PRELIMINARY NOTES

A New Method Using Anhydrous [^{18}F]fluoride to Radiolabel 2-[^{18}F]Fluoro-2-Deoxy-D-Glucose

Shlomo Levy, David R. Elmaleh, and Eli Livni

Massachusetts General Hospital, Boston, Massachusetts

We report a new chemical route for the preparation of 2-[^{18}F]fluoro-2-deoxy-D-glucose (2-^{18}FDG) using anhydrous [^{18}F]fluoride produced by the ^{20}Ne(d,α)^{18}F reaction. The anhydrous $^{18}F^-$ is reacted with a previously prepared precursor, methyl 4,6-o-benzylidene-3-o-methyl-2-*O*-trifluoromethanesulfonyl-β-D-mannopyranoside, in dimethyl formamide or hexamethylphosphoric triamide. The corresponding fluoro-deoxy-glucose derivative, upon treatment with borontribromide or concentrated hydrochloric acid, yields 2-^{18}FDG in 10% (overall) yield. The substrate was characterized by thin-layer chromatography (TLC), and high-performance liquid chromatography (HPLC). Biodistribution studies were performed in mice, and imaging studies in dogs.

J Nucl Med 23: 918–922, 1982

Glucose labeled with carbon-11, and 2-deoxyglucose labeled with either carbon-11 or fluorine-18, have been used to measure local glucose metabolism in man in conjunction with positron computed tomography (*1–6*). 2-[^{18}F]Fluoro-2-deoxy-D-glucose has been used for quantitating local cerebral glucose metabolism in normal men (*7*), and in patients with stroke (*8*), Huntington's disease (*9*), seizure disorders (*10*), and schizophrenia (*11*). It has also been used in audio and visual stimulation studies (*12–15*), and to a certain extent for studying myocardial glucose metabolism (*16*).

Several synthetic routes have been reported for the preparation of 2-fluoro-2-deoxy-D-glucose. Pacák and coworkers used fluoride displacement with potassium hydrogen fluoride on the anhydro sugar 1,6:2,3-dianhydro-4-o-benzyl-β-D-mannopyranose (*17*). Adamson et al. used an electrophilic fluorination with trimoromethylhypofluoride (CF_3OF) to incorporate the fluorine into 3,4,6,-tri-o-acetyl-D-glucal (*18*). The first synthesis of F-18-labeled 2-fluoro-2-deoxy-D-glucose was developed by Ido et al. (*19*) at Brookhaven National Laboratories. This method involves the reaction of 3,4,6-tri-o-acetyl-D-glucal with [^{18}F]F_2.

Received Feb. 1, 1982; revision accepted May 20, 1982.

For reprints contact: D. R. Elmaleh, Physics Research Laboratory, Massaschusetts General Hospital, Boston, MA 02114.

A need for multiple productions of 2-fluoro-2-deoxy-D-glucose has led to the development of a remote semiautomated production of this radiopharmaceutical by two groups using the same reaction sequence (*20,21*). Unfortunately, the generation of sufficient quantities of the anhydrous [^{18}F]F_2 needed for this synthesis can be done only by institutions that have cyclotrons delivering deuterons with energies higher than 6 MeV (*22,23*). Anhydrous $^{18}F^-$ can be produced more easily by a cyclotron or a reactor (*24–26*) and is more easily manipulated.

To date the only alternative synthesis for 2-^{18}FDG has been proposed by Firnau*. This route calls for the production of Xe[^{18}F]F_2 from anhydrous $^{18}F^-$ and its reaction with 3,4,6-tri-o-acetyl-D-glucal, together with a workup similar to that previously reported by Ido et al. (*19*).

In this paper we report a new approach using the direct displacement of anhydrous [^{18}F]fluoride† on the β-methyl-mannopyranoside (**1**) (Fig. 1) followed by acid hydrolysis to give 2-^{18}FDG with 10% yield (corrected for decay) in a 180-min preparation time. 2-[^{18}F]Fluoro-2-deoxy-D-glucose prepared by this new method was identified by TLC‡ and HPLC, and its biodistribution was compared with that of 2-^{18}FDG produced by BNL and shipped to MGH.

