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Supporting Information

"Reactions of Ester Derivatives of Carcinogenic N-(4-Biphenylyl)hydroxylamine and the Corresponding Hydroxamic Acid with Purine Nucleosides", Sonya A. Kennedy, Michael Novak*, and Brent A. Kolb, Department of Chemistry, Miami University, Oxford, OH 45056

Synthesis and Product Isolation

8-Methylguanosine:

To a flask containing 0.4 g of G (1.4 mmol) and 80 ml of 1 N H_2SO_4 was added 1.6 g of $FeSO_4$(5.7 mmol). This was stirred at room temperature while 0.49 mL of t-butylhydroperoxide(4.9 mmol) in 20 mL of H_2O was added in a dropwise fashion. The mixture was stirred for 1/2 h after the addition was complete. The reaction mixture was neutralized with aqueous KOH, and centrifuged. The precipate was washed twice with hot H_2O, and the aqueous layers were combined and concentrated until a white precipitate appeared. After standing at 4° overnight, the mixture was filtered, and the filter cake was washed with cold H_2O and dried under vacuum. The crude 8-MeG was recrystallized from aqueous NaCl to give 180 mg (43%) of product. Cyclic voltametry experiments with 8-MeG were performed on a CH Instruments Model 750 Electrochemical Workstation. Conditions were: three electrode mode consisting of a Ag/AgCl reference, a platinum counter electrode, and a 3 mm diameter glassy carbon electrode, cycled from 0 to 1.30 V, scan rate of 50 mV/s.

Isolation of Adducts:

Unless otherwise indicated, all carcinogen-nucleoside adducts were generated in 5% CH_3CN-H_2O, 20 mM 9/1 Na_2HPO_4/NaH_2PO_4, pH 7.5 and 20°C.

N-(Guanosin-8-yl)-4-acetylaminobiphenyl(4a):

A 25 mL saturated solution of G(ca. 20 mM) in 5% CH_3CN-H_2O(μ = 0.5($NaClO_4$), 0.02

M 9/1 Na_2HPO_4/NaH_2PO_4, pH 7.5, 20°C) was stirred as 50 mg of **1a** (0.145 mmol) in 1 mL of dry DMF was added in 200 μL portions at 10 min intervals. About 5 h after the last addition, the solution was cooled in an ice bath and filtered to recover the precipitated **4a**. The solution was extracted with EtOAc to recover additional **4a**. Crude **4a** was dissolved in EtOAc. After concentrating, the solution was placed in a -25°C freezer overnight, and the recrystallized material was collected (yield: 28 mg, 39%). ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.90(1H, bs), 7.71-7.64(4H, m), 7.48-7.33(5H, m), 6.50(2H, s), 5.60(1H, d, J = 6.7 Hz), 5.30(2H, bs), 5.02(1H, m), 4.10(1H, m), 3.84(1H, m), 3.62(1H,m), 3.49(2H, m), 2.04(3H, s). ^{13}C NMR (75.5 MHz, DMSO-d_6) δ 170.7(C), 156.3(C), 153.7(C), 150.4(C), 139.2(C), 138.6(C), 138.6(C), 138.6(C), 129.0(CH), 127.6(CH), 127.3(CH), 126.7(CH), 125.6(CH), 115.2(C), 87.9(CH), 86.4(CH), 70.8(CH), 70.6(CH), 62.0(CH_2), 22.6(CH_3). MS: $C_{24}H_{24}N_6O_6Na^+$ requires 515.2 m/e; LD-TOF MS(α-cyano-4-hydroxycinnamic acid matrix) found 515.4 m/e. $C_{24}H_{24}N_6O_6K^+$ requires 531.3 m/e; LD-TOF MS(α-cyano-4-hydroxycinnamic acid matrix) found 531.3 m/e.

N-(Xanthosin-8-yl)-4-acetylaminobiphenyl(5a):

A 250 mL 20 mM solution of X was incubated as 50 mg of **1a** was added as described above. About 5 h after the addition the aqueous solution was extracted with CH_2Cl_2. The pH of the aqueous solution was adjusted to 3.5 and then extracted again with CH_2Cl_2. The acidic CH_2Cl_2 extracts were evaporated to dryness to give crude product. Purification of **5a** was accomplished using C-18 reverse phase chromatography with 1/1 MeOH/H_2O eluent (yield: 20 mg, 28%). ^{1}H NMR (300 MHz, DMSO-d_6) δ 9.75(1H, bs), 7.67(5H, m), 7.45(2H, t, J = 7.2 Hz), 7.35(2H, m), 5.50(1H, d, J = 7.6 Hz), 4.90(1H, m), 4.03 (1H, m), 3.90 - 3.52 (3H, m), 2.08(3H, s). ^{13}C NMR (75.5 MHz, DMSO-d_6) δ 170.9(C), 159.1(C), 156.1(C), 150.1(C), 139.3(C),

139.1(C), 138.4(C), 138.1(C), 129.0(CH), 127.6(CH), 127.2(CH), 126.7(CH), 125.3(CH), 113.0(C), 88.1(CH), 87.5(CH), 71.6(CH), 62.4(CH), 59.3(CH_2), 22.9(CH_3). MS: $C_{24}H_{24}N_5O_7^+$ requires 494.2 m/e; FAB-MS, (m-NBA matrix) found 494.3 m/e; $C_{24}H_{23}N_5O_7Na^+$ requires 516.2 m/e; FAB-MS, (m-NAB matrix) found 516.3 m/e. Table S.1 is a COSY correlation table for the ^1H resonances of **5a**.

