Synthesis and preliminary evaluation of $[^{11}\text{C}]$hexanoate as a PET tracer of fatty acid metabolism

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The potential of $[^{11}\text{C}]$hexanoate ($^{11}\text{C}$-HA) as a radiopharmaceutical assessing fatty acid metabolism of the myocardium and brain tissues by PET studies was evaluated. $^{11}\text{C}$-HA was synthesized by the Grignard reaction of pentylmagnesium bromide and $^{14}\text{CO}_2$. $^{11}\text{C}$-HA, $[^{1-}\text{H}]$acetate and $[^{1-}\text{H}]$deoxyglucose were simultaneously injected i.v. into mice, and the tissue distribution of the three radionuclides was measured. In the heart, high uptake and rapid clearance of $^{11}\text{C}$ and $^3\text{H}$ was found. The brain uptake of $^{11}\text{C}$ was twice as high as that of $^3\text{H}$, and both $^{11}\text{C}$ and $^3\text{H}$ decreased slowly compared to the heart. The level of $^3\text{H}$ increased with time in both the heart and brain. In fasting conditions, the uptake of $^{11}\text{C}$ by the heart was enhanced and the level of $^3\text{H}$ decreased with time. The brain uptake of $^{11}\text{C}$ and $^3\text{H}$ was also enhanced. The fasting conditions did not affect the distribution of $^3\text{H}$. The radiation absorbed dose of $^{11}\text{C}$-HA was also estimated.

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