

عنوان مقاله:

Two-chamber Microfluidic System Used as Artificial Blood Vessel for the Investigation of the Entire Migration Steps of Metastatic Intravascular Cancer Cells

محل انتشار:

هفتمین کنفرانس دانشجویی مهندسی مکانیک (سال: 1392)

تعداد صفحات اصل مقاله: 5

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خلاصه مقاله:

We present the design and the fabrication process of an artificial blood vessel system for the in vitro examination of the entire migration steps of metastatic intravascular cancer cells under continuous laminar flow conditions at distinct tunable shear rates using live cell fluorescence microscopy. The microfluidic system is composed of two layers: An upper layer with two sets of microstructured channels simulating the blood vasculature, and the lower layer, which consists of two large channels filled with components of human vascular surrounding tissue. Both layers are separated by a porous membrane with a specific pore density distribution. Prior to the experiments the membrane is coated with a homogeneous monolayer of endothelial cells (EC) to mimic the blood vessel wall. The whole system consists of the polymer polycarbonate due to its excellent biocompatibility and optical transparency. The two layers of the microfluidic system are fabricated by hot embossing and finally assembled using a thermal bonding process. The work was accompanied by numerical simulations of the flow behavior of the cancer cells considering cell diameter and viscosity of the blood. It could be shown that a predictable number of the cancer cells remains in the blood vessel system, where they can interact with the monolayer of endothelial cells. Our experiments have shown that a small number of those cancer cells penetrate the EC monolayer and the porous membrane entering the matrix of the lower channel. Thus it was possible to observe the process of cancer cell extravasation under laminar flow conditions

کلمات کلیدی:

microfluidic system, hot embossing, thermal bonding, artificial blood vessel, cancer cell

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<https://civilica.com/doc/236517>



