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CONTAMINATION OF 2-DEOXY-2-[F-18]FLUORO-D-MANNOSE IN 2-DEOXY-2-[F-18]FLUORO-D-GLUCOSE. K. Ishiwata, T. Ido and R. Iwata, Cyclotron & Radioisotope Center, Tohoku Univ., Sendai. H. Nakanishi, Shimadzu Corp., Kyoto.

Several synthesis methods of  $^{18}\text{F}$ FDG have been developed. Recent serious problem is contamination of 2-deoxy-2-[F-18]fluoro-D-mannose ( $^{18}\text{F}$ DM) in the  $^{18}\text{F}$ FDG preparations.  $^{18}\text{F}$ FDG was synthesized by the reaction of tri-O-acetyl glucal (TAG) with  $^{18}\text{F}_2$  using an automated synthesis system (Methods A & B), and in the Method C [F-18]glucopyranosyl difluoride ( $^{18}\text{F}$ GP) was separated by HPLC. In the Methods D-J,  $^{18}\text{F}$ FDG was synthesized by the reaction of TAG with liquid  $\text{AcO}^{18}\text{F}$  or gaseous  $\text{AcO}^{18}\text{F}$ . Each  $^{18}\text{F}$ FDG preparation was acetylated and analyzed by HPLC on silica gel column. Results were summarized in a table. The Method E is the most suitable. In the  $^{18}\text{F}_2$  method, the amount of  $^{18}\text{F}$ DM was reduced to be 5% by the careful chromatographic separation of  $^{18}\text{F}$ GP.

Method	Temperature	Solvent	Run	FDG: FDM
A $^{18}\text{F}_2$	-40°C	$\text{CCl}_3\text{F}$	3	92: 8
B $^{18}\text{F}_2$ a)	-40°C	$\text{CCl}_3\text{F}$	10	95: 5
C $^{18}\text{F}_2$	-78°C	$\text{CCl}_3\text{F}$	1	100: 0
D $\text{AcO}^{18}\text{F}$ (l)	room temp.	$\text{AcOH}$	4	80:20
E $\text{AcO}^{18}\text{F}$ (g)	room temp.	$\text{CCl}_3\text{F}$	2	98: 2
F $\text{AcO}^{18}\text{F}$ (g)	-78°C	$\text{CCl}_3\text{F}$	3	97: 3
G $\text{AcO}^{18}\text{F}$ (g)	room temp.	$\text{CCl}_3\text{FCClF}_2$	1	93: 7
H $\text{AcO}^{18}\text{F}$ (g)	room temp.	$\text{CCl}_3\text{CF}_3$	1	90:10
I $\text{AcO}^{18}\text{F}$ (g)	room temp.	$\text{CCl}_3\text{H}$	1	89:11
J $\text{AcO}^{18}\text{F}$ (g)	room temp.	$\text{CCl}_2\text{H}_2$	1	87:13

a) Careful chromatographic separation of  $^{18}\text{F}$ GP.

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BIOCHEMICAL STUDIES OF 2-DEOXY-2-[ $^{18}\text{F}$ ]FLUORO-L-FUCOSE AS THE TRACER ASSOCIATED WITH GLYCOPROTEIN SYNTHESIS AND ITS VALIDITY FOR EXPERIMENTAL TUMORS. Y. Imahori, T. Ido, K. Ishiwata, T. Takahashi, M. Monma, S. Watanuki, K. Yanai, Y. Miura. Tohoku University.

The objective of this work was to synthesize 2-deoxy-2-[ $^{18}\text{F}$ ]fluoro-fucose ( $^{18}\text{F}$ DF) as the analogue of L-fucose in relation to glycoprotein synthesis and was to study its biochemical properties in experimental tumors (EA285s/c, EL4, AH109A). The uptake of  $^{18}\text{F}$ DF was 0.38% dose/g in rat glioma cells (EA285s/c) sacrificed at 60min and tumor/brain ratio was 6.13. The isolated tumor tissues of rats injected with  $^{18}\text{F}$ DF were homogenized and the proteins precipitated with perchloric acid and the acid-soluble fraction was analyzed on radio-HPLC and TLC.

The most part of the accumulation of total radioactivity in the tumor tissue was found in the acid soluble fraction (97%) and two radioactive peaks were observed. L-fucose is an excellent precursor of glycoprotein because L-fucose is not converted to other monosaccharides and is mainly incorporated to glycoprotein.

These results suggest that  $^{18}\text{F}$ DF can be trapped in the cells which has rapid turnover of the fucosyl glycoprotein synthesis such as tumor cells as a result of anabolizing the fucose analogue.  $^{18}\text{F}$ DF as a positron emitter will be useful to evaluate a tumor for glycoprotein synthesis.

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COMPARATIVE STUDIES OF [U-C-11]- AND [1-C-11]GLUCOSE AND [F-18]FDG AS TRACERS FOR GLUCOSE METABOLISM. K. Ishiwata, Y. Miura, K. Kawashima, Y. Imabori, K. Yanai, M. Monma, T. Takahashi and T. Ido. Cyclotron and Radioisotope Center, Tohoku University, Sendai.

Biodistribution of [U-C-11]glucose (Glc), [1-C-11]Glc and [F-18]FDG in rats were investigated as basic studies for positron emission tomography.

[U-C-11]Glc and [1-C-11]Glc were synthesized by photosynthetic methods and a modification of the classical Kiliani-Fischer cyanohydrin synthesis using  $\text{H}^{11}\text{CN}$ , respectively.

[1-C-11]Glc was more accumulated in the brain and liver than [U-C-11]Glc. Consequently, the amounts of expired  $^{11}\text{CO}_2$  was significantly much just after injection of the [U-C-11]Glc. Other organ distributions were similar. Among three tracers, uptakes in the brain increased with time in order of [1-C-11]Glc > [F-18]FDG > [U-C-11]Glc. The uptake of [F-18]FDG in the heart increased, but those of two Glc preparations decreased. By double-tracer autoradiography ([U-C-11]Glc and [1-C-14]Glc, and [1-C-14]Glc and [F-18]FDG) in the brain, uptake of [1-C-14]Glc was more different in each region than those of [F-18]FDG and [U-C-11]Glc. In conclusion, characteristics of three tracers for glucose metabolism were shown for organ and regional cerebral distributions in rats.

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Development of the Synthetic System for the Production of F-18 Labelled Compounds

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A synthetic system for the preparation of F-18 fluorinating reagent from F-18 anion was developed. This system is also equipped with a device to recover the expensive 0-18 enriched target water. By using this system, we have effectively prepared F-18 KF/crown ether as a fluorinating reagent, and at the same time recovered 0-18 enriched water in good yield. Furthermore, F-18 fluoropurine and F-18 6-fluoro-9-benzylpurine were synthesized in this system.