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Towards the veterinary diagnostics of the future

Main topic :

Innovation on microfluidic-based device for biomedical study and diagnosis

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Introduction

Since, cellular heterogeneity is still the major hassle for our comprehension in cancer cell biology. Therefore, to overcome the problem, a single cell analysis method should be established. Then, the development of microfluidics-based device on single cell analysis had been conducted in order to sorting, trapping, identification and also as the lab on chip for diagnosis. The cellular heterogenicity is the major hassle in cancer cell biology. To overcome the problem, the single cell analysis is indispensably recommended.

Methods

Microfluidics device is fabricated with an elastomer substrate, poly dimethyl siloxane (PDMS) under standard soft lithography using canine round cell tumors, Mast Cell Tumor (MCT) as a model

a) Sized-based cancer cell sorting with Archimedean spiral microchannel based on the chip. The mechanical Dean drag forces and micro-vortices which focus cells into the responsible streamlines depending on their individual sizes. The viability of the sorted cells has been observed.

b) Microfluidics-single cancer trapping; the objectives of this project are to design the microfluidics-based device which can trap cancer stem cells in to the triangular microwell array at the ratio of 1 cell per microwell using recirculation flow generated by microwells. This isolation system is so indispensable because it is the prototype for cultivating any cancer cells could in microwell array and can be merged the releasing system into the chip for liberating our targeted from the microwell for further biological identification and viability investigation.

The developed microfluidic system; Lab on Chip (LOC) applying for diagnostic purpose of blood parasite infection from the blood and blood cell samples.

The device has been successfully applied on the diagnosis of microfilaria, Dirofilaria immitis from the dog blood and the screening of red blood cells infected with Malaria by the magnetophoretic on the chip.

Results &Conclusion

The performance of the microfluidic device is high-throughput and sensitive. The yield of MCT cells trapped in single cells the wells is approximately 50 % with ratio of single to multiple cell trapping was high at 2.7:1. In addition, 80.5% of the trapped cells were viable. We could demonstrated how to use the fundamental of microfluidic devices to manipulate the behavior of fluid in microchannels resulting in the separation of different-sized cancer cells and trapping in the single cell in the wells with satisfactory viability results. The obtained results are especially beneficial in cancer cells, as it can provide modernized guidelines for treatment and monitoring of cancer in precision medicine. Additionally, the parasitic diagnosis from blood sample could be applied.

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