

Miura, T.; Tanaka, R.**In vitro vasculogenesis models revisited – measurement of VEGF diffusion in matrigel.**(English) [Zbl 1167.92005](#)[Math. Model. Nat. Phenom. 4, No. 4, 118-130 \(2009\).](#)

Summary: The circulatory system is one of the first to function during development. The earliest event in the system's development is vasculogenesis, whereby vascular progenitor cells form clusters called blood islands, which later fuse to form capillary networks. There exists a very good in vitro system that mimics this process. When HUVECs (Human Umbilical Vein Endothelial Cells) are cultured on Matrigel, they spontaneously form a capillary network structure. Two theoretical models have been proposed to explain the pattern formation of this in vitro system. Both models utilize chemotaxis to generate spatial instability, and one model specifies VEGF as the chemoattractant.

However, there are several unknown factors concerning the experimental model. First, the pattern formation process occurs at the interface between the liquid medium and matrigel, and it is unclear whether diffusion in the liquid or gel is critical. Second, the diffusion coefficient of VEGF, which determines the spatial scale of the capillary structure, has not been properly measured. We modified the experimental system to clarify the effect of diffusion in matrigel, and experimentally measured the diffusion coefficient of VEGF in this system. The relationship with the spatial scale of the pattern generated is discussed.

MSC:[92C15](#) Developmental biology, pattern formation[92C17](#) Cell movement (chemotaxis, etc.)[35Q92](#) PDEs in connection with biology, chemistry and other natural sciencesCited in **5** Documents**Keywords:**

pattern formation; HUVEC; vascular endothelial growth factor (VEGF)

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