Supporting information

Experimental

The exact mass spectral data were obtained with a Agilent LC-MSTOF or with Bruker BIOTOF II by electrospray ionization (ESI). ^{1}HNMR spectra were recorded on a Nicolet NT-300 NB spectrometer operating at 300.635 MHz or on Agilent/Varian MR-400 spectrometer operating at 399.930 MHz. Chemical shifts in $CDCl_3$ and Me_2SO-d_6 are expressed in parts per million downfield from tetramethylsilane (TMS) Chemical shifts (δ) listed for multiplets were measured from the approximate centers, and relative integrals of peak areas agreed with those expected for the assigned structures. Determination of % purity were obtained by HPLC (column type: vydac C18) using an Agilent 1100 LC equipped with a diode array UV detector and monitored at multiple wavelengths. Melting points were automatically determined on Otpi Melt apparatus and are uncorrected. Flash column chromatography was performed *via* the Biotage Isolera One flash purification system using silica-packed SNAP cartridge, KP-Sil.

5'-amino-5'-deoxy-adenosine 3

Diisopropyl azodicarboxylate (0.105 mol) was added drowse to a magnetically stirred suspension of 2',3'-(1-methylethy1idene)adenosine **1** (32.15 g, 0.105 mol), 1,3-dihydro-l,3-dioxo-2*H*-isoindole (0.108 mol), and triphenylphosphine (0.105 mol) in dry THF (360 ml) under nitrogen. An exothermic reaction occurred, and after complete addition, an orange solution was obtained. Ten to fifteen minutes later, a white precipitate separated, and after an additional 2 h, the reaction mixture was filtered. The isolated solid was washed with 1 l of diethyl ether and dried at 25 ^{o}C to give **2** as a white powder: yield 40 g (87%). A mixture of this later (0.065 mol) and hydrazine hydrate (1.04 mol) in EtOH (2 l) was refluxed overnight. The obtained solution was allowed to cool to room temperature and then filtered, and the filtrate was evaporated to dryness in vacuo. The residue was treated with H_2O (300 ml), and the mixture was acidified with glacial acetic acid (pH 4), and filtered. The filtrate was adjusted to pH 10 with aqueous 4 N NaOH. Extraction with CH_2Cl_2, (4 **x** 500 ml), drying of the combined organic layers over $MgSO_4$ and removal of the solvent in vacuo gave **3** in 78% yield as white solid. mp 194-196 ^{o}C. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.36 (s, H8), 8.15 (s, H2), 7.31 (s, NH_2), 6.07 (d, H1', J = 3.2 Hz), 5.44 (dd, H2', J = 3.3 Hz and 3 Hz), 4.97 (dd, H3', J = 2.7 Hz and 3.6 Hz), 4.08 (td, H4', J

= 2.7 and 3 Hz), 2.64-2.74 (m, 2H5'), 1.53 and 1.32 (2s, CH_3). FABMS (M+H) calculated for $C_{13}H_{18}N_6O_3$.H was 307.1513, found 307.1514.

General procedure for preparation of compounds: 4-34

To a solution of HATU (0.5 mmol) and the carboxylic acid derivative (0.75 mmol) in acetonitrile (5 ml) was added amine **3** (0.5 mmol) followed by DIEA (0.75 mmol) under argon in a 12-place carousel reaction station at room temperature. The reaction mixture was stirred for 30-180 minutes (TCL monitored), pre-adsorbed on silica gel and purified using automated flash chromatography system. The obtained pure intermediate (0.25 mmol) and 4 ml of formic acid (50%) in a Radleys' reaction tube was heated to 70 °C and stirred vigorously for 2 h whereby TLC showed no remaining starting material. The solvent was removed *in vacuo* at ~60 °C bath temperature, silica gel was added to the residue dissolved in methanol and the mixture was concentrated, and chromatographed to give the desired product.

(2S)-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-5-oxopyrrolidine-2-carboxamide 4

Yield 65%, white solid, mp 188-190 ^oC. HPLC 100%, t_R = 5.14 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.33 (s, H8), 8.32 (t, NH5', J = 5.9 Hz), 8.17 (s, H2), 7.77 (s, NH), 7.31 (s, NH_2), 5.84 (d, H1', J = 6 Hz), 5.46 (d, OH2', J = 6 Hz), 5.25 (d, OH3', J = 4.7 Hz), 4.68 (m, H2'), 3.95-4.06 (2m, H3', H4' and CHCO), 3.42 (m, 2H5'), 2.05-2.26 (m, CH_2CH), 1.82-1.88 (m, CH). FABMS (M+H) calculated for $C_{15}H_{19}N_7O_5$.H was 378.1520, found 378.1526.

N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-2-(1,3-dimethyl-2,6-dioxopurin-7-yl)acetamide 5

Yield 74%, white solid, mp 178-180 ^oC. HPLC 100%, t_R = 6.39 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.63 (t, NH5', J= 5.7 Hz), 8.36 (s, H8), 8.2 (s, H2), 8 (s, NCHN), 7.32 (s, NH_2), 5.87 (d, H1', J = 6 Hz), 5.42 (d, OH2', J = 6.3 Hz), 5.25 (d, OH3', J = 4.7 Hz), 5.03 (s, CH_2), 4.69 (m, H2'), 4.07 (m, H3'), 3.96 (m, H4'), 3.45 (m, 2H5') 3.44 and 3.19 (2s, $2CH_3$). FABMS (M+H) calculated for $C_{19}H_{22}N_{10}O_6$.H was 487.1796, found 487.1788.

(2S)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]-3-phenylpropanamide 6

Yield 55%, white solid, mp 120-122 ^{o}C. HPLC 94%, t_R = 3 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.33 (s, H8), 8.16 (m, NH5'), 8.15 (s, H2), 7.28 (s, NH_2), 7.07-7.26 (m, 5H, Ph), 5.84 (d, H1', J = 6.1 Hz), 5.45 (br s, OH2'), 5.25 (br s, OH3'), 4.64 (m, H2'), 4.03 (m, H3'), 3.94 (m, H4'), 3.37-3.45 (m, 2H5' and CHCO), 2.92 (dd, CH, J = 4.9 Hz and 8.4 Hz), 2.56 (dd, CH, J = 8.4 Hz and 4.9 Hz). FABMS (M+H) calculated for $C_{19}H_{24}N_7O_4$.H was 414.19, found 414.2.

(2S)-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-pyrrolidine-2-carboxamide 7

Yield 62%, white solid, mp 80-82 ^{o}C. HPLC 100%, t_R = 2.67 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.33 (s, H8), 8.17 (m, NH5'), 8.16 (s, H2), 7.28 (s, NH_2), 5.84 (d, H1', J = 6 Hz), 5.43 (br s, OH2'), 5.23 (br s, OH3'), 4.66 (m, H2'), 4.06 (m, H3'), 3.92-3.95 (m, H4'), 3.38-3.56 (m, 2H5' and CHCO), 2.74-2.83 (m, CH_2NH), 1.9-1.96 (m, CH), 1.55-1.66 (m, CH_2 and CH). FABMS (M+H) calculated for $C_{15}H_{21}N_7O_4$.H was 364.1727, found 364.1719.

(2S)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]-3-hydroxypropanamide 8

Yield 60%, white solid, mp 96-99 ^{o}C. HPLC 100%, t_R = 2.67 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.34 (s, H8), 8.17 (m, NH5'), 8.16 (s, H2), 7.28 (s, NH_2), 5.84 (d, H1', J = 6.2 Hz), 5.42 (br s, OH2'), 5.23 (br s, OH3'), 4.66 (m, H2'), 4.07 (m, H3'), 3.93-4 (m, H4'), 3.39-3.56 (m, 2H5', CH_2 and CHCO). FABMS (M+H) calculated for $C_{13}H_{19}N_7O_5$.H was 354.1520, found 354.1515.

(2S)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]-4-methylsulfanylbutanamide 9

Yield 67%, white solid, mp 98-100 ^{o}C. HPLC 98%, t_R = 2.71 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.34 (s, H8), 8.18 (m, NH5'), 8.16 (s, H2), 7.29 (s, NH_2), 5.84 (d, H1', J = 6.2 Hz), 5.43 (d, OH2', J = 6.3 Hz), 5.23 (d, OH3', J = 4.7 Hz), 4.67 (m, H2'), 4.05 (m, H3'), 3.95 (m, H4'), 3.24-3.46 (m, 2H5' and CHCO), 2.5 (m, SCH_2), 1.96 (s,

CH_3), 1.77-1.9 (m, CH), 1.54-1.61 (m, CH). FABMS (M+H) calculated for $C_{15}H_{23}N_7O_4S.H$ was 398.1605, found 398.1601.

(2R)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]propanamide 10

Yield 74%, white solid, mp 119-121 ^oC. HPLC 100%, t_R = 2.69 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.33 (s, H8), 8.16 (s, H2), 8.14 (m, NH5'), 7.29 (s, NH_2), 5.84 (d, H1', J = 6 Hz), 5.44 (d, OH2', J = 5.3 Hz), 5.24 (br s, OH3'), 4.68 (m, H2'), 4.07 (br s, H3'), 3.94 (m, H4'), 3.38-3.47 (m, 2H5' and CHCO), 1.14 (d, CH_3, J = 6.8). FABMS (M+H) calculated for $C_{13}H_{19}N_7O_4.H$ was 338.1571, found 338.1566.

(2S)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]-3-methylbutanamide 11

Yield 63%, white solid, mp 121-123 ^oC. HPLC 100%, t_R = 2.71 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.34 (s, H8), 8.16 (s, H2), 8.15 (m, NH5'), 7.3 (s, NH_2), 5.84 (d, H1', J = 6.3 Hz), 5.44 (d, OH2', J = 5.9 Hz), 5.22 (br s, OH3'), 4.67-4.71 (m, H2'), 4.02-4.04 (m, H3'), 3.94-3.98 (m, H4'), 3.39-3.48 (m, 2H5'), 1.82-1.9 (m, CH), 0.84 (d, CH_3, J = 6.8 Hz), 0.77 (d, CH_3, J = 6.8 Hz), 3 (d, CH, 6.8 Hz), 2.96-2.97 (m, CHCO), 1.81-2.1 (m, NH_2 and CH), 0.85 and 0.77 (2d, $2CH_3$, J = 6.9 Hz and 6.9 Hz). FABMS (M+H) calculated for $C_{15}H_{23}N_7O_4.H$ was 366.1884, found 366.1882.

(2S)-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-1-(4-fluorophenyl)sulfonylpyrrolidine-2-carboxamide 12

Yield 68%, white solid, mp 130-134 ^oC. HPLC 100%, t_R = 4.24 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^1H NMR (300 MHz, Me_2SO): 8.36 (s, H8), 8.25 (m, NH5'), 8.15 (s, H2), 7.92 (m, 2H, Ph), 7.46 (m, 2H, Ph), 7.32 (s, NH_2), 5.86 (d, H1', J = 6.2 Hz), 5.48 (br s, OH2'), 5.27 (br s, OH3'), 4.67 (m, H2'), 3.94-4.11 (m, H3', H4' and CHN), 3.13-3.46 (m, 2H5' and CH_2N), 1.5-178 (m, CH_2, CH_2). FABMS (M+H) calculated for $C_{21}H_{24}FN_7O_6S.H$ was 522.1565, found 522.1548.

2-amino-N-[2-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl-amino]-2-oxoethyl]acetamide 13

Yield 67%, white solid, mp 146-148 °C. HPLC 100%, t_R = 2.68 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (300 MHz, Me_2SO-d_6): 8.35 (s, H8), 8.28 (t, NH5', J = 5.1 Hz), 8.22 (m, NH), 8.17 (s, H2), 7.33 (s, NH_2), 5.84 (d, H1', J = 6.2 Hz), 5.25 (br s, OH2' and OH3'), 4.67 (m, H2'), 4.05 (m, H3'), 3.95 (m, H4'), 3.77 (br s, CH_2CO), 3.41 (m, 2H5'), 3.21 (s, CH_2 CO). FABMS (M+H) calculated for $C_{14}H_{20}N_8O_5$.H was 381.1629, found 381.1627.

(2R)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]-3-(pyridin-3-yl)propanamide 14

Yield 60%, white solid, mp 131-134 °C. HPLC 100%, t_R = 2.70 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.36-8.4 (m, 2H, pyridine), 8.33 (s, H8), 8.17 (m, NH5'), 8.14 (s, H2), 7.59 (d, 1H, pyridine, J = 7.2 Hz), 7.28 (s, NH_2), 7.26 (m, 1H, pyridine), 5.84 (d, H1', J = 6.1 Hz), 5.43 (br d, OH2', J = 5.6 Hz), 5.23 (br s, OH3'), 4.67 (m, H2'), 4.07 (br s, H3'), 3.9 (m, H4'), 3.36-3.46 (m, 2H5' and CHCO), 2.91 (dd, CH, J = 5.5 Hz and 13.7 Hz), 2.66 (dd, CH, J = 8.2 Hz and 13.5 Hz). FABMS (M+H) calculated for $C_{18}H_{22}N_8O_4$.H was 415.1836, found 415.1838.

(2S,4S)-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-4-fluoropyrrolidine-2-carboxamide 15

Yield 66%, white solid, mp 110-112 °C. HPLC 100%, t_R = 2.68 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.33 (s, H8), 8.2 (t, NH5', J = 4.8 Hz), 8.16 (s, H2), 7.28 (s, NH_2), 5.84 (d, H1', J = 6.1 Hz), 5.43 (d, OH2', J = 6.3 Hz), 5.22 (d, OH3', J = 4.9 Hz), 5.08 (br s, NH), 4.66 (m, H2'), 4.04-4.08 (m, H3'), 3.92-3.95 (m, H4'), 3.59 (m, CHCO), 3.42 (m, 2H5'), 2.98-3.09 (m, CH_2N and CHF), 1.96-2.28 (m, CH_2). FABMS (M+H) calculated for $C_{15}H_{20}FN_7O_4$.H was 382.1633, found 382.1640.

