

Séminaire



LABORATOIRE de MÉCANIQUE et GÉNIE CIVIL

Silvia Todros



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Amphithéâtre Jean-Jacques Moreau
860, rue de Saint Priest, Bat. 2
34090 Montpellier

Department of Industrial Engineering,
University of Padova, Italy

« Mechanics of biomaterials for tissue repair and regeneration: Experimental and computational approaches »

Abstract

The mechanical behavior of biomaterials has a fundamental role in several in vivo biomedical applications aiming at restoring structural function in biological systems. Since biomaterials can either replace damaged tissues or enable their regeneration, there are permanent or temporary interactions between biological tissues and biomaterials that come into contact. These interactions take several forms, among which mechanical aspects – such as tensile and compressive properties, time-dependent behavior, surface mechanics and friction – can be essential. Moreover, biomaterials mechanical properties can influence or regulate their biological performance. All these aspects shall be considered to define the functional requirements of biomaterials in the context of the specific nature of medical implants or artificial tissues.

Synthetic and naturally-derived biomaterials can be tailored to replicate the structural and mechanical properties of native biological tissues, providing a suitable environment for tissue regeneration. In particular, hydrogels are promising biomaterials for soft tissue repair and regeneration due to their structural and mechanical similarity with soft tissue and extracellular matrix.

Experimental and computational approaches for the analysis of the mechanical behavior of biomaterials for tissue repair and regeneration will be presented, with reference to different applications such as cartilage repair, neuro-regeneration, 3D bioprinting, and regenerative medicine of muscular and cardiac tissue.

