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Challenges in method developing of 18F-FMISO synthesis with cartridge purification

Content

[18F]fluoromisonidazole ([18F]FMISO) as nitroimidazole derivative with 18F radioisotope is widely known and studied radiopharmaceutical for PET evaluation of imaging hypoxia. In recent years, there is increasing number of articles describing the modified syntheses with different synthesis modules and purification procedures of [18F]FMISO.
The goal of this work was to take a view of solid phase extraction (SPE) method challenges in developing of [18F]FMISO synthesis process with Synthera module. We synthesized [18F]FMISO under various reaction conditions and different purification cartridges with Synthera synthesizer.
The synthesis was performed by nucleophilic substitution of 1-(2'-nitro-1'-imidazolyl)-2-O-tetrahydropyranyl-3-O-toluenesulfonylpropanediol precursor and subsequent acidic hydrolysis. A product mixture after was sent to waste over the Sep-Pak cartridges, whereby the final product was eluted from the cartridge with small amounts of ethanol in water. SCX, Alumina and six different RP extraction cartridge (HLB light, HLB plus LP, C18, tC18, C18 environmental, PS-RP) were used for SPE purification.
Product samples, cartridges elution samples and waste samples were observed for chemical by-products and radiochemical purity with HPLC and TLC analysis.
In this study, we successfully synthesized final product with reasonable radiochemical yield and high chemical and radiochemical purity of [18F]FMISO. The product meets all the requirements of the Ph. Eur. Monograph.

Key words: production, Sep-Pak cartridges, [18F]fluoromisonidazole, purification

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