N-(Xanthosin-8-yl)-4-aminobiphenyl(5b):

A 250 mL 20 mM solution of X was incubated as 70 mg(0.26 mmol) of **1b** was added as described above. About 1 h after the addition the aqueous solution was extracted with CH_2Cl_2. The pH of the aqueous solution was adjusted to 3.5 and filtered to give crude **5b**. The aqueous layer was extracted with CH_2Cl_2 to recover additional **5b**. Purification of **5b** was accomplished as described above for **5a** (yield: 36 mg, 31%). ^1H NMR (300 MHz, DMSO-d_6) δ 10.7 (1H, bs), 8.75 (1H, s), 7.67(2H, d, J = 8.8 Hz), 7.65-7.60(2H, m), 7.58(2H, d, J = 8.8 Hz), 7.42(2H, t, J = 7.4 Hz), 7.29(1H, t, J = 7.4 Hz), 5.91(1H, d, J = 7.8 Hz), 5.45(1H, bs), 5.35(1H, bs), 4.28(1H, m), 4.07(2H, m), 3.74(2H, m). ^{13}C NMR (75.5 MHz, DMSO-d_6) δ 157.4(C), 150.4(C), 142.7(C), 140.6(C), 139.9(C), 138.2(C), 132.4(C), 128.8(CH), 126.8(CH), 126.6(CH), 126.0(CH), 117.5(CH), 111.5(C), 87.6(CH), 86.2(CH), 72.5(CH), 70.8(CH), 61.2(CH_2). MS: $C_{22}H_{22}N_5O_6^+$ requires 452.2 m/e; FAB-MS, (m-NBA matrix) found 452.2 m/e; $C_{22}H_{21}N_5O_6Na^+$ requires 474.2 m/e; FAB-MS, (m-NBA matrix) found 474.2 m/e; $C_{22}H_{21}N_5O_6K^+$ requires 490.3 m/e; FAB-MS, (m-NBA matrix) found 490.3 m/e. Table S.2 is a COSY correlation table for the ^1H resonances of **5b**.

N-(Inosin-8-yl)-4-acetylaminobiphenyl(6a) and 3-(Inosin-O^6-yl)-4-acetylaminobiphenyl(7a):

A 250 mL 60 mM solution of I was incubated as 50 mg of **1a** was added as described

above. About 5 h after the addition, the aqueous solution was extracted with CH_2Cl_2. The CH_2Cl_2 extracts were combined and evaporated to dryness to give a mixture of **13**, **14a**, and **6a**. Isolation and purification of **6a** was performed by C-18 reverse phase column chromatography with 1/1 MeOH/H_2O eluent (yield: 3 mg, 4%). The aqueous portion contained I, salts, and **7a**. Isolation of **7a** was accomplished by C-18 reverse phase chromatography using 1/1 MeOH/H_2O eluent, and purified by semi-prep HPLC (yield: 19 mg, 27%). HPLC conditions were: C-8 Ultrasphere octyl semi-prep column, 1/1 MeOH/H_2O, 3 ml/min, 250 nm. **6a**: ^{1}H NMR (300 MHz, DMSO-d_6) δ 8.11(1H, s), 7.68(5H, m), 7.48-7.35(5H, m), 5.74(1H, d, J = 7.0 Hz), 5.55(1H, bs), 5.34(2H, bs), 5.02(1H, m), 4.14(1H, m), 3.93(1H, m), 3.69-3.32(2H, m), 2.07(3H, s). ^{13}C NMR(75.5 MHz, DMSO-d_6) δ 173.7(C), 170.7(C), 165.3(C), 152.7(CH), 148.0(C), 139.3(C), 139.3(C), 139.3(C), 128.9(CH), 127.5(CH), 127.2(CH), 126.6(CH), 125.4(CH), 122.0(C), 88.4(CH), 87.7(CH), 72.2(CH), 71.5(CH), 62.6(CH_2), 22.8(CH_3). MS: $C_{24}H_{24}N_5O_6^+$ requires 478.2 m/e; FAB MS (m-NBA matrix) found 478.2. $C_{24}H_{23}N_5O_6K^+$ requires 516.3; FAB MS (m-NBA matrix) found 516.3 m/e. Table S.3 is a COSY correlation table for the ^{1}H resonances of **6a**. **7a**: ^{1}H NMR(300 MHz, DMSO-d_6) δ 10.4(1H, s), 8.37(1H, s), 8.22(1H, s), 7.73(2H, m), 7.45(1H, d, J = 8.3 Hz), 7.27-7.14(5H, m), 5.79(1H, dd, J = 5.5, 1.8 Hz), 5.50(1H, bs), 4.95(2H, bs), 4.37(1H, m), 4.09(1H, m), 3.89(1H, m), 3.60-3.52(2H, m), 2.08(3H, m). The peaks at 8.37 and 8.22 ppm appear as closely spaced doublets at room temperature, but show no COSY correlations to other peaks, and they coalesce into sharp singlets above 70°C. ^{13}C NMR(75.5 MHz, DMSO-d_6) δ 168.8(C), 156.2(C), 148.5(CH), 147.4(C), 139.5(C), 139.3(CH), 137.5(C), 135.0(C), 134.3(C), 131.0(CH), 128.5(CH), 128.3(CH), 127.4(CH), 123.4(C), 120.0(CH), 119.3(CH), 87.3(CH), 85.6(CH), 74.3(CH), 70.1(CH), 61.2(CH_2), 24.1(CH_3). ^{13}C

peaks at 147.4, 139.3, 123.4, 87.3 and 70.1 ppm also show temperature dependent coalescence over the same temperature range as the ^{1}H resonances described above. MS: $C_{24}H_{24}N_5O_6^+$ requires 478.2 m/e; FAB-MS, (m-NBA matrix) found 478.3 m/e; $C_{24}H_{23}N_5O_6Na^+$ requires 500.2 m/e; FAB-MS, (m-NBA matrix) found 500.3 m/e; $C_{24}H_{23}N_5O_6K^+$ requires 516.3 m/e; FAB-MS, (m-NBA matrix) found 516.3 m/e. Table S.4 is a COSY correlation table for the ^{1}H signals of **7a**. Table S.5 is a XHCORR table for the ^{1}H and ^{13}C signals of **7a**.