(2S)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]-3-(4-prop-2-enoxyphenyl)propanamide 16

Yield 63%, white solid, mp 94-96 °C. HPLC 99%, t_R = 3.62 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.34 (s, H8), 8.15 (s, H2), 8.14 (m, NH5'), 7. 31 (s, NH_2), 7.08 (d, 2H, Ph, J = 8.8 Hz), 6.81 (d, 2H, Ph, J = 8.6 Hz) 5.97-6.06 (m, CH), 5.84 (d, H1', J = 6.1 Hz), 5.44 (d, OH2', J = 5.1 Hz), 5.38 (dq, CH, J = 1.8 Hz and 15.7 Hz), 5.21-5.25

(m, CH and OH3'), 4.64 (m, H2'), 4.48-4.5 (m, OCH_2), 4.01 and 3.94 (m, H3' and H4'), 3.34-3.38 (m, 2H5' and CHCO), 2.85 (dd, CH, J = 4.9 Hz and 13.5 Hz), 2.53 (m, CH), 1.7 (br s, NH_2). FABMS (M+H) calculated for $C_{22}H_{27}N_7O_5$.H was 470.2146, found 470.2153.

(2R)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]-3-(benzoymethyimidazol-5-yl)propanamide 17

Yield 72%, white solid, mp 147-150 ^oC. HPLC 98%, t_R = 4.37 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.52 (t, NH5', J = 5.9 Hz), 8.33 (s, H8), 8.23 (s, H2), 7.68 (d, NCHN, J = 0.8 Hz), 7.24-7.35 (m, 5H, Ph and NH_2), 6.72 (br s, NCH), 5.83 (d, H1', J = 6.2 Hz), 5.41 (d, OH2', J = 6 Hz), 5.38 (d, NH_2, J = 7.1 Hz), 5.25 (d, OH3', J = 4.3 Hz), 4.66-4.72 (m, H2'), 4.37 (s, OCH_2), 3.94 (br s, H3' and H4'), 3.41 (m, 2H5' and CHCO), 3.01(dd, CH, J = 5.6 Hz and 10 Hz), 2.87 (dd, CH, J = 8.4 Hz and 7 Hz). FABMS (M+H) calculated for $C_{25}H_{29}N_9O_6$.H was 552.2313, found 552.2319.

(2S,3R)-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-2-(methylamino)-3-phenylmethoxybutanamide 18

Yield 71%, white solid, mp 71-73 ^oC. HPLC 97%, t_R = 4.16 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.34 (s, H8), 8.15-8.17 (m, NH5'), 8.16 (s, H2), 7.23-7.31 (m, 5H, Ph and NH_2), 5.85 (d, H1', J = 6.1 Hz), 5.45 (d, OH2', J = 6.1 Hz), 5.23 (d, OH3', J = 4.7 Hz), 4.72 (q, H2', J = 6.1 Hz), 4. 48 (d, CHO, J = 11.8 Hz), 4.4 (d, CHO, J = 12 Hz), 4.05-4.1 (m, H3'), 3.96-4 (m, H4'), 3.62-3.67 (m, CH), 3.39-3.53 (m, 2H5'), 2.89 (d, CHCO, J = 5.2 Hz), 2.21 (s, CH_3), 1.11 (d, CH_3, J = 6.2 Hz). FABMS (M+H) calculated for $C_{22}H_{29}N_7O_5$.H was 472.2302, found 472.2309.

(2S)-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-azetidine-2-carboxamide 19

Yield 64%, white solid, mp 175-178 ^oC. HPLC 100%, t_R = 2.67 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.34 (s, H8), 8.16 (s, H2), 8.08 (t, NH5', J = 6.1 Hz), 7.28 (s, NH_2), 5.85 (d, H1', J = 6 Hz), 5.43 (d, OH2', J = 6 Hz), 5.24 (d, OH3', J = 4.7 Hz), 4.66 (q, H2', J = 5.8 Hz), 4.08-4.13 (m, H3' and CHCO), 3.95-3.99 (m, H4'), 3.49-3.54 (m, CH), 3.37-3.44 (m, 2H5'), 3.11-3.16 (m, CH), 2.4-2.44 (m, CH), 2.08-2.13 (m, CH), CO, J = 4.3 Hz),

1.65-1.98 (m, CH), 1.32-1.38 (m, CH), 1.1-1.19 (m, CH), 0.82 (t, CH_3, J = 7.4 Hz), 0.69 (d, CH_3, J = 6.7 Hz). FABMS (M+H) calculated for $C_{14}H_{19}N_7O_4$.H was 350.1571, found 350.1576.

(2S,3R)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]-3-methylpentanamide 20

Yield 61%, white solid, mp 105-107 ^oC. HPLC 97%, t_R = 2.72 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.34 (s, H8), 8.16 (s, H2), 8.16 (t, NH5', J = 5.2 Hz), 7.29 (s, NH_2), 5.84 (d, H1', J = 6.2 Hz), 5.43 (d, OH2', J = 6.3 Hz), 5.22 (d, OH3', J = 4.7 Hz), 4.67 (dd, H2', J = 6.2 Hz and J = 5.2 Hz), 4.03-4.06 (m, H3'), 3.94-3.97 (m, H4'), 3.42-3.45 (m, 2H5'), 3.12 (d, CHCO, J = 4.3 Hz), 1.65-1.98 (m, CH), 1.32-1.38 (m, CH), 1.1-1.19 (m, CH), 0.82 (t, CH_3, J = 7.4 Hz), 0.69 (d, CH_3, J = 6.7 Hz). FABMS (M+H) calculated for $C_{16}H_{25}N_7O_4$.H was 380.2040, found 380.2048.

(2S)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]-2-cyclohexylacetamide 21

Yield 67%, white solid, mp 131-134 ^oC. HPLC 94%, t_R = 2.94 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.34 (s, H8), 8.16 (m, NH5'), 8.15 (s, H2), 7.3 (s, NH_2), 5.84 (d, H1', J = 6.5 Hz), 5.45 (br s, OH2'), 5.25 (m, OH3'), 4.69 (t, H2', J = 5.4 Hz), 4.02-4.05 (m, H3'), 3.95-3.98 (m, H4'), 3.36-3.48 (m, H5'), 2.99 (d, CHCO, J = 5.5 Hz), 0.92-1.65 (m, 11H). FABMS (M+H) calculated for $C_{18}H_{27}N_7O_4$.H was 406.2197, found 406.2204.

(2R)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]-3-(1,3-thiazol-4-yl)propanamide 22

Yield 62%, white solid, mp 110-112 ^oC. HPLC 100%, t_R = 2.69 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.99 (d, CHS, J = 1.9 Hz), 8.34 (s, H8), 8.21 (t, NH5', J = 6 Hz), 8.17 (s, H2), 7.34 (d, CHS, J = 1.8 Hz), 7.29 (s, NH_2), 5.84 (d, H1', J = 6.3 Hz), 5.42 (d, OH2', J = 6.2 Hz), 5.22 (d, OH3', J = 4.7 Hz), 4.66 (m, H2'), 4.02-4.04 (m, H3'), 3.95-3.96 (m, H4'), 3.55-3.57 (m, CHCO), 3.35-3.45 (m, H5'), 3.12 (dd, CH, J = 5.2 Hz 9.8 Hz), 2.79 (dd, CH, J = 8.7 Hz and 5.6 Hz), 1.89-2.08 (bs s, NH_2). FABMS (M+H) calculated for $C_{16}H_{20}N_8O_4S$.H was 421.1401, found 421.1409.

(2S)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]-3-[4-(trifluoromethyl)phenyl]propanamide 23

Yield 65%, white solid, mp 136-139 ^{o}C. HPLC 100%, t_R = 4 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.34 (s, H8), 8.2 (m, NH5'), 8.15 (s, H2), 7.59 (d, 2H, Ph, J = 8.2), 7.41 (d, 2H, Ph, J = 8 Hz), 7.29 (s, NH_2), 5.85 (d, H1', J = 6.1 Hz), 5.44 (br s, OH2'), 5.23 (m, OH3'), 4.66 (t, H2', J = 5.3 Hz), 4.02-4.05 (m, H3'), 3.93-3.96 (m, H4'), 3.36-3.48 (m, CH_2 and CHCO), 2.97-3.02 (dd, H5', J = 4.9 Hz and 8.4 Hz), 2.67-2.73 (dd, H5', J = 8.4 Hz and 5.1 Hz). FABMS (M+H) calculated for $C_{20}H_{22}F_3N_7O_4$.H was 482.1758, found 482.1759.

(2R)-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-2-(methylamino)propanamide 24

Yield 60%, white solid, mp 115-118 ^{o}C. HPLC 100%, t_R = 2.69 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.32 (s, H8), 8.16 (s, H2), 8.15 (t, NH5', J = 6.1 Hz), 7.3 (s, NH_2), 5.83 (d, H1', J = 6.2 Hz), 5.43 (d, OH2', J = 6.2 Hz), 5.22 (d, OH3', J = 4.5 Hz), 4.69 (dd, H2', J = 6.1 Hz and 5.4 Hz), 4.02-4.07 (m, H3'), 3.96-3.98 (m, H4'), 3.41-3.46 (m, 2H5'), 2.94-2.97 (m, CHCO), 2.15 (s, CH_3), 1.10 (d, CH_3, J = 6.8 Hz). FABMS (M+H) calculated for $C_{14}H_{21}N_7O_4$.H was 352.1727, found 352.1724.

3-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-propanamide 25

Yield 66%, liquid. HPLC 100%, t_R = 2.65 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (300 MHz, Me_2SO-d_6): 8.42 (m, NH5'), 8.36 (s, H8), 8.18 (s, H2), 7.34 (br s, NH_2), 5.84 (d, H1', J = 6.1 Hz), 5-5.6 (m, OH2' and OH3'), 4.67 (m, H2'), 4.03-4.06 (m, H3'), 3.95-3.96 (m, H4'), 3.26-3.5 (m, 2H5'), 2.84-2.89 (m, CH_2), 2.37 (t, CH_2CO, J = 6.4 Hz). FABMS (M+H) calculated for $C_{13}H_{19}N_7O_4$.H was 338.1571, found 338.1577.

(2R)-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-5-(tosylguanidine)butanamide 26

Yield 68%, white solid, mp 144-147 ^{o}C. HPLC 100%, t_R = 3.19 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.33 (s, H8), 8.19 (m, NH5'), 8.15 (s, H2), 7.62 (d,

2H, Ph, J = 8.2 Hz), 7.29 (s, NH_2), 7.27 (d, 2H, Ph, J = 8 Hz), 6.56-7-08 (m, 5NH), 5.85 (d, H1', J = 6.1 Hz), 5.44 (d, OH2', J = 6.1 Hz), 5.23 (d, OH3', J = 4.8 Hz), 4.68 (dd, H2', J = 5.7 Hz and 5.5 Hz), 4.05-4.08 (m, H3'), 3.92-3.96 (m, H4'), 3.36-3.49 (m, 2H5'), 3.19 (m, CHCO), 3.02 (br s, CH_2), 2.33 (s, CH_3), 1.34-1.56 (m, $2CH_2$). FABMS (M+H) calculated for $C_{23}H_{32}N_{10}O_6S.H$ was 577.2299, found 577.2304.

(2S)-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-2-(methylamino)propanamide 27

Yield 61%, white solid, mp 119-121 ^oC. HPLC 100%, t_R = 2.69 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.33 (s, H8), 8.16 (s, H2), 8.08 (t, NH5', J = 5.9 Hz), 7.29 (s, NH_2), 5.84 (d, H1', J = 6.2 Hz), 5.44 (d, OH2', J = 6.1 Hz), 5.22 (d, OH3', J = 4.7 Hz), 4.69 (dd, H2', J = 5.9 Hz and 5.4 Hz), 4.04-4.07 (m, H3'), 3.93-3.97 (m, H4'), 3.34-3.48 (m, 2H5'), 2.92-2.97 (m, CHCO), 2.16 (s, CH_3), 1.08 (d, CH_3, J = 6.9 Hz). FABMS (M+H) calculated for $C_{14}H_{21}N_7O_4.H$ was 352.1727, found 352.1727.

(2S)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]-3-phenylmethoxypropanamide 28

Yield 63%, white solid, mp 103-105 ^oC. HPLC 91%, t_R = 3.05 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.35 (s, H8), 8.23 (m, NH5'), 8.16 (s, H2), 7.22-7.33 (m, 5H, Ph and NH_2), 5.85 (d, H1', J = 6.3 Hz), 5.42 (d, OH2', J = 6.3 Hz), 5.24 (d, OH3', J = 4.9 Hz), 4.65-4.7 (m, H2'), 4.45 (s, CH_2), 4.06-4.09 (m, H3'), 3.95-3.98 (m, H4'), 3.48-3.52 (m, CHCO), 3.38-3.44 (m, 2H5' and OCH_2), 3.07-3.12 (dd, CH, J = 5.7 Hz and 8 Hz), 2.8-2.85 (dd, CH, J = 8.6 Hz and 5.1 Hz). FABMS (M+H) calculated for $C_{20}H_{25}N_7O_5.H$ was 444.1989, found 444.1999.

