Supporting Information

[^{18}F]-5-Fluoro-5-deoxyribose, an efficient peptide bioconjugation ligand for positron emission tomography (PET) imaging

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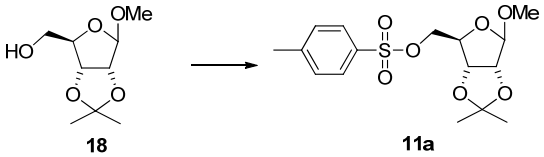
Material and methods.

All reagents and solvents were of highest grade from commercial sources, unless otherwise specified. Compound **18** and **19** were prepared as previously described.[1, 2] Peptide **16** was purchased from PolyPeptide Laboratories AS, Denmark. Normal phase column chromatography was performed using silica gel 60 (40–63 micron). Reverse phase column chromatography was performed using Alltech High Capacity Cartridge columns. NMR spectra were recorded on Bruker AVANCE 300, 400 or 500 instruments. ^{1}H and ^{13}C NMR spectra were recorded using deuterated solvent as the lock and residual solvent as the internal standard. ^{19}F NMR spectra were referenced to $CFCl_3$ as the external standard. Chemical shifts are reported in parts per million (ppm) and coupling constants (*J*) are given in Hertz (Hz). The abbreviations for the multiplicity of the proton, carbon and fluorine signals are as follows: s singlet, d doublet, dd doublet of doublets, ddd doublet of doublet of doublets, triplet, dt double triplets, q quartet, m multiplet, br s broad singlet. When necessary, resonances were assigned using two-dimensional experiments (COSY, HMBC, HSQC). Mass spectrometric (*m*/*z*) data was acquired by electrospray ionisation (ESI). High resolution mass analyses were recorded on a Micromass LCT TOF mass spectrometer using ESI in positive mode. Analytical Reverse Phase HPLC was performed using a Gynkotek HPLC system consisting of a gradient pump (P580), column oven (STHS8S) and variable UV detector (UVD340S) coupled in series with a BIOSCAN NaI detector (B-FC-3200) or a Shimadzu Prominence HPLC system equipped with a PDA UV detector and HERM LB500 activity detector. Analytical Ion Exchange HPLC was performed using a DIONEX HPLC system consisting of an electrochemical detector (ED40) and an isocratic pump (IP25) coupled in series with a BIOSCAN NaI detector (B-FC-3200). Radio TLCs were analysed using a RAYTEST mini GITA and pH was measured using a KNICK pH Meter 766 CALIMATIC.

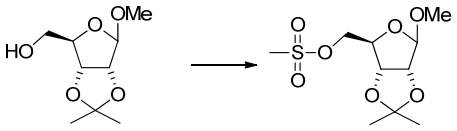
Preparation of methyl 2,3-*O*-isopropylidene-5-*O*-(*p*-toluenesulfonyl)-β, D-ribofuranoside (11a)[3]



p-Toluenesulfonyl chloride (1.4 g, 7.50 mmol) was added in portions to a solution of **18** (1.0 g, 5.00 mmol) in dry pyridine (3 mL) at 0 °C and the reaction was judged to have gone to completion after 2 h as indicated by TLC (R_f = 0.25, petroleum ether/ethyl acetate, 9:1 by volume). The reaction mixture was poured into ice water (5 mL) with vigorous stirring and the resultant white precipitate was filtered and washed with ice water (5 × 6 mL). Drying gave the product **11a** (1.7 g, 4.85 mmol, isolated yield 97%) as a white amorphous solid. M.p. 78-79 °C (Lit,[4] 78.5-79.5 °C); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80 (dt, J=8.3 Hz, 3.0 Hz, 2H, aromatic), 7.38 (d, J=8.0 Hz, 2H, aromatic), 4.95 (s, 1H, H-1), 4.59 (d, J=5.9, 1H,

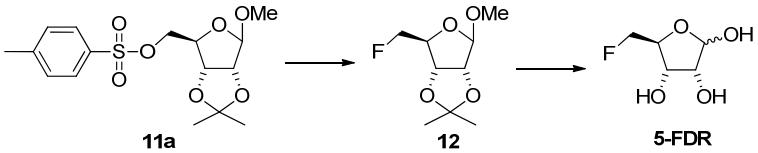
H-3), 4.53 (d, J=5.9, 1H, H-2), 4.32 (t, J=7.5 Hz, 1H, H-4), 4.04 (m, 2H, H-5), 3.23 (s, 3H, OC*H*$_3$), 2.46 (s, 3H, Ar-C*H*$_3$), 1.45 (s, 3H, -CC*H*$_3$), 1.28 (s, 3H, -CC*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.10, 132.75, 129.95, 128.00, 112.73, 109.46, 84.88, 83.58, 81.38, 77.36, 77.04, 76.72, 69.19, 55.06, 26.33, 24.86, 21.68. HRMS ES$^+$ (*m*/*z*) [M + Na]$^+$ calculated for $C_{16}H_{22}O_7NaS$, 381.0984; found 381.0972.

Preparation of methyl 2,3-*O*-isopropylidene-5-*O*-(methylsulfonyl)- β, D-ribofuranoside (11b)



Following the emthod for **11a**, compound **11b** was prepared in quantitative yield from **18**. Mp. 74-75 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 4.99 (s, 1H, H-1), 4.70 (d, J=5.9 Hz, 1H, H-3), 4.61 (d, J=5.9 Hz, 1H, H-2), 4.41 (t, J=6.8 Hz, 1H, H-4), 4.21 (m, 2H, H-5), 3.35 (s, 3H, OC*H*$_3$), 3.07 (s, 3H, OSO_2CH_3), 1.49 (s, 3H, CC*H*$_3$), 1.32 (s, 3H, CC*H*$_3$); ^{13}C NMR (100 MHz, $CDCl_3$) δ 112.88, 109.59, 84.93, 83.81, 81.37, 68.41, 55.29, 37.79, 26.39, 24.92. HRMS ES$^+$ (*m*/*z*) [M + Na]$^+$ calculated for $C_{10}H_{18}O_7NaS$, 305.0671; found 305.0679.

Preparation of 5-deoxy-5-fluoro-α/β,D-ribose (5-FDR)[5,6]



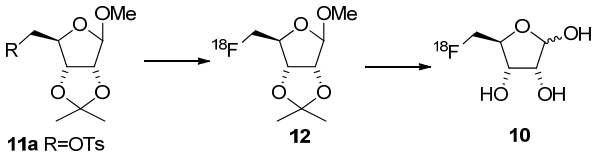
Tetrabutylammonium fluoride (TBAF, 1 M in THF, 2 mL) was added to a solution of tosylate **11a** (600.0 mg, 1.68 mmol) in anhydrous CH_3CN (7 mL). The reaction went to completion in 4 h as indicated by TLC and the solvent was removed under vacuum. Purification over silica gel column (petroleum ether:ethyl acetate, 30:1) afforded product **12** (294.6 mg, 1.43 mmol, isolated yield 85%) as an oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.97 (d, J=2.4 Hz, 1H, H-1), 4.66 (d, J=6.0 Hz, 1H, H-3), 4.57 (dd, J=6.0Hz, 2.3 Hz, H-2), 4.46-4.27 (m, 3H, H-5 and H-4), 3.31 (s, 3H, OCH_3), 1.47 (s, 3H, CCH_3), 1.31 (s, 3H, CCH_3).

