Enabling technologies for engineering osteochondral tissues

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As basic science advances, one of the major challenges in TE is the translation of the increasing biological knowledge on complex cell and tissue behavior into a predictive and robust engineering process. Mastering this complexity is an essential step towards clinical applications of TE. Enabling technologies, such as computational modeling allows to study the biological complexity in a more integrative and quantitative way [1]. Specifically, computational tools can help in quantifying and optimizing the TE product and process but also in assessing the influence of the in vivo environment on the behavior of the TE product after implantation.
The growing field of in silico medicine is focusing mostly on the two largest classes of medicinal products: medical devices and pharmaceuticals. However, also for advanced therapeutic medicinal products, which essentially combine medical devices with a viable cell or tissue part, the in silico approach has considerable benefits. In this talk an overview will be provided of the budding field of in silico regenerative medicine in general and computational bone tissue engineering (TE) in particular.
Examples will be shown to demonstrate how computational modeling can contribute in all aspects of the TE product development cycle: cells, carriers, culture conditions and clinics. Depending on the specific question that needs to be answered the optimal model systems can vary from single scale to multiscale. Furthermore, depending on the available information, model systems can be purely data-driven or more hypothesis-driven in nature. The talk aims to make the case for in silico models receiving proper recognition, besides the in vitro and in vivo work in the TE field.

Keywords : *In silico regenerative medicine, bone defects, bioreactors, scaffold design, systems biology*

References

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