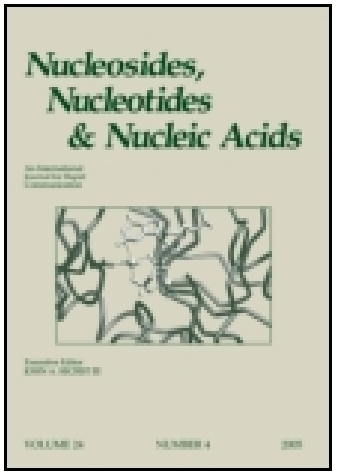

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Synthesis and Antiviral Evaluation of Analogs of Adenosine-N ^{1}-Oxide and 1-(Benzyloxy)Adenosine

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SYNTHESIS AND ANTIVIRAL EVALUATION OF ANALOGS OF ADENOSINE-N^1-OXIDE AND 1-(BENZYLOXY)ADENOSINE

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ABSTRACT: The activity of a series of compounds related to adenosine-N^1-oxide (**1**) and 1-(benzyloxy)adenosine (**42**) against vaccinia virus has been determined both *in vitro* and in a vaccinia mouse tailpox model. Significant activities have been found both *in vitro* and *in vivo* for a number of the synthetic compounds.

Introduction

The application of recombinant DNA technology to vaccinia virus for the purpose of developing vaccines dates back nearly twenty years. Since that time a number of recombinant vaccinia-based vaccines have been developed for both veterinary[1-16] and human[17-27] use. Recent recombinant vaccinia vaccines for human use have focused on both cancer[18,19,21-24] and AIDS.[25-27] Several reviews that summarize recent progress with poxvirus-based vaccines are available.[28-33] Over the years various anecdotal complications with vaccinia virus inoculations have been reported,[34-36] and other human safety concerns include potentially serious adverse consequences in immunocompromised individuals, and adverse reactions in a few normal individuals.[28] Other safety concerns relative to genetic changes in the virus also exist.[32] In view of these issues, some years ago the U.S. Army embarked on a program searching for small molecule drugs that could be used for the prevention or treatment of complications associated with the administration of either vaccinia virus itself or a recombinant vector derived from it. This report presents data on a series of compounds that we prepared as a part of that program.[37]

Chemistry

Adenosine-N^1-oxide (**1**) and the related N^1-oxides (**2-9,** Figure 1) were prepared by oxidation of the appropriate base with *m*-chloroperoxybenzoic acid, employing a modification of a literature procedure.[39,40] Good yields of the target *N*-oxides were obtained (see Experimental Section), and in most cases, the material that was directly obtained from the reaction was adequate for preparative purposes.

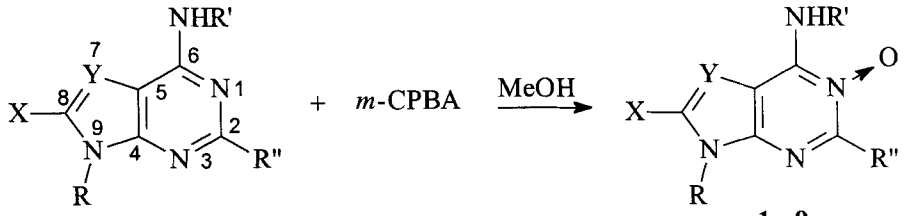
The N^1-oxides were treated with the appropriate benzyl bromides to produce 1-(benzyloxy)adenosine hydrobromides, whose handling we earlier found to be problematic. We had previously isolated these compounds as tetrafluoborate salts, which were stable but hygroscopic in some cases. After re-examination of several possibilities, we settled on perchlorate salts as having the best combination of handling and purification characteristics. The perchlorate salts were readily prepared from the hydrobromides by treatment with a nearly saturated solution of ammonium perchlorate in water.[41] Following this general procedure, a wide variety of substituted 1-benzyloxy derivatives (**10-63**) were prepared (see Figures 2 and 3).

The 9-benzyl and 9-methyl adenines were prepared by following a procedure for 9-benzyladenine.[42,43] Adenine was treated with the appropriate benzyl or methyl halide with Aliquat as a phase transfer catalyst. The obtained product mixture (containing both N^9- and N^3-alkylated adenine) was treated with sulfuric acid to remove the unwanted N^3-alkylated side product.

The 6-methylamino-9-β-D-ribofuranosylpurine for N^1-oxide **5** was prepared by the literature procedure through a Dimroth rearrangement.[44] Reaction of adenosine with iodomethane in dimethylacetamide gave the N^1-methylated product which was converted to the desired 6-methylamino compound by treatment with 0.25 N sodium hydroxide at 100 °C.

Biological Evaluation

Some years ago we examined the activity of adenosine N-oxide, a few 1-(benzyloxy)adenosines, and several related compounds against vaccinia virus in cell culture.[38] These compounds had surprisingly good activity, prompting us to significantly enlarge the series in order to optimize the activity and perhaps obtain some understanding about what structural characteristics contributed to this activity. Our expanded list of



1 - 9

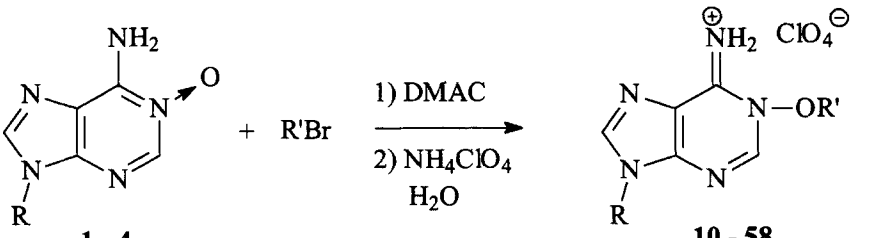
	R	R'	R"	X	Y
1,	β-D-ribofuranosyl	H	H	H	N
2,	β-D-2′-deoxyribofuranosyl	H	H	H	N
3,	benzyl	H	H	H	N
4,	methyl	H	H	H	N
5,	β-D-ribofuranosyl	CH_3	H	H	N
6,	β-D-arabinofuranosyl	H	H	H	N
7,	β-D-ribofuranosyl	H	H	Br	N
8,	β-D-ribofuranosyl	H	NH_2	H	N
9,	β-D-ribofuranosyl	H	H	H	CH

FIGURE 1

target structures allowed us to gain significant structure-activity relationship information. Specifically, we were able to learn about the effects of changes in the structure of the adenine N-oxide moiety, including different substituents on the purine ring as well as the importance and nature of the carbohydrate. With regard to the 1-(benzyloxy)adenosines, our extensive list of compounds allowed us to confirm which compounds had the best activity within the most active series.

Table 1 lists the *in vitro* activities of all of the compounds that were synthesized. Looking first at the series of N-oxides (**1-9**), excellent activity is seen with the parent compound **1** as well as the N6-methyl analog **5**. Lesser activity is seen for the 2'-deoxy compound **2**, and the 2-amino *ribo* analog **8**. Replacement of the carbohydrate with either benzyl (**3**) or methyl (**4**) resulted in loss of activity. Substitution of a bromine at C-8 (**7**) or changing the *ribo* configuration to the *arabino* (**6**) also both resulted in loss of most or all of the activity.

Based upon the above information, a large series of 1-(benzyloxy)adenosines (**10-43**) and a small series of 2'-deoxy-1-(benzyloxy)adenosines (**43-48**) were prepared. A



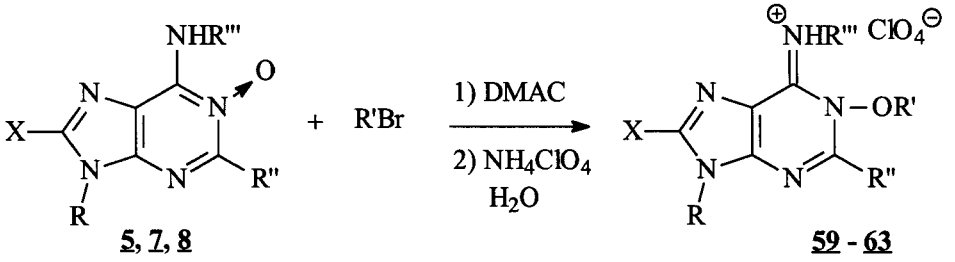
1 - 4 10 - 58

R	R'	R	R'
10, β-D-ribofuranosyl	2-methylbenzyl	**34**, β-D-ribofuranosyl	2-nitrobenzyl
11, "	3-methylbenzyl	**35**, "	3-nitrobenzyl
12, "	4-methylbenzyl	**36**, "	4-nitrobenzyl
13, "	2-methoxybenzyl	**37**, "	2-cyanobenzyl
14, "	3-methoxybenzyl	**38**, "	3-cyanobenzyl
15, "	4-methoxybenzyl	**39**, "	4-cyanobenzyl
16, "	1-(1-phenylethyl)	**40**, "	2-methoxy-5-nitrobenzyl
17, "	2-fluorobenzyl	**41**, "	3-methoxycarbonylbenzyl
18, "	3-fluorobenzyl	**42**, "	benzyl
19, "	4-fluorobenzyl	**43**, "	phenylethyl
20, "	2,4-difluorobenzyl	**44**, 2'-deoxyribofuranosyl	2-methylbenzyl
21, "	2,5-difluorobenzyl	**45**, "	3-methylbenzyl
22, "	2,6-difluorobenzyl	**46**, "	4-methylbenzyl
23, "	3,4-difluorobenzyl	**47**, "	2-fluorobenzyl
24, "	3,5-difluorobenzyl	**48**, "	3-fluorobenzyl
25, "	2,4-dimethylbenzyl	**49**, "	4-fluorobenzyl
26, "	2,5-dimethylbenzyl	**50**, benzyl	2-methylbenzyl
27, "	3,4-dimethylbenzyl	**51**, "	3-methylbenzyl
28, "	3,5-dimethylbenzyl	**52**, "	4-methylbenzyl
29, "	2-trifluoromethylbenzyl	**53**, "	2-fluorobenzyl
30, "	2,4-bis(trifluoromethyl)-benzyl	**54**, "	3-fluorobenzyl
		55, "	4-fluorobenzyl
31, "	3,5-bis(trifluoromethyl)-benzyl	**56**, "	ethyl
		57, methyl	2-methylbenzyl
32, "	2-chlorobenzyl	**58**, "	3-methylbenzyl
33, "	3-chlorobenzyl		

FIGURE 2

comparison of the two series in Table 1 clearly indicates the superiority of the *ribo* configuration. All six of the 2'-deoxy analogs were much poorer in activity than the parent compound **2**.

Focusing on the analogs of 1-(benzyloxy)adenosine, it can be seen that all of them have some activity, with ID_{50}'s as low as 0.01, and selectivity indices as high as 4657. All of the compounds with one exception have substituted benzyloxy groups at N-1. The



5, 7, 8 59 - 63

	R	R'	R''	R'''	X
59,	β-D-ribofuranosyl	2-methylbenzyl	H	CH_3	H
60,	"	3-methylbenzyl	H	CH_3	H
61,	"	2,4-difluorobenzyl	H	CH_3	H
62,	"	3-methylbenzyl	NH_2	H	H
63,	"	3-methylbenzyl	H	H	Br

FIGURE 3

one exception, **43**, has a 2-phenylethyloxy group at N-1, and that change results in significantly diminished activity, suggesting that a benzylic group is important to the optimal activity. Among the most active compounds were the three 1-(methylbenzyloxy)-adenosines (**10-12**), the three 1-(methoxybenzyloxy)adenosines (**13-15**), the four 1-(dimethylbenzyloxy)adenosines (**25-28**), and 1-(1-phenylethyloxy)adenosine (**16**). Thus, electron-donating substituents on the phenyl tended to result in compounds with greater activity than the parent compound. Those compounds with strongly electron-withdrawing groups, including the 1-(mono- and difluorobenzyloxy)adenosines (**17-24**), and the trifluoromethyl-, chloro-, cyano-, carbomethoxy- and nitro-substituted 1-(benzyloxy)adenosines (**29-41**), generally resulted in decreased activity. Interestingly, some of these compounds (**20, 23,** and **29**) had activity comparable to or superior to that of the parent compound **1**. The excellent activity imparted by the electron-donating substituents suggests that stabilization of the benzylic moiety as it is cleaved from the 1-(benzyloxy)adenosine imparts enhanced activity. It might be expected, however, that the electron-withdrawing groups would reduce activity below that of the parent compound, which definitely does not happen in all cases. It is tempting to presume that the effects of these groups would be manifested primarily in the stabilization of the benzylic ion or

Table 1. ***In Vitro*** **Activity vs. Vaccinia Virus**

Compound	ID_{50}[a]	MTC[b]	SI[c]
1	>0.32	100	312
2	3.06	>320	105
3	not active	32	0
4	not active	>320	0
5	0.83(2)	>320	482
6	100(2)	320	3.3
7	102(2)	320	3.2
8	5.9(2)	>320	55
9	1.7(2)	22	13
10	0.32	>320	1000
11	0.54(2)	>320	634
12	0.11	100	3432
13	0.14(2)	>320	2477
14	0.01	32-100	4657
15	0.25(2)	>320	1342
16	0.32(3)	100-320	766
17	7.2(2)	>320	49
18	1.1(2)	>320	305
19	2.2(2)	>320	147
20	0.40(2)	>320	842
21	2.3(2)	>320	148
22	1.7(2)	>320	191
23	0.63(2)	>320	553
24	1.9(2)	>320	171
25	0.08(2)	>320	3998

Table 1. Continued

Compound	ID_{50}[a]	MTC[b]	SI[c]
26	0.31(2)	>320	1100
27	0.25(2)	>320	1380
28	0.39(2)	>320	854
29	0.82	>320	391
30	1.6(2)	>320	201
31	1.0(2)	>320	314
32	1.1(2)	>320	285
33	1.4(2)	>320	244
34	1.4(2)	>320	246
35	10.4(2)	>320	31
36	3.0(2)	>320	113
37	4.0(2)	>320	129
38	2.1(2)	>320	158
39	2.8(2)	>320	117
40	2.9(2)	>320	124
41	1.9(2)	>320	173
42	1.77	320	181
43	49	>320	6.5
44	43	320	7.4
45	179	>320	>1.8
46	94.2	>320	3.4
47	317	>320	1.0
48	not active	>320	0.0
49	not active	320	0.0
50	54	32	0.6

(continued)

Table 1. Continued

Compound	ID_{50}[a]	MTC[b]	SI[c]
51	57	100	1.8
52	not active	<100	0.0
53	100	100	1.0
54	63	100	1.6
55	68	32.0	0.5
56	not active	>320	0.0
57	not active	320	0.0
58	not active	>320	0.0
59	15.3	320	>21
60	157	>320	>2
61	320	>320	>1
62	61	320	53
63	201	100	0.1

[a]ID_{50} = Inhibitory dose 50. Concentration of the drug that causes a 50% reduction in virus replication. The number of experiments, if larger than 1, is given in parentheses. [B]MTC = Minimum toxic concentration. The lowest concentration of the test compound that results in a 50% reduction in percent survival of viable host cells. [c]SI = Selectivity index. A measure of the antiviral potential for the drug calculated as MTC/ID_{50}.

radical that would form upon cleavage of the benzylic moiety from the parent N^1-oxides. One would thus assume that the activities of the benzyloxy compounds is related to the stability of these species, and hence, the ease of cleavability for their benzylic groups. The data certainly support that conclusion in general, but some compounds clearly require additional consideration. We found that the compounds that were most active in the vaccinia screen were also, as might be expected, the ones that were least stable (most reactive) in solution. Thus, decomposition occurred more rapidly with the electron-donating 1-benzyloxy compounds, and less rapidly with the electron-withdrawing analogs.

