

# GENERATION OF EFFECTIVE ENDOTHELIAL CELL POPULATIONS FOR MICROFLUIDIC TECHNIQUES

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Development of techniques for self-developing capillary endothelial networks in vitro [1, 2] has led to the necessity for accelerated production of effective, diverse and mobile populations of free endothelial cells ex tempore for microfluidic biotechnical systems and platforms.

To solve this problem, a biotechnical platform can be proposed: an endothelial cell generator, that includes a hermetic container designed to accommodate an umbilical cord or other morphological formation with the connection of their hemocirculatory systems to the platform's circulation system.

After microsurgical implantation of the umbilical cord or other morphological formation, the hermetic container is filled through one of the hermetic ports with a special nutrient mixture that provides long-term maintenance of vital processes in the biological object. Hermetic ports are also designed for controlled connection with the external environment and circulation of physiological fluids.

A peristaltic pump with a display control processor pumps special physiological fluid through the vessels of the umbilical cord or other morphological formation.

The processor-display module regulates and controls the speed and volume of the pumped liquid and displays information on the screen. The recirculating flask is intended for accumulation and buffering of the circulating liquid. The peristaltic pump selects the physiological fluid from the recirculating flask, pumps it through the vessels of the umbilical cord or other morphological formation, after which the liquid flows back into the recirculating flask. Then the process is repeated cyclically. During the working cycle of the platform, the dynamics of changes in the concentration of free endothelial cells is monitored and their identification is carried out.

The endothelial cell generator has a special interface for connecting external microfluidic biotechnical systems and platforms that implement technologies of self-developing capillary endothelial networks in vitro.

The proposed endothelial cell generator makes it possible to exclude the stage of obtaining a primary endothelial culture with classical methods from the biotechnological cycle of generating self-developing endothelial capillary networks in vitro. It greatly simplifies and reduces the cost of biotechnologies for obtaining artificial tissue-like formations with specified biological properties based on microfluidic technologies of self-developing endothelial capillary networks in vitro.

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[1] Глотов В. А. Перспективы получения саморазвивающихся и функционирующих капиллярных сетей in vitro на основе клеточных культур эндотелия. // Стволовые клетки и перспективы их использования в здравоохранении. Материалы конференции (Приложение к журналу "Бюллетень экспериментальной биологии и медицины"). М.: Издательство РАМН, 2003. – С. 64-68.

[2] Sudong Kim, Hyunjae Lee, Minhwan Chung, Noo Li Jeon. Engineering of functional, perfusable 3D microvascular networks on a chip Lab Chip, 2013, 13, 1489-1500.