A solution of **12** (315.2 mg, 1.53 mmol) in aqueous H_2SO_4 (20 mM, 3 mL) was heated for 1.5 h at 98 ^{o}C. The reaction mixture was cooled to ambient temperature and the pH was adjusted to neutral by adding $BaCO_3$. The suspension was centrifuged and the supernatant was passed through a syringe filter (0.22 μm). The resultant solution was freezed dried for 16 h, affording **5-FDR** an oil (214.0 mg, 1.41 mmol, isolated yield 92%). ^{1}H NMR (400 MHz, $CDCl_3$) δ 5.30 (d, J=4.0 Hz, 0.3 H, α anomer, H-1), 5.17 (d, J=1.4 Hz, 0.7 H, β anomer, H-1), other signals were not interpreted due to the overlap;[4] ^{13}C NMR (100 MHz, D_2O) δ 101.12 (β anomer, C-1), 96.38 (α anomer, C-1), 83.31(d, J=168.4 Hz, β anomer, C-5), 82.85 (d, J=167.8 Hz, α anomer, C-5), 80.94 (d, J=18.1 Hz, α anomer, C-4), 80.46 (d, J=18.1 Hz, β anomer, C-4), 74.89 (β anomer, C-2), 70.60 (β anomer, C-2), 69.36 (d, J=6.8 Hz, β anomer, C-3), 69.18 (d, J=6.7 Hz, α anomer, C-3); ^{19}F NMR (376 MHz, D_2O) δ -229.26 (dt, J= 47.3 Hz, 25.9 Hz, β anomer), -231.58 (dt, J=47.3 Hz, 25.9 Hz, α anomer); HRMS ES$^-$ (*m*/*z*) [M - H]$^-$ calculated for $C_5H_8FO_4$, 151.0407; found 151.0412.

[^{18}F]-Fluoride production

[^{18}F]-Fluoride was prepared on a cyclotron by proton bombardment of 97% enriched [^{18}O]H_2O (Cambridge Isotope Laboratories, Inc.) by the $^{18}O(p,n)^{18}F$ nuclear reaction. The silver target (1.1ml) was pressurised to 600psi and irradiated with 11MeV protons produced by the CTI/SIEMENS RDS-111 cyclotron at the John Mallard Scottish PET Centre in Aberdeen. Irradiation with a beam current of 29 μA for 50 minutes was typically used. At the end of bombardment (EOB) the target was unloaded within 5 min using argon gas, delivering on average 11GBq of [^{18}F]-fluoride.

Production of 5-deoxy-5-[^{18}F]-fluoro-α/β,D-ribose ([^{18}F]-FDR 10)



11a R=OTs
11b R=OMes

12 **10**

The automated radiosynthesis of [^{18}F]-FDR **10** was carried out using the right, beige coloured side of the remote controlled synthesis module GE Healthcare TRACERlab FX_{FDG} synthesizer (Figure 1). Prior to the EOB, vial 7 was filled with K_2CO_3 aqueous solution (0.5 mL, 6 mg/mL), and vial 8 was filled with Kryptofix 2.2.2 (K222, 15 mg) in dry acetonitrile (1 mL). Vial 9 was filled with compound **11a** or **11b** (5 mg) in dry acetonitrile (1 mL). Vial 10 was filled with aqueous HCl (0.8 mL, 1 N). Vial 11 and 12 were loaded with sterile water (3 mL and 10 mL, respectively).

After the EOB [^{18}F]-fluoride was unloaded and transferred with argon gas to the synthesis module which was contained in a lead shielded mini hot cell (Von Gahlen). The [^{18}F]-fluoride was subsequently isolated using a CHROMAFIX anion exchange cartridge (Macherey Nagel, Germany) and then eluted into the reaction vessel with potassium carbonate (vial 7). The solution in vial 8 was added to the reaction vessel and the azeotropic mixture of water and acetonitrile was evaporated under vacuum using a stream of helium to form the dried complex [K/K222]^{18}F. Precursor **11a** or **11b** in vial 9 was then added and the reaction mixture was heated at 110 ^{o}C for 20 min to produce the fluorinated protected sugar [^{18}F]-**12**. Acetonitrile was removed under vacuum and with a stream of helium, and compound [^{18}F]-**12** was subsequently hydrolysed to form [^{18}F]-FDR **10** by treatment with aqueous HCl solution from vial 10 at 110^{o}C for 10 minutes. After cooling down the reaction vessel, the radioactivity was transferred onto a CHROMABOND IV purification cartridge (Macherey Nagel, Germany) and washed with water (3 mL) from vial 11. The [^{18}F]-FDR was obtained from a second rinse of the cartridge with sterile water (10 mL) from vial 12. The pH of the water solution of [^{18}F]-FDR was 6.5. The average radiochemical yield for **11a** was 28% (+/- 2.5 %, 6 production runs) and for **11b** was 26% (+/- 7 %, 3 production runs) considering the activity produced while considering the activity transferred into the reaction vessel was 35% (+/- 5 %, 6 production runs) and for **11b** was 33% (+/- 8 %, 3 production runs). The radiochemical purity was more than 98% in both cases. About 29% of the activity transferred in the reaction vessel was lost during the evaporation step, in order to avoid emission of radioactivity, the solvent and volatile radioactive substances were collected in the cooling trap in liquid nitrogen between the reaction vessel and the vacuum pump. The remaining activity was [^{18}F]-fluoride trapped into the Chromabond cartridge.

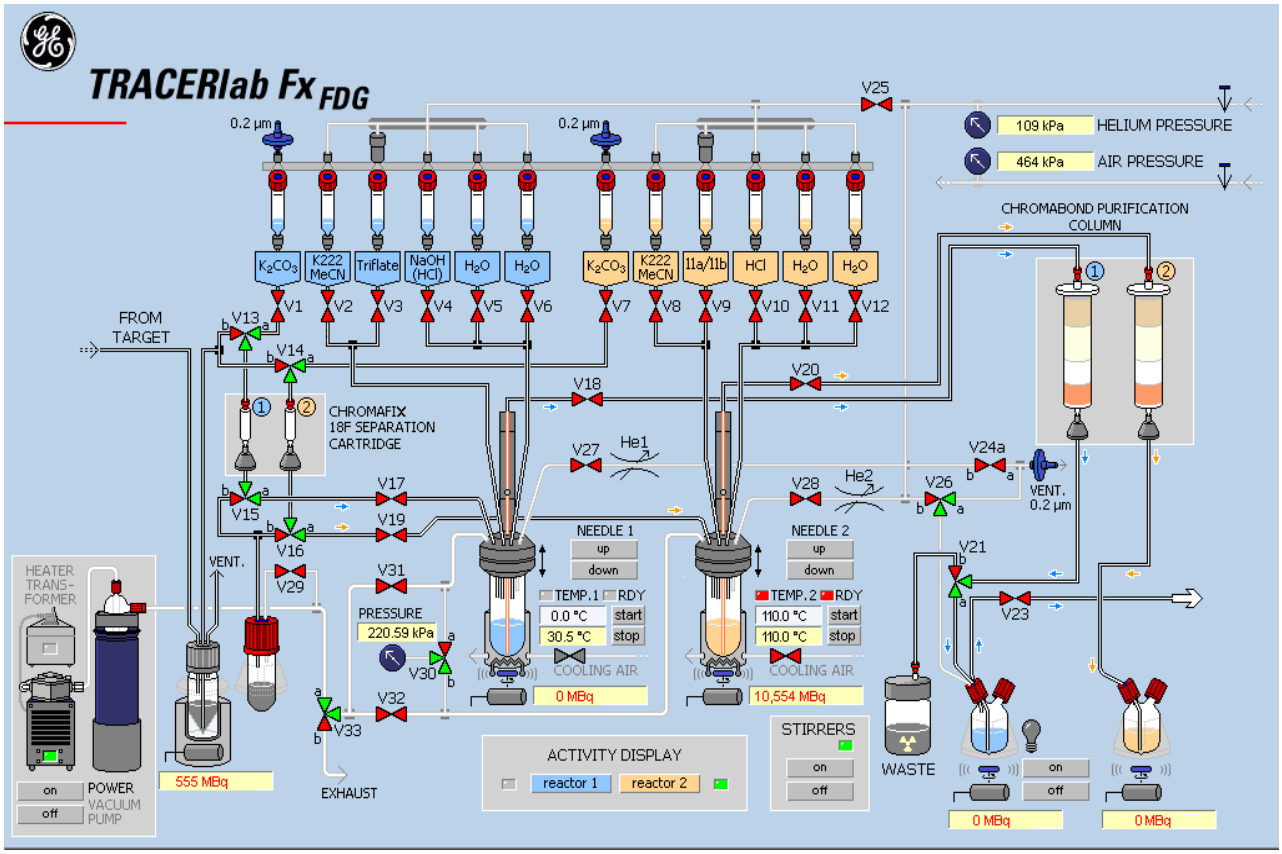


Figure 1. Graphical representation of the GE Healthcare TRACERlab FX_{FDG} synthesis module used for [^{18}F]-FDR **10** synthesis.