N-(Inosin-8-yl)-4-aminobiphenyl(6b) and 3-(Inosin-O^6-yl)-4-aminobiphenyl(7b):

A 250 mL 60 mM solution of I was incubated as 70 mg of **1b** was added as described above. About 1 h after the addition the aqueous solution was extracted with CH_2Cl_2. The aqueous layer contained I, salts, **6b**, and **7b**. Isolation of **6b** and **7b** was accomplished with C-18 reverse phase column chromatography with 1/1 MeOH/H_2O eluent. Purification of **7b** was performed by HPLC as described above for **7a** (yield: 26 mg, 23%) . Purification of **6b** was accomplished by HPLC methods using 3/2 MeOH/H_2O eluent (yield: 22 mg, 20%). **6b**: ^{1}H NMR (300 MHz, DMSO-d_6) δ 9.12(1H, bs), 7.93(1H, s), 7.90(2H, d, J= 8.7 Hz), 7.62(4H, m), 7.43(2H, t, J = 7.4 Hz), 7.29(1H, t, J = 7.3 Hz), 6.09(1H, d, J = 7.6 Hz), 4.58(1H, dd, J = 7.5, 5.5 Hz), 4.16(1H, dd, J = 5.4, 1.6 Hz), 4.03(1H, m), 3.73-3.53(2H, m). ^{13}C NMR (75.5 MHz, DMSO-d_6) δ 174.5 (C), 156.9(C), 147.3(C), 145.6(C), 144.7(CH), 139.9(C), 132.8(C), 128.8(CH), 126.7(CH), 126.6(CH), 126.1(CH), 121.1(C), 118.3(CH), 86.8(CH), 86.1(CH), 71.4(CH), 70.9(CH), 61.5(CH_2). MS: $C_{22}H_{22}N_5O_5^+$ requires 436.2 m/e; FAB-MS, (m-NBA matrix) found 436.2 m/e; $C_{22}H_{21}N_5O_5Na^+$ requires 458.1 m/e; FAB-MS, (m-NBA matrix) found 458.2 m/e. Table S.6 is a COSY correlation table for the ^{1}H resonances of **6b**. **7b**: ^{1}H NMR (300 MHz, DMSO-d_6) δ 8.36(1H, s), 8.14(1H, s), 7.23-7.07(6H, m), 6.77(1H, dd, J = 8.3, 2.3 Hz),

6.55(1H, d, J = 2.1 Hz), 5.79(1H, d, J = 5.7 Hz), 5.54(2H, bs), 4.40(1H, q, J = 5.7 Hz), 4.08(1H, m), 3.89(1H, m), 3.61-3.50(2H, m). The peaks at 8.36 and 8.14 ppm show temperature dependence similar to the corresponding peaks of **7a**. ^{13}C NMR (75.5 MHz, DMSO-d_6) δ 156.2(C), 149.2(C), 148.6(CH), 147.3(C), 139.1(C), 138.4(C), 135.5(C), 131.2(CH), 128.5(CH), 128.5(CH), 126.7(CH), 126.5(CH), 123.5(C), 114.9(CH), 113.7(CH), 87.1(CH), 85.5(CH), 74.3(CH), 70.1(CH), 61.2(CH_2). ^{13}C peaks at 147.4, 139.1, 123.5, 87.1 and 74.3 ppm show temperature dependent coalescence similar to ^{13}C peaks of **7a**. MS: $C_{22}H_{21}N_5O_5Na^+$ requires 458.1 m/e; FAB-MS, (m-NBA matrix) found 458.2 m/e. Table S.7 is a COSY correlation table for the ^{1}H resonances of **7b**.

N-(7,8-Dihydro-8-methylguanosin-8-yl)-4-acetylaminobiphenyl (8a):

A 25 mL saturated solution of 8-MeG(ca. 15 mM) was stirred as 51 mg (0.148 mmole) of **1a** was added as described above. About 3 days after the addition, the aqueous solution was extracted with CH_2Cl_2. The aqueous layer, containing **8a**, was lyophilized and products were separated using HPLC as described above for **7a** except that the eluent was 55/45 MeOH/H_2O. Diastereomer 1 (yield: 14 mg, 19%) (**8a**): ^{1}H NMR (300 MHz, DMSO-d_6) δ 9.48(2H bs), 7.81-7.37(5H, m), 7.74(2H, d, J = 7.2 Hz), 7.50(2H, d, J = 7.2 Hz), 5.34(1H, d, J = 5.4 Hz), 5.25(2H, bs), 4.65(2H, m), 4.03(1H, m), 3.81(1H, q, J = 4.3 Hz), 3.58-3.46(2H, m), 1.68(3H, s), 1.42(3H, s). ^{13}C NMR (75.5 MHz, DMSO-d_6) δ 170.5(C), 165.6(C), 162.5(C), 160.9(C), 152.7(C), 140.3(C), 139.6(C), 138.9(C), 131.0(CH), 129.1(CH), 128.0(CH), 127.6(CH), 126.8(CH), 99.4(C), 88.3(CH), 84.7(CH), 70.6(CH), 69.8(CH), 62.0(CH_2), 26.9(CH_3), 25.6(CH_3). ^{13}C peaks at 131.0 and 127.6 ppm show temperature dependent coalescence from apparent doublets to singlets. MS analysis of this compound failed to generate a molecular ion. MS: $C_{14}H_{13}NO^+$

