Photoactivatable substrate: a new platform for cell migration assay

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Cell migration plays critical roles in various physiological and pathological processes. For example, it is essential in embryonic development and morphogenesis. Also, cancer metastasis starts with tumor cell migration from original tissues, eventually forming a new colony in other tissues. Therefore, it is important to know how different between cell migration in these salutary and corruptive processes. Various in vitro assays have been developed for studying migratory behavior. Through these studies, it becomes clear that various internal and external factors regulate migration characteristics. However most of which were focusing on soluble factors or oncogenes, and less attention was paid for the contribution of cellular niches, composed of surrounding cells and extracellular matrices, on the regulation process.

To address this issue, we developed photoactivatable substrates which change the surface cell adhesiveness in response to light. On these substrates, we are able to not only confine the cells within the irradiated spots for controlling the geometry of individual cells and cell clusters, but also induce their migration by the secondary irradiation. It would remind you the conventional scratching wound healing assay, but the present approach has a big advantage in studying cell migration at the leading edge, as we can precisely control initial cellular pattern and exclude the effect of cell debris created during the scratching process. As an example, we examined the effect of initial cluster geometry on leader cell appearance in an epithelial cell line and found that its collective characteristics became enhanced by increasing cluster size as well as culture time. In addition, we have recently applied this concept to a nanopatterned substrate to look at the impact of cell-substrate interaction on migration collectivity. In this presentation, I will present some of our recent progress in our group.

References

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