(2R)-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-5-oxopyrrolidine-2-carboxamide 29

Yield 64%, white solid, mp 160-163 ^oC. HPLC 100%, t_R = 2.68 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.33 (s, H8), 8.26 (t, NH5', J = 5.9 Hz), 8.16 (2, H2), 7.79 (s, NH), 7.29 (s, NH_2), 5.85 (d, H1', J = 6.1 Hz), 5.45 (d, OH2', J = 5.3 Hz), 5.25 (d, OH3', J = 3.9 Hz), 4.67 (m, H2'), 4.05-4.08 (m, H3'), 4-4.03 (m, CHCO), 3.93-3.96 (m, H4'),

3.34-3.5 (m, 2H5'), 2.02-2.27 (m, 3H), 1.8-1.85 (m, 1H). FABMS (M+H) calculated for $C_{15}H_{19}N_7O_5$.H was 378.1520, found 378.1518.

(2S)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]propanamide 30

Yield 60%, white solid, mp 105-108 ^{o}C. HPLC 100%, t_R = 2.68 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.34 (s, H8), 8.27 (t, NH5', J = 5.9 Hz), 8.16 (2, H2), 7.3 (s, NH_2), 5.85 (d, H1', J = 6.1 Hz), 5.2-5.5 (m, OH2' and OH3'), 4.66-4.68 (m, H2'), 4.05-4.07 (m, H3'), 3.94-3.98 (m, H4'), 3.16-3.49 (m, 2H5' and CHCO), 1.18 (d, CH_3, J = 6.8). FABMS (M+H) calculated for $C_{13}H_{19}N_7O_4$.H was 338.1571, found 338.1572.

(2R)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]-3-methylbutanamide 31

Yield 61%, white solid, mp 128-130 ^{o}C. HPLC 100%, t_R = 2.72 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.34 (s, H8), 8.15 (s, H2), 8.11 (t, NH5', J = 5.7 Hz), 7.29 (s, NH_2), 5.84 (d, H1', J = 6.3 Hz), 5.42 (d, OH2', J = 6.1 Hz), 5.22 (d, OH3', J = 4.9 Hz), 4.68-4.72 (m, H2'), 4.05-4.09 (m, H3'), 3.93-3.96 (m, H4'), 3.35-3.49 (m, 2H5'), 2.96-2.97 (m, CHCO), 1.81-2.1 (m, NH_2 and CH), 0.85 and 0.77 (2d, $2CH_3$, J = 6.9 Hz and 6.9 Hz). FABMS (M+H) calculated for $C_{15}H_{23}N_7O_4$.H was 366.1884, found 366.1884.

(2S)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]-3-(2-cyanophenyl)propanamide 32

Yield 68%, white solid, mp 114-118 ^{o}C. HPLC 100%, t_R = 2.91 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.33 (s, H8), 8.23 (t, NH5', J = 5.7 Hz), 8.16 (s, H2), 7.72-7.73 (*m*, 1H, Ph), 7.55-7-59 (m, 1H, Ph), 7.34-7.46 (m, 2H, Ph), 7.29 (br s, NH_2), 5.83 (d, H1', J = 6 Hz), 5.42 (d, OH2', J = 5.8 Hz), 5.23 (d, OH3', J = 4.5 Hz), 4.59-4.68 (m, H2'), 4-3.92 (m, H3' and H4'), 3.48-3.52 (m, CHCO), 3.37-3.46 (m, 2H5'), 3.07-3.12 (dd, CH, J = 5.7 Hz and 8 Hz), 2.8-2.85 (dd, CH, J = 8.6 Hz and 5.1 Hz). FABMS (M+H) calculated for $C_{20}H_{22}N_8O_4$.H was 439.1836, found 439.1841.

(2S)-2-methylamino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-3-hydroxypropanamide 33

Yield 70%, white solid, mp 154-156 ^{o}C. HPLC 100%, t_R = 2.67 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.33 (s, H8), 8.13-8.17 (m, NH5'), 8.16 (s, H2), 7.28 (s, NH_2), 5.84 (d, H1', J = 6.3 Hz), 5.42 (br s, OH2'), 5.23 (br s, OH3'), 4.69 (br s, H2'), 4.07 (m, H3'), 3.93-3.96 (m, H4'), 3.53-3.56 (m, CH), 3.39-3.45 (m, 2H5' and CH), 2.98-3.01 (m, CHCO), 2.24 (s, CH_3). FABMS (M+H) calculated for $C_{14}H_{21}N_7O_5$.H was 368.1676, found 368.1669.

(2R)-2-amino-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]-methyl]-(4-phenylcarbonylphenyl)propanamide 34

Yield 62%, white solid, mp 133-136 ^{o}C. HPLC 97%, t_R = 4.1 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.33 (s, H8), 8.20 and 8.22 (dd, NH5', J = 4.1 Hz), 8.14 (s, H2), 7.38-7.71 (*m*, 9H, Ph), 7.3 (br s, NH_2), 5.84 (d, H1', J = 6.1 Hz), 5.41 (d, OH2', J = 6.2 Hz), 5.23 (d, OH3', J = 4.9 Hz), 4.63 (dd, H2', J = 5.9 Hz and 5.7 Hz), 4.02-4.05 (m, H3'), 3.93-3.97 (m, H4'), 3.47-3.5 (m, CHCO), 3.35-3.44 (m, 2H5'), 3-3.04 (dd, CH, J = 5.1 Hz and 8.2 Hz), 2.68-2.73 (dd, CH, J = 8.4 Hz and 4.9 Hz). FABMS (M+H) calculated for $C_{26}H_{27}N_7O_5$.H was 518.2146, found 518.2150.

General procedure for preparation of compounds: 35-67

To a solution of **3** (0.5 mmol) and molecular sieves in methanol (8 ml) was added the appropriate aldehyde (1.5 mmol) under argon for 3h in a 12-place carousel reaction station from Radleys at room temperature or at 40 ^{o}C. The resulting aldimine was carefully treated with solid sodium borohydride for one half hour, pre-adsorbed on silica gel and purified using automated flash chromatography system. The pure intermediate was hydrolyzed following the same protocol used for the preparation of compounds **4-34**.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[(benzylamino) methyl]oxolane-3,4-diol 35

Yield 67%, white solid, mp 96-98 ^{o}C. HPLC 100%, t_R = 9.55 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.4 (t, NH5', J = 6.3 Hz), 8.3 (s, H8), 7.96 (s, H2), 7.19-7.22 (m, 1H, Ph), 7.26 (s, NH_2), 7.27-7.34 (m, 4H, Ph), 5.82 (d, H1', J = 6.4 Hz), 5.36 (d, OH2', J = 6.3 Hz), 5.12 (d, OH3', J = 4.7 Hz), 4.75 (m, H2'), 4.14-4.18 (m, H3'), 4-4.03 (m, H4'), 3.73 (s, CH_3), 2.8 (dd, 1H5', J = 4.3 Hz and 8.2 Hz), 2.71 (dd, 1H5', J = 5.1 Hz and 7.3 Hz), 2.57 (br s, NH). FABMS (M+H) calculated for $C_{17}H_{20}N_6O_3$.H was 357.1669 found 357.1669.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[(3,4-dimethoxyphenyl)methylamino]methyl] oxolane-3,4-diol 36

Yield 68%, white solid, mp 101-104 ^{o}C. HPLC 98%, t_R = 6.43 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.4 (t, NH5', J = 6.3 Hz), 8.32 (s, H8), 8.02 (s, H2), 7.26 (s, NH_2), 6.92 (d, 1H, Ph, J = 1.5 Hz), 6.85 (d, 1H, Ph, J = 8.2 Hz), 6.8 (dd, 1H, Ph, J = 1.7 Hz and 6.3 Hz), 5.82 (d, H1', J = 6.2 Hz), 5.37 (d, OH2', J = 6.2 Hz), 5.12 (d, OH3', J = 4.7 Hz), 4.74 (m, H2'), 4.15-4.17 (m, H3'), 3.99-4.02 (m, H4'), 3.71 and 3.68 (2s, 2CH_3), 3.63-3.67 (m, CH_2), 2.79 (dd, 1H5', J = 4.3 Hz and 8.3 Hz), 2.69 (dd, 1H5', J = 5.3 Hz and 7.2 Hz). FABMS (M+H) calculated for $C_{19}H_{24}N_6O_5$.H was 417.1880 found 417.1880.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[(4-pyrazol-1-ylphenyl)methylamino]methyl] oxolane-3,4-diol 37

Yield 65%, white solid, mp 111-113 ^{o}C. HPLC 100%, t_R = 9.09 minutes, H_2O/MeCN. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.45 (d, NCH, J = 2.2 Hz), 8.4 (t, NH5', J = 6.3 Hz), 8.32 (s, H8), 7.99 (s, H2), 7.75-7.77 (m, 2H, Ph), 7.71 (d, CHN, 1.4 Hz), 7.43 (d, 2H, Ph, J = 8.4 Hz), 7.26 (s, NH_2), 6.52 (dd, CH, J = 1.7 Hz, and 0.6 Hz), 5.83 (d, H1', J = 6.3 Hz), 5.38 (d, OH2', J = 5.7 Hz), 5.13 (d, OH3', J = 4.5 Hz), 4.75 (m, H2'), 4.16-4.19 (m, H3'), 4.01-4.04 (m, H4'), 3.77 (s, CH_2), 2.83 (br s, 1H5'), 2.74 (br s, 1H5'), 2.63 (br s, NH). FABMS (M+H) calculated for $C_{20}H_{22}N_8O_3$.H was 423.1887 found 423.1888.

2-[3-[[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-l]methylamino]-methyl]phenyl-4-N-acetamide 38

Yield 62%, white solid, mp 117-119 ^{o}C. HPLC 99%, t_R = 8.88 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 9.58 (s, CONH), 8.31 (s, H8), 7.98 (s, H2), 7.49 (d, 2H, Ph, J = 8.4 Hz), 7.21-7.25 (m, 2H, Ph and NH_2), 5.81 (d, H1', J = 6.3 Hz), 5.36 (d, OH2', J = 6.3 Hz), 5.12 (d, OH3', J = 4.7 Hz), 4.73 (m, H2'), 4.13-4.16 (m, H3'), 3.99-4.02 (m, H4'), 3.67 (s, CH_2), 2.79 (dd, 1H5', J = 3.9 Hz and 8.4 Hz), 2.69 (dd, 1H5', J = 5.1 Hz and 7.7 Hz), 2.02 (s, CH_3). FABMS (M+H) calculated for $C_{19}H_{23}N_7O_4$.H was 414.1884 found 414.1881.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[(4-phenylmethoxyphenyl)methylamino] methyl]oxolane-3,4-diol 39

Yield 72%, white solid, mp 129 ^{o}C. HPLC 99%, t_R = 10.88 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.31 (s, H8), 8 (s, H2), 7.21-7.45 (m, 7H, Ph), 7.26 (s, NH_2), 6.92-6.94 (m, 2H, Ph), 5.82 (d, H1', J = 6.3 Hz), 5.36 (d, OH2', J = 6.2 Hz), 5.11 (d, OH3', J = 4.7 Hz), 5.07 (s, OCH_2), 4.74 (m, H2'), 4.13-4.16 (m, H3'), 3.99-4.02 (m, H4'), 3.66 (s, CH_2N), 2.78 (dd, 1H5', J = 4.5 Hz and 8.2 Hz), 2.69 (dd, 1H5', J = 5.3 Hz and 7.2 Hz). FABMS (M+H) calculated for $C_{24}H_{26}N_6O_4$.H was 463.2088 found 463.2084.

N-[[5-[[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methylamino]-methyl]furan-2-yl]methyl]-N-methylmethanesulfonamide 40

Yield 73%, white solid, mp 85 ^{o}C. HPLC 98%, t_m = 9.04 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.31 (s, H8), 8.08 (s, H2), 7.26 (s, NH_2), 6.33 (d, CH, J = 3.1 Hz), 6.2 (d, CH, J = 3.1 Hz), 5.81 (d, H1', J = 6.3 Hz), 5.37 (br s, OH2'), 5.12 (br d, OH3', J = 3.9 Hz), 4.70 (br s, H2'), 4.24 (s, CH_2), 4.12 (br s, H3'), 4.98 (m, H4'), 3.7 (br d, CH_2, J = 0.6 Hz), 2.67-2.78 (m, 2H5' and 2CH_3). FABMS (M+H) calculated for $C_{18}H_{25}N_7O_6S$.H was 468.1659 found 468.1655.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[(6-methoxy-1,3-benzodioxol-5-yl)methyl-amino]methyl]oxolane-3,4-diol 41

Yield 75%, white solid, mp 108-110 ^{o}C. HPLC 100%, t_R = 9.8 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.29 (s, H8), 8.04 (s, H2), 7.26 (s, NH_2), 6.91 (s, CH), 6.72 (s, CH), 5.92 (m, OCH_2O), 5.82 (d, H1', J = 6.1 Hz), 5.36 (d, OH2', J = 4.2 Hz), 5.12 (d, OH3', J = 4.7 Hz), 4.74 (m, H2'), 4.13-4.16 (m, H3'), 3.98-4.01 (m, H4'), 3.66 (s, CH_3), 3.61 (s, CH_2), 2.78 (dd, 1H5', J = 5.9 Hz and 8.8 Hz), 2.67-2.72 (m, 1H5'). FABMS (M+H) calculated for $C_{19}H_{22}N_6O_6$.H was 431.1673 found 431.1667.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[[2-[(2-fluorophenyl)methoxy]naphthalen-1-yl]methylamino]methyl]oxolane-3,4-diol 42

Yield 76%, white solid, mp 106-108 ^{o}C. HPLC 100%, t_R = 11.23 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.24 (s, H8), 8.08 (d, 1H, naphthalene, J = 8.6 Hz), 7.83-7.87 (m, 2H, naphthalene), 7.81 (s, H2), 7.51-7.55 (m, 1H, Ph and 1H, naphthalene), 7.32-7.44 (m, 1H, Ph and 2H, naphthalene), 7.23 (s, NH_2), 7.11-7.2 (m, 2H, Ph and 1H, naphthalene), 5.78 (d, H1', J = 6.2 Hz), 5.31 (d, OH2', J = 6.2 Hz), 5.27 (dd, CH_2O, J = 12.5 Hz and 6.1 Hz), 5.07 (d, OH3', J = 4.7

