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FLUORINE-18 LABELED TRACERS FOR PET STUDIES IN THE NEUROSCIENCES

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Fluorine-18 is a positron emitting isotope of fluorine. It has the longest half-life (110 minute) and the lowest positron energy (0.635 Mev) of the four common positron emitters for positron emission tomography (PET). PET, in conjunction with appropriate radiotracers labeled with fluorine-18, has been used to assess functional activity, biochemical transformations and drug pharmacokinetics and pharmacodynamics in the human and animal body. The PET method, F-18 labeling of organic molecules, and some of the applications of F-18 labeled compounds in the neurosciences (brain and heart) are described.

Positron Emission Tomography (PET) is an imaging method which uses short-lived positron emitting isotopes to track labeled compounds in the living human and animal body (see Table I for the commonly used positron emitters). In a PET study, a radiotracer labeled with a short-lived positron emitting isotope is administered either by intravenous injection or inhalation and the spatial and temporal distribution of the radioactivity are quantitatively measured using a positron emission tomograph. The short half-life of the PET isotopes and their decay to non-radioactive products combine to make this an imaging method exquisitely suited to the study of biochemical processes and drug action in the living human body. In addition, the positron emitters have very high specific activities (radioactivity/unit of chemical mass) and thus PET studies can be carried out at true tracer doses which avoid perturbing the process being measured.

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