Carbon-11 labeled ethionine and propionine as tumor detecting agents

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To develop ¹¹F-fluoroalkyl derivatives of methionine (MET) as a tumor detecting agent by mean of clinical PET, a pilot study assessing the potential of their parent compounds, ¹³C-labeled ethionine (¹³C-ETH) and propionine (¹³C-PRO), was performed. ¹³C-ETH and ¹³C-PRO were prepared by the reaction of L-homocysteine thiolactone and corresponding ¹³C-alkyl iodides. After i.v. injection of a mixture of ²H-MET, ¹³C-ETH and ¹³C-PRO into mice bearing FM3A mammary carcinoma, the highest FM3A uptake was found in ¹³C-ETH, followed by ²H-MET and ¹³C-PRO, while the FM3A-to-brain and FM3A-to-muscle ratios were nearly the same for all three compounds. The FM3A uptake of ¹³C-ETH and ¹³C-PRO were nearly equal or slightly higher than the liver uptake. In the pancreas, liver, FM3A and brain tissues, incorporation of ¹³C-ETH into acid-precipitable materials was much lower than that of ²H-MET, whereas no incorporation of ¹³C-PRO was found. Brain uptake of all three compounds was significantly reduced by carrier MET-loading (5 min p.i.) or by cycloheximide treatment to inhibit protein synthesis (60 min p.i.), whereas the FM3A uptake was not affected. Incorporation of ¹³C-ETH into acid-precipitable materials was inhibited by the cycloheximide. The results suggest that ¹³C-labeled ETH has a similar potential for tumor detection by PET as ¹³C-MET, and that ¹³C-PRO has similar properties to those of other artificial amino acids. The development of ¹¹F-fluoroalkyl derivatives of MET is of interest as the next step.

Key words: [¹¹C]ethionine, [¹³C]propionine, tumor detection, PET