

Preface

In late 2002, I was exposed to microarray bioprinting technology when my postdoctoral advisor, Professor Jonathan S. Dordick at Rensselaer Polytechnic Institute, received a MicroSys microarray spotter manufactured by Cartesian Technologies (later acquired by Genomic Solutions and DigiLab, Inc.) from VA Medical Center in Albany, NY. Since then, I was fascinated by the potential of microarray bioprinting technology and have focused my research career on developing surface chemistry and methods of printing various biological samples on chip platforms for miniaturized high-throughput toxicology assays. Through several research programs at Rensselaer Polytechnic Institute, Solidus Biosciences, Inc., and Cleveland State University, we have developed highly automatable, high-throughput microarray chip platforms and associated instruments that can be used for miniaturized biochemical- and cell-based assays to assess human metabolism and toxicology. As the lead scientist and the principle investigator, I have been working on the underlying technology for enzyme and cell encapsulation in hydrogel spots and “microarray three-dimensional (3D) bioprinting” on plastic chip platforms for high-throughput, high-content imaging assays. Specific areas of current research include enzyme, virus, and cell printing with inkjet-driven dispensing robots for use in miniaturized 3D cell cultures and organotypic tissue constructs created via layer-by-layer cell printing. In collaboration with engineers from Samsung Electro-Mechanics, Co., a chip platform (S+ micropillar chip and microwell chip) and associated instruments (S+ MicroArrayer and S+ Scanner) have been commercialized. However, implementing microarray bioprinting in miniaturized cell-based assays has been still challenging because of lack of standardized experimental procedures. To this end, I decided to write a book on microarray bioprinting technology with a number of fundamental and practical protocols. Although the majority of protocols provided in this book are based on methodologies we developed and optimized over 10 years, the chapters have all been written with significant contributions from my graduate students and postdoctoral fellow. Without their assistance, it would be

impossible for me to complete this book. I hope that this book will serve as a valuable reference manual for graduate students, postdoctoral fellows, scientists, and researchers working in this area of research. We envision that microarray bioprinting technology offers new opportunities for creating highly organized multicellular tissue constructs by precisely dispensing multiple human cell types in hydrogel layers on a chip with printing robots and mimicking the microenvironments of tissues *in vivo*, thereby potentially revolutionizing regenerative medicine, oncology, and drug discovery.

Cleveland, OH

Moo-Yeal Lee

Microarray Bioprinting Technology

Fundamentals and Practices

Lee, M.-Y. (Ed.)

2016, XIII, 175 p. 120 illus., 114 illus. in color.,

Hardcover

ISBN: 978-3-319-46803-7