effective synergy between mechanical engineering (including robotics automatization) and biomedical sciences. That will benefit TERM from the revolutionary steps in manufacturing at industry 4.0. Revolutionizing the available procedures for tissue repair and regeneration brings the robotics expertise to the biofabrication domain; it will be possible to promote an outstanding precision with the ability to develop stimuli-responsive implant, employing a combination of responsive materials and novel construct geometries to amplify the consequence of the material response. Accordingly, we will provide up-to-date examples on significant steps on tailored implants for osteochondral tissue regeneration, as well as demonstrate what we should expect in the near future.

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