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A practical method for the preparation of 18F[TFB] labeled with sodium fluoride, using a ITG IQS Fluidic Labelling Module

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Background:18F-Tetrafluoroborate (18F-TFB) is a radiotracer, promising iodide analog for PET imaging of thyroid cancer and sodium/iodide symporter (NIS) reporter activity in viral therapy applications. The aim of this study was to Standardization y characterization of new radiosynthesis method of 18F[TFB], in facilities with little infrastructure.
Methods: 18F was produced in a cyclotron via the 18O(p,n)18F reaction with 18 MeV protons and then delivered to the hot cell and trapped on a QMA and plus accell CM cartridges, the cartridge was rinsed with 10 mL of water and dried with nitrogen for 3 minutes. After this step the QMA was eluted with 1.2 mL of NaCl 0.9 % ([18F]-NaF 740-1850 MBq) in the reactor where it contains 100uL of NaBF4 dissolved in water (10ug) were mixed. The mixture was left to react at 120℃ for 20 min venting the reactor every 5 minutes.
The crude 18F-TFB product was purified by SPE using a Sep-Pak Alumina Light and plus cartridge, and washed with 1 mL of water. Then it was diluted with 5 ml of isotonic sterile saline and filtered through a hydrophilic 0.22 μm Millex. Radiochemical purity was determined by TLC using SG strips as stationary phase methanol as mobile phase. TLC-strips were analyzed by autoradiography. Preclinical evaluation in Wistar rats was performed using a Focus 120 microPET (UNAM).
Results: Labeling and formulation took about 30 min, and radiochemical purity of 18F[TFB] was higher than 98%. The radiochemical yield of 18F-TFB was 31.0% ± 0.7% (n=10) uncorrected in a synthesis time of 20 min (Fig 1).
The final product 18F-TFB was analyzed for radiochemical purity by both radio-TLC (MeOH, Rf = 0.23 for fluoride, 1.04 for 18F-TFB) and anion chromatography HPLC with a radioactivity detector (retention times, 3.7 min for 18Ffluoride, 7.8 min for 18F-TFB).

Conclusion
Based on the results of radiochemical purity and quality control, we can determine that the method is possible to adapt in facilities where there is little equipment infrastructure.
A solid-phase supported synthesis of 18F-TFB was developed via [18F]-*NaF. With the optimized condition, the radiochemical yield of 18F-TFB was 31.0% ± 0.7% (n=10) uncorrected in a synthesis time of 20 min.

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