Because the assay is done over a significant period of time, some of the latter compounds would perhaps have had time to have a greater effect than might be expected because of their increased stability.

Based upon considerations of potency, selectivity, and stability, a series of target compounds were chosen for evaluation in a vaccinia virus-induced tailpox lesion mouse model. The results of those experiments are presented in Table 2. As can be seen, all of the compounds had some activity in this model. Compounds **10**, **11**, and **28** were comparable in activity to Ara-A, while compounds **1**, **12**, **19**, and **29** may be slightly less active than Ara-A. 1-(4-Methoxybenzyloxy)adenosine (**15**) was found to be extremely active when freshly prepared solutions were used within 10 min. Half of the animals had no lesions at all, while all of the animals had fewer lesions than only half of the animals treated with Ara-A.

Conclusions

Many compounds designed based upon the structures of adenosine N-oxide (**1**) and 1-(benzyloxy)adenosine (**42**) possessed excellent activity against vaccinia virus in a standard cell culture assay. Of those compounds, some were selected for evaluation in a mouse tailpox model, and all of them had good to excellent activity, as well, suggesting that they could be considered for further development. For a compound from this series to be carried forward, additional information on stability and pharmacology would need to be gathered to evaluate in conjunction with the activity data presented herein.

Experimental Section

All solvents and materials were reagent grade and were either used as received or purified as required. ^{1}H NMR and ^{13}C NMR spectra were run with a Nicolet NMC NT-300 NB spectrometer operating at 300.65 MHz with tetramethylsilane as an internal reference. Chemical shifts (δ) for multiplets were measured from the appropriate centers. The mass spectral data were obtained from a Varian MAT 311A mass spectrometer in fast atom bombardment (FAB) or electron-impact (EI) mode (direct probe temperature 20 °C), as indicated. Infrared data were obtained with a Nicolet 10-MX spectrometer. In most cases, only strong or medium peaks in the 1800-600 cm^{-1} range were reported. UV absorption spectra were determined in the appropriate pH 1 (0.1 N HCl), pH 7 buffer, and pH 13 (0.1 N NaOH) solutions with either a Cary 17 spectrometer or a Perkin Elmer

Table 2. Percent Reduction in Average Numerical Tailpox Counts for Drug Treated Mice[a]

Compound	% Reduction[b]	Number of Assays[c]
1	32	3
10	50	1
11	54	7
12	38	1
15	96	1
19	31	1
28	57	1
29	39	1
Ara-A (control)	54	7

[a]Outbred Swiss mice (Charles River Labs. VAF+, CD-1)

[b] $\left(1 - \frac{\text{pox count of drug treated}}{\text{pox count of diluent control}}\right) \times 100$

[c]Number of assays averaged to give the % reduction values shown

Model Lambda 9 UV/VIS/NIR spectrophotometer. Melting point data were obtained with a Mel-Temp Capillary Melting Point apparatus, and all melting points were uncorrected. Elemental analysis data were obtained from Atlantic Microlab of Atlanta, Georgia.

General Procedure for Preparing All N^1-Oxides

The following preparation for adenosine-N^1-oxide served as the general method for preparing all of the N^1-oxides. All N^1-oxides were prepared starting with amounts of the adenosine analogs from 4.1 - 10.6 mmoles and 1.2 equivalents of *m*-chloroperbenzoic acid. The same ratio of reactants and solvents was used for all of these preparations.

Adenosine-N^1-oxide (1). In a 1-L round-bottomed flask protected with a calcium sulfate drying tube was placed 5.0 g (18.7 mmol) of adenosine and 500 mL of methanol. The mixture was stirred at room temperature and 4.85 g (22.5 mmol) of *m*-chloroperoxybenzoic acid (MCPBA, 85%) was added in 7-10 portions over 2 h. If thin-layer chromatography after 15-20 h of stirring indicated the presence of starting material, an additional 0.5 g (2.9 mmol) of MCPBA was added and the reaction stirred an additional 4 h. If the TLC continued to show starting material, another portion of MCPBA was added and the stirring continued overnight. After the TLC showed little or no starting material left, the reaction mixture was poured slowly into 2 L of ethyl acetate with good stirring. After having been stirred 2 h, the product was collected, washed with ethyl acetate, and dried *in vacuo* over phosphorus pentoxide to yield 5.6 g. This material was generally adequate for preparative purposes. One recrystallization from boiling ethanol usually provided analytically pure material. Yield, 70%; mp 222-225°C; ^{1}H NMR (Me_2SO-d_6) δ 3.57, 3.69 (2 m, 2, $J_{5'a,5'b}$ = 12.0 Hz, CH_2-5′), 3.96 (apparent q, 1, $J_{4',5'b}$ = 4.0 Hz, $J_{4',5'a}$ = 4.1 Hz, H-4′), 4.16 (apparent q, 1, $J_{3',4'}$ = 3.7 Hz, H-3′), 4.56 (apparent q, 1, $J_{2',3'}$ = 5.0 Hz, H-2′), 5.09 (apparent t, 1, 5′-OH), 5.28 (apparent d, 1, 3′-OH), 5.64 (apparent d, 1, 2′-OH), 5.89 (d, 1, H-1′), 8.55 (s, 1, H-2), 8.64 (s, 1, H-8).

2′-Deoxyadenosine-N^1-oxide (2). Yield, 100%; mp 219-221°C (dec); UV λ_{max} 258 nm (12,520) at pH 1; 261 (8,490) at pH 7; 268 (8,600) at pH 13; MS (FAB) *m/e* 268 (M + 1); IR 1680, 1499, 1380, 1233, 1213, 1091, 1075, 1070, 1025 cm^{-1}; ^{1}H NMR (Me_2SO-d_6) δ 2.32 (m, 1, $J_{2'a,3'}$ = 3.6 Hz, $J_{1',2'a}$ = 6.2 Hz, H-2′a), 2.70 (m, 1, $J_{2'b,3'}$ = 5.9 Hz, $J_{1',2'b}$ = 7.2 Hz, $J_{2'a,2'b}$ = 13.3 Hz, H-2′b), 3.52, 3.60 (2 m, 2, $J_{5'a,5'b}$ = 11.8 Hz, CH_2-5′), 3.87 (apparent q, 1, $J_{4',5'a}$ = $J_{4',5'b}$ = 4.7 Hz, H-4′), 4.41 (apparent q, 1, $J_{3',4'}$ = 2.7 Hz, $J_{2'a,3'}$ = 3.6 Hz, $J_{2'b,3'}$ = 5.9 Hz, H-3′), 4.98 (apparent t, 1, $J_{5',5'\text{-OH}}$ = 5.0 Hz, 5′-OH), 5.38 (apparent d, 1, $J_{3',3'\text{-OH}}$ = 3.8 Hz, 3′-OH), 6.33 (t, 1, $J_{1',2'a}$ = 6.2 Hz, $J_{1',2'b}$ = 7.2 Hz, H-1′), 8.51 (s, 1, H-2), 8.63 (s, 1, H-8).

9-Benzyladenine-N^1-oxide (3). Yield, 62%; mp 270-272°C (dec); UV λ_{max} 259 (13,000) at pH 1; 262 (9,100), 233 (46,100) at pH 7; 308 (4,400), 269 (8,700), 232 (26,300) at pH 13; MS (EI) *m/e* 241 (M), 225 (M - O); IR 1669 broad, 1503, 1490, 1410, 1361, 1330, 1263, 1235, 1221, 1160, 1140, 713, 695 cm^{-1}; ^{1}H NMR (Me_2SO-d_6) δ 5.40 (s, 2, CH_2Ar), 7.33 (m, 5, Ar), 8.43 (s, 1, H-2), 8.63 (s, 1, H-8); ^{13}C NMR (Me_2SO-d_6) δ

46.29 (C-CH_2Ar), 127.37 (C-Ar-2,6), 127.71 (C-Ar-4), 128.57 (C-Ar-3,5), 136.43 (C-Ar-1), 141.80 (C-4), 143.09, 143.74 (C-2,8), 148.02 (C-6).

9-Methyladenine-N^1-oxide (4). Yield, 50%; mp >300°C; UV λ_{max} 259 nm (11,300) at pH 1; 262 (7,700) at pH 7; 268 (8,100) at pH 13; MS (FAB) *m/e* 166 (M + 1); IR 1678, 1511, 1233, 1150, 1039, 692, 438 cm^{-1}; ^1H NMR (D_2O) δ 3.84 (s, 3, CH_3), 8.17 (s, 1, H-2), 8.57 (S, 1, H-8); ^{13}C NMR (Me_2SO-d_6) δ 30.80 (C-CH_3), 119.01 (C-5), 144.57 (C-2), 145.01 (C-4), 146.51 (C-8), 149.03 (C-6).

6-Methylamino-9-β-D-ribofuranosylpurine-N^1-oxide (5).[8] Yield, 30%; mp 142-152°C; UV λ_{max} 215 nm (25,800), 262 nm (13,900) at pH 1; 235 (37,900), 270 (9,800) at pH 7; 235 (38,000), 271 (9,500) at pH 13; MS (FAB) *m/e* 298 (M + 1); IR 1656, 1580, 1500, 1425, 1215, 1090 (broad), 1050, 1025 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.45 (apparent d, 3, NCH_3), 3.54, 3.66 (2 m, 2, $J_{4',5'a}$ = 4.0 Hz, $J_{4',5'b}$ = 3.9 Hz, $J_{5'a,5'b}$ = 12.0 Hz, CH_2-5′), 3.93 (apparent q, 1, H-4′), 4.16 (apparent q, 1, $J_{3',4'}$ = 3.8 Hz, H-3′), 4.51 (apparent q, 1, $J_{2',3'}$ = 5.0 Hz, H-2′), 5.07 (t, 1, $J_{5',5'\text{-OH}}$ = 5.5 Hz, OH-5′), 5.24 (d, 1, $J_{3',3'\text{-OH}}$ = 5.1 Hz, OH-3′), 5.59 (d, 1, $J_{2',2'\text{-OH}}$ = 5.9 Hz, OH-2′), 5.88 (d, 1, $J_{1',2'}$ = 5.5 Hz, H-1′), 8.39 (br d, 1, CH_3N-*H*), 8.55 (s, 1, H-2), 8.62 (s, 1, H-8); ^{13}C NMR (Me_2SO-d_6) δ 29.84 (C-NCH_3), 61.01 (C-5′), 70.00 (C-3′), 73.67 (C-2′), 85.33 (C-4′), 87.27 ($J_{C,H}$ = 166.57 Hz, C-1′), 118.29 (C-5), 141.66 (C-2), 142.47 (C-4,8), 147.52 (C-6).

9-β-D-Arabinofuranosyladenine-N^1-oxide (6). Yield, 85%; mp >250°C; UV λ_{max} 258 nm (12,600), 213 nm (28,300) at pH 1; 293 (2,200), 261 (8,500), 232 (42,200) at pH 13; MS (FAB) *m/e* 284 (M + 1); IR 1669, 1505, 1425, 1385, 1216, 1135 (sh), 1130, 1115, 1083, 1040, 1035 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.66 (m, 1, CH_2-5′), 3.80 (apparent q, 1, H-4′), 4.12 (apparent q, 1, H-3′), 4.19 (apparent q, 1, H-2′), 5.10 (t, 1, OH-5′), 5.17 (d, 1, OH-3′), 5.69 (d, 1, OH-2′), 6.22 (d, 1, H-1′), 8.37 (s, 1, H-2), 8.63 (s, 1, H-8); ^{13}C NMR (Me_2SO-d_6) δ 60.61 (C-5′), 74.59 (C-3′), 75.54 (C-2′), 83.55 (C-1′), 84.14 (C-4′), 117.83 (C-5), 141.65 (C-4), 142.87, 142.95 (C-8,2), 148.02 (C-6).

8-Bromoadenosine-N^1-oxide (7). Yield, 23%; mp 180-190°C (dec); UV λ_{max} 263 nm (15,300), 214 (27,700) at pH 1; 298 (2,700), 265 (10,500), and 237 (40,400) at pH 7; 315 (5,700), 278 (9,000), and 236 (23,100) at pH 13; MS (FAB) *m/e* 362 (M + 1); IR 1678, 1466, 1295, 1275 (sh), 1270, 1142, 1100, 1075, 1070 (sh), 1057, 1051, 1025 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.49, 3.64 (2 m, 2, $J_{5'a,5'b}$ = 11.8 Hz, CH_2-5′), 3.91 (apparent q,

1, $J_{4',5'a}$ = 5.7 Hz, $J_{4',5'b}$ = 4.9 Hz, H-4′), 4.21 (apparent q, 1, $J_{3',4'}$ = 3.4 Hz, H-3′), 4.83 (t, 1, $J_{5'a,5'\text{-OH}}$ = 6.5 Hz, $J_{5'b,5'\text{-OH}}$ = 5.4 Hz, OH-5′), 5.09 (q, 1, $J_{2',3'}$ = 5.3 Hz, H-2′), 5.26 (d, 1, $J_{3',3'\text{-OH}}$ = 5.0 Hz, OH-3′), 5.49 (d, 1, $J_{2',2'\text{-OH}}$ = 6.0 Hz, OH-2′), 5.81 (d, 1, $J_{1',2'}$ = 6.1 Hz, H-1′), 8.65 (s, 1, H-2).

2,6-Diamino-9-β-D-ribofuranosylpurine-N^1-oxide (8). Yield, 76%; mp >250°C; UV λ_{max} 213 nm (26,200), 253 (11,100), 289 (10,200) at pH 1; 211 (16,200), 233 (33,700), 260 (9,000), 292 (6,900) at pH 7; 233 (31,700), 262 (9,200), 288 (7,200) at pH 13; MS (FAB) *m/e* 299 (M + 1); IR 1672, 1633, 1618, 1420, 1225, 1125, 1105, 1055, 1040 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.56, 3.64 (2 m, 2, $J_{4',5'a}$ = 4.2 Hz, $J_{4',5'b}$ = 4.1 Hz, $J_{5'a,5'b}$ = 12.0 Hz, H-5′), 3.89 (apparent q, 1, H-4′), 4.10 (apparent q, 1, $J_{3',4'}$ = 3.5 Hz, H-3′), 4.45 (apparent q, 1, $J_{2',3'}$ = 5.0 Hz, H-2′), 5.02 (apparent t, 1, $J_{5',5'\text{-OH}}$ = 5.5 Hz, OH-5′), 5.15 (apparent d, 1, $J_{3',3'\text{-OH}}$ = 4.8 Hz, OH-3′), 5.43 (d, 1, $J_{2',2'\text{-OH}}$ = 6.0 Hz, OH-2′), 5.75 (d, 1, $J_{1',2'}$ = 5.9 Hz, H-1′), 7.23 (br s, 2, H-NH_2), 8.15 (s, 1, H-8).

