INTRODUCTION

[18F]-Fluorocholine is used to detect metastatic prostate cancer [1], recurrent brain tumors and hepatocellular carcinoma [2,3]. Automated methods to synthesize [18F]-Fluorocholine are available on several radiosynthesis platforms, but these approaches suffer from fluctuations of yield, emission of radioactive gas when using the older dibromomethane method and high quantity of 2-Dimethylaminomethane (DMEA) in the final product. Herein, we present an automated one-pot method with an improved purification for the efficient routine production of [18F]-Fluorocholine under cGMP conditions, avoiding the pitfalls of the gaseous method.

METHODS

[18F]-Fluorocholine is prepared using an AllinOne synthesizer. The reaction of methylene bis(toluene-4-sulfonate) precursor (1) with cyclotron-produced [18F]Fluoride gives the [18F]Fluoromethyl 4-methylbenzene sulfonate intermediate (2). Upon completion of the labelling step, a mixture of DMEA and DMF is added to the reactor and the quaternization of the amino group is achieved leading to compound 3. The solution is efficiently purified passing through a series of SPE Sep-Pak tC18 and HLB cartridges and [18F]-Fluorocholine is trapped on Sep-Pak CM cartridges. After elimination of residual impurities such as the DMEA, the formulated product (4) is eluted from the CM cartridges with 0.9% physiological saline, passed through a 0.22 µm filter to a sterile dose vial and submitted for quality control testing.

RESULTS

This synthetic method has been successfully implemented on an AllinOne synthesizer and gives a high reproducible yield without release of any radioactive gas and a high chemical (DMEA content < 1 µg/mL) and radiochemical (RCP > 99%) purities. Total synthesis time is about 39 minutes. Typical non-decay-corrected yields of [18F]-Fluorocholine are around 25 ± 5% non-decay corrected, whatever the starting activity (Figure 2). The product is stable up to 10 hours with a volumic activity of 4.5 GBq/mL and is compliant to any QC testing.

CONCLUSIONS

A fully automated synthesis of [18F]-Fluorocholine, purification and formulation included, has been implemented on the AllinOne synthesizer by Trasis with high reproducible radiochemical yield and efficient chemical purity.

References: