# ABSTRACT

This paper deals with the expression of vascular endothelial growth factor (*vascular endothelial growth factor, VEGF*) and its use in tissue engineering of vascular wall. During the work interaction of endothelial cells with the modified fibrin-based biomaterial into which vascular endothelial growth factor (VEGF-A121) has been incorporated was monitored. This modification supported the adhesion and growth of endothelial cells.

Vascular endothelial growth factor VEGF-A121 is signal glycoprotein that activates transmembrane receptors on endothelial cells. VEGF-A121 is a key regulator in vasculogenesis, angiogenesis, proliferation, migration and survival of endothelial cells. In this work, this protein was heterologously expressed at a thioredoxin fusion partner in an expression system of *E. coli* Origami B (DE3). Recombinant VEGF-A121 was additionally coexpressed with bacterial chaperones GroEL/GroES for potential increase of its solubility and biological activity.

In the next part of this work thin fibrin network was prepared by catalytic action of thrombin on the polystyrene-bound monolayer of fibrinogen. This network has been further enriched by vascular endothelial growth factor (VEGF-A121), which was covalently incorporated in it by enzyme activity of transglutaminase (factor XIIIa).

The last part of the thesis is devoted to the vascular tissue engineering. The influence of the growth factor VEGF-A121 on endothelial cell growth was monitored using tests of metabolic activity. The activity of VEGF-A121 was then compared with a commercially available growth factor. Recombinantly prepared growth factor VEGF-A121 showed higher biological activity and promoted endothelial growth of cells on the substrate surface, namely polystyrene.



**Keywords:** growth factor, VEGF-A121, endothelial cells, surface modification, heterologous expression, vascular tissue engineering


(in Czech)