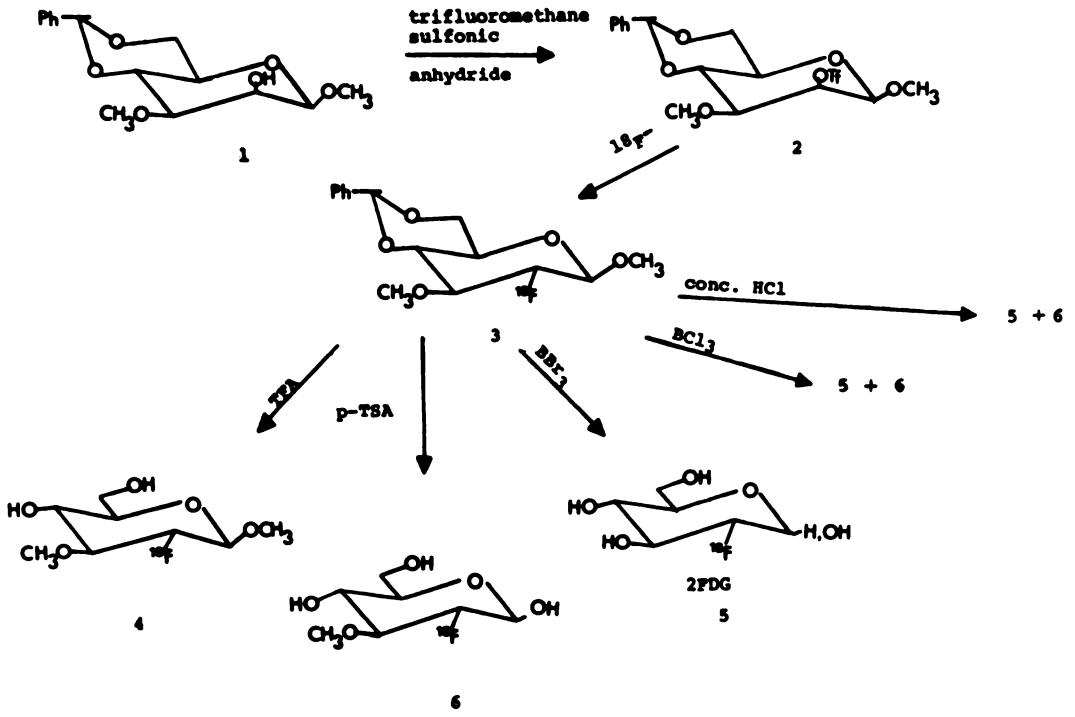

FIG. 1. Synthesis of the radio labeled 2-[^{18}F]fluoro-2-deoxy-D-glucose using anhydrous [^{18}F]fluoride.

MATERIAL AND METHODS

$^{18}F^-$. Neon was bombarded with a 6.5-MeV deuteron beam for 30 min at 50 μA to produce 20–30 mCi of anhydrous H^{18}F. This was trapped from the rapidly circulated gases on a silver-wool plug coated with cesium fluoride (*27*).

Methyl 4,6-o-benzylidene-3-o-methyl-2-*O*-trifluoromethanesulfonyl-β-D-mannopyranoside (**2**). Methyl 4,6-o-benzylidene-3-*O*-methyl-β-D-mannopyranoside (324 mg, 1.09 mmole) prepared according to literature procedures, (*28,29*) was dissolved in methylene chloride (10 ml) and pyridine (0.5 ml), and cooled to −15°C under nitrogen. Trifluoromethane-sulfonic anhydride (0.19 ml, 1.15 mmole) in methylene chloride (2 ml) was slowly added. The mixture was reacted for 90 min at room temperature, then washed with cold 10% sodium bicarbonate solution. The organic layer was dried and the solvent was evaporated under vacuum. The solid was crystallized from 60% ether in hexane to give (**2**) 380 mg (89%), m.p. 113°; mass spec. m/z 428. ^{1}H-NMR ($CDCl_3$, δ, ppm), 7.50–7.34 (m, 5H, aromatic), 5.58 (s, 1H, benzylidenic), 5.14 (d, 1H, H—2, J=3H$_z$), 4.53 (s, 1H, H—1), 4.36–3.36 (m, 5H, H—3, 4, 5, 6), 3.56, 3.53 (S.OMe groups), anal. cal. for $C_{16}H_{19}SF_3O_8$, C = 44.86, H = 4.25, S = 7.47; Found: C = 45.01, H = 4.42, S = 7.43.

