Biofabrication: Chapter 9. A Digital Microfabrication-Based System for the Fabrication of Cancerous Tissue Models (Micro and Nano Technologies)

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Micro-electro-mechanical systems (MEMS) have revolutionized computation power due to their capabilities to develop advanced micro-architectures. MEMS technologies illustrate the potential for many applications in the field of tissue engineering, regenerative medicine, and life sciences. The fabrication of tissue models integrates the multidisciplinary field of life sciences and engineering. Presently, monolayer cell cultures are frequently used to investigate potential anticancer agents. These monolayer cultures give limited feedback on the effects of the microenvironment on chemotherapeutic and the heterogeneity of the tumor. A microenvironment, which mimics that of the cancerous tissue, will eliminate the limitations of the traditional mainstays of cancer research. The fabrication of such microenvironments requires a thorough investigation of the actual target organ, tissue, and/or tumor. Conventional MEMS technologies are developed for the fabrication of integrated circuits (ICs) on silicone wafers. Conventional MEMS technologies are very expensive and are not developed for biological applications. The digital micro-mirroring microfabrication (DMM) system eliminates the need for an expensive chrome mask by incorporating a dynamic maskless fabrication technique. The DMM is designed to utilize its digital micro-mirrors to fabricate biological devices. This digital microfabrication-based system provides a platform for the fabrication of economic biological models that are specifically designed to mimic the in vivo conditions of the tissue of interest.

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