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Design of a mechano responsive molecular brush with tuned biomimetic architectures

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At a fundamental level, cartilage consists of extracellular matrix, cells, and signalling factors. The mutual interaction among all these components assures the proper functionality. In case of injury this functionality is never recovered and the therapeutic modality for the treatment of osteoarticular disorders are still far from being able to generate a tissue that is comparable to native cartilage with respect to quality, stability, and integration. Based on this observation Tissue Engineering tries to reproduce in analogy with Nature this complexity: the scaffold provides cells with an in vivo-like microarchitecture; the cells settle this matrix; and the biological, chemical and physical factors direct the cells to express or maintain the desired tissue phenotype. Concerning scaffold production, Nanoscience and Nanotechnology are driving the revolution of Materials Science and Engineering and are enabling to design and fabricate novel scaffolds incorporating biomimetic characteristics at the cellular and molecular scales. A bottom-up strategy for the design and the synthesis of a biometic and mechano-responsive molecule is shown. In particular it will be shown the molecular features to be reproduced with particular enphasis on the design process.