Hz), 4.74 (q, H2', J = 6.2 Hz), 4.15-4.2 (dd, CH_2N, J = 11.3 Hz and 6.6 Hz), 4.07-4.1 (m, H3'), 3.97-4.01 (m, H4'), 2.98 (dd, 1H5', J = 4.2 Hz and 8.4 Hz), 2.82 (dd, 1H5', J = 5.7 Hz and 6.5 Hz). FABMS (M+H) calculated for $C_{28}H_{27}FN_6O_6$.H was 531.2150 found 531.2147.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[[2-[(2,4-dichlorophenyl)methoxy]phenyl] methylamino]methyl]oxolane-3,4-diol 43

Yield 71%, white solid, mp 116-118 ^oC. HPLC 100%, t_R = 11.42 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.27 (s, H8), 7.98 (s, H2), 7.62 (d, 1H, dichloro-Ph, J = 2.2 Hz), 7.54 (d, 1H, dichloro-Ph, J = 8.4 Hz), 7.34-7.37 (m, 1H, dichloro-Ph and 1H, Ph), 7.19-7.22 (m 1H, Ph), 7.24 (s, NH_2), 7 (d, 1H, Ph, J = 8.1 Hz), 6.93 (t, 1H, J = 7.2 Hz), 5.82 (d, H1', J = 6 Hz), 5.37 (d, OH2', J = 6.2 Hz), 5.07-5.15 (m, OH3' and OCH_2) 4.73 (q, H2', J = 5.9 Hz), 4.13-4.17 (m, H3'), 3.97-4.02 (m, H4'), 3.71 and 3.79 (2 br s, CH_2N), 2.75-2.83 (m, 2H5'). FABMS (M+H) calculated for $C_{24}H_{24}Cl_2N_6O_4$.H was 531.1308 found 531.1305.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[(3-propan-2-yloxynaphthalen-2-yl)methyl-amino]methyl]oxolane-3,4-diol 44

Yield 79%, white solid, mp 115-117 ^oC. HPLC 100%, t_R = 10.76 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.25 (s, H8), 8.07 (d, 1H, naphthalene, J = 8.6 Hz), 7.83 (s, H2), 7.80-7.81 (m, 2H, naphthalene), 7.3-7.43 (m, 3H, naphthalene), 7.23 (s, NH_2), 5.79 (d, H1', J = 6.2 Hz), 5.32 (d, OH2', J = 6.3 Hz), 5.07 (d, OH3', J = 4.7 Hz), 4.74 (q, H2', J = 6.1 Hz), 3.63-4.7 9 (m, OCH), 4.08-4.12 (m, CH_2N and H3'), 4.02-4.05 (m, H4'), 2.9 (dd, 1H5', J = 4.1 Hz and 8.4 Hz), 2.84 (dd, 1H5', J = 5.9 Hz and 6.5 Hz), 1.22 and 1.18 (2s, $2CH_3$). FABMS (M+H) calculated for $C_{24}H_{28}N_6O_4$.H was 465.2244 found 465.2246.

2-[3-[[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-l]methylamino]-methyl]indol-1-yl]-N-cyclopropylacetamide 45

Yield 71%, white solid, mp 140-143 ^oC. HPLC 100%, t_R = 9.65 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.31 (s, H8), 8.25 (d, NHCO, J = 4.1 Hz), 8.02 (s, H2), 7.56 (d, 1H, Ph, J = 7.9 Hz), 7.27 (d, 1H, Ph, J = 8.2 Hz), 7.24 (s, NH_2), 7.17 (s, NCH), 7.09 (m, 1H, Ph), 6.96 (m, 1H, Ph), 5.82 (d, H1', J = 6.2 Hz), 5.35 (d, OH2', J = 6.3 Hz), 5.12 (d, OH3', J = 4.7 Hz), 4.76 (q, H2', J = 6.3 Hz), 4.67 (s, $COCH_2N$), 4.14-4.17 (m, H3'), 4.01-4.04 (m, H4'), 3.87 (s, CH_2N),

2.88 (dd, 1H5', J = 4.3 Hz and 8.3 Hz), 2.79-2.82 (m, 1H5'), 2.61-2.67 (m, CHN), 0.61 and 0.42 (2m, $2CH_2$). FABMS (M+H) calculated for $C_{24}H_{28}N_8O_4$.H was 493.2306 found 493.2302.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[(1,1-dioxo-1,2-benzothiazol-3-yl)amino]-methyl]oxolane-3,4-diol 46

Yield 77%, white solid, mp 203-205 ^oC. HPLC 96%, t_R = 2.99 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 9.58 (br s, NH), 8.38 (s, H8), 8.16-8.18 (m, 1H, Ph), 8.12 (s, H2), 7.96-7.98 (m, 1H, Ph), 7.78-7.84 (m, 2H, Ph), 7.28 (s, NH_2), 5.91 (d, H1', J = 5.3 Hz), 5.54 (d, OH2', J = 5.9 Hz), 5.39 (d, OH3', J = 5.1 Hz), 4.75 (q, H2', J = 5.3 Hz), 4.28-4.31 (m, H3'), 4.19-4.23 (m, H4'), 3.92 (dd, 1H5', J = 4.7 Hz and 9.4 Hz), 3.71 (dd, 1H5', J = 7.2 Hz and 6.7 Hz). FABMS (M+H) calculated for $C_{17}H_{17}N_7O_5S$.H was 432.1090 found 432.1083.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[[3-(4-methoxyphenyl)-1-phenylpyrazol-4-yl]-methylamino]methyl]oxolane-3,4-diol 47

Yield 80%, white solid, mp 126-128 ^oC. HPLC 95%, t_R = 10.39 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.44 (s, NCH), 8.32 (s, H8), 7.94 (s, H2), 7.85 (d, 2H, Ph, J = 8.7 Hz), 7.84 (d, 2H, Ph, J = 7.4 Hz), 7.49 (t, 2H, Ph, J = 7.6 Hz), 7.29 (d, 1H, Ph, J = 7.5 Hz), 7.25 (s, NH_2), 6.97 (d, 2H, Ph, 8.8 Hz), 5.84 (d, H1', J = 6.3 Hz), 5.39 (br s, OH2'), 5.16 (br s, OH3'), 4.77 (br s, H2'), 4.19 (br s, H3'), 4.06-4.09 (m, H4'), 3.78 (s, CH_3), 3.73-3.77 (m, CH_2), 2.94 and 2.87 (2m, 2H5'). FABMS (M+H) calculated for $C_{27}H_{28}N_8O_4$.H was 529.2306 found 529.2303.

2-[4-[[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methylamino]-methyl]phenoxy]-N-pyridin-2-ylacetamide 48

Yield 81%, white solid, mp 116-118 ^oC. HPLC 100%, t_R = 9.85 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 10.42 (s, NHCO), 8.32-8.34 (m, CHN), 8.31 (s, H8), 8.05 (d, 1H, pyridine, J = 8.4 Hz), 8.01 (s, H2), 7.77-7.82 (m, 1H, pyridine), 7.24 (d, 2H, Ph, J = 9 Hz), 7.25 (s, NH_2), 7.11-7.15 (m, 1H, pyridine), 6.89-6.92 (m, 2H, Ph), 5.81 (d, H1', J = 6.3 Hz), 5.36 (d, OH2', J = 6.1 Hz), 5.11 (d, OH3', J = 4.5 Hz), 4.71-4.76 (m, H2' and OCH_2), 4.13-4.16 (m, H3'), 3.98-4.02 (m, H4'), 3.66 (s, NCH_2), 2.78 and 2.67 (2m, 2H5'). FABMS (M+H) calculated for $C_{24}H_{26}N_8O_5$.H was 507.2098 found 507.2097.

2-[4-[[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methylamino]-methyl]phenoxy]-N-(1,3-thiazol-2-yl)acetamide 49

Yield 73%, white solid, mp 126-128 ^{o}C. HPLC 99%, t_R = 9.12 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.31 (s, H8), 8.01 (s, H2), 7.47 (d, 1H, NCH, J = 3.6 Hz), 7.23-7.26 (m, NH_2, SCH and 2H, Ph), 6.89 (d, 2H, Ph, J = 8.6 Hz), 5.81 (d, H1', J = 6.3 Hz), 5.35 (d, OH2', J = 6 Hz), 5.11 (d, OH3', J = 4.5 Hz), 4.81 (s, CH_2O), 4.73 (q, H2', J = 5.9 Hz), 4.14-4.15 (m, H3'), 3.98-4.01 (m, H4'), 3.66 (s, NCH_2), 2.78 (dd, 1H, H5', J = 4.1 Hz and 8.4 Hz), 2.67-2.71 (m, 1H5'). FABMS (M+H) calculated for $C_{22}H_{24}N_8O_5S$.H was 513.1663 found 513.1668.

2-[2-[[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methylamino]-methyl]phenoxy]-1-piperidin-1-ylethanone 50

Yield 72%, white solid, mp 109-111 ^{o}C. HPLC 100%, t_R = 9.98 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.30 (s, H8), 8.02 (s, H2), 7.31 (dd, 1H, Ph, J = 1.5 Hz and 6.1 Hz), 7.25 (s, NH_2), 7.14-7.19 (m, 1H, Ph), 6.87-6.9 (m, 2H, Ph), 5.83 (d, H1', J = 6.1 Hz), 5.38 (br s, OH2'), 5.14 (br s, OH3'), 4.76 (s, OCH_2), 7.72 (br s, H2'), 4.16 (br s, H3'), 3.98-4.02 (m, H4'), 3.74(br s, NCH_2), 3.29-3.36 (m, 4H, $2CH_2$), 2.8-2.84 (m, 1H5'), 2.71-2.74 (m, 1H5')1.39-1.53 (m, $CH_2CH_2CH_2$). FABMS (M+H) calculated for $C_{24}H_{26}N_8O_5$.H was 498.2459 found 498.2460.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[(5-methyl-2-thiophen-2-yl-1,3-oxazol-4-yl)-methylamino]methyl]oxolane-3,4-diol 51

Yield 70%, white solid, mp 175-178 ^{o}C. HPLC 99%, t_R = 9.73 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.33 (s, H8), 8.11 (s, H2), 7.71 (dd, 1H, CHS, J = 1.1 Hz and 3.9 Hz), 7.59 (dd, 1H, CH, J = 1 Hz and 2.7 Hz), 7.26 (s, NH_2), 7.17 (dd, 1H, CH, J = 3.7 Hz and 1.2 Hz), 5.82 (d, H1', J = 6.2 Hz), 5.36 (d, OH2', J = 6 Hz), 5.12 (d, OH3', 4.7 Hz), 4.71 (m, H2'), 4.13-4.16 (m, H3'), 3.99-4.02 (m, H4'), 3.59 (s, NCH_2), 2.84 (dd, 1H, H5', J = 4.3 Hz and 8.4 Hz), 2.74 (dd, 1H, H5', J = 5.5 Hz and 7 Hz), 2.32 (s, CH_3). FABMS (M+H) calculated for $C_{19}H_{21}N_7O_4S$.H was 444.1448 found 444.1450.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[(4-prop-2-ynoxyphenyl)methylamino]-methyl]oxolane-3,4-diol 52

Yield 82%, white solid, mp 96.98 °C. HPLC 100%, t_R = 12.53 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.31 (s, H8), 7.99 (s, H2), 7.26 (s, NH_2), 7.24 (d, 2H, Ph, J = 8.6 Hz), 6.90-6.92 (m, 2H, Ph), 5.81 (d, H1', J = 6.3 Hz), 5.36 (d, OH2', J = 6.2 Hz), 5.11 (d, OH3', J = 4.5 Hz), 4.72-4.76 (m, OCH_2 and H2'), 4.13-4.16 (m, H3'), 3.99-4.02 (m, H4'), 3.66 (s, CH_2N), 3.53 (t, CH, J = 2.3 Hz), 2.78 (dd, 1H5', J = 3.9 Hz and 8.6 Hz), 2.67-2.71 (m, 1H5'). FABMS (M+H) calculated for $C_{20}H_{22}N_6O_4$.H was 411.1775 found 411.1776.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[(2,4-dimethyl-1-pyridin-3-ylpyrrol-3-yl)-methylamino]methyl]oxolane-3,4-diol 53

Yield 75%, white solid, mp 136-138 °C. HPLC 95%, t_R = 13.99 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.62 (dd, 1H, Ph, J = 1.6 Hz and 3.3 Hz), 8.48 (d, 1H, Ph, J = 2.4 Hz), 8.32 (s, H8), 8.03 (s, H2), 7.73-7.77 (m 1H, Ph), 7.53-7.57 (m, 1H, Ph), 7.26 (s, NH_2), 5.87 (s, CH), 5.82 (d, H1', J = 6.2 Hz), 5.36 (d, OH2', J = 6.2 Hz), 5.11 (d, OH3', J = 4.7 Hz), 4.74-4.78 (m, H2'), 4.14-4.16 (m, H3'), 4-4.03 (m, H4'), 3.51 (br s, CH_2N), 2.84 (dd, 1H5', J = 4.3 Hz and 8.2 Hz), 2.76 (dd, 1H5', J = 5.4 Hz and 6.8 Hz), 1.95 and 1.89 (2s, CH_3). FABMS (M+H) calculated for $C_{20}H_{26}N_8O_3$.H was 451.2200 found 451.2199.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[[1-(1,3-thiazol-2-yl)pyrrol-2-yl]methylamino]-methyl]oxolane-3,4-diol 54

