Angiogenesis is the basic process of creating new capillaries from existing blood vessels, necessary for a number of physiological and pathological processes. Its control takes place thanks to the complex signaling pathways in the cells. There are several chemical "switches" produced by the body that regulate this process by stimulating or inhibiting the formation of new blood vessels. In a healthy body, there is an appropriate balance between regulatory factors, and angiogenesis is necessary, inter alia, to repair wounds and create a placenta during pregnancy. The development of many diseases is associated with excess or deficiency in the blood vessels formation, so the possibility of modulation of this process is a significant challenge for modern medicine. One of the strongest stimulators of angiogenesis is vascular endothelial growth factor (VEGF-A_{165}). It regulates cell proliferation and migration, as well as vascular permeability. This protein binds to the receptors from VEGFR and neuropilin (NRP) family, including NRP-1 isoform, which can form NRP-1/VEGF-A_{165}/VEGFR complex and also act independently. Blocking the NRP-1 signaling pathway can be one of the effective ways to fight disease.

The aim of the project is the synthesis, analysis of the stability and biological activity of short peptidomimetics, based on the sequence with high affinity for NRP-1 that was developed in our laboratory. Studies on the structure-activity relationship of peptides will be carried out. For modifications, we will use unnatural amino acids and urea units, which are amide bond mimetics. Designed compounds should be characterized by a significant increase in the half-life in tissues and serum due to fragments that are not recognized by enzymes. Due to the literature reports and preliminary studies that have resulted in the design of sequences with significantly improved inhibitory activity of the VEGF-A_{165}/NRP-1 complex, the effect of thiol group and thiol-containing side chain length on affinity for NRP-1 will also be investigated. In the next stage, the obtained results will be used to design the so-called "super sequence", which will be a peptidomimetic containing all key elements for both, activity and stability. Selected compounds will be also tested for selectivity against other receptors associated with the angiogenesis process. The most active inhibitors will be tested *in vitro* and *in vivo* in the future.

Obtained results in the research will bring new information on the interactions of ligands with NRP-1 and other receptors involved in the formation of blood vessels. Moreover, despite the very great advances in therapies that have taken place in recent decades, there is still a deep need for innovative pharmaceuticals that mark new pathways or improve the functioning of existing therapies. Stable and active peptide-urea inhibitors have a chance for application in the treatment of diseases associated with angiogenesis in the future.