Chip-based Impedance Measurement of Animal Cells Cultured in Peptide Hydrogel

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Abstract

Living organisms have a complex and well-organized 3-dimensional microstructure. Although 2-dimensional culture condition can frequently alter the cellular properties such as cell growth, morphology and cellular metabolism, most cellular experiments are accomplished by 2-dimensional systems.[1] Recently, there has been growing interest to establish in vivo like 3-dimensional environments. Among various biomaterials, peptide hydrogel is useful material for constructing 3-dimensional scaffold structure due to the high availability and biocompatibility. However, because it is difficult to quantify the cell growth and proliferation in 3-dimensional structure by microscope or conventional assays, it is necessary to develop a system for detection of in situ cellular aspects. Because the live cells are shielded by cell membrane, the amount of viable cells lead to higher impedance compared to medium without cells.[2] From this principle, in preliminary research, we have developed a microfabricated cell chip with a three-electrode system based on electrochemical impedance measurements.[3] In this study, we applies the cell chip for continuously monitoring the growth of cells in peptide hydrogel scaffold. The difference of impedance between hydrogel structure with cells and that without cells shows that it can be possible to monitor cell growth, viability, proliferation, and cytotoxicity.

References

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