For Ion Exchange HPLC analysis an aliquot of [^{18}F]-FDR **10** (25 µL) was injected and eluted from a HAMILTON PRP-X100 column (250mm x 4.1mm) using 88mM NaOH solution at a flow rate of 0.9 ml/min. The retention time for [^{18}F]-FDR was 9.1 min (Figure 2a) and the radiochemical purity was ≥ 98%. The electrochemical detector showed the presence of ribose (Figure 2b) as a side product in the [^{18}F]-FDR **10** solution. A reference chromatograph of ribose is reproduced in Figure 2c**.**

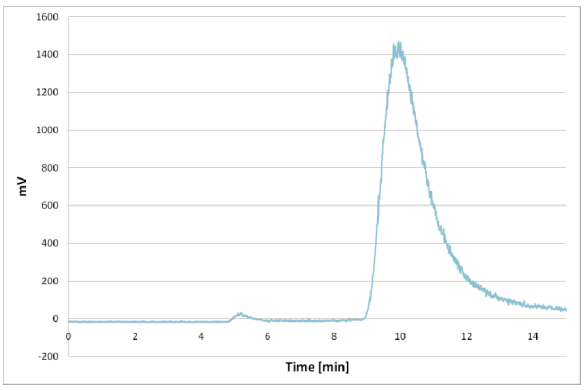


Figure 2a. Radioactivity chromatogram of [^{18}F]-FDR **10** (99% purity, RT 9.1min) using ion exchange chromatography. The peak at 5.1 min is [^{18}F]-fluoride.

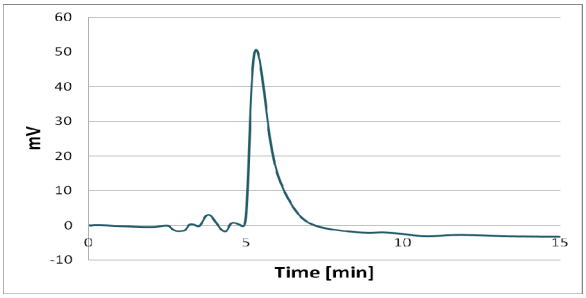


Figure 2b. Electrochemical detector chromatogram of a sample preparation of [^{18}F]-FDR **10**. The concentration of [^{18}F]-FDR **10** is too low to detect, as [18F]-fluoride is used at such low concentrations (~10^{-12}M) but the expected non-fluorinated ribose (peak at 5.3min) is obvious as a side product of the synthesis protocol.

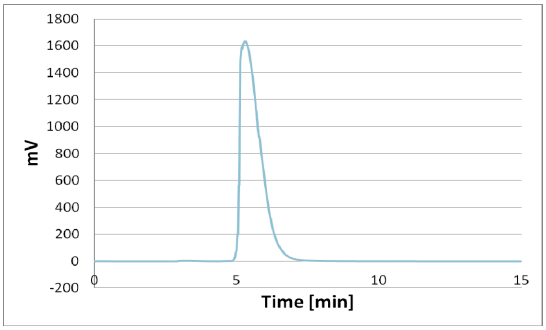


Figure 2c. Electrochemical detector chromatogram of a reference sample of ribose (5.3 min) using ion exchange chromatography.

For Reverse Phase HPLC analysis an aliquot of [^{18}F]-FDR **10** (20 µL) was injected and eluted from a Phenomenex Luna C18 column (250x4.6 mm, 100A, 5 µm) using acetonitrile (solvent A) and water (solvent B) at a flow rate of 1 ml/min with 100% solvent B for 4 min, then from 0% to 60% of solvent A in 10 minutes and finally changing to 95% solvent A to flush the column. The retention time for [^{18}F]-FDR was 3.9 min by this method and the radiochemical purity was ≥ 98% (Figure 3a). There was no trace of intermediate methyl acetal [^{18}F]-**12** (Figure 3b) in this chromatogram indicating high radiochemical purity. The HPLC trace with UV detector did not showed any trace of un-reacted starting material **11** after reverse phase HPLC analysis.

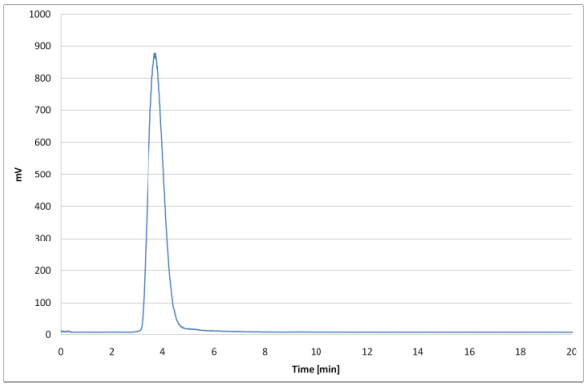


Figure 3a: Radioactivity chromatogram of [^{18}F]-FDR**10** (99.5% purity, RT 3.9min) using reverse phase chromatography.

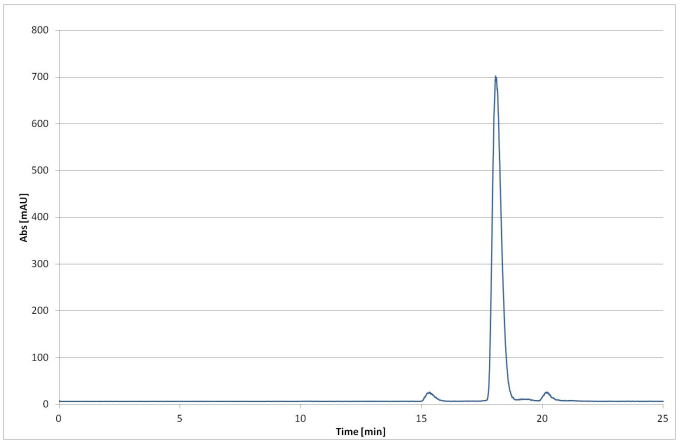
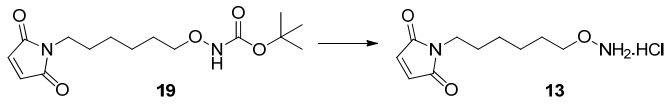


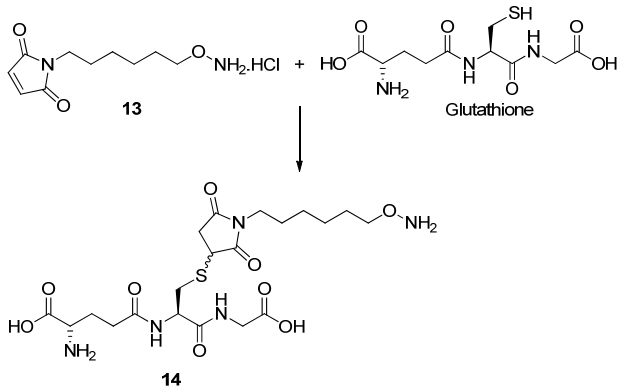
Figure 3b: Radioactivity chromatogram of methyl acetal [^{18}F]-**12** (RT 18 min) using reverse phase chromatography.