7-Deazaadenosine-N^1-oxide (9). Yield, 97%; mp >250°C; UV λ_{max} 210 nm (21,900), 223 (22,900), 272 (8,000) at pH 1; 234 (33,900), 271 (5,500), 303 (3,400) at pH 7; 234 (30,800), 273 (5,900), 305 (3,800) at pH 13; MS (FAB) *m/e* 283 (M + 1); IR 1729, 1655, 1502, 1240, 1120, 1084, 1047, 1025, 1000, 800, 745, 645 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.52, 3.60 (2 m, 2, H-5′), 3.88 (apparent q, 1, H-4′), 4.07 (apparent d, 1, H-3′), 4.33 (apparent q, 1, H-2′), 5.10 (apparent t, 1, OH-5′), 5.17 (apparent d, 1, OH-3′), 5.43 (apparent d, 1, OH-2′), 6.00 (d, 1, H-1′), 6.68 (d, 1, H-7), 7.56 (d, 1, H-8), 8.05 (br s, 1, H-NH_2), 8.45 (s, 1, H-2); ^{13}C NMR (Me_2SO-d_6) δ 61.40 (C-5′), 70.31 (C-3′), 73.92 (C-2′), 84.83 (C-4′), 86.68 ($J_{C,H}$ = 163.77 Hz, C-1′), 99.46 ($J_{C,H}$ = 179.21 Hz, C-7), 102.28 (C-5), 124.59 ($J_{C,H}$ = 192.49 Hz, C-8), 141.64 (C-2), 142.17 (C-4), 148.29 (J_{C_6,H_2} = 5.03 Hz, C-6).

General Procedure for Preparing All 1-(Substituted Benzyloxy)adenosines (10-63)

The following procedure is a general method for the preparation of all of the 1-benzyloxy-adenosine analogs. They were prepared in 310 mg-4 g quantities in 18-84% yields, using 750 mg-3 g of the starting *N*-oxides, 960 mg-11.4 g of the benzyl bromide, 30-85 mL DMAC, and 3-6.25 g ammonium perchlorate. The same ratio of reactants and solvents were used in all cases.

General Procedure for the Preparation of the Following 1-(Substituted Benzyloxy)adenosines

1-(Substituted Benzyloxy)adenosines, Perchloric Acid Salts (10-63). In a 100-mL round-bottomed flask equipped with a magnetic stirrer and a calcium sulfate drying tube was placed 2.5 g (8.83 mmol) of adenosine-N^1-oxide (**1**), 50 mL of molecular sieve (4A) dried *N,N*-dimethylacetamide (DMAC), and 26.5 mmol of the appropriate benzyl bromide was added to the well-stirred suspension. The mixture was stirred for 2 h after complete solution was achieved. The reaction mixture was poured into 300-500 mL of anhydrous ether with slight swirling. After the product stuck to the walls of the flask the supernatant was decanted. The gummy residue was washed with 400 mL of ether, decanted, again covered with 400 mL of ether, and ground to a powder. The powder was allowed to settle, the ether was decanted, and the residue was dried in a stream of argon. The residue was dissolved in 25 mL of H_2O and added with stirring to a warm solution of 5 g (42.6 mmol) of ammonium perchlorate dissolved in 25 mL of H_2O. The product crystallized upon scratching and chilling. One recrystallization from H_2O and drying at either 56 °C or 78 °C for 16 h over phosphorus pentoxide usually yielded an analytical sample (see Table 2). See Table 2 for the amounts of the reactants used. The ratios of the reactants were maintained.

1-(2-Methylbenzyloxy)adenosine, Perchloric Acid Salt (10). UV λ_{max} 259 nm (13,420) at pH 1; 259 (13,260) at pH 7; 258 (13,210) at pH 13; MS (FAB) *m/e* 388 (M + 1); IR 1687, 1510, 1415, 1227, 1127, 1083 (broad), 916, 880, 767, 690, 623 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 2.47 (s, 3, CH_3), 3.57, 3.68 (2 m, 2, $J_{4',5'a}$ = 3.9 Hz, $J_{4',5'b}$ = 4.0 Hz, $J_{5'a,5'b}$ = 12.0 Hz, CH_2-5′), 3.99 (apparent q, 1, H-4′), 4.15 (apparent t, 1, $J_{3',4'}$ = 3.8 Hz, H-3′), 4.47 (br s, 1, $J_{2',3'}$ = 4.9 Hz, H-2′), 5.08 (br s, 1, 5′-OH), 5.32 (br s, 1, 3′-OH), 5.46 (s, 2, OCH_2Ar), 5.60 (br s, 1, 2′-OH), 5.92 (d, 1, $J_{1',2'}$ = 5.4 Hz, H-1′), 7.35 (m, 4, H-Ar), 8.61 (s, 1, H-2), 8.83 (s, 1, H-8), 9.79, 10.48 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 18.64 (CH_3), 60.83 (C-5′), 69.92 (C-3′), 74.46 (C-2′), 79.56 (C-OCH_2Ar), 85.83 (C-4′), 87.74 (C-1′), 119.84 (C-5), 125.84 (Ar-C3), 129.93 (Ar-C6), 130.45 (Ar-C4), 131.34 (Ar-C2), 138.13 (Ar-Cl), 142.84 (C-8), 144.40 (C-2), 145.17 (C-4), 148.32 (C-6).

The analytical data for all of the other 1-benzyloxyadenosine analogs were generally as would have been predicted for this series of compounds. For example, the UV spectra

for the 1-benzyloxyadenosines, deoxyadenosines, 9-benzyladenines, and 9-methyladenines all showed λ_{max}'s of 257-261 with ϵ's of 12,000-14,000 at pH 1, 7, and 13. The absorbances for the 1-benzyloxy-6-methyl, 2-amino, and 8-bromoadenosine analogs deviated slightly and showed λ_{max}'s of 260-263, 256-268, and 265 with ϵs of 11,500-13,600, 10,900-16,000, and 13,700-16,500, respectively.

The variations in the ^1H and ^{13}C NMR data for these compounds occurred mainly in the signals for the 8- and 2-positions, and these variances could all be attributed to substituent effects caused by adjacent carbon centers. For example, the signals for the H-8 protons occurred in the 8.76-8.84 ppm range while the H-2 protons occurred from 8.61-9.17. The assignments of the H-8 and H-2 positions were made according to the ^{13}C satellite peaks present in the proton spectra, which gave the 1-bond C:H coupling constants. The ranges for these coupling constants were $^1J_{C_8,H_8}$ = 216.5-219.0 and $^1J_{C_2,H_2}$ = 221.5-222.6 Hz.

1-(2,4-Difluorobenzyloxy)adenosine, Perchloric Acid Salt (20). UV λ_{max} 259 nm (13,500) at pH 1; 259 (13,300) at pH 7; 257 (13,000) at pH 13; MS (FAB) *m/e* 410 (M + 1); IR 1690, 1620, 1508, 1100 (broad), 624 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.58, 3.70 (2 m, 2, $J_{4',5'a}$ = 3.7 Hz, $J_{4',5'b}$ = 4.0 Hz, $J_{5'a,5'b}$ = 12.1 Hz, CH_2-5′), 3.99 (apparent q, 1, H-4′), 4.16 (apparent s, 1, $J_{3',4'}$ = 3.9 Hz, H-3′), 4.48 (apparent q, 1, $J_{2',3'}$ = 4.9 Hz, H-2′), 5.09, 5.33 (2 apparent s, 2, OH-5′,3′), 5.47 (s, 2, OCH_2Ar), 5.60 (apparent d, 1, OH-2′), 5.94 (d, 1, $J_{1',2'}$ = 5.3 Hz, H-1′), 7.22, 7.39 (2 m, 2, Ar-H-3,5), 7.76 (q, 1, Ar-H-6), 8.81 (s, 2, H-8,2), 9.79, 10.44 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 60.86 (C-5′), 69.95 (C-3′), 74.36 (C-OCH_2Ar), 74.48 (C-2′), 85.89 (C-4′), 87.73 (C-1′), 104.24 (Ar-C-3), 111.85 (Ar-C-5), 117.00 (Ar-C-1), 119.39 (C-5), 134.60 (Ar-C-6), 142.87 (C-8), 144.55 (C-2), 145.25 (C-4), 148.41 (C-6), 161.55, 163.47 (Ar-C-2,4).

1-(2,5-Difluorobenzyloxy)adenosine, Perchloric Acid Salt (21). UV λ_{max} 260 nm (13,800) at pH 1; 260 (13,800) at pH 7; 258 (13,200) at pH 13; MS (FAB) *m/e* 410 (M + 1); IR 1691, 1510, 1500, 1435, 1240, 1230, 1195, 1100 (broad), 975, 880, 735, 624 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.59, 3.70 (2 m, 2, $J_{4',5'a}$ = 3.9 Hz, $J_{4',5'b}$ = 4.0 Hz, $J_{5'a,5'b}$ = 12.0 Hz, CH_2-5′), 4.01 (apparent q, 1, H-4′), 4.17 (apparent q, 1, $J_{3',4'}$ = 3.8 Hz, H-3′), 4.50 (apparent q, 1, $J_{2',3'}$ = 4.9 Hz, H-2′), 5.11 (t, 1, $J_{5',5'\text{-OH}}$ = 5.3 Hz, OH-5′), 5.35 (d, 1, $J_{3',3'\text{-OH}}$ = 5.2 Hz, OH-3′), 5.49 (s, 2, OCH_2Ar), 5.63 (d, 1, $J_{2',2'\text{-OH}}$ = 6.1 Hz, OH-2′), 5.96 (d,

1, $J_{1',2'}$ = 5.4 Hz, H-1′), 7.40, 7.64 (2 m, 3, H-Ar), 8.83 (s, 1, H-8), 8.89 (s, 1, H-2); ^{13}C NMR (Me_2SO-d_6) δ 60.85 (C-5′), 69.95 (C-3′), 74.24 (C-CH_2Ar), 74.45 (C-2′), 85.90 (C-4′), 87.71 (J_{C_1,H_1} = 164.5 Hz, C-1′), 117.20 (J_{C_6,F_5} = 24.34 Hz, J_{C_6,F_2} = 8.54 Hz, C-Ar-6), 118.96 (J_{C_3,F_2} = 27.44 Hz, J_{C_3,F_5} = 3.02 Hz, C-Ar-3), 119.39 (C-5), 121.20 (J_{C_1,F_2} = 17.39 Hz, J_{C_1,F_5} = 8.19 Hz, C-Ar-1), 142.87 (C-8), 144.55 (C-2), 145.25 (C-4), 148.36 (C-6), 155.80 (J_{C_2,F_2} = 48.54 Hz, C-Ar-2), 159.02 (J_{C_5,F_5} = 45.74 Hz, C-Ar-5).

1-(2,6-Difluorobenzyloxy)adenosine, Perchloric Acid Salt (22). UV λ_{max} 259 nm (14,000) at pH 1; 259 (13,900) at pH 7; 257 (13,400) at pH 13; MS (FAB) *m/e* 410 (M + 1); IR 1685, 1629, 1515, 1476, 1415, 1405, 1245, 1230, 1100 (broad), 920, 910, 800, 675, 622 cm^{-1}; ^{1}H NMR (Me_2SO-d_6) δ 3.58, 3.68 (2 m, 2, $J_{4',5'a}$ = 3.9 Hz, $J_{4',5'b}$ = 4.0 Hz, $J_{5'a,5'b}$ = 12.1 Hz, CH_2-5′), 3.99 (apparent q, 1, H-4′), 4.16 (apparent t, 1, $J_{3',4'}$ = 3.9 Hz, H-3′), 4.49 (apparent q, 1, $J_{2',3'}$ = 4.9 Hz, H-2′), 5.10 (br s, 1, OH-5′), 5.33 (br s, 1, OH-3′), 5.57 (s, 2, OCH_2Ar), 5.62 (apparent d, 1, OH-2′), 5.94 (d, 1, H-1′), 7.23 (t, 2, H-Ar-3,5), 7.63 (m, 1, H-Ar-4), 8.83 (s, 1, H-8), 8.87 (s, 1, H-2), 9.83, 10.48 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 60.84 (C-5′), 68.78 (C-CH_2Ar), 69.94 (C-3′), 74.43 (C-2′), 85.90 (C-4′), 87.68 ($J_{C,H}$ = 167.91 Hz, C-1′), 108.44 ($J_{C,F}$ = 10.74 Hz, C-Ar-1), 111.88 ($J_{C,F}$ = 24.95 Hz, C-Ar-3,5), 119.29 (C-5), 133.57 ($J_{C,F}$ = 12.78 Hz, C-Ar-4), 142.95 (C-8), 144.43 (C-2), 145.24 (C-6), 161.47 (J_{C_1,F_1} = 251.15 Hz, J_{C_1,F_2} = 6.65 Hz, C-Ar-2,6).

1-(3,4-Difluorobenzyloxy)adenosine, Perchloric Acid Salt (23). UV λ_{max} 259 nm (13,000) at pH 1; 259 (13,400) at pH 7; 258 (12,900) at pH 13; MS (FAB) *m/e* 410 (M + 1); IR 1687, 1522, 1440, 1294, 1100 (broad), 624 cm^{-1}; ^{1}H NMR (Me_2SO-d_6) δ 3.59, 3.69 (2 m, 2, $J_{4',5'a}$ = 3.9 Hz, $J_{4',5'b}$ = 3.7 Hz, $J_{5'a,5'b}$ = 12.1 Hz, CH_2-5′), 4.00 (apparent q, 1, H-4′), 4.17 (apparent t, 1, $J_{3',4'}$ = 3.9 Hz, H-3′), 4.50 (br s, 1, $J_{2',3'}$ = 4.9 Hz, H-2′), 5.10, 5.35, 5.60 (3 br s, 3, OH-5′,3′,2′), 5.38 (s, 2, OCH_2Ar), 5.95 (d, 1, $J_{1',2'}$ = 5.3 Hz, H-1′), 7.55, 7.88 (2 m, 3, Ar-H-2,5,6), 8.82 (s, 1, H-8), 9.03 (s, 1, H-2), 9.76, 10.44 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 60.88 (C-5′), 69.98 (C-3′), 74.45 (C-2′), 80.12 (C-CH_2-Ar), 85.91 (C-4′), 87.75 (C-1′), 117.53 (C-Ar-5), 119.39 (J_{C_5,H_8} = 11.1 Hz, C-5), 120.04 (C-Ar-2), 128.16 (J_{C_6,F_4} = 6.8 Hz, J_{C_6,F_3} = 3.3 Hz, C-Ar-6), 129.72 (J_{C_1,F_3} = 6.2 Hz, J_{C_1,F_4} = 3.8 Hz, C-Ar-1), 142.86 (J_{C_8,H_8} = 218.5 Hz, $J_{C_8,H_1'}$ = 3.8 Hz, C-8), 144.89 (J_{C_2,H_2} = 222.5 Hz, C-2), 145.24 (J_{C_4,H_8} = 13.1 Hz, J_{C_4,H_2} = 5.2 Hz, $J_{C_4,H_1'}$ = 2.5 Hz, C-4), 148.32 (J_{C_6,H_2} = 5.2 Hz, C-6), 149.11, 150.24 (C-Ar-4,3).