Yield 78%, white solid, mp 110-112 °C. HPLC 100%, t_R = 13.38 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.26 (s, H8), 8.01 (s, H2), 7.56 (d, CH, J = 3.7 Hz), 7.5 (d, CH, J = 3.6 Hz), 7.28 (t, CHN, J = 2.3 Hz), 7.26 (s, NH_2), 6.22 (br d, 2CH), 5.8 (d, H1', J = 6.2 Hz), 5.34 (d, OH2', J = 6.2 Hz), 5.1 (d, OH3', J = 4.7 Hz), 4.67-4.71 (m, H2'), 4.12 and 3.98 (2m, H3' and H4'), 3.89 (br s, CH_2), 2.74-7.84 (2m, 2H5'), 2.58 (br s, NH). FABMS (M+H) calculated for $C_{18}H_{20}N_8O_3S$.H was 429.1451, found 429.1451.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[[methyl-1-vinylpyrazol-4-yl]methylamino]-methyl]oxolane-3,4-diol 55

Yield 77%, white solid, mp 125-127 °C. HPLC 99%, t_R = 11.51 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.31 (s, H8), 7.99 (s, H2), 7.77 (s, CH), 7.26 (s, NH_2), 7.06 (dd, CH, J = 9 Hz and 6.4 Hz), 5.81 (d, H1', J = 6.1 Hz), 5.36 (d, OH2', J = 6.2 Hz), 5.35 (d, CH, J = 9.3 Hz),

5.11 (d, OH3', J = 4.7 Hz), 4.71-4.75 (m, H2'), 4.65 (d, CH, J = 8.8 Hz), 4.13 and 4 (2m, H3' and H4'), 3.54 (s, CH_2), 2.82 (dd, 1H5', J = 4.3 Hz and 8.2 Hz), 2.72 (dd, 1H5', 5.5 Hz and 7 Hz), 2.58 (br s, NH), 2.13 (s, CH_3). FABMS (M+H) calculated for $C_{17}H_{22}N_8O_3$.H was 387.1887, found 387.1880.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[(1-prop-2-ynylindol-3-yl)methylamino]-methyl]oxolane-3,4-diol 56

Yield 70%, white solid, mp 126-128 ^oC. HPLC 100 %, t_R = 13.52 minutes, H_2O/MeOH. H NMR (400 MHz, Me_2SO-d_6): 8.3 (s, H8), 7.99 (s, H2), 7.6 (d, 1H, Ph, J = 7.8 Hz), 7.45 (d, 1H, Ph, J = 8.2 Hz), 7.27 (s, NH_2), 7.14 (t, 1H, Ph, J = 7 Hz), 7 (t, 1H, Ph, J = 7 Hz), 5.82 (d, H1', J = 6.3 Hz), 5.35 (br d, OH2', J = 5.3 Hz), 5.11 (br d, OH3', J = 4.3 Hz), 5.02 (d, CH_2N, J = 2.5 Hz), 4.76 (m, H2'), 4.15 (m, H3'), 4.02 (m, H4'), 3.78 (br s, CH_2N), 3.31-3,36 (m, CH), 2.87 and 2.8 (2m, 2H5'), 2.26 (br s, NH). FABMS (M+H) calculated for $C_{22}H_{23}N_7O_3$.H was 434.1935 found 434.1939.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[(2-methyl-1-benzothiophen-3-yl)methylamino]-methyl]oxolane-3,4-diol 57

Yield 74%, white solid, mp 133-135 ^oC. HPLC 98 %, t_R = 7.87 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.28 (s, H8), 7.88 (s, H2), 7.79-7.84 (m, 2H, Ph), 7.26 (s, NH_2), 7.23-7.3 (m, 2H, Ph), 5.79 (d, H1', J = 6.5 Hz), 5.34 (d, OH2', J = 6 Hz), 5.1 (d, OH3', J = 4.3 Hz), 4.76 (m, H2'), 4.1-4.13 (m, H3'), 4-4.03 (m, H4'), 3.91 (br s, CH_2), 2.86 and 2.79 (2m, 2H5'), 2.49 (s, CH_3), 2.32 (br s, NH). FABMS (M+H) calculated for $C_{20}H_{22}N_6O_3S$.H was 427.1547 found 427.1551.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[(3-phenylprop-2-ynylamino)methyl]oxolane-3,4-diol 58

Yield 75%, white solid, mp 122-124 ^oC. HPLC 99 %, t_R = 6.42 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.33 (s, H8), 8.13 (s, H2), 7.34-7.4 (m, 5H, Ph), 7.27 (s, NH_2), 5.84 (d, H1', J = 6.2 Hz), 5.39 (d, OH2', J = 6.1 Hz), 5.16 (br d, OH3', J = 3.3 Hz), 4.72 (m, H2'), 4.17 (m, H3'), 4.0-4.05 (m, H4'), 3.64 (d, CH, J = 17 Hz), 3.59 (d, CH, 17.2 Hz), 2.96 (dd, 1H5', 4.3

Hz and 8 Hz), 2.85 (dd, 1H5', J = 5.5 Hz and 6.8 Hz). FABMS (M+H) calculated for $C_{20}H_{22}N_6O_3S.H$ was 381.1669 found 381.1675.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[[5-(3-hydroxy-3-methylbut-1-ynyl)thiophen-2-yl]methylamino]methyl]oxolane-3,4-diol 59

Yield 73%, white solid, mp 131-133 ^oC. HPLC 92%, t_R = 10.47 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.31 (s, H8), 8 (s, H2), 7.26 (s, NH_2), 7.05 (d, CH, J = 3.5 Hz), 6.86 (d, CH, J = 3.5 Hz), 5.82 (d, H1', J = 6.5 Hz), 5.47 (s, OH), 5.38 (d, OH2', J = 6.3 Hz), 5.12 (d, OH3', J = 4.6 Hz), 4.71-4.76 (m, H2'), 4.14-4.17 (m, H3'), 4-.4.03 (m, H4'), 3.58-3.94 (m, CH_2), 2.94 (br s, NH), 2.73 and 2.83 (2m, 2H5'), 1.43 (s, $2CH_3$). FABMS (M+H) calculated for $C_{20}H_{24}N_6O_4S.H$ was 445.1652 found 445.1651.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[(2-morpholin-1,3-thiazol-5-yl)methylamino]-methyl]oxolane-3,4-diol 60

Yield 74%, white solid, mp 129-131 ^oC. HPLC 98 %, t_R = 5.39 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.3 (s, H8), 8.04 (s, H2), 7.26 (s, NH_2), 6.99 (s, CH), 5.81 (d, H1', J = 6.4 Hz), 5.36 (d, OH2', J = 6.2 Hz), 5.12 (d, OH3', J = 4.7 Hz), 4.71 (m, H2'), 4.1-4.14 (m, H3'), 3.97-4 (m, H4'), 3.77 (br s, CH_2), 3.68 (t, $2CH_2$, J = 4.7 Hz), 3.29-3.3 (m, $2CH_2$), 2.79 and 2.71 (2m, 2H5'), 2.63 (br s, NH). FABMS (M+H) calculated for $C_{18}H_{24}N_8O_4S.Na$ was 471.1533 found 471.1537.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[(2,6-dichloro-3-hydroxy-4-methoxyphenyl)-methylamino]methyl]oxolane-3,4-diol 61

Yield 71%, white solid, mp 160 ^oC. HPLC 90 %, t_R = 7.13 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.26 (s, H8), 8.01 (s, H2), 7.24 (s, NH_2), 7 (s, 1H, Ph), 5.79 (d, H1', J = 6.1 Hz), 5.34 (br d, OH2', J = 5.3 Hz), 5.12 (br s, OH3'), 4.74 (br d, H2', J = 4.8 Hz), 4.12 (br s, H3'), 3.97-4 (m, H4'), 3.79-3.88 (m, CH_2 and CH_3), 2.75-2.81 (m, 2H5'). FABMS (M+H) calculated for $C_{18}H_{20}Cl_2N_6O_5.H$ was 471.0945 found 471.0952.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[(5-methyl-1,2-oxazol-3-yl)methylamino]-methyl]oxolane-3,4-diol 62

Yield 79%, white solid, mp 68-70 ^{o}C. HPLC 98%, t_R = 4.73 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.31 (s, H8), 8.08 (s, H2), 7.26 (s, NH_2), 6.14 (s, CH), 5.82 (d, H1', J = 6 Hz), 5.37 (d, OH2', J = 6 Hz), 5.14 (d, OH3', J = 4.7 Hz), 4.7 (m, H2'), 4.11 and 3.98 (2m, H3', H4'), 3.7 (br s, CH_2), 2.7-2,77 (2m, 2H5'), 2.35 (s, CH_3). FABMS (M+H) calculated for $C_{15}H_{19}N_7O_4$.H was 362.1571 found 362.1576.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[[5-[2-chloro-5-(trifluoromethyl)phenyl]furan-2-yl]methylamino]methyl]oxolane-3,4-diol 63

Yield 71%, white solid, mp 173-175 ^{o}C. HPLC 97%, t_R = 9.72 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.32 (s, H8), 8.07 (s, H2), 8.05 (d, 1H, Ph, J = 1.9 Hz), 7.78 (d, 1H, Ph, J = 8.4 Hz), 7.64 (dd, 1H, Ph, J = 2.1 Hz and 6.3 Hz), 7.24 (s, NH_2), 7.22 (d, CH, J = 3.3 Hz), 6.46 (d, CH, J = 3.5 Hz), 5.83 (d, H1', J = 6 Hz), 5.37 (br s, OH2'), 5.14 (br d, OH3', J = 4 Hz), 4.71 (m, H2'), 4.15 (m, H3'), 4-4.03 (m, H4'), 3.84 (br s, CH_2), 2.87 and 2.8 (2m, 2H5'), 2.7 (br s, NH). FABMS (M+H) calculated for $C_{22}H_{20}ClF_3N_6O_4$.H was 524.1259 found 524.1259.

2-[2-[[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methylamino]-methyl]phenoxy]-6-(hydroxymethyl)oxane-3,4,5-triol 64

Yield 72%, white solid, mp 158-160 ^{o}C. HPLC 100%, t_R = 13.50 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.32 (s, H8), 8.08 (s, H2), 7.27-7.29 (m, 1H, Ph), 7.26 (s, NH_2) 7.19-7.23 (m, 1H, Ph), 7.13 (d, 1H, Ph, J = 8.3 Hz), 6.93-6.97 (m, 1H, Ph), 5.84 (d, H1', J = 6.3 Hz), 5.4 (d, OH2', J = 6.1 Hz), 5.15 (br s, OH3'), 4.04 (d, OH, J = 6.1 Hz), 4.99 (d, OH, J = 5.1 Hz), 4.71-4.75 (m, H2' and CHO), 4.59 (br s, OH), 4.15-4.7.17 (m, H3'), 4.02-4.05 (m, H4'), 3.87 (d, CHN, J = 13.7 Hz), 3.68-3.73 (m, CHN and CH), 3.45-3.49 (m, CH), 3.22-3.28 (m, CH_2 and CH), 3.13-3.18 (m, CH), 2.83 (dd, 1H5', J = 4.3 Hz and 8.2 Hz), 2.76 (dd, 1H5', J = 5.9 Hz and 6.3 Hz). FABMS (M+H) calculated for $C_{25}H_{24}N_6O_3$.H was 535.2147 found 535.2149.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[[[3-(2-phenylethynyl)phenyl]methylamino]-methyl]oxolane-3,4-diol 65

Yield 72%, white solid, mp 101-103 ^{o}C. HPLC 96%, t_R = 10.57 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.29 (s, H8), 7.99 (s, H2), 7.29-7.54 (m, 10H, Ph), 5.83 (d, H1', J = 6 Hz), 5.37 (d, OH2', J = 6.2 Hz), 5.13 (d, OH3', J = 4.7 Hz), 4.73 (m, H2'), 4.18, 4.0 and 3.97

(2m, H3'and H4'), 3.97 (dd, CH_2, J = 4.5 Hz and 3.7 Hz), 2.9 (dd, 1H5', J = 3.9 Hz and 8.6 Hz), 2.8 (dd, 1H5', J = 5.1 Hz and 6.8 Hz). FABMS (M+H) calculated for $C_{25}H_{24}N_6O_3$.H was 457.1982 found 457.1985.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[(2,3-dihydroxypropylamino)methyl]oxolane-3,4-diol 66

Yield 79%, white solid, mp 154-156 ^oC. HPLC 96%, t_R = 13.21 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6, D_2O exchange): 8.33 (s, H8), 8.17 (s, H2), 7.26 (s, NH2), 5.87 (d, H1', J = 5.9 Hz), 4.66 (t, H2', J = 4.2 Hz), 4.14 (t, H3', J = 4 Hz), 3.98-4.01 (m, H4'), 3.51-3.55 (m, CH), 3.27-3.35 (m, CH_2), 2.88 (dd, CHN, J = 4.1 Hz and 8.2 Hz), 2.82 (dd, CHN, J = 6.5 Hz and 7.8 Hz), 2.75 (dd, 1H5', J = 3.9 Hz and 8.2 Hz), 2.57 (dd, 1H5', J = 7.8 Hz and 8 Hz). FABMS (M+H) calculated for $C_{13}H_{20}N_6O_5$.H was 341.1567 found 341.1565.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[(3-(4-hydroxy-3-methoxy)phenylprop-2-enyl-amino)methyl]oxolane-3,4-diol 67

Yield 77%, white solid, mp 127-129 ^oC. HPLC 100%, t_R = 2.72 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.97 (s, OH), 8.33 (s, H8), 8.07 (s, H2), 7.26 (s, NH_2), 6.97 (d, 1H, Ph, J = 2 Hz), 6.78 (dd, 1H, Ph, J = 1.8 Hz and 6.4 Hz), 6.69 (d, 1H, Ph, J = 8 Hz), 6.39 (d, CH, J = 5.8 Hz), 6.12 (dt, CH, J = 6.1 Hz and 3.5 Hz), 5.82 (d, H1', J = 6.3 Hz), 5.38 (d, OH2', J = 6.3 Hz), 5.14 (d, OH3', J = 4.7 Hz), 4.76 (m, H2'), 4.14-4.17 (m, H3'), 4.02-4.05 (m, H4'), 3.77 (s, CH_3), 3.29 (m, CH_2), 2.84 (dd, 1H5', J = 4.3 Hz and 8.4 Hz), 2.75 (dd, 1H5', J = 5.5 Hz and 7.1 Hz). FABMS (M+H) calculated for $C_{20}H_{24}N_6O_5$.H was 429.1880 found 429.1882.