Preparation of N-(6-aminoxyhexyl)maleimide, hydrochloric acid salt (13)



To a solution of compound **19** (212.8 mg, 0.68 mmol) in ethyl acetate (5 mL) was added aqueous HCl (3 M, 5 mL). The mixture was stirred at room temperature for 1 hour before the solvents were removed under vacuum. The residue was dissolved in methanol (1 mL) and subsequently diethyl ether (Et_2O, 30 mL) was added. The resulted white precipitate was filtered off and was washed with Et_2O (3 × 10 mL), affording a solid product **13** (145.5 mg, 0.59 mmol, isolated yield 87%). M.p. 137-138 °C (Litrature data,[2] 135-137 °C); ^{1}H NMR (400 MHz, CD_3OD) δ 1.33 (m, 2H), 1.42 (m, 2H), 1.60 (m, 2H), 1.69 (m, 2H), 3.51 (t, J=7.1 Hz, 2H), 4.03 (t, J=6.4 Hz, 2H), 6.82 (s, 2H); ^{13}C NMR (100 MHz, CD_3OD) δ 172.62, 135.37, 76.25, 38.32, 29.32, 28.59, 27.30, 26.13. HRMS ES$^+$ (*m*/*z*) [M + Na]$^+$ calculated for $C_{10}H_{16}N_2O_3Na$, 235.1059; found 235.1059.

Preparation of compound 14



A solution of linker **13** (12.4 mg, 50.0 µmol) and glutathione (15.4 mg, 50.0 µmol) in phosphate buffer (1 mL, 10 mM, Ph 7.0) or sterile water (1 mL) in an Eppendorf tube was incubated for 3 minutes at 25 °C. HPLC analysis indicated that full conversion was reached. The obtained solution of **14** (50 mM) was divided into aliquots and stored at -80 °C for further use. Above obtained **14** was used for next step conjugation without any need for purification. For analytic purposes, **14** was purified conveniently by passing through a C18 RP column (Alltech, High Capacity C18). ^{1}H NMR (400 MHz, D_2O) δ 3.95 (ddd,

J=12.8Hz, 9.0Hz, 4.0Hz, 1H), 3.83 (t, J=6.5Hz, 2H), 3.68 (m, 3H), 3.40 (t, J=7.0Hz, 2H), 3.20 (m, 2H), 3.04 (dd, J=14.0Hz, 8.4Hz, 0.5H), 2.89 (dd, J=14.1Hz, 9.0Hz, 0.5H), 2.59 (ddd, J=18.9Hz, 7.3Hz, 4.0Hz, 1H), 2.43(m, 2H), 2.05(m, 2H), 1.49(m, 4H), 1.21(m, 4H); HRMS ES$^+$ (*m*/*z*) [M + H]$^+$ calculated for $C_{20}H_{34}N_5O_9S$, 520.2077; found 520.2080.

Preparation of [^{19}F]-15 (cold conjugation)

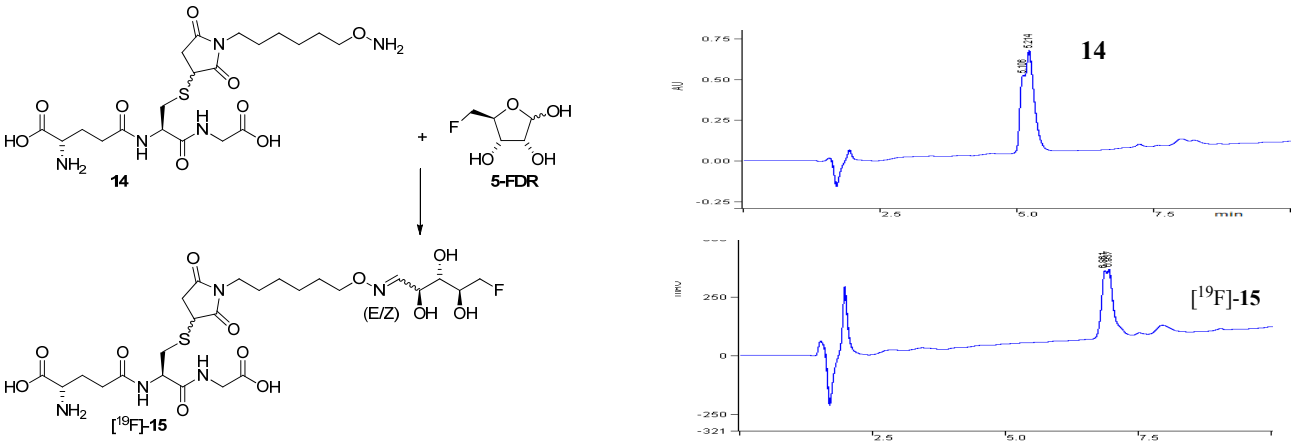
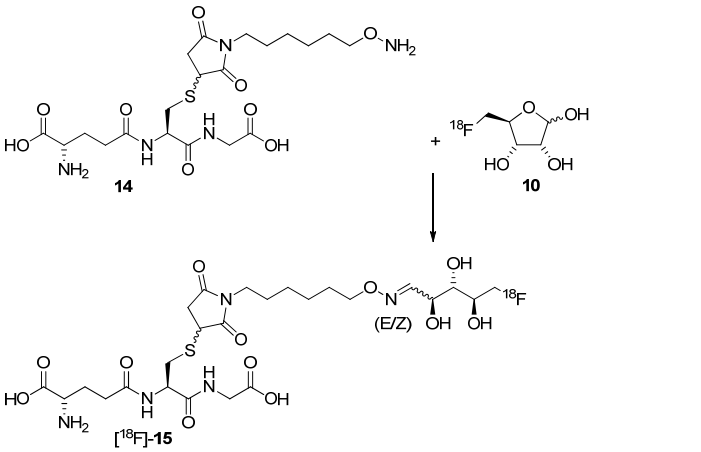


Figure 4 HPLC (UV detector) traces of **14** and unlabelled conjugate [^{19}F]-**15**.

Test scale experiments: A solution of **14** (1.0 mg, 2.0 µmol) and FDR (0.3 mg, 2.0 µmol) in sodium acetate buffer (100 µL, 0.25 M, pH 4.6) was placed in an Eppendorf tube and was incubated at 25 ^{o}C. Samples (2 µL each) were taken at intervals and were diluted with water by 50 times for HPLC analysis (Figure 4). Full conversion was reached after 7 min of reaction.