Production of methyl 4,6-o-benzylidene-2-[^{18}F]fluoro-2-deoxy-3-*O*-methyl-β-D-glucopyranoside (**3**): (a) The CsH[^{18}F]F$_2$ was reacted for 25 min with methyl 4,6-o-benzylidene-3-o-methyl-2-*O*-trifluoromethanesulfonyl-β-D-mannopyranoside (**2**) (26 mg) in 1 ml of freshly distilled dimethyl formamide (CaH_2) in a reaction vial immersed in an oil bath at 130°C. The solvent was evaporated and ether and water added. The ether solution was separated, washed twice with water, dried (Na_2SO_4), and evaporated under a stream of nitrogen to give methyl 4,6-o-benzylidene-2-[^{18}F]fluoro-2-deoxy-3-*O*-methyl-β-D-glucopyranoside (**3**) in over 30% yield. (b) The triflate (**2**) was reacted with CsH[^{18}F]F$_2$ (7.2 mCi) at 130° for 25 min in freshly distilled (molecular sieve) hexamethylphosphoric triamide (HMPA). The HMPA mixture was extracted with ether, the etheral solution was washed with water, dried (Na_2SO_4) and evaporated to give (1.5 mCi, 30% of the activity) the fluorinated deoxyglucopyranoside.

2-[^{18}F]Fluoro-2-deoxy-D-glucose and other products. *Hydrolysis.* The ^{18}F-glucopyranoside derivative (**3**) was hydrolyzed with the following reagents and the products isolated by column chromatography.

A. Trifluoroacetic acid (TFA). Five milliliters of 60% TFA were added and the mixture heated for 30 min at 50°C. From the hydrolyzate only one product could be identified, compound (**4**), r_f = 0.56.

B. p-Toluene sulfonic acid (p-TSA). Three ml of 10% p-TSA were added and the tube was sealed. The mixture was allowed to stand for 30 min at 160°C. The main product identified was 1,3-*O*-dimethyl-2-[^{18}F]fluoro-2-deoxy-D-glucose (**4**), r_f = 0.56. Similar treatment with 50% p-TSA for 30 min at 120°C gave only 3-*O*-methyl-2-[^{18}F]fluoro-2-deoxy-D-glucose (**5**), r_f = 0.5.

C. Boron trichloride. Compound (**3**) was reacted with 5 ml boron trichloride (1 *M* in methylene chloride) at

room temperature for 30 min. Three compounds were obtained. The starting material (**3**), $r_f = 0.65$, (**5**), $r_f = 0.5$, and 2-^{18}FDG, $r_f = 0.40$. The radiochemical yield of 2-^{18}FDG was poor (1–2%). A modification—using 5 ml boron trichloride (1 *M* in methylene chloride in a pressure vessel heated in an oil bath for 45 min at 130°C—produced two compounds: **5** (40%) and **6** (60%).

D. Concentrated hydrochloric acid. One ml of HCl was added to the ether extract (**3**) and the tube was sealed. The mixture was hydrolyzed for 45 min at 125°C to give **5** (40%) and **6** (60%).

E. Boron tribromide. Three ml boron tribromide (2 *M* in methylene chloride) were added to **3**. The mixture was allowed to stand 30 min at room temperature. Two products were obtained: **5** (10%) and **6** (90%).

