

Direct impact of novel technologies and their evolution into viable products for the benefit of the human race is the major focus of this book. It describes the fundamentals of cell microenvironment to bring forth the relevance of 3D cell culture in tissue engineering and regenerative medicine. It also discusses the extracellular matrix/microenvironment (ECM) and emphasizes its significance for growing cells in 3D to accomplish physiologically viable cell mass/tissue *ex vivo*.

This work bridges the knowledge gaps between molecular-level fundamentals and technology applications through illustrations. It discusses the available models for 3D cell culture as well as the techniques to create substrates and scaffolds for achieving the desired 3D microenvironment. A definitive text, it can help upgrade our understanding about human physiology to the highest level with the scope of applying the knowledge for better diagnosis as well as therapeutics.



Ranjna C. Dutta is founder-director of ExCel Matrix Biological Devices (India's first and only innovation-based start-up in tissue engineering and regenerative medicine), Hyderabad, India, and manager at the Center of Excellence, Biomaterials for Orthopedic and Dental Applications, Material Research Centre, Indian Institute of Sciences (IISc), Bengaluru, India. She obtained her PhD from the Central Drug Research Institute, Lucknow, India.

She has worked at the National Institute of Immunology and the International Center for Genetic Engineering and Biotechnology, New Delhi, India, and the Indian Institute of Chemical Technology (IICT) and the National Institute of Nutrition, Hyderabad, India, on various collaborative as well as individual projects. She was also a visiting postdoctoral fellow at Northwestern University, Illinois, USA. She won the Prolog to Discovery award from IICT for an innovative project; a gold medal for one of her patents, co-authored with Dr. Aroop K. Dutta, from the DST-Lockheed Martin Innovation Growth Program (2009); and the Leaders in Innovation Fellowship (2015) from the Royal Academy of Engineering, UK. Dr. Dutta has over 22 international publications to her credit. Currently, she is engaged in the design and synthesis of novel, well-defined ECM mimicking macro-conjugates that can be used for creating instructive 3D scaffolds.



Aroop K. Dutta is managing director of ExCel Matrix Biological Devices. He received his BTech from the Harcourt Butler Technological Institute, Kanpur, India, and his MTech and PhD from the Indian Institute of Technology, Kharagpur, India. After working with both small and large pharmaceutical companies, he decided to pursue innovative R&D and along with Dr. Ranjna C. Dutta started ExCel Matrix. His vision is to develop innovative

3D cell culture technologies for regenerative medicine and conceptualize relevant business models to commercialize such technologies in India. Currently, he is involved with application development of ECM Analog® and Sol-Cell-Gel® technologies and their commercialization in India. Dr. Dutta has pioneered innovative rapid tissue prototypes and tissue manufacturing concepts. His key strategic focus is on socioeconomic challenges to innovation in a developing economy and on the development of bioengineering and regenerative medicine products.



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