Preparative scale experiments: A solution of **14** (10.4 mg, 20.0 µmol) and FDR (3.0 mg, 20.0 µmol) in sodium acetate buffer (1 mL, 0.25 M, pH 4.6) in an Eppendorf tube was incubated for 7 min at 25 ^{o}C. The reaction mixture was loaded to a C18 RP cartridge column. The column was washed with water (5 × 2 mL, containing 0.1% formic acid) and subsequently with elution buffer (30% CH_3CN, 0.1% formic acid in H_2O, typically 10 mL). The fractions containing [^{19}F]-**15** was combined and the combined solution was freezed dried, to afford "cold" [^{19}F]-**15** (12.9 mg, 19.8 µmol, isolated yield 99 %) as a white amorphous solid. ^{1}H NMR (500 MHz, CD_3OD) δ 7.40 (d, J=6.8 Hz, 0.8H, N=C*H*, *E*-isomer), 6.78 (d, J=6.0 Hz, 0.2 H, N=C*H*, *Z*-isomer), 4.91 (dd, J=5.9 Hz, 3.1 Hz, 0.2 H, N=CHC*H*, *Z*-isomer), 4.54 (m, 1H), 4.44 (d, J=3.7 Hz, 1H), 4.34 (dd, J=6.8 Hz, 4.0 Hz, 0.8H, N=CHC*H*, *E*-isomer), 3.94 (m, 3H), 3.82 (s, 2H), 3.72 (m, 2H), 3.68 (t, J=6.4 Hz, 2H), 3.38 (t, J=7.0 Hz, 2H, NCH_2), 3.06 (m, 3H), 2.56 (ddd, J=18.9 Hz, 10.2 Hz, 3.9 Hz, 1H), 2.41 (m, 2H), 2.03 (q, J=7.3 Hz, 2H), 1.50 (m, 2H), 1.43 (m, 2H), 1.23 (m, 2H), 1.16 (m, 2H). δ ^{19}F NMR (470 MHz, D_2O) δ -234.43 (ddt, J= 47.4 Hz, 24.7 Hz, 3.3 Hz), -235.14 (ddt, J=47.4 Hz, 25.7 Hz, 3.9 Hz). HRMS ES$^+$ (*m*/*z*) [M + H]$^+$ calculated for $C_{25}H_{41}FN_5O_{12}S$, 654.2456; found 654.2457.

Preparation of [^{18}F]-15 (hot conjugation)



[^{18}F]-FDR **10** (100 µL, 8-12 MBq) prepared on the cyclotron as described above was added to a solution of **14** (2 mg) in sodium acetate buffer (10 µL, 1 M, pH 4.6) in an Eppendorf tube. The reaction mixture was kept at 25°C for 10 min. An aliquot (20 µL) of the reaction was injected and eluted from a Phenomenex Luna C18(2) column (250 x 4.6 mm, 100A, 5 µm) using 0.1% HCOOH in acetonitrile (solvent A) and 0.1% HCOOH in water (solvent B) at a flow rate of 1 ml/min with 100% solvent B for 4 min, then from 0% to 60% of solvent A in 10 min and finally changing to 95% solvent A to flush the column. The retention time of [^{18}F]-**15** was 12.4 min and the radiochemical purity was ≥ 95% (n=3) (Figure 5). The identity of the radiolabelled conjugate was confirmed by co-injection with a cold reference sample of [^{19}F]-**15**.

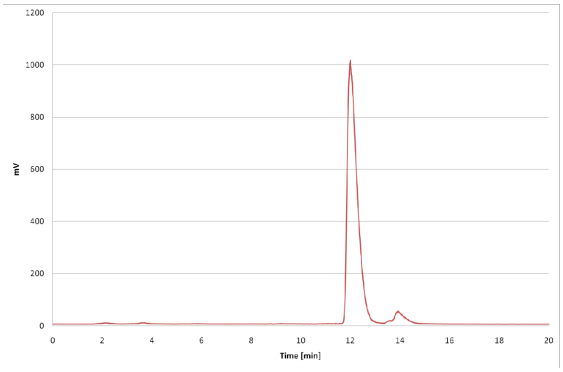
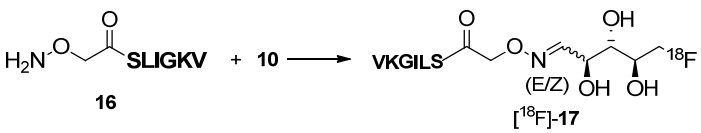


Figure 5: Radioactivity chromatogram of [^{18}F]-**15** (purity 96.5%, RT 12.4 min) using reverse phase HPLC.

Preparation of [^{18}F]-17



A solution of [^{18}F]-FDR **10** (11-17 MBq) prepared on the cyclotron and peptide **16** (2 mg, in CF_3CO_2H salt form) was incubated in sodium acetate buffer (110 µL, 90 mM, pH 4.6) at 25°C in an Eppendorf tube. After 10 min an aliquot (10 µL) of the reaction mixture was diluted with water (40 µL). The sample was analyzed on a Phenomenex Luna C18(2) column (250×4.6 mm, 100A, 5 µm) using 0.1% TFA in ACN (solvent A) and 0.1% TFA in water (solvent B) at a flow rate of 1ml/min with 100% solvent B for 4 min, then from 0% to 60% of solvent A in 10 min and finally changing to 95% solvent A to flush the column.

The retention time for the conjugated [^{18}F]-**17** was 13.4 minutes and the radiochemical purity was ≥ 95% (n=2) (Figure 6a). The identity of [^{18}F]-**17** was confirmed by co-injection with a "cold" reference sample of [^{19}F]-**17** which, obtained by conjugation of **16** and 5-FDR (Figure 6b). HRMS ES$^+$ (*m/z*) [M + H]$^+$ calculated for [^{19}F]-**17**, $C_{35}H_{64}FN_8O_{13}$, 823.4571; found 823.4509.

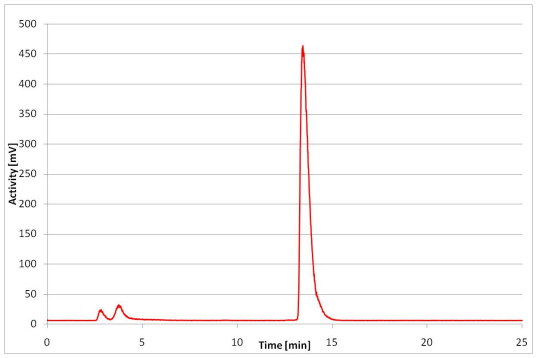


Figure 6a: Radioactivity chromatogram of [^{18}F]-**17** (RT 13.4 min) using reverse phase HPLC.

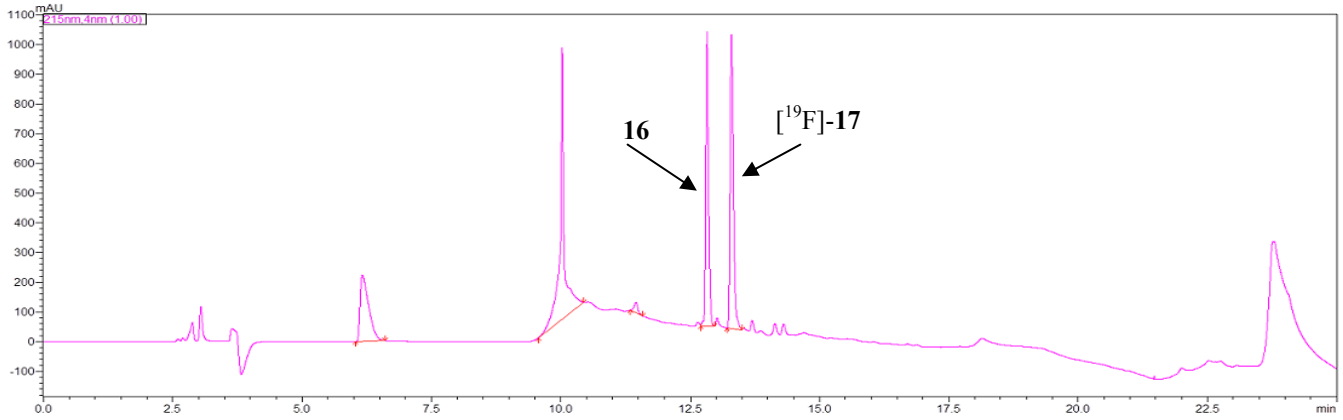


Figure 6b: UV chromatogram of [^{18}F]-**17** reaction mixture co-injected with [^{19}F]-**17** using reverse phase HPLC. [^{19}F]-**17** has a retention time of 13.3 min. Unreacted peptide **16** has a retention time of 12.8 min.