Column chromatography. Each hydrolyzate was cooled, evaporated, dissolved in water, heated for five more min and neutralized (50% NaOH), reconcentrated, and taken up in 2 ml of aqueous acetonitrile (0.2 ml H_2O in 100 ml CH_3CN). The solution was then placed on a column (0.75 × 30 cm) containing a dry mixture (1:1) of silica gel and alumina. The column was eluted with 10 ml of water-acetonitrile (0.2:100) and the purified 2-^{18}FDG was eluted in the following 20 ml of water-acetonitrile (5:95). The eluate was evaporated to dryness, saline added, and the solution sterilized by passing through a 0.22-μ Millipore filter. The overall yield of 2-^{18}FDG was 10% (200–900 μCi), (sp. act. 100 mCi/mg).

Characterization of 2-^{18}FDG. The purity of the 2-^{18}FDG was ascertained using TLC (eluent CH_3CN:H_2O, 85:15, v/v) and HPLC (Lichrosorb-NH_2 columns 30 cm × 0.6 cm; eluent CH_3CN:H_2O 95:5 v/v; at 660 psi, 2.5 ml/min). Compound **6** was chromatographed with samples of 2-^{18}FDG obtained from BNL. The experimental and BNL samples gave the same values (TLC $r_f = 0.40$; HPLC residence time 5.5 min).

Animal experiments. Mice. 2-[^{18}F]Fluoro-2-deoxy-D-glucose in saline (3–5 μCi in 0.1 ml) was injected into groups of six CD-1 Fisher Mice (Charles River strain) through a tail vein. At the desired time after injection, the mice were killed by cervical fracture. The organs and tissues were excised, rinsed, blotted to remove adhering blood, and weighed. They were then counted in a gamma well scintillation counter and the activity corrected for decay.

RESULTS AND DISCUSSION

The current synthesis of 2-^{18}FDG (*1*,*2*) relies on the preparation of [^{18}F]F_2 gas. The reported radiochemical yield of this important agent is 10–12%. The recently proposed alternative using Xe[^{18}F]F_2 for fluorine saturation of 3,4,6-tri-o-acetyl-D-glucal has a preliminary yield of 1%.

In this work we describe a new synthetic approach for producing 2-^{18}FDG (Fig. 1) using $^{18}F^-$ ion, which is easier to prepare than either elemental [^{18}F]F_2 gas or Xe-[^{18}F]F_2. The sugar derivative (**1**) prepared according to the literature procedure in a five-step synthesis (*28*,*29*) is reacted with triflic anhydride to give (**2**) (20% overall yield).

The nucleophilic displacement on the triflate derivative (**2**) with [^{18}F]fluoride is a reasonably facile process, giving the fluorinated intermediate **3** with inversion of configuration at the reaction center in relatively good yield (30%).

2-[^{18}F]Fluoro-2-deoxy-D-glucose was prepared by subsequent hydrolysis of the fluorinated intermediate (**3**) under relatively drastic conditions. Evidently the electronegative effect of the fluorine atom at carbon-2 affects the electron density of the neighbor atoms by decreasing the ease of protonation of the oxygen at carbon-3. Five hydrolysis processes were tried. Hydrolysis of **3** with 60% trifluoro acetic acid gave mainly **4**, and with 50% p-TSA mainly **5**, whereas with concentrated HCl it gave **5** and **6** in 2 to 3 ratio.

Boron trichloride (methylene chloride) generated partially protected compound **5**, together with the desired compound **6**. However, the use of boron trichloride in a pressure vessel at 120° for 40 min gave 2-^{18}FDG as the main product of hydrolysis (see methods). This procedure gave different yields for each experiment and there was unexplained activity loss. This hydrolysis affected some of the sugar activity, but the yield of this step was still reasonable.

The most promising process used boron tribromide in methylene chloride to give 2-^{18}FDG in over 90% yield, together with 3-*O*-methyl-2-^{18}FDG. **5** as an impurity (10%).

2-[^{18}F]Fluoro-2-deoxy-D-glucose produced through this chemical route was identified by comparing its r_f on TLC, its residence time on HPLC, and its biodistribution in mice with data obtained using 2-^{18}FDG produced by BNL and flown to MGH. Table 1 represents the biodistribution results in mice at 30 and 60 min compared with literature values (*30*).

Positron-camera tomographic studies of the normal dog using the 2-^{18}FDG synthesized were comparable with results previously published (*31*).

Improvement and automation of this new route for the preparation of 2-^{18}FDG will enable multiple productions of this agent in many institutions on a routine basis.