General procedure for preparation of compounds: 68-85

To a suspension of **3** (0.5 mmol) and cesium carbonate (1.5 mmol) in DMF (5 ml) was added the appropriate sulfonyl chloride (1.5 mmol) under argon for 3-16 hours in a 12-place carousel reaction station from Radleys at room temperature. The resulting intermediate was isolated, hydrolyzed and purified following the same protocol used for the preparation of **4-34**.

N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-2,5-dimethylthiophene-3-sulfonamide 68

Yield 52%, white solid, mp 150-152 ^{o}C. HPLC 100%, t_R = 5.41 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.35 (m, NH5'), 8.30 (s, H8), 8.13 (s, H2), 7.37 (s, NH_2), 6.86 (s, CH), 5.82 (d, H1', J = 6.6 Hz), 5.47 (d, OH2', J = 6.2 Hz), 5.28 (d, OH3', J = 4.5 Hz), 4.7 (m, H2'), 4.07 (m, H3'), 4 (m, H4'), 3.03-3.15 (m, 2H5'), 2.55 and 2.34 (2s, 2CH_3). FABMS (M+H) calculated for $C_{16}H_{20}N_6O_5S_2$.H was 441.1009 found 441.1007.

N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-4-methyl-piperazine-1-sulfonamide 69

Yield 64%, white solid, mp 220 ^{o}C dec. HPLC 100%, t_R = 6.64 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.32 (s, H8), 8.19 (m, NH5'), 8.12 (m, H2), 7.37 (s, NH_2), 5.84 (d, H1', J = 6.6 Hz), 5.49 (d, OH2', J = 6.2 Hz), 5.28 (d, OH3', J = 4.3Hz), 4.71 (m, H2'), 4.14 (m, H3'), 4.04 (m, H4'), 2.99-3.27 (m, CH3N and 2H5'), 2.31 (t, 2CH_2, J = 4.3 Hz), 2.15 (br s, 2CH_2), 2.55 and 2.34 (2s, 2CH_3). FABMS (M+H) calculated for $C_{15}H_{24}N_8O_5S$.H was 429.1663 found 429.1666.

4-acetyl-N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-2,3-dihydro-1,4-benzoxazine-6-sulfonamide 70

Yield 65%, white solid, mp 172-175 ^{o}C. HPLC 96%, t_R = 4.39 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6, 76 ^{o}C): 8.35 (br s, NH5'), 8.19 (s, H8), 8.14 (m, H2), 8.1 (br s, 1H, Ph), 7.42 (dd, 1H, Ph, J = 2.4 Hz and J = 6.2 Hz), 7.02 (s, NH_2), 6.99 (d, 1H, Ph, J = 8.6 Hz), 5.81 (d, H1', J = 6.3 Hz), 5.17 and 4.97 (br s, OH2' and OH3'), 4.65 (m, H2'), 4.32 (t, OCH_2, J = 4.5 Hz), 4.1 (m, H3'), 4 (m, H4'), 3.87 (t, OCH_2, J = 4.4 Hz), 3.11 (m, 2H5'), 2.22 (s, CH_3). FABMS (M+H) calculated for $C_{20}H_{23}N_7O_7S$.H was 506.1452 found 506.1451.

ethyl 1-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methylsulfamoyl]piperidine-3-carboxylate 71

Yield 78%, white solid, mp 110-112 ^{o}C. HPLC 98%, t_R = 4.61 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.31 (d, H8, J = 2.8 Hz), 8.2 and 8,6 (2m, NH5'), 8.12 (d, H2, 1.3 Hz), 7.37 (s, NH_2), 5.84 (dd, H1', J = 1.5 Hz and 4.9 Hz), 5.48 (d, OH2', J = 6.1 Hz), 5.28 (d, OH3', J = 4.5 Hz), 4.71 (m, H2'), 4.13 (m, H3'), 4.01-4.07 (m, H4' and CH_2O), 3.49-3.56 (m CHN), 3.24-3.29 (m, 1H5' and CHN), 3.13-3.16 (m, 1H5'), 2.7 (m, CHN), 2.53 (m, CH), 1.83 (m, CH),

1.66 (m, CH), 1.48 (m, CHCH), 1.15 (q, CH_3, J = 5.3 Hz). FABMS (M+H) calculated for $C_{18}H_{27}N_7O_7S.H$ was 486.1765 found 486.1767.

6-amino-9-[(2R,3R,4S,5R)-5-[[bis(2-methoxyethyl)sulfamoylamino]methyl]-3,4-dihydroxyoxolan-2-yl]purine 72

Yield 66%, white solid, mp 91-94 ^oC. HPLC 97%, t_R = 3.35 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.31 (s, H8), 8.12 (s, H2), 8.02 (m, NH5'), 7.37 (s, NH_2), 5.84 (d, H1', 6.7 Hz), 5.48 (d, OH2', J = 5.5 Hz), 5.28 (d, OH3', J = 3.7 Hz), 4.32 (m, H2'), 4.14 (br s, H3'), 4.05 (m, H4'), 3.43 (t, $2OCH_2$, J = 6.1 Hz), 3.28-3.33 (m $2NCH_2$), 3.2 (m, $2CH_3$ and 1H5'), 3.06-3.12 (m, 1H5'). FABMS (M+H) calculated for $C_{16}H_{27}N_7O_7S.H$ was 462.1765 found 462.1766.

N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-5-methyl-thiophene-2-sulfonamide 73

Yield 63%, white solid, mp 138-141 ^oC. HPLC 99%, t_R = 4.55 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.76 (bs s, NH5'), 8.30 (s, H8), 8.15 (s, H2), 7.4 (s, NH_2), 7.39 (d, CH, J = 3.7 Hz), 6.86 (d, CH, J = 2.8 Hz), 5.82 (d, H1', J = 6.8 Hz), 5.48 (d, OH2', J = 6.1 Hz), 5.29 (d, OH3', J = 3.5 Hz), 4.69 (m, H2'), 4.05 (m, H3' and H4'), 3.12 (d, 2H5', J = 3.3 Hz), 2.47 (s, CH_3). FABMS (M+H) calculated for $C_{15}H_{18}N_6O_5S_2.H$ was 427.0652 found 427.0652.

N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-4-(benzene-sulfonyl)thiophene-2-sulfonamide 74

Yield 60%, white solid, mp 142-144 ^oC. HPLC 100%, t_R = 4.35 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.98 (br s, CHS), 8.71 (br s, CHS), 8.31 (br s, H8), 8.13 (s, H2), 7.98-8.02 (m, 2H, Ph), 7.86 (br s, NH5'), 7.62-7.75 (m, 3H, Ph), 7.41 (br s, NH_2), 5.84 (d, H1', J = 6.5 Hz), 5.51 (d, OH2', J = 5.9 Hz), 5.3 (br s, OH3'), 4.66 (m, H2'), 4.09 (m, H3'), 4 (m, H4'), 3.16-3.19 (m, 2H5'). FABMS (M+H) calculated for $C_{20}H_{20}N_6O_7S_3.H$ was 553.0628 found 553.0628.

N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-4-methyl-benzenesulfonamide 75

Yield 58%, white solid, mp 130-132 ^{o}C. HPLC 98 %, t_R = 4.1 minutes, $NH_4H_2PO_4$ (0.01 M, pH 5.1)/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.4 (t, NH5', J = 6.3 Hz), 8.29 (s, H8), 8.13 (s, H2), 7.66 (d, 2H, Ph, J = 8.3 Hz), 7.35-7.37 (m, NH_2 and 2H, Ph), 5.81 (d, H1', J = 6.3 Hz), 5.47 (d, OH2', J = 6.3 Hz), 5.27 (d, OH3', J = 5.4 Hz), 4.68 (m, H2'), 4.05-4.08 (m, H3'), 3.97-4 (m, H4'), 3.04 (m, 2H5'), 2.36 (s, CH_3). FABMS (M+H) calculated for $C_{17}H_{20}N_6O_5S$.H was 421.1288 found 421.1296.

N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]cyclo-propanesulfonamide 76

Yield 62%, white solid, mp 135-137 ^{o}C. HPLC 100%, t_R = 2.98 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.33 (br s, H8), 8.12 (s, H2), 7.97 (br s, NH5'), 7.31 (br s, NH_2), 5.85 (d, H1', J = 6.6 Hz), 5.48 (d, OH2', J = 5.7 Hz), 5.28 (br d, OH3', J = 3.9 Hz), 4.71 (m, H2'), 4.15 (br s, H3'), 4.05 (m, H4'), 3.35-3.39 (m, 1H5'), 3.24-3.27 (m, 1H5'), 2.55-2.58 (m, $CHSO_2$), 0.85-0.97 (m, CH_2CH_2). FABMS (M+H) calculated for $C_{13}H_{18}N_6O_5S$.H was 371.1132 found 371.1138.

N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-5-(1,2-oxazol-5-yl)thiophene-2-sulfonamide 77

Yield 62%, white solid, mp 150-152 ^{o}C. HPLC 99%, t_R = 4.57 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 9.05 (br s, NH5'), 8.71 (d, CHN, J = 2 Hz), 8.3 (s, H8), 8.15 (s, H2), 7.67 and 7.15 (2d, CHCHCS, J = 4.1 Hz and 3.9 Hz), 7.39 (s, NH_2), 7.07 (d, CH, J = 2 Hz), 5.84 (d, H1', J = 6.7 Hz), 5.5 (d, OH2', J = 6.3 Hz), 5.32 (d, OH3', 4.5 Hz), 4.68 (m, H2'), 4.08-4.11 (m, H3'), 4.03-4.06 (m, H4'), 3.24 (br s, 2H5'). FABMS (M+H) calculated for $C_{17}H_{17}N_7O_6S_2$.H was 480.0754, found 480.0760.

N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-4-cyano-benzenesulfonamide 78

Yield 55%, white solid, mp 147-150 ^{o}C. HPLC 100%, t_R = 3.51 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.76 (br s, NH5'), 8.29 (s, H8), 8.13 (s, H2), 7.92-8.04 (2m, 4H, Ph), 7.37 (br s, NH_2), 5.81 (d, H1', J = 6.5 Hz), 5.48 (d, OH2', J = 6.3 Hz), 5.28 (d, OH3', J = 4.5

Hz), 4.65 (m, H2'), 4.04 (m, H3'), 3.96 (m, H4'), 3.16 (m, 2H5'). FABMS (M+H) calculated for $C_{17}H_{17}N_7O_5S.H$ was 432.1084 found 432.1084.

ethyl 1-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methylsulfamoyl]pyrrolidine-3-carboxylate 79

Yield 59%, white solid, mp 167-170 ^oC. HPLC 100%, t_R = 4.4 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.31 (s, H8), 8.25 (m, NH5'), 8.14 (s, H2), 7.38 (s, NH_2), 5.84 (d, H1', J = 6.7 Hz), 5.48 (d, OH2', J = 6.3 Hz), 5.28 (d, OH3', J = 4.3 Hz), 4.71 (m, H2'), 4.02-4.17 (m, H3', H4', CH_2O and CHN), 3.16-3.28 (m, 2H5' and CH_2N), 2.14-2.21 (m, CH), 1.81-1.89 (m, CH_2CH), 1.17 (t, CH_3, J = 7.1 Hz). FABMS (M+H) calculated for $C_{17}H_{25}N_7O_7S.H$ was 472.1608, found 472.1611.

N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-1-benzo-thiophene-2-sulfonamide 80

Yield 51%, white solid, mp 153-155 ^oC. HPLC 100%, t_R = 5.8 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 9.12 (br s, NH5'), 8.3 (s, H8), 8.16 (s, CH), 7.99-8.08 (m, 2CH, and H2), 7.46-7.54 (m, CHCH), 7.41 (s, NH_2), 5.83 (d, H1', J = 6.7 Hz), 5.49 (d, OH2', J = 6.3 Hz), 5.31 (d, OH3', J = 4.3 Hz), 4.7 (m, H2'), 4.06-4.12 (m, H3' and H4'), 3.22 (m, 2H5'). FABMS (M+H) calculated for $C_{18}H_{18}N_6O_5S_2.H$ was 463.0852 found 463.0856.

N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-2-(2,2,2-trifluoroacetyl)-3,4-dihydro-1H-isoquinoline-6-sulfonamide 81

Yield 60%, white solid, mp 169-171 ^oC. HPLC 100%, t_R = 5.53 minutes, H_2O/MeOH. ^1H NMR (400 MHz, Me_2SO-d_6): 8.44 (m, NH5'), 8.27 (d, H8, J = 3.7 Hz), 8.13 (d, H8, J = 3.6 Hz), 7.59-7.76 (m, 2CH), 7.39 (br s, CH), 7.37 (s, NH_2), 5.81 (d, H1', J = 6.7 Hz), 5.47 (d, OH2', J = 6.2 Hz), 5.28 (d, OH3', J = 4.5 Hz), 4.82 (d, NCH_2, J = 7.1 Hz), 4.68 (m, H2'), 3.98-4.08 (m, H3' and H4'), 3.81 (m, NCH_2), 3.08 (m, CH_2), 2.97 (m, 2H5'). FABMS (M+H) calculated for $C_{21}H_{22}F_3N_7O_6S.H$ was 558.1377, found 558.1376.