1-(3,5-Difluorobenzyloxy)adenosine, Perchloric Acid Salt (24). UV λ_{max} 259 nm (13,600) at pH 1; 259 (13,500) at pH 7; 257 (12,700) at pH 13; MS (FAB) *m/e* 410 (M + 1); IR 1697, 1686 (sh), 1630, 1605, 1455, 1380, 1330, 1230, 1100 (broad), 870, 860 (sh), 845, 665, 624 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.59, 3.70 (2 m, 2, $J_{4',5'a}$ = 3.9 Hz, $J_{4',5'b}$ = 4.0 Hz, $J_{5'a,5'b}$ = 12.0 Hz, CH_2-5′), 4.01 (apparent q, 1, H-4′), 4.17 (apparent d, 1, $J_{3',4'}$ = 3.8 Hz, H-3′), 4.50 (apparent q, 1, $J_{2',3'}$ = 4.9 Hz, H-2′), 5.10 (br s, 1, OH-5′), 5.34 (apparent d, 1, OH-3′), 5.40 (s, 2, O*C*H_2Ar), 5.61 (apparent d, 1, $J_{2',2'\text{-OH}}$ = 6.1 Hz, OH-2′), 5.96 (d, 1, $J_{1',2'}$ = 5.4 Hz, H-1′), 7.39 (m, 1, H-Ar-4), 7.50 (m, 2, H-Ar-2,6), 8.83 (s, 1, H-8), 9.07 (s, 1, H-2), 9.78, 10.47 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 60.87 (C-5′), 69.98 (C-3′), 74.45 (C-2′), 79.85 (C-CH_2Ar), 85.92 (C-4′), 87.76 ($J_{C,H}$ = 166.97 hz, C-1′), 105.05 ($J_{C,F}$ = 25.55 Hz, C-Ar-4), 113.73 ($J_{C,F}$ = 25.33 Hz, C-Ar-2,6), 119.41 (C-5), 136.08 ($J_{C,F}$ = 9.93 Hz, C-Ar-1), 142.86 (C-8), 144.84 (C-2), 145.25 (C-4), 148.29 (C-6), 162.07 ($J_{C,F}$ = 233.31 Hz, C-Ar-3,5).

1-(2,4-Dimethylbenzyloxyadenosine, Perchloric Acid Salt (25). UV λ_{max} 259 (13,300) at pH 1; 259 (13,400) at pH 7; 258 (13,200) at pH 13; MS (FAB) *m/e* 402 (M + 1); IR 1689, 1615, 1510, 1430, 1220, 1100 (broad), 895, 645, 623 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 2.31, 2.42 (2 s, 6, Ar-CH_3), 3.57, 3.67 (2 m, 2, CH_2-5′), 3.98 (apparent q, 1, H-4′), 4.15 (apparent t, 1, H-3′), 4.48 (apparent t, 1, H-2′), 5.09 (br s, 1, OH-5′), 5.33 (br s, 1, OH-3′), 5.40 (s, 2, O*C*H_2Ar), 5.60 (br s, 1, OH-2′), 5.91 (d, 1, $J_{1',2'}$ = 5.35 Hz, H-1′), 7.03, 7.15, 7.31 (m, 3, H-Ar), 8.52 (s, 1, H-2), 8.82 (s, 1, H-8), 9.76, 10.45 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 18.57 (C-Ar-CH_3-2), 20.73 (C-Ar-CH_3-4), 60.82 (C-5′), 69.92 (C-3′), 74.36 (C-2′), 79.42 (C-Ar-2), 85.84 (C-4′), 87.54 (C-1′), 119.37 (J_{C_5,H_8} = 12.2 Hz, C-5), 126.38 (C-Ar-5), 127.44 (C-Ar-1), 131.16, 131.70 (C-Ar-3,6), 138.16, 139.56 (C-Ar-2,4), 142.81 (C-8), 144.49 (C-2), 145.16 (C-4), 148.31 (C-6).

1-(2,5-Dimethylbenzyloxyadenosine, Perchloric Acid Salt (26). UV λ_{max} 259 nm (13,100) at pH 1; 259 (13,200) at pH 7; 258 (13,200) at pH 13; MS (FAB) *m/e* 402 (M + 1); IR 1688, 1508, 1415, 1225, 1100 (broad), 915, 900, 880, 875, 825, 685, 655, 622 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 2.26, 2.39 (2 s, 6, Ar-CH_3), 3.58, 3,69 (2 m, 2, $J_{4',5'a}$ = $J_{4',5'b}$ = 3.8 Hz, $J_{5'a,5'b}$ = 12.1 Hz, CH_2-5′), 3.99 (apparent q, 1, H-4′), 4.15 (apparent t, 1, $J_{3',4'}$ = 3.9 Hz, H-3′), 4.48 (apparent q, 1, $J_{2',3'}$ = 4.9 Hz, H-2′), 5.09 (br s, 1, OH-5′), 5.32 (br s, 1, OH-3′), 5.41 (s, 2, O*C*H_2Ar), 5.59 (apparent d, 1, OH-2′), 5.93 (d, 1, $J_{1',2'}$ = 5.37

Hz, H-1′), 7.18, 7.20, 7.30 (m, 3, H-Ar), 8.65 (s, 1, H-2), 8.82 (s, 1, H-8), 9.75, 10.45 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 18.15 (C-Ar-CH_3-2), 20.28 (C-Ar-CH_3-5), 60.84 (C-5′), 69.93 (C-3′), 74.43 (C-2′), 79.66 (C-CH_2Ar), 85.85 (C-4′), 87.75 (C-1′), 119.41 (J_{C_5,H_8} = 12.3 Hz, C-5), 130.22, 130.31, 130.38, 131.84, 134.82, 134.86 (C-Ar), 142.86 (J_{C_8,H_8} = 218.6 Hz, $J_{C_8H_{1'}}$ = 03.9 Hz, C-8), 144.46 (J_{C_2,H_2} = 222.3 Hz, C-2), 145.17 ($J_{C_4H_8}$ = 130.0 Hz, J_{C_4,H_2} = 5.5 Hz, $J_{C_4,H_{1'}}$ = 2.6 Hz, C-4), 148.30 (J_{C_6,H_2} = 5.2 Hz, C-6).

1-(3,4-Dimethylbenzyloxyadenosine, Perchloric Acid Salt (27). UV λ_{max} 259 nm (13,300) at pH 1; 259 (13,300) at pH 7; 258 (13,600) at pH 13; MS (FAB) *m/e* 402 (M + 1); IR 1691, 1510, 1100 (broad), 624 cm^{-1}; ^{1}H NMR (Me_2SO-d_6) δ 2.25 (s, 6, Ar-CH_3), 3.58, 3.69 (2 m, 2, $J_{4,5'a}$ = $J_{4,5'b}$ = 3.87 Hz, $J_{5'a,5'b}$ = 12.1 Hz, CH_2-5′), 4.00 (apparent q, 1, H-4′), 4.16 (apparent t, 1, $J_{3',4'}$ = 3.85 Hz, H-3′), 4.49 (apparent q, 1, $J_{2',3'}$ = 4.88 Hz, H-2′), 5.09 (br s, 1, OH-5′), 5.33 (s, 2, OCH_2Ar), 5.60 (br d, 1, $J_{2',2'\text{-OH}}$ = 4.57 Hz, OH-2′), 5.94 (d, 1, $J_{1',2'}$ = 5.4 Hz, H-1′), 8.81 (s, 1, H-8), 8.91 (s, 1, H-2), 9.72, 10.41 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 19.17 (C-Ar-CH_3), 60.86 (C-5′), 69.96 (C-3′), 74.49 (C-2′), 81.71 (C-CH_2Ar), 85.87 (C-4′), 87.77 (C-1′), 119.30 (J_{C_5,H_8} = 11.6 Hz, C-5), 128.24 (C-Ar-6), 129.20 (C-Ar-1), 129.46 (C-Ar-5), 131.84 (C-Ar-2), 136.38, 138.08 (C-Ar-3,4), 142.83 (J_{C_8,H_8} = 218.4 Hz, $J_{C_8H_{1'}}$ = 3.8 Hz, C-8), 144.78 ($J_{C_2H_2}$ = 222.0 Hz, C-2), 145.19 (J_{C_4,H_8} = 12.9 Hz, J_{C_4,H_2} = 5.2 Hz, J_{C_4,H_1} = 2.1 Hz, C-4), 148.29 (J_{C_6,H_2} = 5.2 Hz, C-6).

1-(3,5-Dimethylbenzyloxy)adenosine, Perchloric Acid Salt (28). UV λ_{max} 259 nm (12,900) at pH 1; 259 (13,100) at pH 7; 258 (13,000) at pH 13; MS (FAB) *m/e* 402 (M + 1); IR 1693, 1510, 1225, 1100 (broad), 890, 853, 638, 623 cm^{-1}; ^{1}H NMR (Me_2SO-d_6) δ 2.30 (s, 6, Ar-CH_3), 3.59, 3.69 (2 m, 2, $J_{4',5'a}$ = 3.8 Hz, $J_{4',5'b}$ = 3.9 Hz, $J_{5'a,5'b}$ = 12.0 Hz, CH_2-5′), 4.00 (apparent q, 1, H-4′), 4.16 (apparent t, 1, $J_{3',4'}$ = 3.8 Hz, H-3′), 4.49 (br s, 1, $J_{2',3'}$ = 4.9 Hz, H-2′), 5.09 (br s, 1, OH-5′), 5.32 (s, 2, OCH_2Ar), 5.60 (br d, 1, OH-2′), 5.95 (d, 1, $J_{1',2'}$ = 5.38 Hz, H-1′), 7.11, 7.28 (2 s, 3, Ar-H), 8.82 (s, 1, H-8), 8.96 (s, 1, H-2), 9.72, 10.42 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 20.69 (C-Ar-CH_3), 60.85 (C-5′), 69.95 (C-3′), 74.50 (C-2′), 81.83 (C-CH_2Ar), 85.86 (C-4′), 87.78 (C-1′), 119.32 (J_{C_5,H_8} = 11.3 Hz, C-5), 128.32 (C-Ar-2,6), 130.99 (C-Ar-4), 131.78 (C-Ar-1), 137.54 (C-Ar-3,5), 142.84 (J_{C_8,H_8} = 218.2 Hz, $J_{C_8,H_{1'}}$ = 3.7 Hz, C-8), 144.82 (J_{C_2,H_2} = 222.2 Hz, C-2), 145.19 (J_{C_4,H_8} = 13.0 Hz, $J_{C_4H_2}$ = 5.1 Hz, C-4), 148.26 (J_{C_6,H_2} = 5.3 Hz, C-6).

1-(2-Trifluoromethylbenzyloxy)adenosine, Perchloric Acid Salt (29). UV λ_{max} 258 nm (13,100) at pH 1; 258 (12,900) at pH 7; 257 (12,700) at pH 13; MS (FAB) *m/e* 442 (M + 1); IR 1682, 1317, 1177, 1108 (broad), 778, 624 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.58, 3.68 (2 m, 2, $J_{4',5'a} = J_{4',5'b} = 3.9$ Hz, $J_{5'a,5'b} = 12.1$ Hz, CH_2-5′), 4.00 (apparent q, 1, H-4′), 4.17 (apparent t, 1, $J_{3',4'} = 3.9$ Hz, H-3′), 4.49 (apparent t, 1, $J_{2',3'} = 4.9$ Hz, H-2′), 5.09 (br s, 1, 5′-OH), 5.32 (br s, 1, 3′-OH), 5.60 (br s, 1, 2′-OH), 5.61 (s, 2, O-CH_2Ar), 5.94 (d, 1, $J_{1',2'} = 5.3$ Hz, H-1′), 7.80 (m, 4, H-Ar), 8.68 (s, 1, H-2), 8.83 (s, 1, H-8), 9.81, 10.47 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 60.84 (C-5′), 69.93 (C-3′), 74.46 (C-2′), 77.11 (C-CH_2Ar), 85.86 (C-4′), 87.71 ($J_{C_1{}',H_1{}'} = 168.0$ Hz, C-1′), 119.65 ($J_{C_5H_8} = 11.8$ Hz, C-5), 123.94 ($J_{C,F} = 273.8$ Hz, C-CF_3), 126.29 ($J_{C_{Ar}{}^3,F} = 5.4$ Hz, C-Ar-3), 127.39 ($J_{C_{Ar}{}^2,F} = 30.5$ Hz, C-Ar-2), 130.05, 132.77 (C-Ar-4,5), 132.11 (C-Ar-6), 142.80 (C-8), 144.34 (C-2), 148.43 (C-6).

1-[2,4-Bis(trifluoromethyl)benzyloxy]adenosine, Perchloric Acid Salt (30). UV λ_{max} 259 nm (13,240) at pH 1; 259 (12,710) at pH 7; 257 (12,090) at pH 13; MS (FAB) *m/e* 510 (M + 1); IR 1684, 1348, 1304, 1281, 1123 (broad, 624 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.60, 3.69 (2 m, 2, $J_{4',5'a} = 3.8$ Hz, $J_{4',5'b} = 3.6$ Hz, $J_{5'a,5'b} = 12.3$ Hz, CH_2-5′), 4.00 (apparent q, 1, H-4′), 4.16 (apparent t, 1, $J_{3',4'} = 3.9$ Hz, H-3′), 4.50 (apparent t, 1, $J_{2',3'} = 5.0$ Hz, H-2′), 5.09 (br s, 1, 5′-OH), 5.33 (br s, 1, 3′-OH), 5.60 (br s, 1, 2′-OH), 5.71 (s, 2, OCH_2Ar), 5.93 (apparent d, 1, H-1′), 8.15 (m, 2, Ar-H-3,6), 8.27 (apparent d, 1, Ar-H-5), 8.84 (s, 1, H-8), 8.91 (s, 1, H-2), 9.84, 10.48 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 60.94 (C-5′), 70.04 (C-3′), 74.58 (C-2′), 76.36 (C-OCH_2Ar), 85.99 (C-4′), 87.81 (C-1′), 119.77 (C-5), 123.08, 123.14, 123.21 (2 C-CF_3, Ar-C-3), 128.04, 129.71, 130.03, 132.35 (Ar-C-2,4,5,6), 135.91 (Ar-C-1), 142.86 (C-8), 144.53 (C-2), 145.31 (C-4), 148.53 (C-6).

1-[3,5-Bis(trifluoromethyl)benzyloxy]adenosine, Perchloric Acid Salt (31). UV λ_{max} 259 nm (12,600) at pH 1; 259 (12,280) at pH 7; 257 (12,100) at pH 13; MS (FAB) *m/e* 510 (M + 1); IR 1684, 1366, 1282, 1129 (broad), 684, 624 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.61, 3.68 (2 m, 2, $J_{4',5'a} = 3.8$ Hz, $J_{4',5'b} = 3.9$ Hz, $J_{5'a,5'b} = 11.9$ Hz, CH_2-5′), 4.01 (apparent q, 1, H-4′), 4.18 (apparent t, 1, $J_{3',4'} = 3.8$ Hz, H-3′), 4.52 (apparent t, 1, $J_{2',3'} = 4.9$ Hz, H-2′), 5.08 (br s, 1, 5′-OH), 5.34 (br s, 1, 3′-OH), 5.59 (br s, 1, 2′-OH), 5.56 (s, 2, OCH_2Ar), 5.98 (apparent d, 1, $J_{1',2'} = 5.41$ Hz, H-1′), 8.26 (s, 1, Ar-H-4), 8.52 (s,

1, Ar-H-6), 8.84 (s, 1, H-8), 9.30 (s, 1, H-2), 9.84, 10.51 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 61.02 (C-5′), 70.15 (C-3′), 74.62 (C-2′), 79.74 (C-OCH_2Ar), 86.08 (C-4′), 87.96 (C-1′), 119.55 (C-5), 123.21 (Ar-C-4), 123.23 (2 C-CF_3), 130.35 (Ar-C-3,5), 131.74 (Ar-C-2,6), 135.37 (Ar-C-1), 143.04 (C-8), 145.14 (C-2), 145.41 (C-4), 148.39 (C-6).

