[68Ga] peptide high-output production on commercially available MiniAiO® synthesizer

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Introduction: Gallium-68 is a metallic positron emitter with a half-life of 68 min that is ideal for labelling small peptides as radiopharmaceuticals thanks to the use of a chelating agent with several clinical applications. Numerous gallium-68 labelled peptides (eg. [68Ga]DOTA-TOC/-NOC, [68Ga]HBED-PSMA-11, [68Ga]NODAGA-RGD) have shown their interest [1,2]. Developing an easy, rapid and performant labelling method is important. Different methods for the pre-purification of the generator eluate have been explored in the literature, although recent improvement on some generator brands (i.e. low 68Ge breakthrough and low metallic impurities content), makes this pre-purification unnecessary. Development of a labelling process, GMP-compatible and reproducible, using a commercial synthesis module for every peptide labelling is a real challenge for the nuclear medicine. The method presented herein uses a cassette-based approach and a MiniAiO (mAiO, Trasis®) module and has been tested with the IGG100 68Ge/68Ga generators.
Materials & Methods: Preclinical IGG100 was used as 68Ge/68Ga generator. Precursors of radiolabelling were bought from ABX. Automated 68Galabelling was performed without pre-purification in mAiO module. Reaction parameters such as sodium acetate concentration, precursor quantity, temperature and time were optimized for each peptide. Labelling efficiency was determined on Waters HPLC system. Results: DOTANOC, DOTATOC, HBED-PSMA-11 and NODAGA-RGD were tested for 68Ga-labelling without pre-purification. Optimal and reproducible conditions were determined for each peptide. 68Ga-peptides were synthesised with excellent incorporation yields, (90-99%) and high synthesis yields > 60% in less than 15 min.
Discussion/Conclusion: We developed an efficient automated strategy for peptide labelling with gallium-68. [68Ga]DOTANOC, DOTATOC, [68Ga]HBED-PSMA-11, [68Ga]NODAGA-RGD were obtained in high radiochemical yield. Their preparation could be performed with this automation and their use in human could be done under clinical trial.
References: [1] Breeman W, de Blois E, Chan HS, et al. [2011], Semin Nucl Med, 41: 314-321 [2] Velikyan [2014], Theranostic, 4(1): 47-80