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Program Title (English) : Effect of geometric curvature on collective cell migration using tortuous microchannel
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1. 概要(Summary)

Collective cell migration is crucial in physiological and pathological processes such as tissue development, wound healing and cancer metastasis. Many pieces of evidence showed that the mechanical cues, including topography, stiffness and confine environment influence cellular functions such as motility, differentiation and proliferation.

In recent research, Chihiro Okutani et al. reported C2C12 mouse myoblast cell descended or repelled by changing the radius of geometric curvature (Okutani et al., JJAP, 2017). However, the previous study focused on single cell behaviors; thus the understanding of collective cell migration response to the geometric curvature is still lacking. In this study, we developed a tortuous microchannel device to investigate the collective cell migration behaviors under different curvatures.

2. 実験(Experimental)

【利用した主な装置】

電子ビーム描画装置 (ELS 3700, Ellionix, Japan); 両面マスクアライナ (ZUSS MA-6)

【実験方法】

The fabrication process of the tortuous microchannel device was carried out using photolithography and soft-lithography techniques. Before photolithography process, we designed the tortuous microchannel using Wecas software that available in Electron Beam Lithography system (ELS 3700, Ellionix, Japan). The dimension of the tortuous microchannel is shown in Table 1. Next, we patterned the tortuous microchannel on a blank photomask using the E-Beam lithography system. To produce a silicon mold, we coated the negative photoresist SU-8 3050 on a blank silicon wafer with a spin speed at 3500 RPM to have a thickness around 50 µm. Then, UV exposure was performed using mask aligner (SUSS MA6) through the patterned mask and followed by development process. using developer chemical (PGMEA). After the development, the silicon mold was hard baked inside oven at 180 °C for 24 hours. To minimize adhesion effect, the surface of the silicon mold was salinized. We performed the soft lithography to obtain the tortuous microchannel using PDMS. The configuration of the tortuous microchannel is shown in Figure 1. Finally, we performed a collective cell migration experiment and study the effect of the curvature on the cell migration behavior.

Table 1: Dimension of the tortuous channels

Channel	1	2	3	4
Radius (µm)	25	25	50	50
Amplitude (µm)	75	100	100	125
Segment length (µm)	157	207	236	286
Channel length (µm)	100	100	150	150
Tortuosity index (TI)	1.57	2.3	1.57	1.91

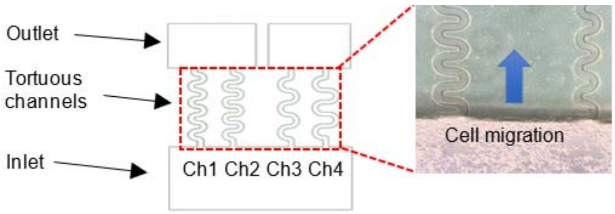

Figure 1: Configuration of tortuous microchannel

3. 結果と考察(Results and Discussion)

We have developed a confined tortuous channel device to examine the effect of geometric curvature on collective cell migration. Our results suggested that the geometric curvatures influence the collective cells velocity and morphology in tortuous microchannel.

4. その他・特記事項(Others)

I would like to thank you to Dr. Agus Subagyo for his guidance and technical assistant during the fabrication process of the tortuous microchannel.

5. 論文・学会発表(Publication/Presentation)

1) JSME Biorheology Conference, 2019

6. 関連特許(Patent) -*none*-