1-(2-Chlorobenzyloxy)adenosine, Perchloric Acid Salt (32). UV λ_{max} 260 nm (12,690) at pH 1; 259 (12,550) at pH 7; 258 (12,510) at pH 13; MS (FAB) *m/e* 408 (M + 1); IR 1689, 1509, 1220, 1100 (broad), 931, 860, 774, 769, 645, 640, 623 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.58, 3.68 (2 m, 2, $J_{4',5'a}$ = 3.9 Hz, $J_{4',5'b}$ = 3.9 Hz, $J_{5'a,5'b}$ = 12.0 Hz, CH_2-5′), 3.99 (apparent q, 1, H-4′), 4.16 (apparent t, 1, $J_{3',4'}$ = 4.0 Hz, H-3′), 4.49 (apparent t, 1, $J_{2',3'}$ = 4.6 Hz, H-2′), 5.09 (br s, 1, 5′-OH), 5.31 (br s, 1, 3′-OH), 5.54 (s, 2, OCH_2Ar), 5.60 (br s, 1, 2′-OH), 5.93 (d, 1, $J_{1',2'}$ = 5.3 Hz, H-1′), 7.42-7.78 (m, 4, H-Ar), 8.70 (s, 1, H-2), 8.83 (S, 1, H-8), 9.82, 10.48 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 60.82 (C-5′), 69.91 (C-3′), 74.45 (C-2′), 78.14 (C-OCH_2Ar), 85.84 (C-4′), 87.71 (C-1′), 119.44 (C-5), 127.42, 129.50, 131.70 (Ar-C-3,4,5), 129.99 (Ar-C-2), 132.94 (Ar-C-6), 134.02 (Ar-C-1), 142.84 (C-8), 144.33 (C-2), 145.19 (C-4), 148.39 (C-6).

1-(3-Chlorobenzyloxy)adenosine, Perchloric Acid Salt (33). UV λ_{max} 259 nm (12,910) at pH 1; 259 (12,560) at pH 7; 258 (12,560) at pH 13; MS (FAB) *m/e* 408 (M + 1); IR 1694, 1620, 1575, 1510, 1430, 1415, 1380, 1220, 1075 (broad), 885, 785, 685, 622 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.59, 3.69 (2 m, 2, $J_{4',5'a}$ = 3.9 Hz, $J_{4',5'b}$ = 4.0 Hz, $J_{5'a,5'b}$ = 12.0 Hz, CH_2-5′), 4.00 (apparent q, 1, H-4′), 4.17 (apparent t, 1, $J_{3',4'}$ = 3.9 Hz, H-3′), 4.50 (apparent t, 1, $J_{2',3'}$ = 4.7 Hz, H-2′), 5.09 (br s, 1, 5′-OH), 5.33 (brs, 1, 3′-OH), 5.40 (s, 2, OCH_2Ar), 5.60 (br s, 1, 2′-OH), 5.96 (d, 1, $J_{1',2'}$ = 5.4 Hz, H-1′), 7.48-7.88 (m, 4, H-Ar), 8.82 (s, 1, H-8), 9.10 (s, 1, H-2), 9.78, 10.44 (2 br s, 1, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 60.85 (C-5′), 69.95 (C-3′), 74.46 (C-2′), 80.63 (C-OCH_2Ar), 85.87 (C-4′), 87.78 (C-1′), 119.34 (C-5), 129.23, 129.54, 130.41 (Ar-C-2,4,6), 130.24 (Ar-C-5), 133.00 (Ar-C-3), 134.32 (Ar-C-1), 142.84 (C-8), 144.82 (C-2), 145.20 (C-4), 148.26 (C-6).

1-(2-Nitrobenzyloxy)adenosine, Perchloric Acid Salt (34). UV λ_{max} 259 nm (18,170) at pH 1; 259 (18,090) at pH 7; 257 (16,890) at pH 13; MS (FAB) *m/e* 419 (M + 1); IR 1685, 1538, 1530, 1510, 1347, 1105 (broad), 624 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.59, 3.68 (2 m, 2, $J_{4',5'a}$ = 3.7 Hz, $J_{4',5'b}$ = 4.0 Hz, $J_{5'a,5'b}$ = 12.1 Hz, CH_2-5′), 4.00 (apparent q, 1, H-4′), 4.16 (apparent t, 1, $J_{3',4'}$ = 3.9 Hz, H-3′), 4.49 (apparent t, 1, $J_{2',3'}$

= 4.9 Hz, H-2′), 5.08 (br s, 1, 5′-OH), 5.32 (br s, 1, 3′-OH), 5.60 (br s, 1, 2′-OH), 5.76 (s, 2, OCH_2Ar), 5.95 (d, 1, $J_{1',2'}$ = 5.35 Hz, H-1′), 7.75 (m, 1, Ar-H-4), 7.90 (m, 1, Ar-H-5), 7.99 (apparent d, 1, Ar-H-3), 8.22 (apparent d, 1, Ar-H-6), 8.83 (s, 1, H-8), 8.94 (s, 1, H-2), 9.80, 10.46 (br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 60.83 (C-5′), 69.92 (C-3′), 74.46 (C-2′), 77.01 (C-OCH_2Ar), 85.84 (C-4′), 87.77 (C-1′), 119.54 (C-5), 124.81 (Ar-C-3), 128.32 (Ar-C-1), 130.29 (Ar-C-4), 131.11 (Ar-C-5), 134.03 (Ar-C-6), 142.79 (C-8), 144.45 (C-2), 145.21 (C-4), 147.54 (Ar-C-2), 148.36 (C-6).

1-(3-Nitrobenzyloxy)adenosine, Perchloric Acid Salt (35). UV λ_{max} 259 nm (19,400) at pH 1; 259 (19,100) at pH 7; 258 (17,560) at pH 13; MS (FAB) *m/e* 419 (M + 1); IR 1691, 1620, 1533, 1511, 1352, 1225, 1090 (broad), 900, 740, 622 cm^{-1}; ^{1}H NMR (Me_2SO-d_6) δ 3.60, 3.71 (2 m, 2, $J_{4',5'a} = J_{4',5'b}$ = 3.9 Hz, $J_{5'a,5'b}$ = 12.0 Hz, CH_2-5′), 4.01 (apparent q, 1, H-4′), 4.18 (apparent t, 1, $J_{3',4'}$ = 3.7 Hz, H-3′), 4.51 (apparent t, 1, $J_{2',3'}$ = 4.8 Hz, H-2′), 5.10 (br s, 1, 5′-OH), 5.34 (br s, 1, 3′-OH), 5.55 (s, 2, OCH_2Ar), 5.60 (br s, 1, 2′-OH), 5.97 (d, 1, $J_{1',2'}$ = 5.4 Hz, H-1′), 7.80 (t, 1, H-Ar-5), 8.17 (d, 1, H-Ar-6), 8.35 (m, 1, H-Ar-4), 8.67 (s, 1, H-Ar-2), 8.83 (s, 1, H-8), 9.17 (s, 1, H-2), 10.15 (br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 60.88 (C-5′), 69.99 (C-3′), 74.49 (C-2′), 80.11 (C-OCH_2Ar), 85.92 (C-4′), 87.79 (C-1′), 119.42 (C-5), 124.40 (Ar-C-5), 125.45 (Ar-C-4), 129.95 (Ar-C-2), 134.13 (Ar-C-6), 137.25 (Ar-C-1), 142.87 (C-8), 144.95 (C-2), 145.24 (C-4), 147.64 (Ar-C-3), 148.31 (C-6).

1-(4-Nitrobenzyloxy)adenosine, Perchloric Acid Salt (36). UV λ_{max} 260 nm (22,270) at pH 1; 260 (21,970) at pH 7; 265 (18,550) at pH 13 (slowly decreased); MS (FAB) *m/e* 419 (M + 1); IR 1686, 1524, 1348, 1220, 1090 (broad), 854, 750, 622 cm^{-1}; ^{1}H NMR (Me_2SO-d_6) δ 3.57, 3.70 (2 m, 2, $J_{4',5'a}$ = 4.0 Hz, $J_{4',5'b}$ = 3.9 Hz, $J_{5'a,5'b}$ = 12.0 Hz, CH_2-5′), 4.00 (apparent q, 1, H-4′), 4.16 (apparent q, 1, $J_{3',4'}$ = 3.7 Hz, H-3′), 4.50 (apparent q, 1, $J_{2',3'}$ = 4.9 Hz, H-2′), 5.09 (t, 1, $J_{5',5'\text{-OH}}$ = 5.3 Hz, 5′-OH), 5.34 (d, 1, $J_{3',3'\text{-OH}}$ = 5.2 Hz, 3′-OH), 5.55 (s, 2, OCH_2Ar), 5.60 (d, 1, $J_{2',2'\text{-OH}}$ = 6.1 Hz, 2′-OH), 5.95 (d, 1, $J_{1',2'}$ = 5.4 Hz, H-1′), 7.97 (d, 2, Ar-H-2,6), 8.34 (d, 2, Ar-H-3,5), 8.83 (s, 1, H-8), 9.11 (s, 1, H-2), 10.15 (broad, 2, H-$\overset{\oplus}{N}H_2$; ^{13}C NMR (Me_2SO-d_6) δ 60.87 (C-5′), 69.97 (C-3′), 74.53 (C-2′), 80.03 (C-OCH_2Ar), 85.89 (C-4′), 87.84 (C-1′), 119.43 (C-5), 122.38 (Ar-C-3,5), 131.38 (Ar-C-2,6), 139.45 (Ar-C-1), 142.88 (C-8), 144.76 (C-2), 145.24 (C-4), 148.01 (Ar-C-4), 148.33 (C-6).

1-(2-Cyanobenzyloxy)adenosine, Perchloric Acid Salt (37). UV λ_{max} 260 nm (12,700) at pH 1; 259 (12,560) at pH 7; 257 (12,160) at pH 13; MS (FAB) *m/e* 399 (M + 1); IR 2250, 1684, 1505, 1222, 1100 (broad), 772, 623 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.59, 3.68 (2 m, 2, $J_{4',5'a}$ = 3.8 Hz, $J_{4',5'b}$ = 3.9 Hz, $J_{5'a,5'b}$ = 12.0 Hz, CH_2-5′), 3.99 (apparent q, 1, H-4′), 4.16 (apparent t, 1, $J_{3',4'}$ = 3.5 Hz, H-3′), 4.49 (apparent t, 1, $J_{2',3'}$ = 4.8 Hz, H-2′), 5.09 (br s, 1, 5′-OH), 5.33 (br s, 1, 3′-OH), 5.60 (br, 1, 2′-OH), 5.60 (s, 2, OCH_2Ar), 5.94 (apparent d, 1, $J_{1',2'}$ = 5.3 Hz, H-1′), 7.70 (t, 1, Ar-H-4), 7.87, 7.90 (2 m, 2, Ar-H-3,5), 7.99 (d, 1, Ar-H-6), 8.81 (s, 1, H-2), 8.83 (s, 1, H-8), 9.92, 10.48 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 60.81 (C-5′), 69.89 (C-3′), 74.44 (C-2′), 78.56 (C-OCH_2Ar), 85.83 (C-4′), 87.74 (C-1′), 112.53 (Ar-C-2), 117.12 (C-C≡N), 119.58 (C-5), 130.50, 131.71, 133.20, 133.38 (Ar-C-3,4,5,6), 135.16 (Ar-C-1), 142.81 (C-8), 144.23 (C-2), 145.16 (C-4), 148.38 (C-6).

1-(3-Cyanobenzyloxy)adenosine, Perchloric Acid Salt (38). UV λ_{max} 259 nm (13,500) at pH 1; 259 (12,900) at pH 7; 257 (12,980) at pH 13; MS (FAB) *m/e* 399 (M + 1); IR 2230, 1694, 1510, 1235, 1215, 1090 (broad), 892, 690, 655, 640, 623 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.59, 3.69 (2 m, 2, $J_{4',5'a}$ = 3.8 Hz, $J_{4',5'b}$ = 3.8 Hz, $J_{5'a,5'b}$ = 12.0 Hz, CH_2-5′), 4.00 (apparent q, 1, H-4′), 4.16 (apparent t, 1, $J_{3',4'}$ = 3.7 Hz, H-3′), 4.50 (apparent t, 1, $J_{2',3'}$ = 4.7 Hz, H-2′), 5.12 (br s, 1, 5′-OH), 5.34 (br s, 1, 3′-OH), 5.45 (s, 2, OCH_2Ar), 5.60 (br s, 1, 2′-OH), 5.96 (apparent d, 1, $J_{1',2'}$ = 5.4 Hz, H-1′), 7.69 (t, 1, Ar-H-5), 7.96, 8.02 (2 m, 2, Ar-H-4,6), 8.25 (s, 1, Ar-H-2), 8.83 (s, 1, H-8), 9.13 (s, 1, H-2), 9.78, 10.45 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 60.87 (C-5′), 69.97 (C-3′), 74.50 (C-2′), 80.26 (C-OCH_2Ar), 85.90 (C-4′), 87.82 (C-1′), 111.44 (Ar-C-3), 118.31 (C-C≡N), 119.41 (C-5), 129.64 (Ar-C-5), 133.18 (Ar-C-4), 133.60 (Ar-C-1), 134.32 (Ar-C-2), 135.33 (Ar-C-6), 142.87 (C-8), 144.84 (C-2), 145.25 (C-4), 148.28 (C-6).

1-(4-Cyanobenzyloxy)adenosine, Perchloric Acid Salt (39). UV λ_{max} 259 nm (13,800) at pH 1; 259 (13,620) at pH 7; 258 (sh) at pH 13; MS (FAB) *m/e* 399 (M + 1); IR 2240, 1687, 1510, 1420, 1385, 1225, 1215, 1075 (broad), 825, 621 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.61, 3.73 (2 m, 2, $J_{4',5'a}$ = 3.9 Hz, $J_{4',5'b}$ = 5.6 Hz, $J_{5'a,5'b}$ = 12.0 Hz, CH_2-5′), 4.02 (apparent q, 1, H-4′), 4.19 (apparent q, 1, $J_{3',4'}$ = 3.7 Hz, H-3′), 4.51 (apparent q, 1, $J_{2',3'}$ = 4.8 Hz, H-2′), 5.11 (t, 1, $J_{5',5'\text{-OH}}$ = 5.3 Hz, 5′-OH), 5.35 (apparent d, 1, $J_{3',3'\text{-OH}}$ =

5.2 Hz, 3′-OH), 5.51 (s, 2, OCH_2Ar), 5.62 (apparent d, 1, $J_{2',2'\text{-OH}}$ = 6.1 Hz, 2′-OH), 5.97 (apparent d, 1, $J_{1',2'}$ = 5.4 Hz, H-1′), 7.90 (d, 2, Ar-H-3,5), 7.99 (d, 2, Ar-H-2,6), 8.83 (s, 1, H-8), 9.10 (s, 1, H-2), 10.15 (broad, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 60.84 (C-5′), 69.94 (C-3′), 74.51 (C-2′), 80.44 (C-OCH_2Ar), 85.85 (C-4′), 87.83 (C-1′), 112.16 (Ar-C-4), 118.38 (C-C≡N), 119.39 (C-5), 131.03 (Ar-C-2,6), 132.26 (Ar-C-3,5), 137.43 (Ar-C-1), 142.85 (C-8), 144.71 (C-2), 145.21 (C-4), 148.29 (C-6).

