Photoresponsive cell-trapping hydrogel layers for image-based single-cell sorting

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Recent advances in single-cell analysis have revealed that cellular heterogeneity is critical in diseases and therapy. A high-throughput workflow consisting single-cell imaging, sorting and gene analysis can directly associate single-cell phenotypes with genetic information, giving new insights into biological phenomena. Such workflow using microwells and droplets recently has been actively studied[1,2], but cannot allow for phenotypic analysis of adherent cells. In this study, we envision that a photoresponsive cell attachment surface achieves both the construction of single-cell array of adherent cells for image-based analysis and light-induced sorting in a high-throughput manner. Therefore, a substrate surface that allows light-induced control of both the attachment and retrieval of adherent cells was developed as a platform tool for the single-cell analytical workflow.

A thin photodegradable gel layer was prepared on a substrate surface by crosslinking gelatin with a photocleavable brunched polymers. Then, photoactivatable poly(ethylene glycol) (PEG)-lipid (PA-BAM)[3] was modified onto the surface of the gel layer. On the surface, cells were positioned through PA-BAM by exposure to a pattern of near UV light. Then, the cells were incubated, and their adhesion was observed with a microscope, followed with light-induced release from the surface (Figure 1).

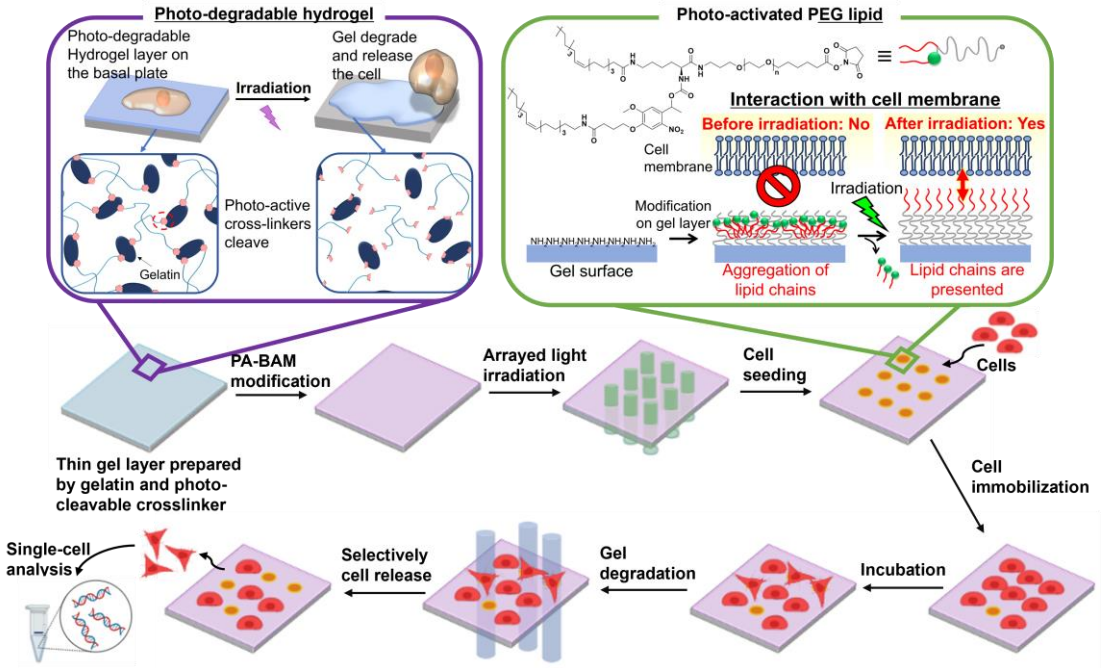

Figure 1. Illustration of the substrate surface enabling both light-induced cell patterning and release.

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