The reaction between the peptide **16** and [^{18}F]-FDR **10** was explored with a decreasing amount of peptide (2.0 - 0.5 mg) **16** otherwise using exactly the same experimental protocol described above. In order to achieve a relatively rapid conjugation time of ~10min, ~2mgs of peptide was required as shown in Table 2.

Peptide **16** amount [mg]	[^{18}F]FDR **10** amount [MBq]	Reaction time [min]	Conversion to [^{18}F]-**17**
2	17.50	10	97%
	11.45	10	95%
1	20.00	10	61%
	13.40	20	79%
0.5	15.00	10	35%
	20.00	20	62%
	15.00	40	73%
	20.00	60	97%

Table 2 Conjugation of peptide **16** with [^{18}F]FDR **10**, varying the peptide (in mgs) level under the conditions described above the 'Preparation of [^{18}F]-**17**'.

For analysis an aliquot (20 µL) of the reaction mixture of **16** (1mg) and [^{18}F]-FDR **10** at 20 min was loaded on the Phenomenex Luna C18 column and eluted using the HPLC gradient described above the protocol for the 'Preparation of [^{18}F]-**17**'. The radioactive peak at 13.4 min was collected and analyzed. The radioactivity trace showed a single peak at 13.4 min (radiopurity of 100%) (Figure 7a) and the HPLC trace did not show any peptide **16** (Figure 7b)

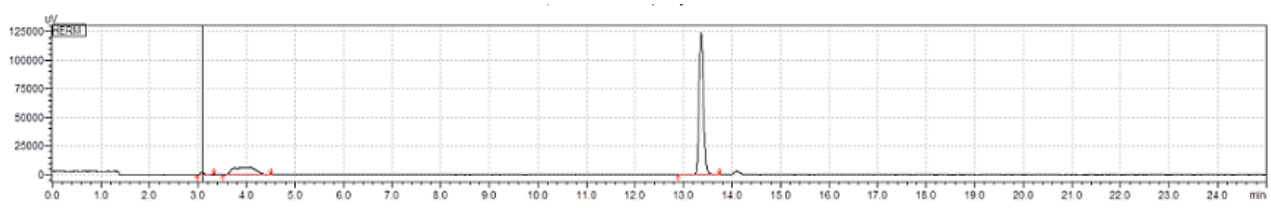


Figure 7a: Radioactivity chromatogram of unpurified [^{18}F]-**17** using reverse phase HPLC after a 20 min conjugation using peptide **16** (1mg).

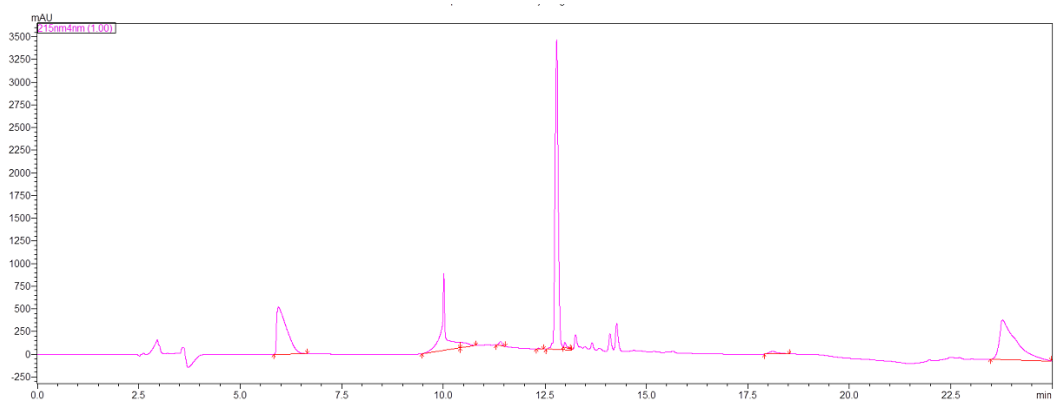


Figure 7b: UV (215 nm) chromatogram using reverse phase HPLC of the preparative sample of the unpurified [^{18}F]-**17** (This is the same sample as Figure 7a above). The concentration of [^{18}F]-**17** is too low to detect by UV. The most prominent peak (12.8 min) is that of unreacted peptide **16**.

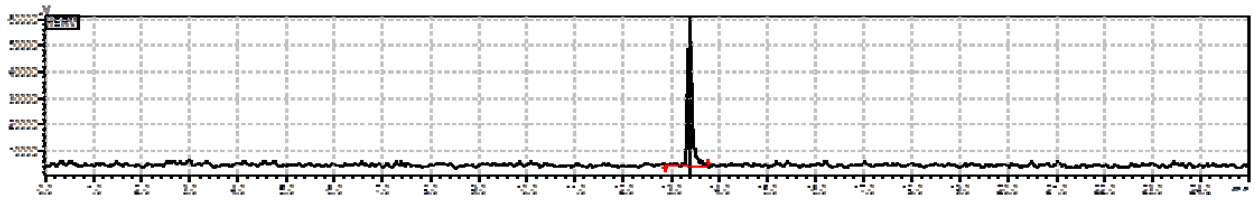


Figure 8a: HPLC Radioactivity trace of purified [^{18}F]-**17** (RT 13.4 min) using reverse phase HPLC, indicating a sing radioactive species.

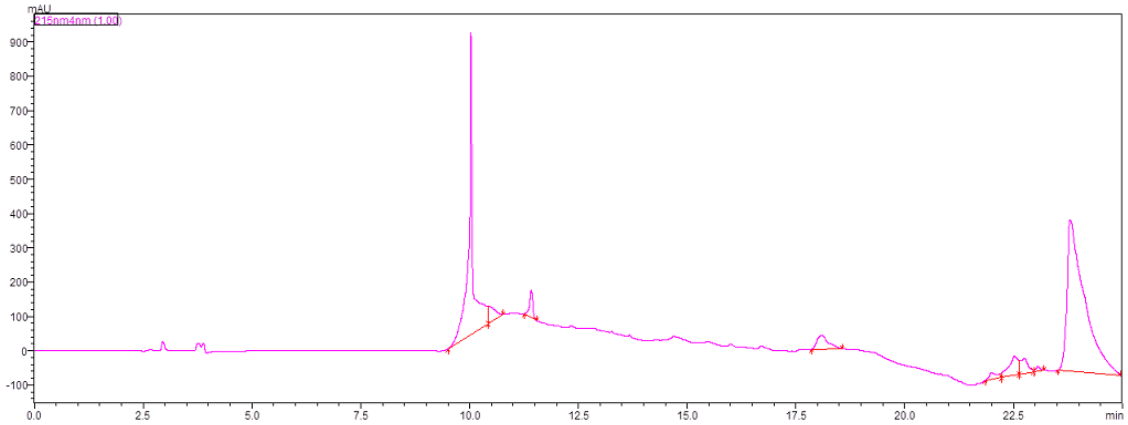


Figure 8b: UV (215 nm) chromatogram of the sample of purified [^{18}F]-**17.** (This is the same sample as Figure 8a above). The concentration of [^{18}F]-**17** is too low to detect by UV but it is clear that the purification has remove any trace of peptide **16** when this chromatogram is compared to that in 7b.