1-(2-Methoxy-5-nitrobenzyloxy)adenosine, Perchloric Acid Salt (40). UV λ_{max} 259 nm (14,550), 310 (10,620) at pH 1; 259 (14,510), 310 (10,870) at pH 7; 311 (11,800) at pH 13; MS (FAB) *m/e* 449 (M + 1); IR 1681, 1595, 1510, 1500, 1490, 1332, 1261, 1212, 1127, 1090 (broad), 1036, 900, 640, 620 cm^{-1}; ^{1}H NMR (Me_2SO-d_6) δ 3.59, 3.68 (2 m, 2, $J_{4',5'a}$ = 3.5 Hz, $J_{4',5'b}$ = 3.5 Hz, $J_{5'a,5'b}$ = 12.0 Hz, CH_2-5′), 3.86 (s, 3, CH_3OAr), 4.00 (apparent q, 1, H-4′), 4.16 (apparent t, 1, $J_{3',4'}$ = 4.0 Hz, H-3′), 4.49 (apparent t, 1, $J_{2',3'}$ = 4.1 Hz, H-2′), 5.09 (apparent t, 1, $J_{5',5'\text{-OH}}$ = 4.9 Hz, 5′-OH), 5.33 (apparent d, 1, $J_{3',3'\text{-OH}}$ = 5.0 Hz, 3′-OH), 5.50 (s, 2, OCH_2Ar), 5.59 (apparent d, 1, $J_{2',2'\text{-OH}}$ = 6.0 Hz, 2′-OH), 5.95 (d, 1, $J_{1',2'}$ = 5.3 Hz, H-1′), 7.31 (d, 1, Ar-H-3), 8.40 (apparent q, 1, Ar-H-4), 8.56 (d, 1, Ar-H-6), 8.84 (s, 2, H-2,8), 9.74, 10.35 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 56.78 (C-ArOCH_3), 60.86 (C-5′), 69.96 (C-3′), 74.59 (C-2′), 75.61 (C-OCH_2Ar), 85.89 (C-4′), 87.89 (C-1′), 111.80 (Ar-C-3), 119.35 (C-5), 121.12 (Ar-C-1), 127.77, 128.24 (Ar-C-6,4), 140.31 (Ar-C-5), 142.93 (C-8), 144.52 (C-2), 145.25 (C-4), 148.39 (C-6), 163.21 (Ar-C-2).

1-(3-Methoxycarbonylbenzyloxy)adenosine, Perchloric Acid Salt (41). UV λ_{max} 259 nm (12,670) at pH 1; 259 (12,670) at pH 7; 257 (13,410) at pH 13; MS (FAB) *m/e* 432 (M + 1); IR 1710, 1684, 1435, 1315, 1294, 1214, 1100 (broad), 895, 765, 624 cm^{-1}; ^{1}H NMR (Me_2SO-d_6) δ 3.59, 3.69 (2 m, 2, $J_{4',5'a}$ = 3.7 Hz, $J_{4',5'b}$ = 3.9 Hz, $J_{5'a,5'b}$ = 12.1 Hz, CH_2-5′), 3.89 (s, 3, ArCO$_2$CH_3), 4.00 (apparent q, 1, H-4′), 4.16 (apparent t, 1, $J_{3',4'}$ = 3.7 Hz, H-3′), 4.50 (apparent t, 1, $J_{2',3'}$ = 4.8 Hz, H-2′), 5.10, 5.34, 5.61 (3 br s, 3, 5′,3′,2′-OH), 5.49 (s, 2, OCH_2Ar), 5.96 (d, 1, $J_{1',2'}$ = 5.4 Hz, H-1′), 7.64 (t, 1, Ar-H-5), 7.99, 8.06 (d, 2, Ar-H-6,4), 8.33 (s, 1, Ar-H-2), 8.83 (s, 1, H-8), 9.03 (s, 1, H-2), 9.82, 10.44 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 52.21 (C-ArCO$_2$CH_3), 60.88 (C-5′), 69.99 (C-3′), 74.56 (C-2′), 81.02 (C-OCH_2Ar), 85.90 (C-4′), 87.87 (C-1′), 119.38 (C-5),

128.94 (Ar-C-5), 129.81 (Ar-C-3), 130.32, 131.40, 135.49 (Ar-C-6,4,2), 132.78 (Ar-C-1), 142.87 (C-8), 144.88 (C-2), 145.23 (C-4), 148.33 (C-6), 165.80 (C-Ar*C*O_2CH_3).

1-Benzyloxyadenosine, Perchloric Acid Salt (42). UV λ_{max} 259 nm (13,100) at pH 1; 259 (13,200) at pH 7; 257 (13,100) at pH 13; MS (FAB) *m/e* 374 (M + 1); IR 1686, 1515, 1415, 1230, 1100 (broad), 755, 622 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 3.58, 3.68 (2 m, 2, $J_{4',5'a}$ = 3.9 Hz, $J_{4',5'b}$ = 3.9 Hz, $J_{5'a,5'b}$ = 12.1 Hz, CH_2-5′), 3.99 (apparent q, 1, H-4′), 4.15 (apparent q, 1, $J_{3',4'}$ = 3.9 Hz, H-3′), 4.49 (apparent q, 1, $J_{2',3'}$ = 4.9 Hz, H-2′), 5.18 (apparent t, 1, $J_{5',5'\text{-OH}}$ = 5.1 Hz, OH-5′), 5.33 (d, 1, $J_{3',3'\text{-OH}}$ = 5.1 Hz, OH-3′), 5.42 (s, 2, O*C*H_2Ar), 5.60 (d, 1, $J_{2',2'\text{-OH}}$ = 6.1 Hz, OH-2′), 5.94 (d, 1, $J_{1',2'}$ = 5.4 Hz, H-1′), 7.48, 7.66 (2 m, 5, H-Ar), 8.82 (s, 1, H-8), 8.97 (s, 1, H-2); ^{13}C NMR (Me_2SO-d_6) δ 60.84 (C-5′), 69.93 (C-3′), 74.42 (C-2′), 81.63 (C-*C*H_2Ar), 85.85 (C-4′), 87.70 (C-1′), 119.28 (C-5), 128.42 (C-Ar-3,5), 129.73 (C-Ar-4), 130.69 (C-Ar-2,6), 131.97 (C-Ar-1), 142.81 (C-8), 144.78 (C-2), 145.17 (C-4), 148.29 (C-6).

1-(2-Phenylethyloxy)adenosine, Perchloric Acid Salt (43). UV λ_{max} 259 nm (12,100) at pH 1; 259 nm (13,000) at pH 7; 257 nm (12,700) at pH 13; MS (FAB) *m/e* 388 (M + 1); IR 1691, 1505, 1225, 1100 (broad), 760, 705, 625 cm^{-1}; ^{1}HNMR (Me_2SO-d_6) s 3.23 (t, 2, OCH_2*C*H_2Ar), 3.58, 3.68 (2 m, 2, $J_{4',5'a}$ = 3.8 Hz, $J_{4',5'b}$ = 3.8 Hz, $J_{5'a,5'b}$ = 12.0 Hz, CH_2-5′), 3.99 (apparent q, 1, H-4′), 4.15 (apparent q, 1, $J_{3',4'}$ = 3.7 Hz, H-3′), 4.48 (apparent q, 1, $J_{2',3'}$ = 5.01 Hz, H-2′), 4.60 (t, 2, O*C*$H_2$$CH_2$Ar), 5.09 (apparent t, 1, OH-5′), 5.34 (apparent d, 1, $J_{3',3'\text{-OH}}$ = 5.0 Hz, OH-3′), 5.60 (apparent d, 1, $J_{2',2'\text{-OH}}$ = 6.0 Hz, OH-2′), 5.94 (d, 1, $J_{1',2'}$ = 5.3 Hz, H-1′), 7.25, 7.36 (2 m, 5, Ar-H), 8.80 (s, 1, H-8), 9.06 (s, 1, H-2), 9.65, 10.39 (br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 32.91 (OCH_2*C*H_2Ar), 60.83 (C-5′), 69.91 (C-3′), 74.46 (C-2′), 80.41 (O*C*$H_2$$CH_2$Ar), 85.82 (C-4′), 87.80 (C-1′), 119.37 (C-5), 126.55 (Ar-C-4), 128.40 (Ar-C-2,6), 128.78 (Ar-C-3,5), 136.08 (Ar-C-1), 142.75 (C-8), 145.45 (C-2), 145.21 (C-4), 148.21 (C-6).

2′-Deoxy-1-(2-methylbenzyloxy)adenosine, Perchloric Acid Salt (44). UV λ_{max} 259 nm (13,400) at pH 1; 259 (13,100) at pH 7; 258 (13,100) at pH 13; MS (FAB) *m/e* 372 (M + 1); IR 1684, 1505, 1220, 1100 (broad), 765, 750, 635, 625 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 2.37, 2.64 (2 m, 2, CH_2-2′), 2.47 (s, 3, *C*H_3Ar), 3.52, 3.61 (2 m, 2, CH_2-5′), 3.90 (apparent q, 1, H-4′), 4.41 (m, 1, H-3′), 4.95 (br s, 1, OH-5′), 5.39 (br s, 1, OH-3′), 5.46 (s, 2, O*C*H_2Ar), 6.38 (t, 1, H-1′), 7.24, 7.36, 7.45 (3 m, 4, H-Ar), 8.59 (s, 1, H-2),

8.78 (s, 1, H-8), 9.76, 10.44 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 18.64 (C-CH_3), 39.84 (C-2′), 61.20 (C-5′), 70.26 (C-3′), 79.54 (C-OCH_2Ar), 83.99 (C-1′), 88.21 (C-4′), 119.43 (J_{C_5,H_8} = 11.7 Hz, C-5), 125.85 (C-Ar-5), 129.92 (C-Ar-4), 130.45, 130.50, 131.36 (C-Ar-1,3,6), 138.12 (C-Ar-2), 142.90 (J_{C_8,H_8} = 218.3 Hz, $J_{C_8,H_{1'}}$ = 3.8 Hz, C-8), 144.28 (J_{C_2,H_2} = 222.2 Hz, C-2), 144.83 (J_{C_4,H_8} = 13.0 Hz, $J_{C_4,H_{1'}}$ = 2.5 Hz, C-4), 148.30 (J_{C_6,H_2} = 5.4 Hz, C-6).

2′-Deoxy-1-(3-methylbenzyloxy)adenosine, Perchloric Acid Salt (45). UV λ_{max} 260 nm (13,300) at pH 1; 259 (13,300) at pH 7; 258 (13,400) at pH 13; MS (FAB) *m/e* 372 (M + 1); IR 1691, 1507, 1425, 1218, 1100 (broad), 933, 624 cm^{-1}; ^{1}H NMR (Me_2SO-d_6) δ 2.35 (s, 3, *CH*$_3$Ar), 2.39, 2.65 (2 m, 2, CH$_2$-2′), 3.54, 3.61 (2 m, 2, CH$_2$-5′), 3.92 (apparent q, 1, H-4′), 4.42 (m, 1, H-3′), 4.97 (br s, 1, OH-5′), 5.37 (s, 2, O*CH*$_2$Ar), 5.39 (m, 1, OH-3′), 6.38 (t, 1, H-1′), 7.28, 7.34, 7.43, 7.49 (m, 4, Ar-H-2,4,5,6), 8.76 (s, 1, H-8), 8.93 (s, 1, H-2), 9.74, 10.37 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 20.78 (C-*CH*$_3$Ar), 39.84 (C-2′), 61.20 (C-5′), 70.26 (C-3′), 81.74 (C-O*CH*$_2$Ar), 84.02 (C-1′), 88.20 (C-4′), 119.31 (C-5), 127.72, 128.30, 130.30, 131.23, 131.87, 137.71 (Ar-C-1,2,3,4,5,6), 142.86 (C-8), 144.59 (C-4), 144.83 (C-2), 148.24 (C-6).

2′-Deoxy-1-(4-methylbenzyloxy)adenosine, Perchloric Acid Salt (46). UV λ_{max} 259 nm (13,300) at pH 1; 259 (13,300) at pH 7; 258 (13,300) at pH 13; MS (FAB) *m/e* 372 (M + 1); IR 1692, 1505, 1425, 1380, 1220, 1100 (broad), 931, 855, 815, 641, 623 cm^{-1}; ^{1}H NMR (Me_2SO-d_6) δ 2.34 (s, 3, CH_3Ar), 2.39, 2.64 (2 m, 2, CH$_2$-2′), 3.53, 3.61 (2 m, 2, CH_2-5′), 3.91 (apparent q, 1, H-4′), 4.42 (br m, 1, H-3′), 4.97 (br s, 1, OH-5′), 5.36 (s, 2, O*CH*$_2$Ar), 6.37 (t, 1, H-1′), 7.26, 7.53 (2 d, 4, H-Ar), 8.76 (s, 1, H-8), 8.89 (s, 1, H-2), 9.70, 10.36 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 20.84 (C-CH_3), 39.87 (C-2′), 61.22 (C-5′), 70.28 (C-3′), 81.54 (C-OCH_2Ar), 84.00 (C-1′), 88.22 (C-4′), 119.27 (C-5), 129.00 (C-Ar-3,5,1), 130.83 (C-Ar-2,6), 139.39 (C-Ar-4), 142.86 (J_{C_8,H_8} = 218.6 Hz, J_{C_8,H_1} = 3.7 Hz, C-8), 144.59 (J_{C_2,H_2} = 221.9 Hz, C-2), 144.84 (J_{C_4,H_8} = 13.1 Hz, J_{C_4,H_2} = 5.4 Hz, $J_{C_4,H_{1'}}$ = 2.5 Hz, C-4), 148.28 (J_{C_6,H_2} = 5.3 Hz, C-6).

2′-Deoxy-1-(2-fluorobenzyloxy)adenosine, Perchloric Acid Salt (47). UV λ_{max} 259 nm (13,700) at pH 1; 259 (13,600) at pH 7; 258 (13,300) at pH 13; MS (FAB) *m/e* 376 (M + 1); IR 1680, 1645, 1508, 1420, 1220, 1205, 1100 (broad), 990, 944, 930, 915,

875, 870, 765, 622 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ ^1H NMR (Me_2SO-d_6) δ 2.39, 2.65 (2 m, 2, CH_2-2′), 3.53, 3.61 (2 m, 2, $CH_2$5′), 3.91 (apparent q, 1, H-4′), 4.42 (apparent s, 1, H-3′), 4.97 (br s, 1, OH-5′), 5.39 (apparent s, 1, OH-3′), 5.50 (s, 2, OCH_2Ar), 6.37 (t, 1, H-1′), 7.30, 7.56, 7.69 (3 m, 4, H-Ar), 8.77 (2 apparent s, 2, H-8,2), 9.76, 10.42 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 39.83 (C-2′), 61.18 (C-5′), 70.24 (C-3′), 74.90 ($J_{CH_2,F}$ = 2.9 Hz, C-OCH_2Ar), 83.96 ($J_{C_{1'},H_{1'}}$ = 169.8 Hz, C-1′), 88.20 (C-4′), 115.52 ($J_{Ar_{C3}F}$ = 21.0 Hz, C-Ar-3), 119.32 (J_{C_5,H_8} = 8.6 Hz, C-Ar-4), 133.02 ($J_{Ar_{C6}F}$ = 2.7 Hz, C-Ar-6), 142.90 (J_{C_8,H_8} = 218.5 Hz, $J_{C_8H_{1'}}$ = 4.1 Hz, C-8), 144.33 (J_{C_2,H_2} = 222.3 Hz, C-2), 144.85 (J_{C_4,H_8} = 13.1 Hz, J_{C_4,H_2} = 5.3 Hz, $J_{C_4,H_{1'}}$ = 2.6 Hz, C-4), 148.32 (J_{C_6,H_2} = 5.4 Hz, C-6), 161.05 ($J_{Ar_{C2_F}}$ = 248.9 Hz, C-Ar-2).

