A Mathematical Cellular Pott's Model for Growth and Migration of Endothelial Cells

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Several studies have suggested mathematical models that simulate growth and migration of endothelial cells and capillary network formation in angiogenesis[1-2]. The target is to predict endothelial cells and constructed capillary network behavior in different cellular environmental conditions. This study presents a cellular Pott's model to simulate an endothelial cell growth and migration. The extracellular matrix affects the cell through environmental signals which are chemical and mechanical. Chemical signals activate cell receptors and start changes in cells' internal machinery. It is considered that the main signaling agent in extracellular matrix is tumor angiogenic factor(TAF) that is released by tumor. Mechanical signals are created due to interaction of cell receptors and extracellular matrix elements like fibers.

Using a cellular Pott's model for cellular dynamics, growth and migration of an endothelial cell integrated with the signals cell receive from the environment. The results of the model predict cell migration and growth based on environmental cues. Chemotactic movement of the endothelial cell in response to the TAF gradient is seen clearly in this model. The results of this model can be extended to multiple endothelial cells and in next steps, to simulate a capillary and eventually, network formation.

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