Reactions and HPLC conditions related to Table 1

A solution of **14** (20 mM) and one of the sugars (5-FDR, D-ribose, D-glucose, 6-FDG or FDG, 20 mM) was incubated in sodium acetate buffer (pH 4.6, 0.25 M) at 25 ^{o}C. Samples were taken at intervals and subjected to HPLC analyses which were carried out on a Varian Prostar Station equipped with a HICHROM C18 RP column (250 × 4.6 mm). Typical elution protocol: Solvent A contained 5% CH_3CN and 0.1% formic acid in water, solvent B contained 95% CH_3CN and 0.1% formic acid in water, gradient from 0% to 40% B in 20 minutes, flow rate 1 mL/min, detector UV 215 nm.

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1. F. Klepper, E.-M. Jahn, V. Hickmann, T. Carell, *Angew. Chem. Int. Ed*. **2007**, *46*, 2325-2327.
2. M. Berndt, J. Pietzsch, F. Wuest, *Nucl. Med. Biol*. **2007**, *34*, 5-15.
3. F. Sarabia-Garcia, F. J. Lopez-Herrera, *Tetrahedron*, **1996**, *52*, 4757-4768.
4. T. D. Ashton, P. J. Scammells, *Bioorg. Med. Chem. Lett*., **2005**, *15*, 3361-3363.
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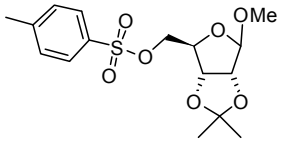
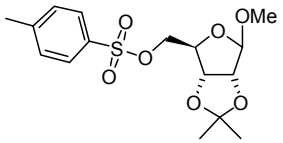
NMRs

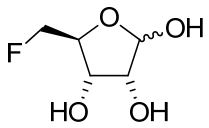
^{1}H NMR of **11a**



^{13}C NMR of **11a**



^{1}H NMR of **5-FDR**



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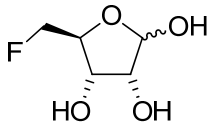
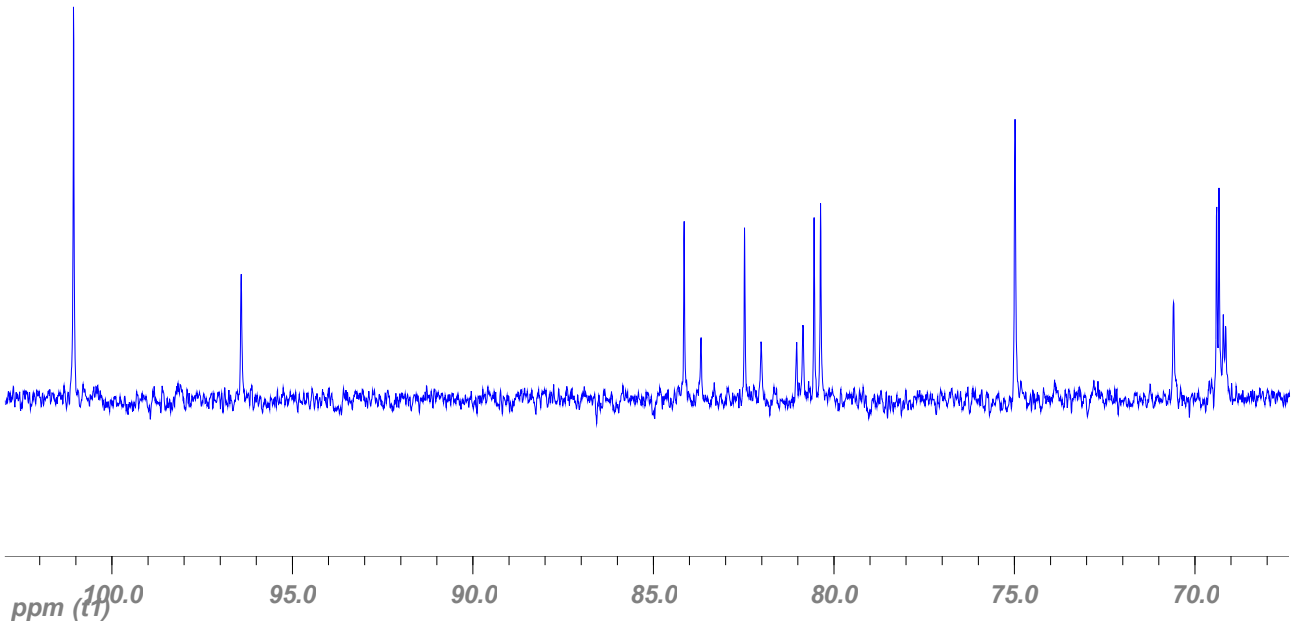
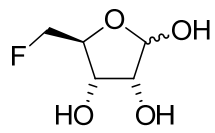
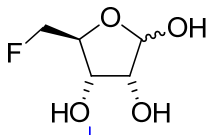


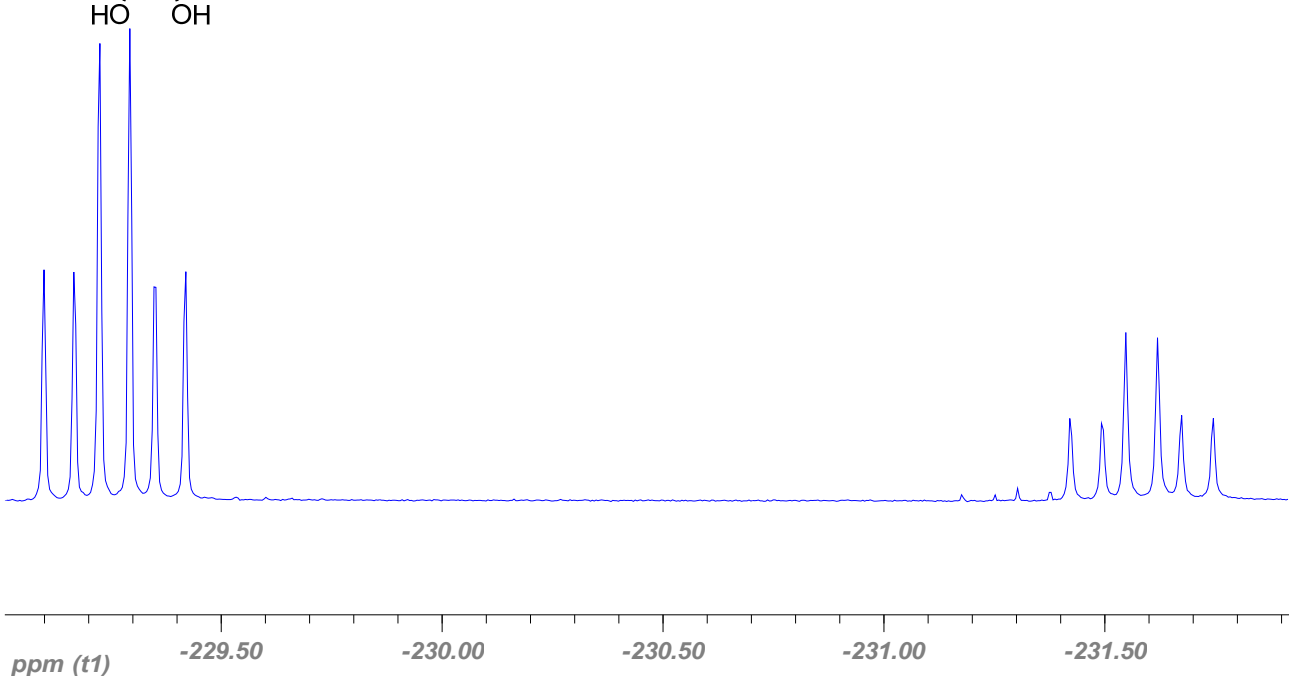


^{13}C-DEPT-135° NMR of **5-FDR**

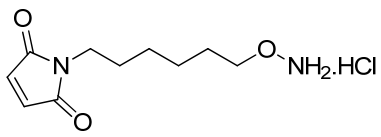


^{19}F NMR of **5-FDR**





^{1}H NMR of **13**



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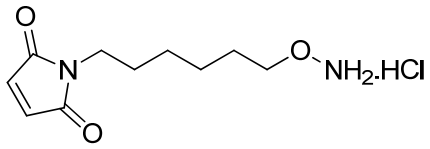