N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-1-methyl-pyrazole-4-sulfonamide 82

Yield 64%, white solid, mp 147-150 ^{o}C. HPLC 100%, t_R = 2.88 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.32 (t, NH5', J = 6.6 Hz), 8.3 (s, H8), 8.23 (s, NCH), 8.14 (s, H2), 7.71 (s, NCH), 7.37 (s, NH_2), 5.83 (d, H1', J = 6.7 Hz), 5.47 (d, OH2', J = 6.4 Hz), 5.28 (d, OH3', J = 4.5 Hz), 4.68 (m, H2'), 4.07-4.1 (m, H3'), 4-4.06 (m, H4'), 3.86 (s, CH_3), 3.09 (m, 2H5'). FABMS (M+H) calculated for $C_{14}H_{18}N_8O_5S.H$ was 411.1193, found 411.1197.

(2R,3R,4S,5R)-2-(6-aminopurin-9-yl)-5-[(1,1-dioxo-1,2-thiazolidin-2-yl)methyl]oxolane-3,4-diol 83

Yield 67%, white solid, mp 124-126 ^{o}C. HPLC 100%, t_R = 2.78 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.34 (s, H8), 8.15 (s, H2), 7.28 (s, NH_2), 5.87 (d, H1', J = 5.5 Hz), 5.5 (d, OH2', J = 5.7 Hz), 5.31 (d, OH3', J = 5.1 Hz), 4.67 (m, H2'), 4.16-4.2 (m, H3'), 4-4.03 (m, H4'), 3.13-3.24 (m, 2H5', CH2S and CH2N), 2.16 (q, CH2, J = 6.8 Hz). FABMS (M+H) calculated for $C_{13}H_{18}N_6O_5S.H$ was 471.1133, found 471.1133.

N-[[(2R,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl]-3-chloro-propane-1-sulfonamide 84

Yield 60%, white solid, mp 130-132 ^{o}C. HPLC 100%, t_R = 3.41 minutes, H_2O/MeOH. ^{1}H NMR (400 MHz, Me_2SO-d_6): 8.3 (s, H8), 8.12 (s, H2), 8.02 (m, NH5'), 7.36 (s, NH_2), 5.86 (d, H1', J = 6.7 Hz), 5.49 (d, OH2', J = 6.3 Hz), 5.29 (d, OH3', J = 4.5 Hz), 4.70 (m, H2'), 4.12-4.15 (m, H3'), 4.02-4.05 (m, H4'), 3.67 (t, $ClCH_2$, J = 6.7 Hz), 3.2-3.27 (m, 2H5'), 3.13 (t, CH_2S, J = 7 Hz), 2.02-2.1 (m, CH2). FABMS (M+H) calculated for $C_{13}H_{19}ClN_6O_5S.H$ was 407.0898, found 407.0898.

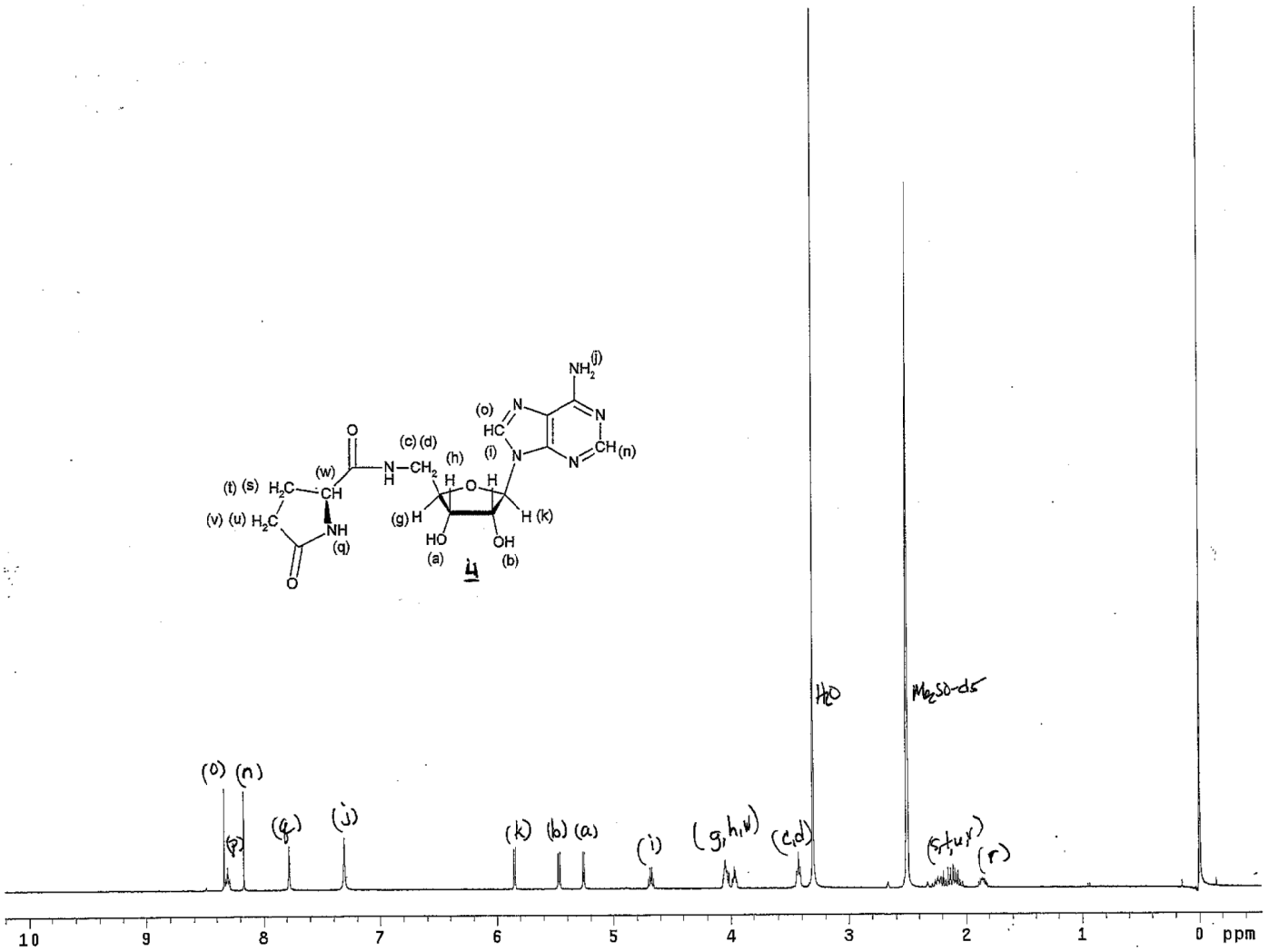
Biological Studies

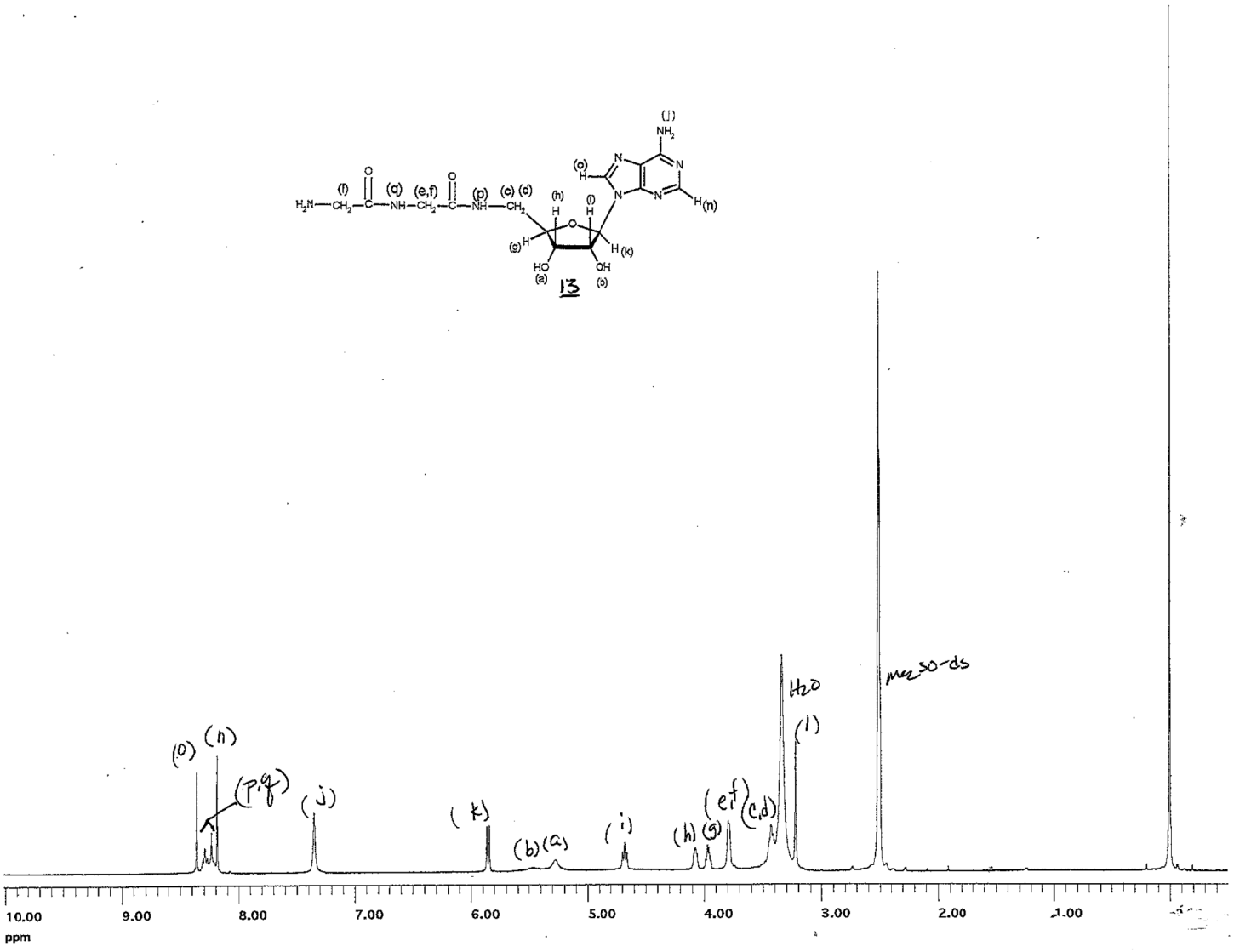
Cancer Cell Cytotoxicity Screening: All target adenosine analogs were screened against three cancer cell lines (prostate, colon and breast) using a quantitative high-throughput screen (qHTS). In brief, liquid handling was performed on a Biomek FX with a 384-multichannel head. In 384 well plates, compounds were arrayed in columns 3-22 leaving 32 wells for positive and negative controls. All compounds were diluted together in a plate to plate transfer. Cells were then added to assay plates containing diluted compound using a Matrix/Thermo wellmate. Cells were incubated with compound for three cell doublings. Due to differences in growth rates between cell lines, the incubation period for PC3 and HT-29 cells was 72 hours, but was increased to 96 hours for MDA cells. Plates were incubated for the appropriate time 72 or 96 hours and cell viability determined using Cell Titer Glo (Promega).

The dose response format employed a cross-plate method rather than an in-plate method, allowing for more efficient compound dilution and addition to assay plates. Two-fold dilutions of the compound mother plate were aliquoted to a series of 384-well plates using a stacked plate (or cross-plate) format. Object manager was used to create the assay plates by replicating the compound mother plate and assigning concentration values to the assay plates. Luminescence values were read on the envision plate reader for each of the assay plates. The entire experiment of assay plates was set up in a single day with a complete read of all plates occurring at 72 hours and or at 96 hours as required for the cell lines. Data were imported and analyzed within 24 hours of the endpoint read. From set up to final report, all data points were generated and reported within one week. Therefore, only a single passage was required for each cell line, eliminating potential variation due to passage and cell count.

Data were analyzed using Activity Base software (IDBS). Data were imported directly into the database and calculated using an ActivityBase XE template where the Virtual Plate functionality was employed to maintain the link between the assay plates and the compound mother plate from which they were created. For each plate the median, standard deviations, CVs and Z values were calculated for the control wells. These values were used to assure quality and consistency across all test plates and to normalize percent cell viability for each well. XLFit and MathIQ were used within the ActivityBase XE template to plot the dose response curves and calculate CC_{50} values. The CC_{50}s were calculated by plotting the cell viability relative to the mean of the cell control at each of the tested compound concentration. Compounds that caused cell viability < 80% were considered active. CC_{50} were calculated only for active compounds using a 4-parameter Levenburg-Marquardt algorithm (XLFit #205), with the maximum and minimum locked at 0 and 100 respectively. Data and graphical results were then reported and compared across the three cell lines.

