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Advanced Engineering of Tissue. Interdisciplinary Challenges and Opportunities Along the Science-based Value Chains

Tissue Engineering (TE) is a multidisciplinary research field which combines methods and approaches of several engineering disciplines (biomaterials, bioprocess engineering etc.), cell biology and medicine, aiming to create three dimensional mammalian tissue constructs which can be utilised for basic research, drug testing and medical applications. After a furious development in the 1980s and 90s legal restrictions and limitations concerning suitable and safe cell sources have slowed down further progress and especially translation to clinical applications. In the last decade novel research lines like organ-on-a-chip and 3D bioprinting have stimulated new approaches and raised new hope concerning the applicability of TE.
At the Centre for Translational Bone, Joint and Soft Tissue Research, a central research facility of University Hospital and Medical Faculty of TU Dresden, we are working on several aspects of TE including biomaterials research and scaffold fabrication, additive manufacturing, 3D cell culture and bioprinting, mostly of musculoskeletal and complex tissue equivalents. The lecture will provide an overview on recent developments in the field of artificial extracellular matrices, biomaterials for the treatment of defects in systemically altered bone, patient specific solutions and bioprinting. In collaboration with a South Korean research group we have also applied microgravity conditions as model for osteoporosis-like alterations of bone remodelling. Finally, the contributor will try to assess the value chains and future development of TE, also in connection to space research.