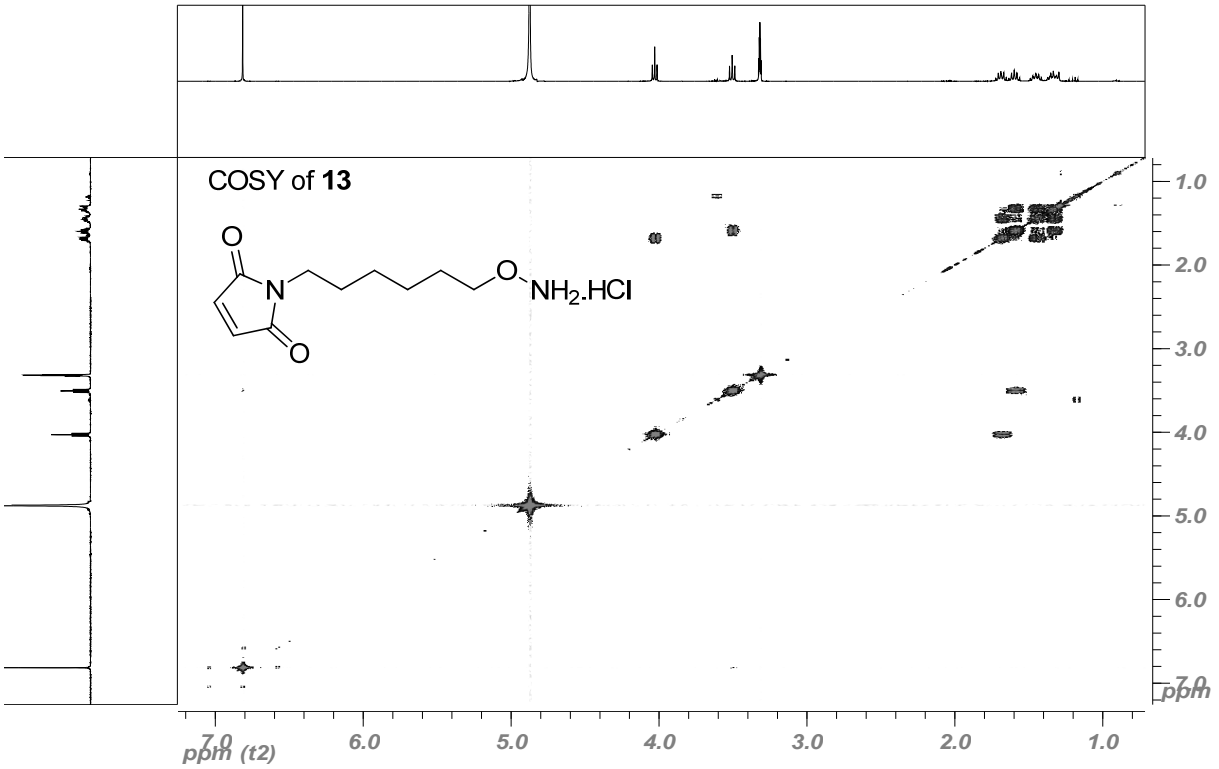
COSY of 13
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3.0
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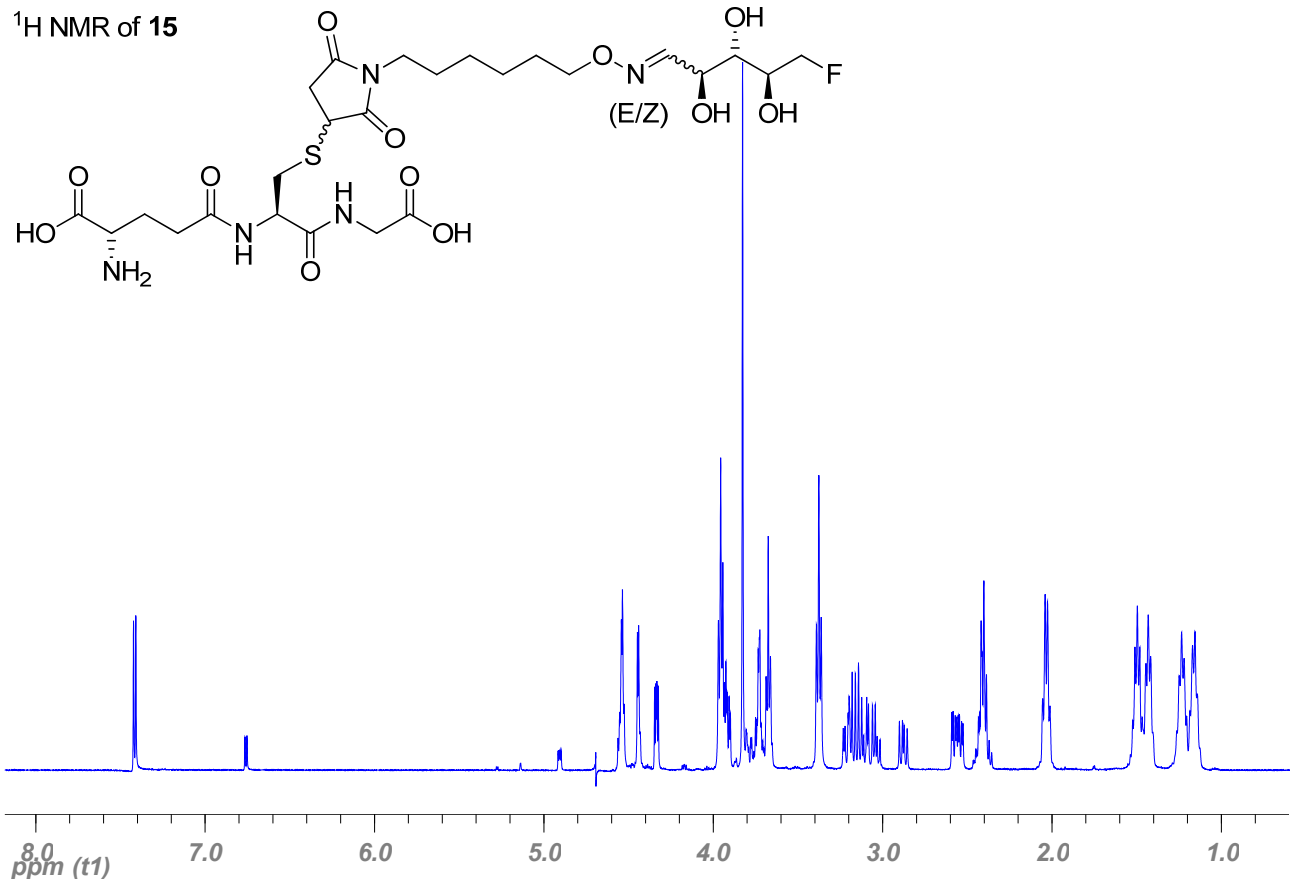
7.0
ppm
7.0
6.0
5.0
4.0
3.0
2.0
1.0
ppm (t2)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HO
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O
H
N
O
OH
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7.0
6.0
5.0
4.0
3.0
2.0
1.0
ppm (t1)

^{19}F NMR of **15**