M. tuberculosis **(Mtb) Screening:** The complete adenosine library was evaluated in a dose response (DR) format against Mtb and in a cell cytotoxicity assay using VERO cells as previously described.[38]


(o)
(n)
(g)
(j)
(k)
(b)
(a)
(i)
(g,h,w)
(c,d)
H2O
Me2SO-d5
(s,t,u,v)
(r)
10
9
8
7
6
5
4
3
2
1
0
ppm


13
(o)
(n)
(p,q)
(j)
(k)
(b)(a)
(i)
(h)
(g)
(e,f)
(c,d)
H2O
(l)
Me2SO-d6
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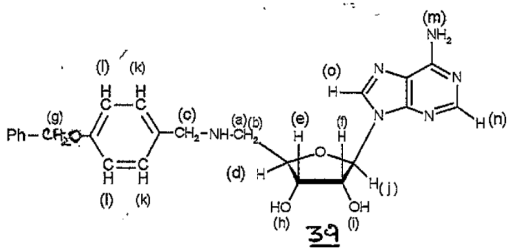
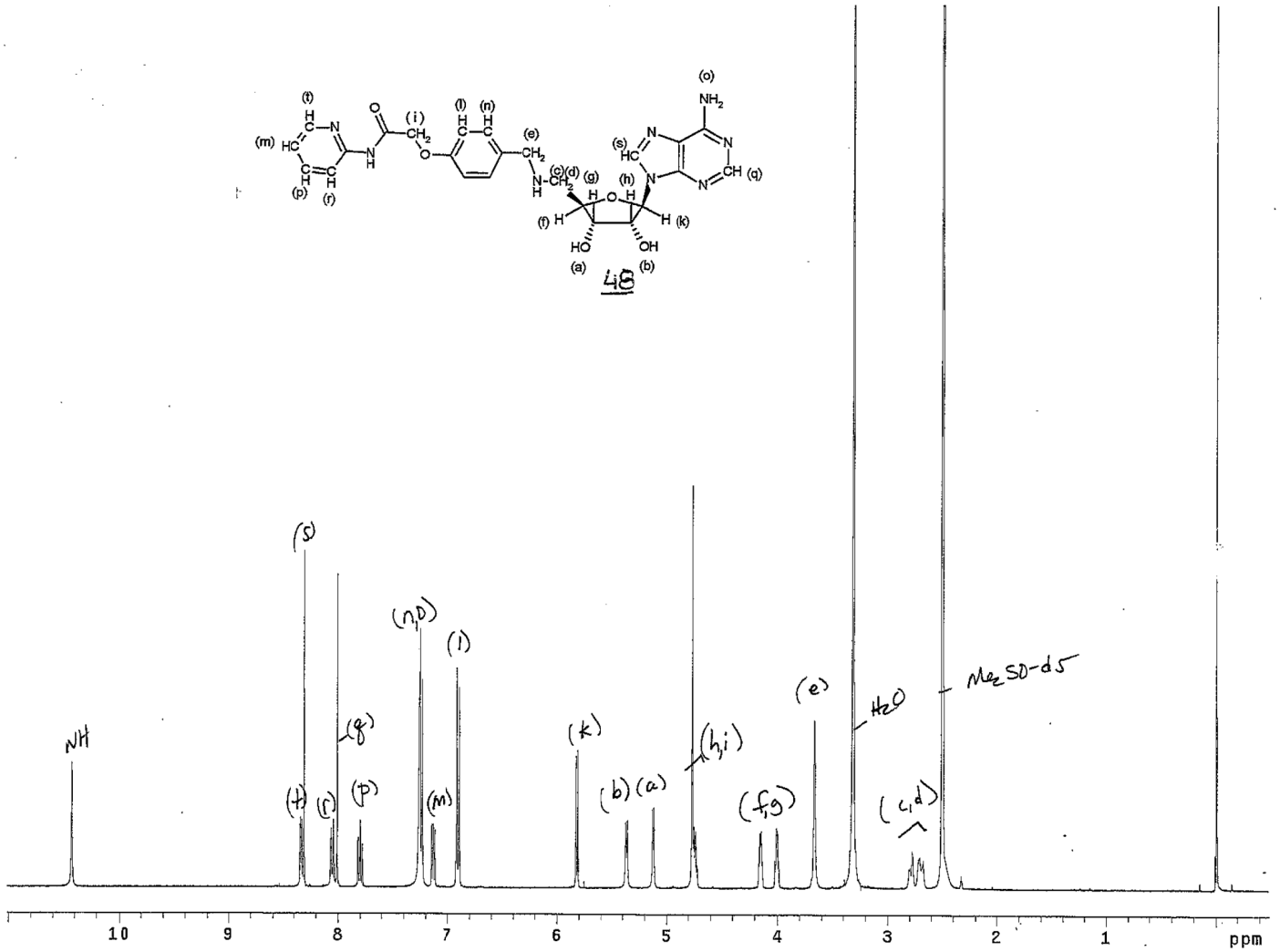
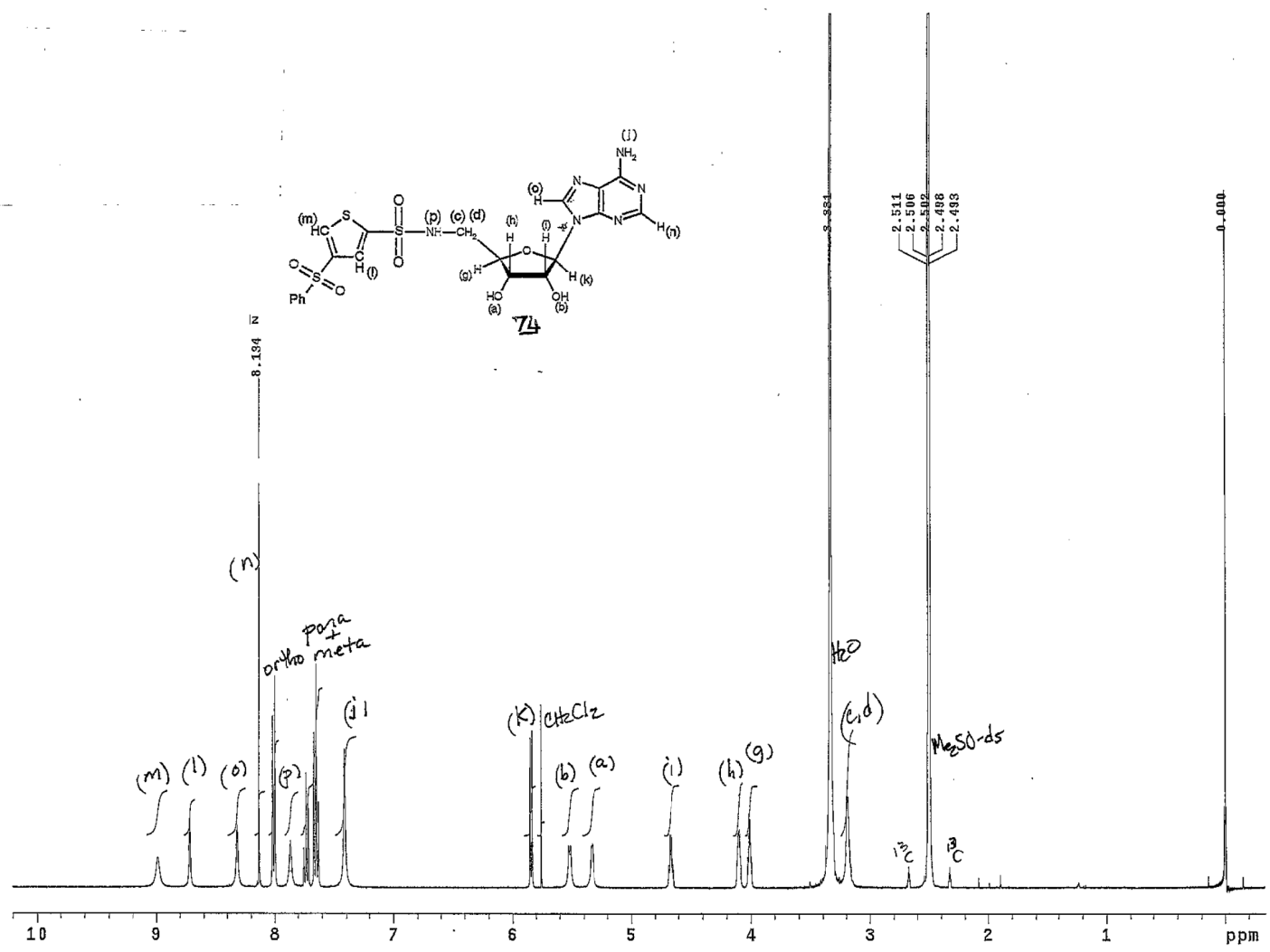
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
ppm

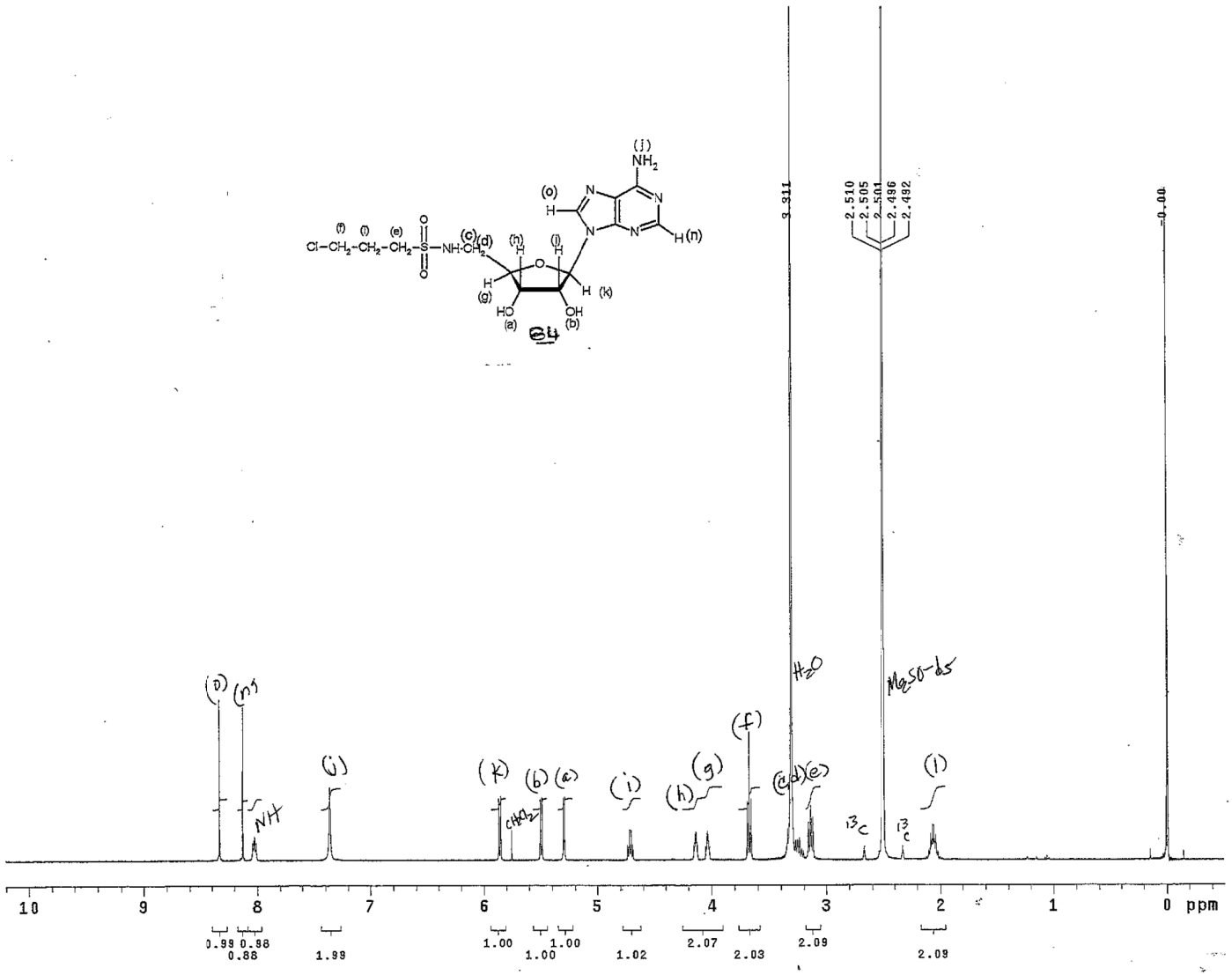

(m)
NH2
(o)
(l) (k)
(g)
Ph–CH2O
(c)
CH2–NH–CH2
(a)(b)
(e)
(f)
(d)
H(j)
HO
(h)
OH
(i)
H(n)

39

(o)
(n)
(k, m)
aromatic
H's
(l)
(j)
(i)
(g, h)
(f)
(d, e)
(c)
H2O
DMSO-d5
(a, b)
CH2Cl2
10
9
8
7
6
5
4
3
2
1
0
ppm


NH
(s)
(t)
(r)
(q)
(p)
(n,o)
(m)
(l)
(k)
(b)(a)
(h,i)
(f,g)
(e)
H2O
Me2SO-d5
(c,d)
10
9
8
7
6
5
4
3
2
1
ppm


(m)
(l)
(o)
(n)
(p)
ortho
para + meta
(j)
(K)
CH2Cl2
(b)
(a)
(i)
(h)
(g)
H2O
(c,d)
Me2SO-d5
13C
13C
8.134
3.381
2.511
2.506
2.502
2.498
2.493
0.000
10
9
8
7
6
5
4
3
2
1
ppm


(j) NH2
(o)
H(n)
(f) (i) (e)
Cl–CH2–CH2–CH2–S–NH–CH2 (c)(d)
(g) (h) (l) H (k)
HO (a) OH (b)
B4
3.311
2.510
2.505
2.501
2.496
2.492
0.00
(o) (n)
NH
(j)
(k)
(b) (a)
(i)
(h) (g)
(f)
(c)(d)(e)
H2O
MgSO4
(l)
13C
13C
10 9 8 7 6 5 4 3 2 1 0 ppm
0.99 0.98
0.88
1.99
1.00
1.00
1.00
1.02
2.07
2.03
2.09
2.09