ABSTRACT

Diploma thesis title: **In vitro study of ^{99m}Tc-labelled peptide targeted on VEGF receptor**

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Background: Recent advances in tumour imaging and therapy have highlighted the potential of radionuclide-labelled biologically active molecules specificaly targeting tumour-associated receptors. Therefore, the presented study aimed to develop and evaluate an 18-amino acid peptide labelled with technetium-99m ([^{99m}Tc]Tc-MA peptide) as a possible tool for imaging of cancer processes positive on the VEGF receptor type 2 (VEGFR2), a critical component in tumour angiogenesis.

Methods: The MA peptide was synthesized by extending a previously reported 15-amino acid peptide with three additional amino acids (lysine, aspartic acid, and cysteine) to enhance its water solubility and facilitate radiochemical modification. After labelling the MA peptide with technetium-99m and its purity control, it was tested for stability in mouse serum. Then human glioblastoma cell line (U-87 MG) was used for *in vitro* internalization, saturation, and competition study with the prepared [^{99m}Tc]Tc-MA peptide.

Results: The optimalization of radiolabelling process achieved 100% radiochemical purity, and the [^{99m}Tc]Tc-MA peptide demonstrated high stability in mouse serum, with a biological half-life exceeding 180 minutes. In addition, [^{99m}Tc]Tc-MA peptide showed a good and steady rise in internalization of radioligand and the majority of receptor-bound [^{99m}Tc]Tc-MA peptide was internalized after 90 min. Moreover, a strong binding affinity of [^{99m}Tc]Tc-MA peptide to VEGFR2 was observed, with the found values of equilibrium dissociation constant K_D = 103.2 nM and inhibitory concentration IC_{50} = 3.75 μM.

Conclusion: The above summarized results indicate that the [^{99m}Tc]Tc-MA peptide could be considered a promising agent for VEGFR2-targeted tumour imaging, warranting further investigation in *in vivo* preclinical studies.

Keywords: angiogenesis, peptide, technetium-99m, tumour imaging, SPECT, VEGFR2