論 文 の 内 容 の 要 旨

論文題目 Microfabricated device and technology to manipulate cells for regenerative medicine
（再生医療のための細胞制御を目指したマイクロデバイス）

氏　　名　金 成 旼

Development of microfabrication technology leads to multiple microfluidics tools for chemical and biological fields and development of materials technology has involved various biocomposite materials for medical applications as described in chapter 1.

In this study, the microfabrication-based technologies were employed for directing neuronal regeneration and cytoplasmic transfer associated with protein modification.

In chapter 2, we proposed combined biocomposite materials such as photo reactive gelatin with nerve growth factor and a photo-immobilization method of the biocomposite materials on a biological substrate with various micropatterns was used to properly modulate neuronal network and understand the desirable environment for nerve regeneration. The proposed micropatterned-immobilization platform showed remarkable effects on neuronal formation with simultaneous biochemical and topographical cues.

In chapter 3, we studied on cell fusion technology by a newly designed microfluidic platform for the practical application in regenerative medicine. The microfluidic platform using ES cells showed the feasibility of cytoplasmic fusion that indicates direct protein transduction. Our microfluidic platform-based cytoplasmic fusion may provide important keys and new insights for protein modification and pluripotency induction without requirement of genetic incorporation.

The sophisticated-microfabricated platforms can be introduced to precisely control various cells (e.g. nerve cell, ES cell, and etc.) considering the microenvironment as summarized in chapter 4. In another aspect, the resulting cells after cellular manipulation by our platforms can be deeply studied for its practical application in regenerative medicine and for revealing cellular mechanism.

Taken together, our system contributed to the development of useful platforms for directing cellular behaviors and protein transduction through well organized-microfabricated technology and device. By combining the proposed methods and technologies, we can consider the further study on neuronal regeneration and cell manipulation. Generation of nerve system and network will be deeply studied under multi-functional tools with aforementioned methods and novel properties, and that micro-manipulation of cells will be continuously studied by microfabricated devices with versatile functions for various purposes.

In conclusion, the proposed technologies in this study will offer new approaches useful for the required cell manipulation in regenerative medicine through the integrated and organized microenvironments.