($PhC_6H_4NHAc^+$) requires 211.0997 m/e; EI MS found 211.1023 m/e. $C_{12}H_{11}N^+$ ($PhC_6H_4NH_2^+$) requires 169.0892 m/e; EI MS found 169.0931 m/e. $C_{14}H_{14}NO^+$ requires 212.1 m/e; FAB-MS (α-thioglycerol matrix) found 212.1 m/e. $C_{12}H_{12}N^+$ requires 170.1 m/e; FAB-MS (α-thioglycerol matrix) found 170.1 m/e. Diastereomer 2 (yield: 12 mg, 16%) (**8a**): ^1H NMR (300 MHz, DMSO-d_6) δ 9.49(2H, bs), 7.85-7.40(9H, m), 5.26(1H, d, J = 4.0 Hz), 5.25(2H, bs), 4.65(1H, m), 4.46(1H, bs), 4.06(1H, t, J = 5.6 Hz), 3.75(1H, q, J = 4.5 Hz), 3.68-3.46(2H, m), 1.65(3H, s), 1.38(3H, s). ^{13}C NMR (75.5 MHz, DMSO-d_6) δ 170.3(C), 165.6(C), 162.4(C), 161.0(C), 151.8(C), 140.4(C), 139.5(C), 138.9(C), 131.0(CH), 129.0(CH), 127.9(CH), 127.7(CH), 126.8(CH), 99.5(C), 89.4(CH), 84.4(CH), 70.3(CH), 70.0(CH), 61.8(CH_2), 26.3(CH_3), 25.4(CH_3). ^{13}C peaks at 131.0 and 127.7 ppm show temperature dependent coalescence from apparent doublets to singlets as above for diastereomer 1. MS results were equivalent to diastereomer 1. Table S.8 is a COSY correlation table for the ^1H signals of **8a**(diastereomer 2). Table S.9 is a XHCORR correlation table for the ^1H and ^{13}C signals of **8a**(diastereomer 2).

N-(7,8-Dihydro-8-methylguanosin-8-yl)-4-aminobiphenyl(8b):

A 250 mL saturated solution of 8-MeG was incubated as 70 mg of **1b** was added as described above. About 48 h after the addition, the mixture was extracted several times with CH_2Cl_2. The CH_2Cl_2 extracts were combined and evaporated to dryness to leave a mixture containing 4-aminobiphenyl (**15**), N-acetyl-4-aminobiphenyl(**10**) and the hydrolysis product **13**. The products were isolated and purified by column chromatography(230-400 mesh silica gel, 1/1 toluene/EtOAc eluent). NMR comparisons to authentic compounds confirmed **10** and **15** were isolated.[10] The aqueous layer, containing salts, 8-MeG, and **8b,** was freeze dried. The two diastereomers of **8b** were separated from the 8-MeG and salts by C-18 reverse phase

chromatography(1/1 MeOH/H_2O eluent). The two diastereomers were isolated and purified by HPLC as described above for **7a**. Diastereomer 1(yield: 20 mg, 17%) (**8b**): ^{1}H NMR (300 MHz, DMSO-d_6) δ 7.95(1H, bs), 7.91(1H, bs), 7.75-7.66(6H, m), 7.56(1H, bs), 7.46(2H, t, J = 7.1 Hz), 7.35(1H, t, J = 7.1 Hz), 5.64(1H, d, J = 6.9 Hz), 5.28(1H, bs), 5.00 (2H, bs), 4.50 (1H, bs), 4.15(1H, d, J = 6.7 Hz), 3.58-3.43(5H, m), 1.22(3H, s). ^{13}C NMR (75.5 MHz, DMSO-d_6) δ 184.6(C), 172.1(C), 172.1(C), 168.2(C), 139.4(C), 136.9(C), 135.9(C), 128.9(CH), 127.4(CH), 127.2(CH), 126.5(CH), 122.3(CH), 81.3(C), 73.8(CH), 72.8(CH), 71.5(CH), 68.2(CH), 62.8(CH_2), 29.0(CH_3). MS analysis of this compound failed to generate a molecular ion. MS: $C_{12}H_{11}N^+$ ($PbC_6H_4NH_2^+$) requires 169.0892 m/e; EI MS found 169.0896. Table S.10 is a COSY correlation table for the ^{1}H signals of **8b**(diastereomer 1). Table S.11 is a XHCORR table for the ^{1}H and ^{13}C signals for **8b**(diastereomer 1).

Diastereomer 2 (yield: 18 mg, 15%) (**8b**): ^{1}H NMR (300 MHz, DMSO-d_6) δ 9.00(1H, bs), 8.18(1H, bs), 8.03(1H, bs), 7.73(2H, d, J = 8.6 Hz), 7.70-7.67(2H, m), 7.56(2H, d, J = 8.6 Hz), 7.46(2H, t, J = 7.3 Hz), 7.36(1H, t, J = 7.2 Hz), 5.58(1H, d, J = 2.0 Hz), 5.32(2H, bs), 4.80(1H, bs), 4.48(1H, bs), 4.34(1H, d, J = 3.6 Hz), 3.65-3.49(5H, m), 1.22(3H, s). ^{13}C NMR (75.5 MHz, DMSO-d_6) δ 187.2(C), 171.9(C), 171.9(C), 166.5(C), 139.3(C), 137.6(C), 135.3(C), 129.0(CH), 127.5(CH), 127.1(CH), 126.6(CH), 123.6(CH), 81.4(C), 73.4(CH), 72.7(CH), 72.3(CH), 66.7(CH), 63.1(CH_2), 29.0(CH_3). MS results were equivalent to diastereomer 1.

