

Effective and reliable production of [¹¹C]methionine: on-column ¹¹C-methylation method and simple formulation using solid phase extraction

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Abstract

[¹¹C]Methionine ([¹¹C]MET) is the most commonly used amino acid tracer for PET imaging of brain tumor. A simple and rapid preparation of [¹¹C]MET was achieved with “on column ¹¹C-methylation method” and solid-phase extraction (SPE) method for the formulation. [¹¹C]CH₃I was delivered under nitrogen flow (20 ml/min) to a Sep-Pak tC18 previously loaded with 0.2 mL of a solution of L-homocysteine thiolactone HCl 7.5 mg dissolved in NaOH 0.5 M in water/ethanol 50/50 (0.5 mL). The content of the cartridge was eluted with water (5 ml) from tC18 and collected in a reservoir containing water (5 mL). The diluted solution (pH≥9) passed through Oasis MAX (strong mixed-mode anion exchange cartridge). After trapping the product on cartridge, the cartridge washed with 10 mL water and the product eluted with 5 mL phosphate buffer. This solution was then dispensed a sterile vial containing 5 mL of saline solution. Chemical and radiochemical purity was analyzed by HPLC and enantiomeric purity was also evaluated using chiral HPLC column. Total synthesis time was 20-22 minutes including SPE formulation time (6-7 min) and the radiochemical yield was approximately 15% (end of synthesis) and radiochemical purity was always higher than 99%. In all cases, ethanol levels in the injectable solution were below the recommended limits. This fast and easy to automate process can be considered as an alternative to the conventional methods (rotary evaporators).