Selective attachment of fibroblast cell by using micro pattern of extracellular matrix

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Introduction

Most mammalian cells grow as attached on the substratum through the focal contact which is the co-localization point of the intracellular cytoskeletal system, integrins at plasma membrane, and extracellular matrix(ECM). It has been suggested that intracellular signals delivered by focal contacts affect a variety of cellular behaviour. Therefore, we propose in this study that the pattern of ECM may play important roles in determination of intracellular signal generation and cell attachment.

Materials and methods

To test our hypothesis, we designed fibronectin micropattern as form of strip line with variations in size and spacing(2um~20um) using photolithography and micro-contact printing(uCP). Patterned silicon wafer were fabricated by using photolithograpy and the pattern were transcribed into PDMS stamp, which makes self assembled monolayers(SAMs) of hydrophobic molecules of undecyl-mercaptan on Au surface over glass wafer. The naked region was subsequently coated with hydrophilic molecules of $(CH_3(CH_2)_{11}(OCH_2CH_2)_6OH)$ and fibronectin was selectively attached to hydrophobic region in fibronectin solution(25ug/ml). The hydrophilic molecules were synthesized from 11-bromoundec-1-ene by addition reaction of hexaethylene glycol and thioacetic acid and also deacetylation reaction.

Results

The synthesized molecules were confirmed by UV and NMR spectrum. The fibronectin pattern and focal contact of human dermal fibroblast were confirmed by immunofluoresence staining. We observed that the cell attachment of fibroblast was controled by size and spacing of strip line of fibronectin.

References

1. J. Am. Chem. Soc., Vol. 113, No. 1, 1991.
2. Science, Vol. 264, No. 29, 1994.
3. Biomaterials, Vol. 23, 3123-3130, 2002.