3-Acetamido-6-phenyl-7-(adenosin-N^6-yl)-7-azabicyclo[4.1.0]hepta-2,4-diene(11a):

A 25 mL saturated solution of A (ca. 50 mM) was stirred as 48 mg (0.139 mmol) of **1a** was added as described above. About 5 h after the addition the reaction mixture was extracted with CH_2Cl_2, and the aqueous solution, containing **11a**, was freeze-dried. Isolation of **11a** was

performed by column chromatography using C-18 reverse phase silica gel with 1/1 MeOH/H_2O eluent. Purification was performed by HPLC as described above for **7a** (yield: 20 mg, 30%) . ^{1}H NMR (300 MHz, DMSO-d_6) 9.53(1H, s), 8.24(1H, s), 7.93 (1H,s), 7.38-7.24 (5H, m), 6.65(1H, d, J = 5.5 Hz), 5.98(1H, d, J = 10.0 Hz), 5.86(1H, d, J = 10.0 Hz), 5.78(1H, d, J = 5.7 Hz), 5.46(1H, d, J = 6.1 Hz), 5.19(1H, d, J = 4.9 Hz), 5.12(1H, m), 4.96(1H, dd, J = 5.8, 2.6 Hz), 4.42(1H, m), 4.09(1H, m), 3.92(1H, m), 3.65-3.53(2H, m), 1.99(3H, s). ^{13}C NMR (75.5 MHz, DMSO-d_6) 169.3(C), 150.1(C), 145.9(C), 145.2(C), 143.5(CH), 138.4(CH), 134.6(C), 134.1(CH), 128.6(CH), 127.3(CH), 125.3(CH), 119.6(C), 118.9(CH), 97.3(CH), 87.7(CH), 85.6(CH), 74.1(CH), 72.6(C), 70.3(CH), 62.9(CH), 61.4(CH_2), 24.0(CH_3). ^{13}C peaks at 138.4, 134.1, 119.6, 118.9, 87.7 and 74.1 ppm are doublets at room temperature. They coalesce into singlets at higher temperature. MS: $C_{24}H_{24}N_6O_5Na^+$ requires 499.2 m/e; FAB MS, (α-thioglycerol matrix) found 499.3 m/e; LD-TOF MS found 499.7 m/e. Table S.12 is a COSY correlation table for the ^{1}H signals of **11a**. Table S.13 is a XHCORR table for the ^{1}H and ^{13}C signals for **11a**.

3-Amino-6-phenyl-7-(adenosin-N^6-yl)-7-azabicyclo[4.1.0]hepta-2,4-diene(11b):

A 25 mL saturated solution of A was stirred as 58 mg (0.22 mol) of **1b** was added as described above. About 24 h after the addition, the aqueous solution was extracted with CH_2Cl_2. Isolation and purification were performed in the same manner as described for **11a** (yield: 18 mg, 19%). ^{1}H NMR (300 MHz, DMSO-d_6) δ 8.28(1H, s), 8.24(1H, s), 7.55(2H, m), 7.43(2H, m), 7.36(1H, m), 6.62(1H, d, J = 10.3 Hz), 6.02(1H, d, J = 10.3 Hz), 5.80(1H, dd, J = 5.8, 2.1 Hz), 5.45(2H, bs), 5.15(1H, bs), 4.57(1H, d, J = 2.0 Hz), 4.46(1H, dt, J = 15.6, 5.4 Hz), 4.09(1H, m), 4.05(2H, bs), 3.92(1H, m), 3.66-3.51(2H, m), 3.22-3.14(1H, m). ^{13}C NMR(75.5 MHz, DMSO-

d_6) δ 150.5(C), 146.3(CH), 145.1(C), 143.6(CH), 142.2(C), 138.7(CH), 128.9(CH), 128.7(CH), 128.2(C), 127.9(CH), 126.5(CH), 125.1(CH), 119.9(C), 87.7(CH), 85.7(CH), 74.0(CH), 72.4(C), 70.3(CH), 64.4(CH), 61.3(CH_2). ^{13}C peaks at 145.1, 138.7, 119.9, 87.7 and 74.0 ppm show temperature dependent coalescence similar to that observed for **11a**. MS: $C_{22}H_{22}N_6O_4Na^+$ + α-thioglycerol matrix requires 566.2 m/e; FAB-MS, (Thio-Gly matrix) found 566.3 m/e. Table S.14 is a COSY correlation table for the ^1H signals of **11b**.

Table S1. COSY Correlations for ^1H Signals of **5a**

^1H Signal (ppm)	Correlation (ppm)
7.67	7.45
7.45	7.67, 7.35
7.35	7.45
5.50	4.90
4.90	5.50, 4.03
4.03	4.90, 3.90 - 3.52
3.90 - 3.52	4.03, 3.90 - 3.52

Table S2. COSY Correlations for ^{1}H Signals of **5b**

^{1}H Signal (ppm)	Correlation (ppm)
7.67	7.58
7.58	7.67
7.65 - 7.60	7.42
7.42	7.65 - 7.60, 7.29
7.29	7.42
5.91	4.28
4.28	5.91, 4.07
4.07	4.28, 3.74
3.74	4.07

Table S3. COSY Correlations for ^{1}H Signals of **6a**

1H Signal (ppm)	Correlation (ppm)
7.68	7.48 - 7.35
7.48 - 7.35	7.68
5.74	5.02
5.02	5.74, 4.14
4.14	5.02, 3.93
3.93	4.14, 3.69 - 3.32
3.69 - 3.32	3.93

Table S4. COSY Correlations for ^{1}H Signals of **7a**

^{1}H Signal (ppm)	Correlation (ppm)
7.73	7.45
7.45	7.73
5.79	4.37
4.37	5.79, 4.09
4.09	4.37, 3.89
3.89	4.09, 3.60 - 3.52
3.60 - 3.52	3.89

Table S5. XHCORR Correlations for ^{1}H and ^{13}C Signals of **7a**

^{1}H Signal (ppm)	Correlation (ppm)
8.37	139.3
8.22	148.5
7.73	120.0, 119.3
7.45	131.0
7.27 - 7.14	128.5, 128.3, 127.4
5.79	87.3
4.37	74.3
4.09	70.1
3.89	85.6
3.60 - 3.52	61.2
2.08	24.1

Table S6. COSY Correlations for ^{1}H Signals of **6b**

^{1}H Signal (ppm)	Correlation (ppm)
7.90	7.62
7.62	7.90, 7.43
7.43	7.62, 7.29
7.29	7.43
6.09	4.58
4.58	6.09, 4.16
4.16	4.58, 4.03
4.03	4.16, 3.73 - 3.53
3.73 - 3.53	4.03