2′-Deoxy-1-(3-fluorobenzyloxy)adenosine, Perchloric Acid Salt (48). UV λ_{max} 259 nm (13,700 at pH 1; 259 (23,500) at pH 7; 258 (13,100) at pH 13; MS (FAB) *m/e* 376 (M + 1); IR 1690, 1505, 1425, 1260, 1225, 1100 (broad), 932, 624 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 2.39, 2.65 (2 m, 2, CH_2-2′), 3.54, 3.61 (2 m, 2, CH_2-5′), 3.91 (apparent q, 1, H-4′), 4.42 (m, 1, H-3′), 4.97 (m, 1, OH-5′), 5.41 (s, 2, OCH_2Ar), 5.41 (m, 1, OH-3′), 6.39 (t, 1, H-1′), 7.32, 7.50, 7.62 (3 m, 4, H-Ar), 8.78 (s, 1, H-8), 9.03 (s, 1, H-2), 9.76, 10.40 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 39.86 (C-2′), 61.20 (C-5′), 70.28 (C-3′), 80.63 (C-OCH_2Ar), 84.03 (C-1′), 88.22 (C-4′), 116.55 ($J_{Ar_{C4}F}$ = 20.9 Hz, C-Ar-4), 117.38 ($J_{Ar_{C2}F}$ = 21.9 Hz, C-Ar-2), 119.34 (J_{C_5,H_8} = 12.1 Hz, C-5), 126.72 ($J_{Ar_{C6}F}$ = 2.2 Hz, C-Ar-6), 130.45 ($J_{Ar_{C3}F}$ = 8.2 Hz, C-Ar-5), 134.59 ($J_{Ar_{C1}F}$ = 7.8 Hz, C-Ar), 142.89 (J_{C_8,H_8} = 217.9 Hz, $J_{C_8H_{1'}}$ = 3.7 Hz, C-8), 144.67 ($J_{C_2H_2}$ = 222.3 Hz, C-2), 144.86 ($J_{C_4H_8}$ = 13.1 Hz, J_{C_4,H_2} = 5.4 Hz, $J_{C_4,H_{1'}}$ = 2.5 Hz, C-4), 148.25 (J_{C_6,H_2} = 5.4 Hz, C-6), 161.83 ($J_{Ar_{C3}F}$ = 243.8 Hz, C-Ar-3).

2′-Deoxy-1-(4-fluorobenzyloxy)adenosine, Perchloric Acid Salt (49). UV λ_{max} 259 nm (13,000) at pH 1; 259 (12,900) at pHG 7; 258 (12,900) at pH 13; MS (FAB) *m/e* 376 (M + 1); IR 1683, 1514, 1508, 1385, 1229, 1218, 1100 (broad), 924, 622 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 2.38, 2.65 (2 m, 2, CH_2-2′), 3.53, 3.61 (2 m, 2, CH_2-5′), 3.91 (apparent 1, H-4′), 4.42 (m, 1, H-3′), 4.97 (br s, 1, OH-5′), 5.39 (s, 2, OCH_2Ar), 6.38 (t, 1, H-1′), 7.30 (m, 2, Ar-H-3,5), 7.74 (m, 2, Ar-H-2,6), 8.77 (s, 1, H-8), 8.98 (s, 1, H-2), 9.72, 10.39 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 39.92 (C-2′), 61.24 (C-5′), 70.31

(C-3′), 80.81 (C-OCH_2Ar), 84.08 (C-1′), 88.25 (C-4′), 115.36 ($J_{Ar_{C3,C5}F}$ = 21.5 Hz, C-Ar-3,5), 119.34 (J_{C_5,H_8} = 11.8 Hz, C-5), 128.41 ($J_{Ar_{C1}F}$ = 3.0 Hz, C-Ar-1), 133.32 ($J_{Ar_{C2}F}$F = 8.7 Hz, C-Ar-2), 142.89 (J_{C_8,H_8} = 28.2 Hz, $J_{C_8,H_{1'}}$ = 3.7 Hz, C-8), 144.64 ($J_{C_{2,H}2}$ = 222.1 Hz, C-2), 144.89 (J_{C_4,H_2} = 5.3 Hz, $J_{C_4,H_{1'}}$ = 2.5 Hz, C-4), 148.31 (J_{C_6,H_2} = 5.2 Hz, C-6), 162.88 ($J_{Ar_{C4}F}$ = 246.8 Hz, C-Ar-4).

9-Benzyl-1-(2-methylbenzyloxy)adenine, Perchloric Acid Salt (50). UV λ_{max} 262 nm (13,500) at pH 1; 261 (13,400) at pH 7; 259 (13,600) at pH 13; MS (FAB) *m/e* 346 (M + 1); IR 1691, 1514, 1220, 1100 (broad), 764, 725, 706, 623 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 2.45 (s, 3, CH_3Ar), 5.45, 5.50 (2 s, 4, OCH_2Ar, NCH_2Ar), 7.17-7.46 (m, 9, H-Ar), 8.57 (s, 1, H-2), 8.72 (s, 1, H-8), 9.73, 10.40 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 18.63 (C-Ar-CH_3), 47.01 (C-NCH_2Ar), 79.40 (C-OCH_2Ar), 119.06 (C-5), 125.81 (C-OCH_2Ar-5), 127.62 (C-NCH_2Ar-2,6), 128.07 (C-NCH_2Ar-4), 128.67 (C-NCH_2Ar-3,5), 129.88 (C-OCH_2Ar-4), 130.42 (C-OCH_2Ar-3), 130.51 (C-OCH_2Ar-1), 131.33 (C-OCH_2Ar-6), 135.63 (C-NCH_2Ar-1), 138.11 (C-OCH_2Ar-2), 144.31 (J_{C_2,H_2} = 222.0 Hz, C-2), 144.84 (J_{C_8,H_8} = 217.2 Hz, C-8), 145.31 (C-4), 148.25 (J_{C_6,H_2} = 5.1 Hz, C-6).

9-Benzyl-1-(3-methylbenzyloxy)adenine, Perchloric Acid Salt (51). UV λ_{max} 261 nm (13,500) at pH 1; 261 (13,300) at pH 7; 259 (13,600) at pH 13; MS (FAB) *m/e* 346 (M + 1); IR 1695, 1575, 1375, 1100 (broad), 795, 765, 729, 645, 640, 623 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 2.33 (s, 3, CH_3Ar), 5.37, 5.50 (s, 4, CH_2Ar), 7.35 (m, 9, Ar-H), 8.71, 8.89 (s, 2, H-8,2), 9.68, 10.34 (br s, 2, H-$\overset{\oplus}{N}H_2$).

9-Benzyl-1-(4-methylbenzyloxy)adenine, Perchloric Acid Salt (52). UV λ_{max} 261 nm (12,900) at pH 1; 261 (13,100) at pH 7; 259 (13,600) at pH 13; MS (FAB) *m/e* 346 (M + 1); IR 1689, 1620, 1514, 1425, 1100 (broad), 725, 710, 622 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 2.33 (s, 3, CH_3Ar), 5.35 (s, 2, OCH_2Ar), 5.49 (s, 2, NCH_2Ar), 7.22-7.52 (3 m, 9, H-Ar), 8.69 (s, 1, H-8), 8.85 (s, 1, H-2), 9.67, 10.34 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 20.84 (C-CH_3), 47.01 (C-NCH_2Ar), 81.44 (C-OCH_2Ar), 118.91 (J_{C_5,H_8} = 12.2 Hz, C-5), 127.65 (C-NCH_2Ar-2,6), 128.08 (C-NCH_2Ar-4), 128.68 (C-NCH_2Ar-3), 128.98 (C-OCH_2Ar-3,5), 129.02 (C-OCH_2Ar-1), 130.83 (C-OCH_2Ar-2), 135.64 (C-NCH_2Ar-1), 139.36 (C-OCH_2Ar-4), 144.64 (J_{C_2,H_2} = 221.9 Hz, C-2), 144.81 (J_{C_8,H_8} = 216.5 Hz, C-8), 145.32 (J_{C_4,H_8} = 12.9 Hz, J_{C_4,H_2} = 6.0 Hz, C-4), 148.24 (J_{C_6,H_2} = 5.6 Hz, C-6).

9-Benzyl-1-(2-fluorobenzyloxy)adenine, Perchloric Acid Salt (53). UV λ_{max} 261 nm (13,800) at pH 1; 261 (13,800) at pH 7; 259 (14,000) at pH 13; MS (FAB) *m/e* 350 (M + 1); IR 1684, 1620, 1580, 1514, 1490, 1455, 1415, 1100 (broad), 754, 697, 623 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 5.49 (s, 4, OCH_2Ar, N-CH_2Ar), 7.25-7.70 (m, 9, Ar-H), 8.70 (s, 1, H-8), 8.74 (s, 1, H-2), 9.73, 10.39 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 47.02 (C-NCH_2Ar), 74.84 ($J_{CH_2,F}$ = 2.6 Hz, C-OCH_2Ar), 115.48 (C-OCH_2Ar-3), 118.99 (J_{C_5,H_8} = 11.9 Hz, C-5), 119.42 ($J_{Ar_{C1}F}$ = 14.2 Hz, C-OCH_2Ar-1), 124.62 ($J_{Ar_{C5}F}$ = 3.3 Hz, C-CH_2Ar-5), 127.62 (C-NCH_2Ar-2,6), 128.09 (C-NCH_2Ar-4), 128.70 (C-NCH_2Ar-3,5), 132.48 ($J_{Ar_{C4}F}$ = 8.5 Hz, C-OCH_2Ar-4), 133.02 ($J_{Ar_{C6}F}$ = 2.8 Hz, C-OCH_2Ar-6), 135.62 (C-NCH_2Ar-1), 144.32 (J_{C_2,H_2} = 222.0 Hz, C-2), 144.87 (J_{C_8,H_8} = 217.0 Hz, C-8), 145.36 (C-4), 148.29 (J_{C_6,H_2} = 5.4 hz, C-6), 161.06 ($J_{Ar_{C2}F}$ = 248.9 Hz, C-OCH_2Ar-2).

9-Benzyl-1-(3-fluorobenzyloxy)adenine, Perchloric Acid Salt (54). UV λ_{max} 262 nm (13,700) at pH 1; 261 (13,900) at pH 7; 259 (13,900) at pH 13; MS (FAB) *m/e* 350 (M + 1); IR 1692, 1672, 1510, 1456, 1100 (broad), 713, 702, 623 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 5.40 (s, 2, OCH_2Ar), 5.50 (s, 2, NCH_2Ar), 7.30-7.61 (3 m, 9, H-Ar), 8.72 (s, 1, H-8), 8.98 (s, 1, H-2), 9.71, 10.38 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 47.05 (C-NCH_2Ar), 80.58 (C-OCH_2Ar), 116.53 ($J_{Ar_{C4}F}$ = 20.9 Hz, C-OCH_2Ar-4), 117.37 ($J_{Ar_{C2}F}$ = 21.7 Hz, C-OCH_2Ar-2), 119.00 (J_{C_5,H_8} = 12.0 Hz, C-5), 126.71 ($J_{Ar_{C6}F}$ = 2.6 Hz, C-OCH_2Ar-6), 127.70 (C-NCH_2Ar-2,6), 128.10 (C-NCH_2Ar-4), 128.70 (C-NCH_2Ar-3,5), 130.45 ($J_{Ar_{C5}F}$ = 8.2 Hz, C-OCH_2Ar-5), 134.35 ($J_{Ar_{C1}F}$ = 7.9 Hz, C-OCH_2Ar-1), 135.64 (C-NCH_2Ar-1), 144.67 (J_{C_2,H_2} = 222.0 Hz, C-2), 144.84 (J_{C_8,H_8} = 217.0 Hz, $J_{C_8Ar_1}$ = 4.1 Hz, C-8), 145.37 (J_{C_4,H_8} = 13.3 Hz, J_{C_4,H_2} = 6.0 Hz, C-4), 148.23 (J_{C_6,H_2} = 5.2 Hz, C-6), 161.85 ($J_{Ar_{C3}F}$ = 244.1 Hz, C-OCH_2Ar-3).

9-Benzyl-1-(4-fluorobenzyloxy)adenine, Perchloric Acid Salt (55). UV λ_{max} 261 nm (13,000) at pH 1; 261 (13,000) at pH 7; 259 (13,500) at pH 13; MS (FAB) *m/e* 350 (M + 1); IR 1692, 1615, 1600, 1575, 1513, 1495, 1425, 1355, 1228, 1162, 1100 (broad), 860, 845, 725, 710, 623 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 5.39 (s, 2, OCH_2Ar), 5.51 (s, 2, NCH_2Ar), 7.34, 7.73 (2 m, 9, H-Ar), 8.72 (s, 1, H-8), 8.95 (s, 1, H-2), 9.70, 10.36 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 47.03 (C-NCH_2Ar), 80.68 (C-OCH_2Ar), 115.34 ($J_{Ar_{C3,C5}F}$ = 21.7 Hz, C-OCH_2Ar-3,5), 118.95 ($J_{C_5H_8}$ = 10.8 Hz, C-5), 127.67 (C-NCH_2 Ar-

2,6), 128.09 (C-NCH_2Ar-4), 128.69 (C-NCH_2Ar-3,5), 128.46 ($J_{Ar_{C1}F}$ = 2.9 Hz, C-OCH_2Ar-1), 133.30 ($J_{Ar_{C2,C4}F}$ = 8.7 Hz, C-OCH_2Ar-2,4), 135.62 (C-NCH_2Ar-1), 144.70 (J_{C_2,H_2} = 222.0 Hz, C-2), 144.81 (J_{C_8,H_8} = 217.0 Hz, $J_{C_8Ar_{C1}}$ = 4.5 Hz, C-8), 145.36 (J_{C_4,H_8} = 1.8 Hz, J_{C_4,H_2} = 5.2 Hz, $J_{C_4Ar_{C1}}$ = 3.1 Hz, C-4), 162.84 ($J_{Ar_{C4}F}$ = 246.8 Hz, C-OCH_2Ar-4).

9-Benzyl-1-ethoxyadenine, Perchloric Acid Salt (56). UV λ_{max} 261 nm (12,500) at pH 1; 260 (12,700) at pH 7; 258 (13,100) at pH 13; MS (FAB) *m/e* 270 (M + 1); IR 1701, 1620, 1515, 1455, 1425, 1415, 1225, 1100 (broad), 1000, 735, 707, 650, 623 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 1.43 (t, 3, OCH_2CH_3), 4.42 (q, 2, OCH_2CH_3), 5.51 (s, 2, CH_2Ar), 7.38 (m, 5, Ar-H), 8.71 (s, 1, H-8), 9.11 (s, 1, H-2), 9.56, 10.28 (br s, 2, H-$\overset{\oplus}{N}H_2$).

