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Bioprinting technology for advanced tissue therapeutics

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Lecture : The recent development of bioengineering enables the creation of human tissues by integrating various native microenvironments, including tissue-specific cells and biochemical and biophysical cues. A significant transition of 3D bioprinting technology into the biomedical field helps to improve the function of engineered tissues by recapitulating physiologically relevant geometry, complexity, and vascular network. Bioinks, used as printable biomaterials, facilitate dispensing of cells through a dispenser as well as support their viability and function by providing an engineered extracellular matrix. The successful construction of functional human tissues requires accurate environments that are able to mimic the biochemical and biophysical properties of the target tissue. This talk will cover my research interests in building 3D human tissues and organs to understand, diagnose, and treat various intractable diseases, including cardiovascular, diabetic diseases, and cancers. The development of tissue-derived decellularized extracellular matrix bioink will be mainly discussed as a straightforward strategy to provide biological and biophysical cues into engineered tissues. I will also discuss the development of a 3D vascularized tissue construct generated by integrating the concept of tissue engineering and the developed platform technologies. Combined with recent advances in human pluripotent stem cell technologies, printed human tissues could serve as an enabling platform for studying complex physiology in the tissue and organ contexts of individuals.