Table S7. COSY Correlations for ^{1}H Signals of **7b**

^{1}H Signal (ppm)	Correlation (ppm)
7.23-7.07	6.77
6.77	7.23 - 7.07, 6.55
6.55	6.77
5.79	4.40
4.40	5.79, 4.08
4.08	4.40, 3.89
3.89	4.08, 3.61 - 3.50
3.61 - 3.50	3.89

Table S8. COSY Correlations for the ^{1}H of **8a** (diastereomer 2)

^{1}H Signal (ppm)	Correlation (ppm)
5.26	4.65
4.65	5.26, 4.06
4.06	4.65, 3.75
3.75	4.06, 3.68 - 3.46
3.68 - 3.46	3.75

Table S9. XHCORR Correlations Between the ^{1}H and ^{13}C Signals for **8a** (diastereomer 2)

^{1}H Signal (ppm)	^{13}C Signal (ppm)
7.85 - 7.40	131.0, 129.0, 127.9, 127.7, 126.8
5.26	89.4
4.65	70.3
4.06	70.0
3.75	84.4
3.68 - 3.46	61.8
1.65	25.4
1.38	26.3

Table S10. COSY Correlations for the ^{1}H of **8b** (diastereomer 1)

^{1}H Signal (ppm)	Correlation (ppm)
7.75 - 7.66	7.75 - 7.66, 7.46, 7.35
7.46	7.70 - 7.67, 7.35
7.35	7.70 - 7.67, 7.46
5.64	4.15, 3.58 - 3.43
5.28	3.58 - 3.43
4.50	3.58 - 3.43
4.15	5.64, 3.58 - 3.43
3.58 - 3.43	5.28, 4.50, 4.15, 3.58 - 3.43

Table S11. XHCORR Correlations Between ^{1}H and ^{13}C Signals for **8b** (diastereomer 1)

^{1}H Signal (ppm)	Carbon Signal (ppm)
7.75 - 7.66	127.2, 126.5, 122.3
7.46	128.9
7.35	127.4
5.64	72.8
3.58 - 3.43	73.8, 71.5, 68.2, 62.8
1.22	29.0

Table S12. COSY Correlations for ^{1}H Signals of **11a**

^{1}H Signal (ppm)	Correlation (ppm)
6.65	5.98, 5.86, 4.96
5.98	6.65, 5.86
5.86	6.65, 5.98, 4.96
5.78	4.42
5.46	5.78, 4.42
5.19	4.09
5.12	3.65 - 3.53
4.96	6.65, 5.86
4.42	5.78, 5.46, 4.09
4.09	5.19, 4.42, 3.92
3.92	4.09, 3.65 - 3.53
3.65 - 3.53	5.12, 3.92

Table S13. XHCORR Correlations Between ^{1}H and ^{13}C Signals of **11a**

^{1}H Signal (ppm)	Carbon Signal (ppm)
8.24	138.4
7.93	143.5
7.38 - 7.24	128.6, 127.3, 125.3
6.65	97.3
5.98	118.9
5.86	134.1
5.46	87.7
4.96	62.9
4.42	74.1
4.09	70.4
3.92	85.6
3.65 - 3.53	61.4
1.99	24.0

Table S14. COSY Correlation for ^{1}H Signals of **11b**

^{1}H Signal (ppm)	Correlation (ppm)
7.55	7.43
7.43	7.55, 7.36
7.36	7.43
6.62	6.02, 4.57
6.02	6.62
5.80	4.46
4.57	6.62, 3.22 - 3.14
4.46	5.80, 4.09
4.09	4.46, 3.92
3.92	4.09, 3.66 - 3.51
3.66 - 3.51	3.92
3.22 - 3.14	4.57

