

Nanomedicine in the field of Orthopedic surgery

Name: Francesco Traina

Affiliation Università di Messina

The application of nanotechnology to bone substitutes is relatively a new frontier in orthopedic research, nevertheless they have been utilized in a number of applications, that include targeted drug delivery for orthopedic oncology, implantable materials for bone, cartilage and vertebral disk regeneration, surface enhancement for joint prosthesis, and diagnostic modalities. A variety of nanostructures with unique chemical, physical, and biological properties have been engineered to improve to achieve all these goals, including ceramics, polymers, metals, and composites. All these nanomaterials can be used to improve orthopedic implant by controlling their surface properties and their interaction with host environment. Since natural tissues are nanometer in dimensions and cells directly interact with nanostructured extracellular matrices, the biomimetic features and excellent physiochemical properties of nanomaterials play a crucial role in stimulating cell growth as well as tissue regeneration. Some of the key characteristics that make nanomaterials attractive for orthopedic applications include high strength-to-weight ratio, wear/corrosion resistance, antimicrobial/drug release potentials, and tissue integration/ regeneration capabilities. However, mimicking living bone tissue is still a challenge. The scope of this presentation is to highlight the most recent accomplishments and trends in designing nanomaterials and their applications in orthopedics with an outline on future directions and challenges