FOOTNOTES

* Firnau G. Preparation of [F-18] labeled 2-deoxy-2-fluoro-D-glucose with [F-18]-XeF_2, presented First Annual Conjoint Winter Meeting Society of Nucl. Med., New Orleans, February 7, 1981.

† [^{18}F]fluoride was trapped on CsF.

‡ Silica gel on aluminum, Merck. Eluent CH_3CN:H_2O (85:15).

TABLE 1. DISTRIBUTION OF FLUORINE-18 RADIOACTIVITY IN MOUSE TISSUES FOLLOWING I.V. INJECTION OF 2-^{18}FDG % INJECTED DOSE/GRAM TISSUE (N = 5-6)*

	30 min	†	60 min	•
Blood	1.14± 0.48	0.89 ± 0.11	0.31 ± 0.13	0.55 ± 0.10
Brain	6.15 ± 1.94	5.31 ± 0.94	4.87 ± 1.05	4.57 ± 0.75
Liver	1.36 ± 0.52	1.10 ± 0.07	0.86 ± 0.16	0.82 ± 0.08
Spleen	1.52 ± 0.37	1.94 ± 0.18	1.37 ± 0.21	1.88 ± 0.34
Lung	2.45 ± 0.60	2.45 ± 0.03	2.08 ± 0.18	2.53 ± 0.23
Heart	22.27 ± 7.30	32.7 ± 8.6	18.08 ± 7.03	31.66 ± 2.66
Kidney	1.51 ± 0.51	2.09 ± 0.54	0.64 ± 0.10	1.14 ± 0.11
Bone	1.41 ± 0.64	1.85 ± 0.38	1.40 ± 0.49	2.75 ± 0.58
Muscle	2.32 ± 1.16	3.21 ± 0.43	3.63 ± 1.17	4.01 ± 0.54
Bladder	14.41 ± 12.55	—	9.17 ± 8.33	—

* Means ± s.d.

† Brookhaven National Labs data (*J Nucl Med* 18, 990–996, 1977).

ACKNOWLEDGMENTS

We wish to acknowledge the technical assistance of Ms. D. Varnum, the cyclotron operators—W. Bucelewicz and L. Beagle, and the editorial help of Ms. R. A. Taube.

This research was supported by DOE AC02-76EV04115 and NCI 26371-03.

