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Evaluation of the brain uptake properties of [1-^{11}C]labeled hexanoate in anesthetized cats by means of positron emission tomography

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Positron emission tomography (PET) was performed on the cat brain to characterize [1-^{11}C]hexanoate and other [1-^{11}C]labeled short and medium-chain fatty acids as a tracer of fatty acid oxidative metabolism. After an intravenous injection the brain uptake of [1-^{11}C]hexanoate reached a peak followed by rapid washout until 2 min (first phase). Subsequently the total brain uptake was again increased and reached to a peak 7–10 min after tracer injection (second phase). The blood radioactivity of unmetabolized [1-^{11}C]hexanoate was rapidly decreased and almost eliminated within the first 2 min, whereas the blood radioactivity of [^{11}C]CO_2/HCO_3^- was gradually increased and reached a peak approximately 5 min after tracer injection. As the effect of circulating [^{11}C]CO_2/HCO_3^- was examined by a bolus intravenous injection of [^{11}C]CO_2/HCO_3^-, the brain uptake of [^{11}C]CO_2/HCO_3^- was rapidly increased right after the injection and changed parallel to the blood level of [^{11}C]CO_2/HCO_3^-.

These results suggest that, in contrast to the previous mouse data, the time-activity curve in the cat brain following intravenous injection of [1-^{11}C]hexanoate has a biphasic pattern, the second phase being determined by peripherally originating [^{11}C]CO_2/HCO_3^-, and therefore does not reflect the metabolism of ^{11}C-labeled fatty acid in the brain.

Key words: hexanoate, fatty acid, brain, cats, PET