課題番号　:F-19-KT-0101
利用形態　:機器利用
利用課題名（日本語）　:生体外における腎機能と腎毒性評価のための近位尿細管チップの製作
Program Title(English)　:Realization of a proximal tubule on a chip to access the organ function and nephrotoxicity in vitro
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キーワード／Keyword　:バイオ＆ライフサイエンス、リソグラフィ・露光・描画装置、マイクロ流路、PDMS

1. 概要（Summary）

The human renal proximal tubule is comprised of an endothelial/epithelial tissue bilayer and is responsible for reabsorbing water, glucose and certain proteins such as albumin from the glomerulus ultrafiltrate . This project aims to mimic the organ physiology and function in vitro. To do so we designed a microfluidic device comprised of two identical PDMS slabs that sandwich a porous PET membrane. RRPTECs (epithelial cells) and HUVECs (endothelial cells) are seeded through the isolated microchannels on the top and bottom slabs, respetively. In this fassion the bilayer can be fed with two media types using a microfluidic perfusion culture system. Formation of a bilyaer that could last for 10 days was demostrated. The onchip bilayer was subjected to immunostaining and a number of functional and nephrotoxicity assays.

2. 実験（Experimental）

【利用した主な装置】

PEM-800 Double View Mask Aligner

【実験方法】

PDMS slabs with S-shaped channels were cast-molded on a Si wafer carrying the embossed channel pattern. The pattern was formed using standard SU-8 photolithography and had a height of ~350 μm. To align the photomask on the Si substrate we used this PEM-800 mask aligner. After curing PDMS at 65°C, the slabs were cut and peeled off from the Si mold. The bottom slab with the channel side faced down was gently put on a glass slide, initially spin-coated with a thin layer of PDMS (uncured), and then removed immediately. This thin PDMS layer served as an adhesion layer once the membrane was sandwiched in between the layers. The slabs were brought together under a microscope to ensure proper alignment and joined securely by curing the thin adhesion layer at room temperature overnight.

3. 結果と考察（Results and Discussion）

Fig. 1 shows photographs of the device in different views. Top and bottom channels are distinguished by filling with blue and red inks, respectively. The membrane was treated with a cell-adhesion agent before cell seeding.

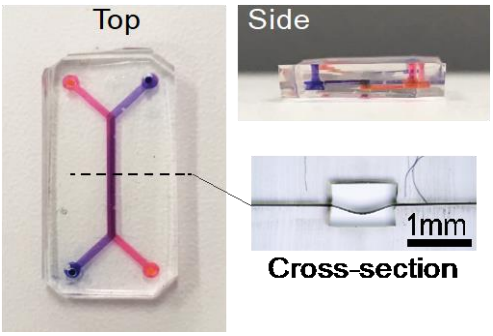

Fig. 1. Photographs of the device showing the microchannels and the suspended membrane.

RPTECs and HUVECs cultured on the opposite sides of the membrane formed a confluent bilayer that was viable for at least 10 days.

4. その他・特記事項（Others）

なし

5. 論文・学会発表（Publication/Presentation）

(1) R. Banan Sadeghian et al., MicroTAS 2019,

Basel, Switzerland, 2019/10/27-31.

(2) R. Banan Sadeghian et al, 36th Sensor Symposium, ACT City, Hamamatsu, 19/11/19-21.

6. 関連特許（Patent） なし