REFERENCES

1. RAICHLE ME, LARSON KB, PHELPS ME, et al: *In vivo* measurement of brain glucose transport and metabolism employing glucose-^{11}C. *Am J Physiol* 228:1936-1948, 1975
2. RAICHLE ME, WELCH MJ, GRUBB R JR., et al: Measurement of regional substrate utilization rates by emission tomography. *Science* 199:986-987, 1978
3. SOKOLOFF L, REIVICH M, KENNEDY C, et al: The [^{14}C]-deoxyglucose method for the measurement of local cerebral glucose utilization: Theory, procedure and normal values in the conscious and anesthetized albino rat. *J Neurochem* 28:897-916, 1977
4. GALLAGHER BM, FOWLER JS, GUTTERSON NI, et al: Metabolic trapping as a principle of radiopharmaceutical design: Some factors responsible for the distribution of [^{18}F]2-deoxy-2-fluoro-D-glucose. *J Nucl Med* 19:1154-1161, 1978
5. REIVICH M, KUHL D, WOLF A, et al: The [^{18}F]fluorodeoxyglucose method for the measurement of local cerebral glucose utilization in man. *Circ Res* 44:127-137, 1979
6. GOODMAN MM, KEARFOTT KH, ELMALEH ĐR, et al: A comparison of C-11 and F-18 carbohydrates. In *Radiopharmaceuticals Structure Activity Relationships*. Spencer RP, Ed., New York, Grune and Stratton, 1981, pp 801-833
7. PHELPS ME, HUANG SC, HOFFMAN EJ, et al: Tomographic measurement of local cerebral glucose metabolic rate in humans with [F-18]2-fluoro-2-deoxy-D-glucose: Validation of method. *Ann Neurol* 6:371-388, 1979
8. KUHL DE, PHELPS ME, KOWELL AP, et al: Effects of stroke on local cerebral metabolism and perfusion: Mapping by emission computed tomography of ^{18}FDG and $^{13}NH_3$. *Ann Neurol* 8:47-60, 1980
9. KUHL DE, PHELPS ME, MARKHAM C, et al: Local cerebral glucose metabolism in Huntington's disease determined by emission computed tomography of ^{18}F-fluorodeoxyglucose. *J Cereb Blood Flow Metab 1* (Suppl. 1):459, 1981
10. KUHL DE, ENGEL J. JR., PHELPS ME, et al: Epileptic patterns of local cerebral metabolism and perfusion in humans determined by emission computed tomography of ^{18}FDG and $^{13}NH_3$. *Ann Neurol* 8:348-360, 1980
11. WIDEN L, BERGSTRON M, BLOMQUIST C: Glucose metabolism in patients with schizophrenia: Emission computed tomography measurements with 11-C-Glucose. *J Cereb Blood Flow Metab 1* (Suppl. 1):455, 1981
12. GREENBERG JH, REIVICH M, ALAVI A, et al: Metabolic mapping of functional activity in human subjects with the [^{18}F]-fluoro-deoxyglucose technique. *Science* 212:678-680, 1981
13. MAZZIOTTA JC, PHELPS ME, MILLER J, et al: Tomographic mapping of human cerebral metabolism: Normal unstimulated state. *Neurology* 31:503-516, 1981
14. PHELPS ME, MAZZIOTTA JC, KUHL DE, et al: Tomographic mapping of human cerebral metabolism: Visual stimulation and deprivation. *Neurology* 31:517-529, 1981
15. PHELPS ME, MAZZIOTTA JC, ENGEL JR J, et al: Metabolic response of the brain to visual and auditory stimulation and deprivation. *J Cereb Blood Flow Metab 1* (Suppl. 1):467, 1981
16. PHELPS ME, HOFFMAN EJ, SELIN C, et al: Investigation of [^{18}F]2-fluoro-2-deoxyglucose for the measure of myocardial glucose metabolism. *J Nucl Med* 19:1311-1319, 1978
17. PACÁK J, PODEŠVA J, TOČIK F, ČERNÝ M: Preparation of 2-deoxy-2-fluoro-D-glucose. *Collect Czech Chem Commun* 37:2589-2599, 1972
18. ADAMSON J, FOSTER AB, HALL LD, et al: Fluorinated Carbohydrates: 2-Deoxy-2-fluoro-D-glucose and 2-Deoxy-2-fluoro-D-mannose. *Carbohydr Res* 15:351-359, 1970
19. IDO T, WAN CN, CASELLA V, et al: Labeled 2-deoxy-D-glucose analogs ^{18}F-labeled 2-deoxy-2-fluoro-D-glucose analogs ^{18}F-labeled 2-deoxy-2-fluoro-D-glucose, 2-deoxy-2-fluoro-D-mannose and [^{14}C]-2-deoxy-2-fluoro-D-glucose. *J Labeled Comp Radiopharm* 14:175-183, 1978
20. FOWLER JS, MACGREGOR RR, WOLF AP, et al: A shielded synthesis system for production of 2-deoxy-2-[^{18}F]fluoro-D-glucose. *J Nucl Med* 22:376-380, 1981
21. BARRIO JR, MACDONALD NS, ROBINSON GD JR, et al: Remote semiautomated production of F-18-labeled 2-