9-Methyl-1-(2-methylbenzyloxy)adenine, Perchloric Acid Salt (57). UV λ_{max} 261 nm (12,400) at pH 1; 261 (12,000) at pH 7; 259 (12,300) at pH 13; MS (FAB) *m/e* 270 (M + 1); IR 1689, 1526, 1410, 1100 (broad), 768, 749, 654, 622 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 2.46 (s, 3, CH_3Ar), 3.83 (s, 3, CH_3-9), 5.45 (s, 2, OCH_2Ar), 7.20-7.44 (3 m, 4, H-Ar), 8.49 (s, 1, H-2), 8.51 (s, 1, H-8), 9.71, 10.36 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 18.62 (C-Ar-CH_3), 30.15 (C-N^9-CH_3), 79.39 (C-CH_2), 118.67 (J_{C_5,H_8} = 12.5 Hz, C-5), 125.85 (C-Ar-5), 129.92 (C-Ar-4), 130.45 (C-Ar-1,3), 131.38 (C-Ar-6), 138.15 (C-Ar-2), 143.98 (J_{C_2,H_2} = 221.9 Hz, C-2), 145.57 (J_{C_8,H_8} = 216.7 Hz, $J_{C_8,NCH}{}^3$ = 3.4 Hz, C-8), 145.68 (C-4), 148.04 (J_{C_6,H_2} = 5.3 Hz, C-6).

9-Methyl-1-(3-methylbenzyloxy)adenine, Perchloric Acid Salt (58). UV λ_{max} 261 nm (12,300) at pH 1; 260 (12,700) at pH 7; 258 (12,800) at pH 13; MS (FAB) *m/e* 270 (M + 1); IR 1686, 1525, 1410, 1385, 1230, 1100 (broad), 793, 692, 644, 623 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 2.34 (s, 3, CH_3Ar), 3.83 (s, 3, CH_3-9), 5.37 (s, 2, OCH_2Ar), 7.28-7.42 (m, 3, Ar-H-4,5,6), 7.48 (s, 1, Ar-H-2), 8.50 (s, 1, H-8), 8.89 (s, 1, H-2), 9.64, 10.29 (2 br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 20.78 (C-$ArCH_3$), 30.16 (C-CH_3-9), 81.63 (C-CH_2Ar), 118.55 (J_{C_5,H_8} = 11.5 Hz, C-5), 127.71, 128.30, 130.29, 131.22, 131.88 (C-Ar), 137.71 (C-Ar-3), 144.30 (J_{C_2,H_2} = 222.0 Hz, C-2), 145.54 (J_{C_8,H_8} = 216.6 Hz, $J_{C_8,9\text{-}CH3}$ = 3.4 Hz, C-8), 145.71 (C-4), 148.00 ($J_{C_6,H2}$ = 5.1 Hz, C-6).

6-Methylamino-1-(2-methylbenzyloxy)-9-β-D-ribofuranosylpurine, Perchloric Acid Salt (59). UV λ_{max} 263 nm (12,900) at pH 1; 263 (13,200) at pH 7; 260 (11,700) at pH 13; MS (FAB) *m/e* 402 (M + 1); IR 1667, 1595, 1505, 1425, 1100 (broad), 1020, 985, 895, 620 cm^{-1}; ^1H NMR (Me_2SO-d_6) δ 2.46 (s, 3, CH_3Ar), 3.59 (s, 3, CH_3N), 3.59,

3.68 (2 m, 2, $J_{4',5'a}$ = 3.8 Hz, $J_{4',5'b}$ = 3.9 Hz, $J_{5'a,5'b}$ = 12.0 Hz, H-5′), 3.98 (apparent q, 1, H-4′), 4.14 (apparent q, 1, $J_{3',4'}$ = 4.4 Hz, H-3′), 4.47 (apparent q, 1, $J_{2',3'}$ = 5.1 Hz, H-2′), 5.10 (apparent t, 1, OH-5′), 5.33 (apparent d, 1, OH-3′), 5.46 (s, 2, OCH_2Ar), 5.61 (apparent d, 1, $J_{2',2'\text{-OH}}$ = 5.9 Hz, OH-2′), 5.94 (d, 1, $J_{1',2'}$ = 5.3 Hz, H-1′), 7.20-7.46 (3 m, 4, H-Ar), 8.62 (s, 1, H-2), 8.85 (s, 1, H-8), 9.89 (br s, 1, H-$CH_3\overset{\oplus}{N}H_2$); ^{13}C NMR ($Me_2SO$-$d_6$) δ 18.61 (C-Ar-$CH_3$), 31.37 (C-$NCH_3$), 60.75 (C-5′), 69.87 (C-3′), 74.33 (C-2′), 79.60 (C-CH_2Ar), 85.84 (C-4′), 87.53 ($J_{C_1',H_1'}$ = 168.0 Hz, C-1′), 119.21 (C-5), 125.81 (C-Ar-5), 129.93 (C-Ar-4), 130.43 (C-Ar-1,3), 131.23 (C-Ar-6), 138.12 (C-Ar-6), 138.12 (C-Ar-2), 142.19 (C-8), 144.74 (C-2), 146.09 (C-4), 146.75 (C-6).

6-Methylamino-1-(3-methylbenzyloxy)-9-β-D-ribofuranosylpurine, Perchloric Acid Salt (60). UV λ_{max} 263 nm (13,500) at pH 1; 263 (13,600) at pH 7; 261 (12,600) at pH 13; MS (FAB) *m/e* 402 (M + 1); IR 1662, 1595, 1509, 1425, 1350, 1220, 1100 (broad), 975, 870, 690, 665, 624 cm^{-1}; ^{1}H NMR (Me_2SO-d_6) δ 2.35 (s, 3, CH_3Ar), 3.56 (s, 3, CH_3N), 3.56, 3.68 (2 m, 2, $J_{4',5'a}$ = 3.8 Hz, $J_{4',5'b}$ = 4.0 Hz, $J_{5'a,5'b}$ = 12.0 Hz, CH_2-5′), 3.99 (apparent q, 1, H-4′), 4.15 (apparent q, 1, $J_{3',4'}$ = 3.9 Hz, H-3′), 4.48 (apparent q, 1, $J_{2',3'}$ = 4.9 Hz, H-2′), 5.10 (apparent t, 1, OH-5′), 5.43 (apparent d, 1, $J_{3',3'\text{-OH}}$ = 5.2 Hz, OH-3′), 5.47 (s, 2, OCH_2Ar), 5.62 (d, 1, $J_{2',2'\text{-OH}}$ = 6.0 Hz, OH-2′), 5.96 (d, 1, $J_{1',2'}$ = 5.3 Hz, H-1′), 7.27-7.47 (m, 4, H-Ar), 8.83 (s, 1, H-8), 8.95 (s, 1, H-2), 9.82 (br s, 1, H-$CH_3\overset{\oplus}{N}H_2$; ^{13}C NMR ($Me_2SO$-$d_6$) δ 20.76 (C-Ar-$CH_3$), 31.32 (C-$NCH_3$), 60.78 (C-5′), 69.89 (C-3′), 74.41 (C-2′), 81.83 (C-CH_2Ar), 85.86 ($J_{C,H}$ = 170.63 Hz, C-1′), 119.15 (C-5), 127.68 (C-Ar-6), 128.33 (C-Ar-5), 130.35 (C-Ar-4), 131.16 (C-Ar-2), 131.78 (C-Ar-1), 137.75 (C-Ar-3), 142.21 (C-8), 145.05 (C-2), 146.14 (C-4), 146.76 (C-6).

6-Methylamino-1-(2,4-difluorobenzyloxy)-9-β-D-ribofuranosylpurine, Perchloric Acid Salt (61). UV λ_{max} 263 nm (14,400) at pH 1; 263 (14,300) at pH 7; 260 (12,600) at pH 13; MS (FAB) *m/e* 424 (M + 1); IR 1671, 1595, 1510, 1505, 1100 (broad), 985, 860, 623 cm^{-1}; ^{1}H NMR (Me_2SO-d_6) δ 3.56 (s, 3, CH_3N), 3.56, 3.66 (2 m, 2, $J_{4',5'a}$ = $J_{4',5'b}$ = 3.9 Hz, $J_{5'a,5'b}$ = 11.9 Hz, CH_2-5′), 3.99 (apparent q, 1, H-4′), 4.15 (apparent q, 1, $J_{3',4'}$ = 3.9 Hz, H-3′), 4.50 (apparent q, 1, $J_{2',3'}$ = 4.9 Hz, H-2′), 5.11 (apparent t, 1, $J_{5',5'\text{-OH}}$ = 5.2 Hz, OH-5′), 5.84 (apparent d, 1, $J_{3',3'\text{-OH}}$ = 5.2 Hz, OH-3′), 5.49 (s, 2, OCH_2Ar), 5.62 (d, 1, $J_{2',2'\text{-OH}}$ = 6.1 Hz, OH-2′), 5.96 (d, 1, $J_{1',2'}$ = 5.3 Hz, H-1′), 7.23, 7.42 (2 m, 2, H-Ar-

3,5), 7.73 (m, 1, H-Ar-6), 8.85 (apparent d, 2, H-8,2), 9.90 (br s, 1, H-$CH_3\overset{\oplus}{N}H_2$); ^{13}C NMR ($Me_2SO$-$d_6$) δ 31.30 (C-$NCH_3$), 60.77 (C-5′), 69.88 (C-3′), 74.39 (C-2′), 74.46 (C-OCH_2Ar), 85.87 (C-4′), 87.59 ($J_{C,H}$ = 167.83 Hz, C-1′), 104.33 ($J_{C,F}$ = 21.17 Hz, C-Ar-3), 111.88 ($J_{C_5F_4}$ = 21.47 Hz, $J_{C_5F_2}$ = 3.10 Hz, C-Ar-5), 116.03 ($J_{C_1F_2}$ = 14.60 Hz, $J_{C_1F_4}$ = 3.48 Hz, C-Ar-1), 119.24 (C-5), 134.46 ($J_{C,F}$ = 10.36 Hz, $J_{C,F}$ = 4.38 Hz, C-Ar-6), 142.23 (C-8), 144.84 (C-2), 146.16 (C-4), 146.81 (C-6), 160.82 ($J_{C_4F_4}$ = 148.93 Hz, $J_{C_4F_2}$ = 12.25 Hz, C-Ar-4), 164.34 ($J_{C_2F_4}$ = 12.50 Hz, C-Ar-2).

2,6-Diamino-1-(3-methylbenzyloxy)-9-β-D-ribofuranosylpurine, Perchloric Acid Salt (62). UV λ_{max} 256 nm (10,900), 295 nm (9,200) at pH 1; 256 (11,200), 295 (9,300) at pH 7; 268 (16,000) at pH 13; MS (FAB) *m/e* 403 (M + 1); IR 1696, 1644, 1634, 1594, 1420, 1100 (broad), 860, 624 cm^{-1}; ^{1}H NMR (Me_2SO-d_6) δ 2.30 (s, 3, CH_3-Ar), 3.55, 3.64 (2 m, 2, $J_{4',5'a}$ = $J_{4',5'b}$ = 4.1 Hz, $J_{5'a,5'b}$ = 12.0 Hz, H-5′), 3.91 (apparent q, 1, H-4′), 4.10 (apparent q, 1, $J_{3',4'}$ = 3.5 Hz, H-3′), 4.40 (apparent q, 1, $J_{2',3'}$ = 4.9 Hz, H-2′), 5.13 (apparent t, 1, OH-5′), 5.18-5.28 (2 m, 2, OCH_2Ar), 5.23 (apparent d, 1, OH-3′), 5.47 (apparent d, 1, OH-2′), 5.71 (d, 1, $J_{1',2'}$ = 5.8 Hz, H-1′), 7.22-7.43 (m, 4, H-Ar), 8.19 (br s, 2, NH_2-2), 8.35 (s, 1, H-8), 9.03, 9.81 (2 br s, 2, H-$\overset{\oplus}{N}H_2$).

8-Bromo-1-(3-methylbenzyloxy)adenosine, Perchloric Acid Salt (63). UV λ_{max} 265 nm (16,500) at pH 1; 264 (15,800) at pH 7; 260 (13,700) at pH 13; MS (FAB) *m/e* 466 (M + 1); IR 1685, 1475, 1410, 1300, 1100 (broad), 985, 890, 880, 765, 623, 610 cm^{-1}; ^{1}H NMR (Me_2SO-d_6) δ 2.35 (s, 3, CH_3Ar), 3.51, 3.67 (2 m, 2, $J_{4',5'a}$ = 5.6 Hz, $J_{4',5'b}$ = 5.4 Hz, $J_{5'a,5'b}$ = 11.7 Hz, CH_2-5′), 3.96 (apparent q, 1, H-4′), 4.22 (apparent t, 1, $J_{3',4'}$ = 3.5 Hz, H-3′), 4.96 (t, 1, $J_{2',3'}$ = 5.3 Hz, H-2′), 5.36 (s, 2, OCH_2Ar), 5.90 (d, 1, $J_{1',2'}$ = 6.0 Hz, H-1′), 7.28-7.50 (m, 4, H-Ar), 9.01 (s, 1, H-2), 9.89, 10.57 (br s, 2, H-$\overset{\oplus}{N}H_2$); ^{13}C NMR (Me_2SO-d_6) δ 20.76 (C-CH_3), 61.51 (C-5′), 70.10 (C-3′), 71.31 (C-2′), 81.85 (C-CH_2Ar), 86.30 (C-4′), 90.65 ($J_{C,H}$ = 162.78 Hz, C-1′), 120.22 (C-5), 127.76 (C-Ar-6), 128.28 (C-Ar-5), 130.32 (C-Ar-2), 130.71 (C-8), 131.29 (C-Ar-4), 131.77 (C-Ar-3), 137.67 (C-Ar-1), 144.82 (C-2), 146.02 (C-4), 147.36 (C-6).

***In Vivo* Assays**

The *in vivo* model used in these studies was originally developed by Boyle et al.[45] and further defined by Joshi et al.[46] Mice inoculated in the tail vein with vaccinia virus

develop dermal lesions over the entire tail surface. These lesions, enumerated after fluorescence staining, are a function of the virus challenge level, animal weight and inoculation distance from the base of the tail. The IHD strain of vaccinia virus, passaged once in mouse brain and once in primary rabbit kidney cell culture, was used. Outbred Swiss mice (CD-1, VAF+, Charles River Laboratories, Inc.), weighing 18-21 g, were inoculated with 0.2 ml of a 1:40 dilution of the stock virus via the tail vein (1 cm from the base). Test compounds were administered intraperitoneally once daily for seven days, with the first dose given the day preceding virus challenge. Each treatment group was composed of 20 virus-infected mice. Uninfected, drug-treated toxicity controls (5 mice per group) were included for each treatment administered. The positive control compound, which was included in all appropriate compound diluent on the same schedule as the compound treated mice. Animals were sacrificed on the sixth day and their tails were stained with a solution of 1% fluorescein-0.5% methylene blue in 70% methanol. Lesions were enumerated under UV light (354 nm) with the aid of a hand lens. The mean and median number of lesions for each treatment group were calculated prior to, and following square root transformation of the individual tailpox counts. Tailpox counts from each of the treatment groups were compared by Student's t test. A p value at or below 0.05 was considered indicative of antiviral activity.

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