Fig. S1. Trapping Data for 1b and d-G at pH 7.5

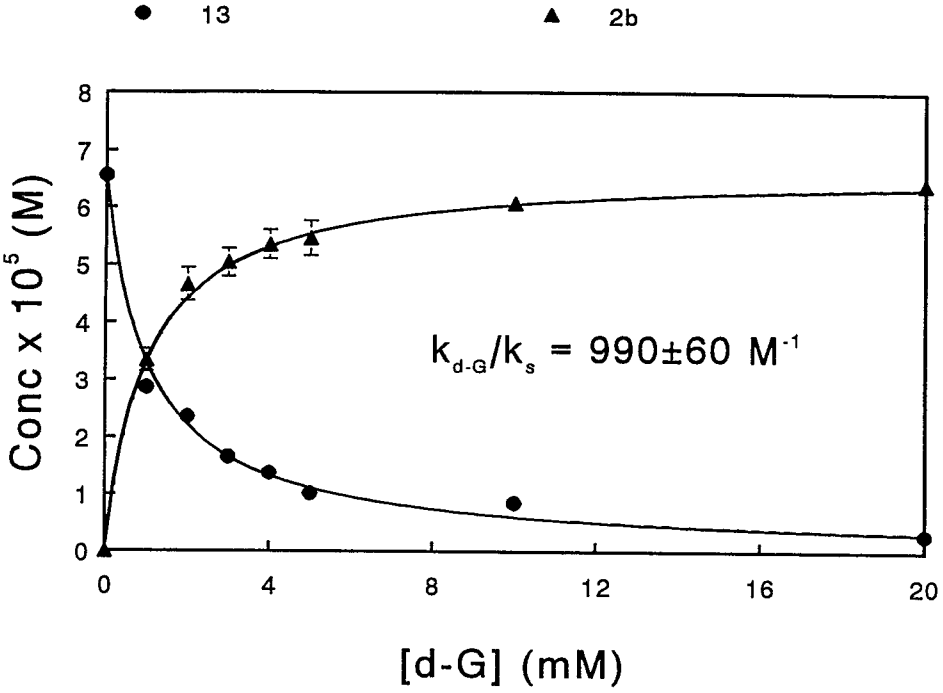

Fig. S2. Trapping Data for 1a and 8-MeG at pH 7.5

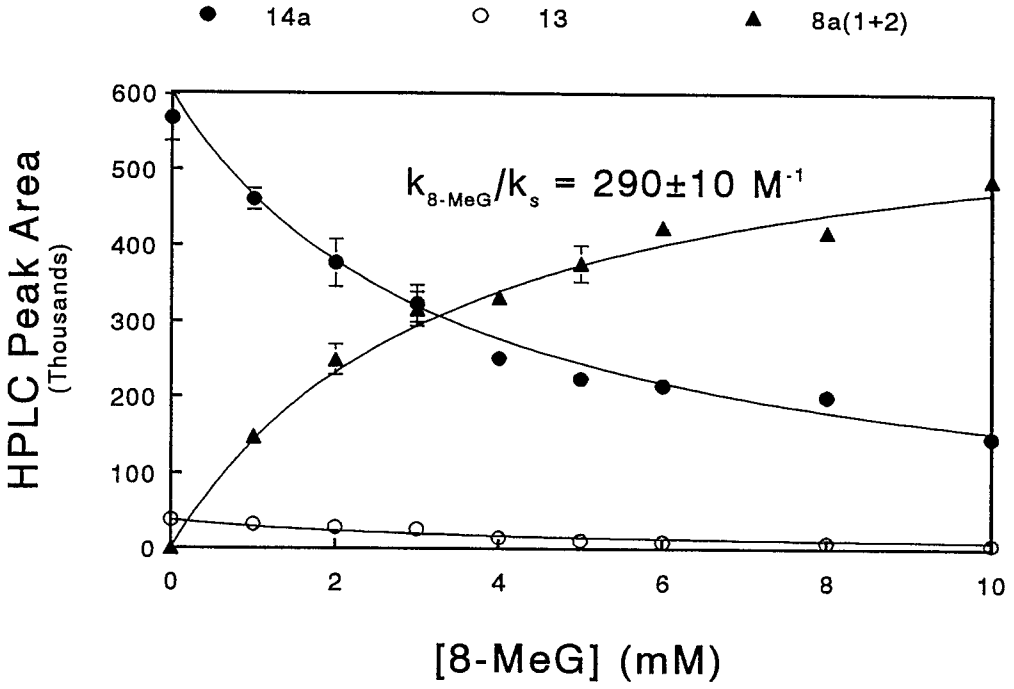

Fig. S3. Trapping Data for 1b and 8-MeG at pH 7.5

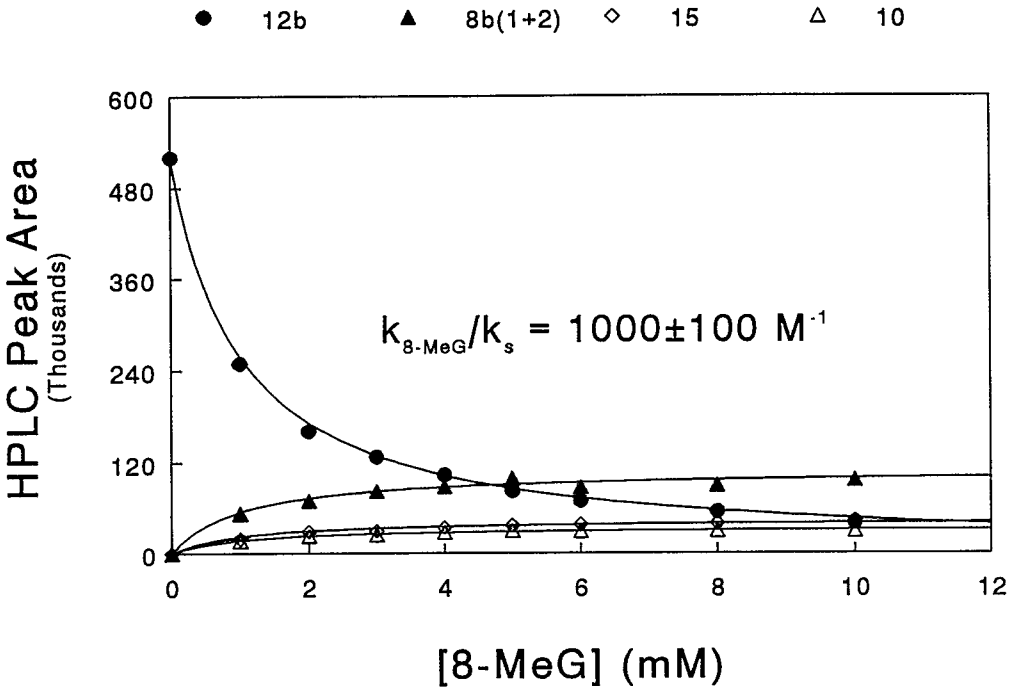