deoxy-2-fluoro-D-glucose. *J Nucl Med* 22:372-375, 1981
22. DAGANI R: Radiopharmaceuticals key to new diagnostic tool. *Chem Eng News* 59:(45), 30-37, 1981
23. GOODMAN MM, ELMALEH DR, KEARFOTT KJ, et al: F-18-labeled 3-deoxy-3-fluoro-D-glucose for the study of regional metabolism in brain and heart. *J Nucl Med* 22:138-144, 1981
24. HELUS F, KRAUSS O, MAIER-BORST W: An effective routine reactor production method of ^{18}F for Medical Use. *Radiochem Radioanal Lett* 15:3 225-230, 1973
25. GNADE BE, SCHWAIGER GP, LIOTTA CL, et al: Preparation of reactor-produced carrier-free ^{18}F-fluoride as the potassium 18-crown-6 complex for synthesis of labelled organic compounds. *Int J Appl Radiat Isotopes* 32:91-95, 1981
26. GATLEY SJ, HICHWA RD, SHAUGHNESSY WJ, et al: ^{18}F-labeled lower fluoroalkanes; reactor-produced gaseous physiological tracers. *Int J Appl Radiat Isotopes* 32:211-214, 1981
27. TEWSON TJ, WELCH MJ, RAICHLE ME: [^{18}F]-labeled 3-deoxy-3-fluoro-D-glucose: Synthesis and preliminary biodistribution data. *J Nucl Med* 19:1339-1345, 1978
28. MILJKOVIĆ M, GLIGORIJEVIĆ M, MILJKOVIĆ D: Steric and electrostatic interactions in reactions of carbohydrates II. Stereochemistry of addition reactions to carbonyl group of glycopyranosidulose. Synthesis of methyl 4,6-O-benzylidene-3-O-methyl-β-D-mannopyranoside. *J Org Chem* 39: 2118-2120, 1974
29. MILJKOVIĆ M, GLIGORIJEVIĆ M, GLIŠIN D: Steric and electrostatic interactions in reactions of carbohydrates III. Direct displacement of the C-2 sulfonate of methyl 4,6-O-benzylidene-3-O-methyl-2-O-methylsulfonyl-β-D-gluco- and -mannopyranosides. *J Org Chem* 39:3233-3226, 1974
30. GALLAGHER BM, ANSARI A, ATKINS H, et al: Radiopharmaceuticals XXVII: ^{18}F-labeled 2-deoxy-2-fluoro-D-glucose as a radiopharmaceutical for measuring regional myocardial glucose metabolism in vivo: Tissue distribution and imaging studies in animals. *J Nucl Med* 18:990-996, 1977
31. ELMALEH DR, KEARFOTT KJ, GOODMAN MM: *A comparison of ^{18}F-sugar analogs.* In *Animals in Medical Application of Cyclotron.* V. Nato, E. M. Soulinna, Eds., pp 153-160, 1981

George Simon Memorial Fellowship Award

The Fourth Annual George Simon Memorial Fellowship Award, given by the Fleischner Society for the best submitted work relating to the imaging of the respiratory system, has been given to H. Dirk Sostman of Yale University for his paper "Experimental Studies with ^{111}Indium Labeled Platelets in Pulmonary Embolism."

Entries for the Fifth George Simon Award are now being accepted. The paper can represent the work of more than one investigator, but the senior author should be the applicant and responsible for the majority of the work. Applicants should be no older than 40 years. Papers which have been published or submitted elsewhere are not eligible. The award consists of an all-expense-paid trip to the 1983 Fleischner Society Meeting, New York City in May, plus a cash prize. All submissions must be in the form of a complete scientific paper, not longer than 25 pages (double spaced) and should be sent in triplicate to:

Richard H. Greenspan, MD
Dept. of Diagnostic Radiology
Yale University School of Medicine
333 Cedar Street
New Haven, CT 06510

Papers must be sent on or before January 1, 1983

16th Annual Hawaii International Conference on System Sciences

January 5-7, 1983 **Honolulu, Hawaii**

The University of Hawaii and the University of Southwestern Louisiana in cooperation with the Association of Computing Machinery (ACM) and the IEEE Computer Society are sponsoring the 16th Annual Hawaii International Conference on System Sciences to be held January 5-7, 1983 in Honolulu, Hawaii. Sessions on Medical Information Processing are included and papers will be presented. Some topics addressed will be:

Medical risk analysis.
Computers and the handicapped.
Graphics applications in medicine.
Technology transfer and impact.

For more information, contact:

Dr. Bruce Shriver, Dr. Thomas Cousins, or Dr. Terry Walker
Computer Science Department
University of Southwestern Louisiana
PO Box 44330
Lafayette, LA 70504