Fig. S4. Trapping Data for 1a and A at pH 7.5

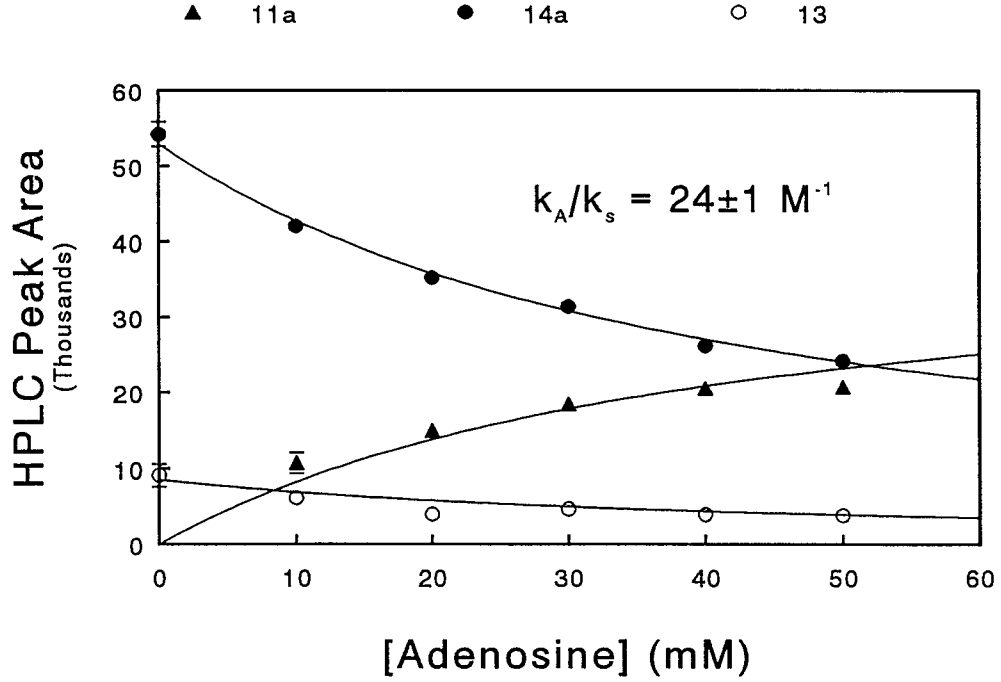

Fig. S5. Trapping Data for 1b and A at pH 7.5

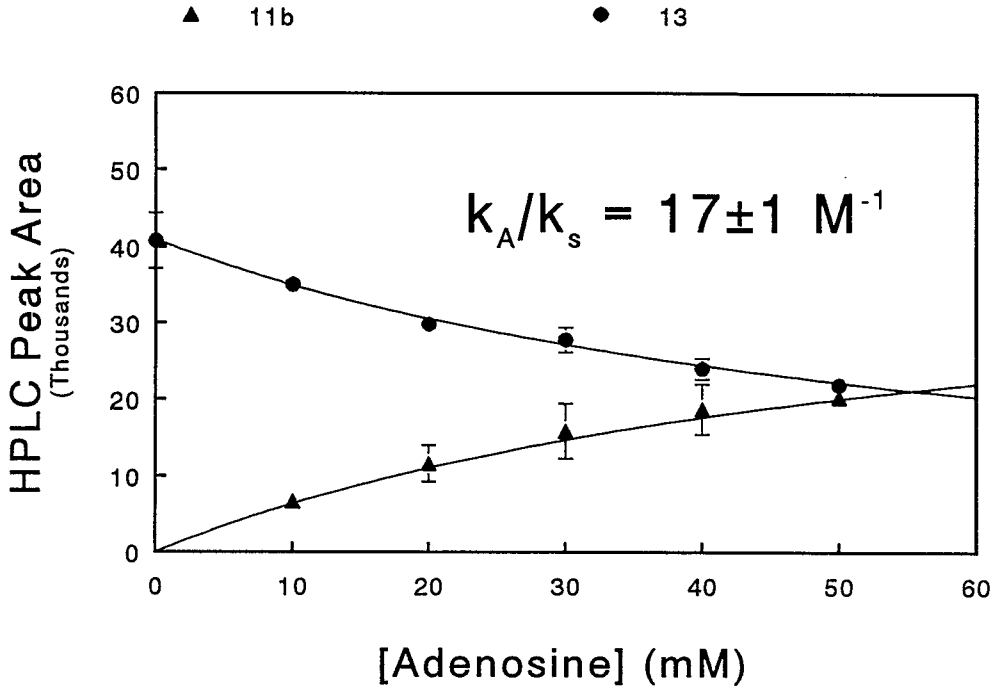

Fig. S6. Trapping Data for 1a and I at pH 7.5

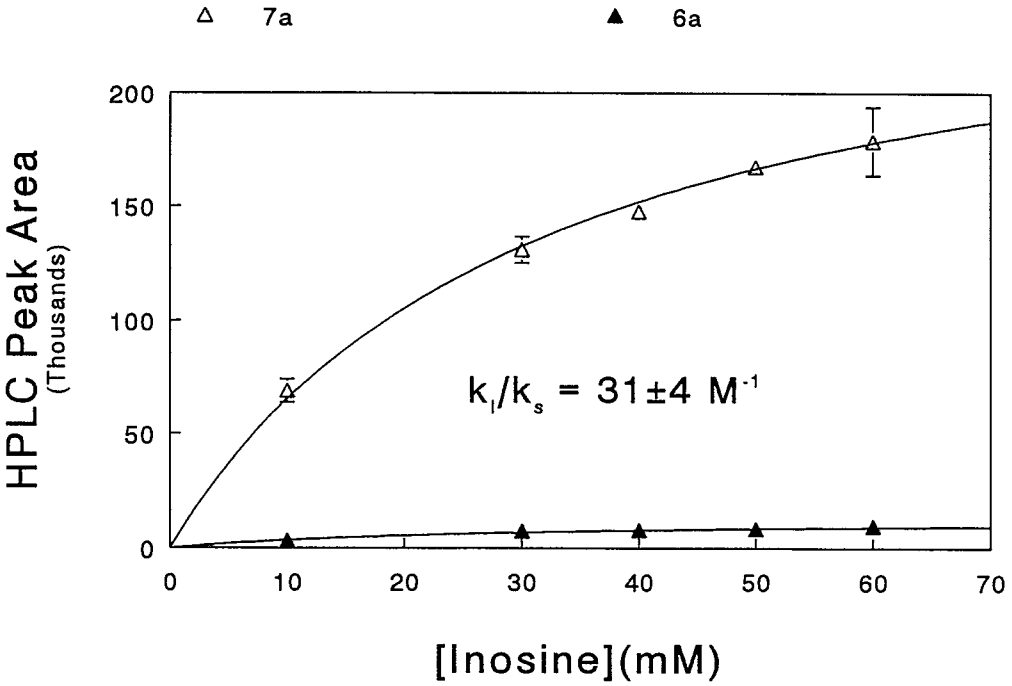

Fig. S7. pH Dependence of k_X/k_s for 1b