Supplemental Material for Exploring Purine N7 Interactions via Atomic Mutagenesis: The Group I Ribozyme as a Case Study

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SUPPLEMENTAL TABLE 1. Calculated molecular properties of guanosine analogs.

Compound	Relative k_{cat}/K_M [a]	Dipole moment (D)[b]	Quadrupole moment, zz component (D•Å)[b]	Polarizability[b]	1-Octanol/water partition coefficient (ALOGP)[c]
G	(1)	7.0	-70.9	42.5	-2.4
7cG	0.08	5.2	-73.4	43.1	-1.5
7mG	1.9	3.8	-74.6	48.6	-2.3
8n7cG	0.9[d]	5.8	-71.0	42.1	-2.3

[a] Relative to G; from Tables 1 and 2.

[b] From Gaussian calculations using N-9 methylated bases.

[c] From Virtual Computational Chemistry Laboratory (http://www.vcclab.org/lab/alogps/)

[d] Assuming that k_{cat}/K_M of 8-aza-7-deazaguanosine (8n7cG) relative to G is the same as 8-aza-7-deazainosine (8n7cI) relative to I; see text for discussion.

SUPPLEMENTAL TABLE 2. Assigned metal ions near to N7 atoms in the *Azoarcus* group I ribozyme (PDB ID: 1U6B).

Metal ion	N7 atom (distance in Å)
M1	None
M2	None
M3	A174 (4.6)
	G175 (5.1)
	G206 (3.7)
M4	A150 (4.7)
	G151 (2.9)
	G152 (4.7)
M5	G125 (5.3)
M6	A2 (4.9)
	G10 (3.9)
M7	G23 (3.6)

	G24 (4.4)
M8	G53 (4.0)
	G54 (4.5)
M9	None
M10	G67 (6.1)
	G76 (5.8)
	G77 (5.8)
M11	G83 (5.2)
	G84 (4.3)
M12	None
M13	G38 (5.8)
	A39 (4.7)
M14	A150 (4.7)
	G151 (2.9)
	G152 (4.7)

M15	G75 (4.3)
M16	A127 (5.1)
	A172 (5.5)
M17	G184 (4.8)
M18	None

SUPPLEMENTAL FIGURE 3. Affinity of G and 7mG for the ribozyme as a function of [Mg^{2+}]. Dissociation constants of 7mG (**A**) and G **(B),** and the ratio of these affinities (**C**)**.** Values measured at pH 6.9 are shown as open symbols; values at pH 5.9 as filled symbols.

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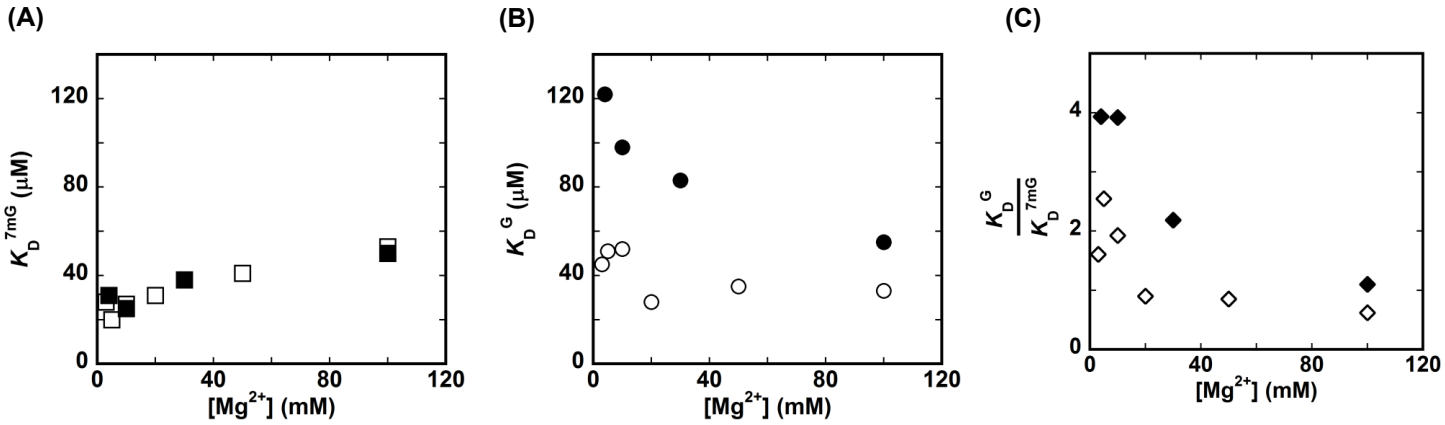
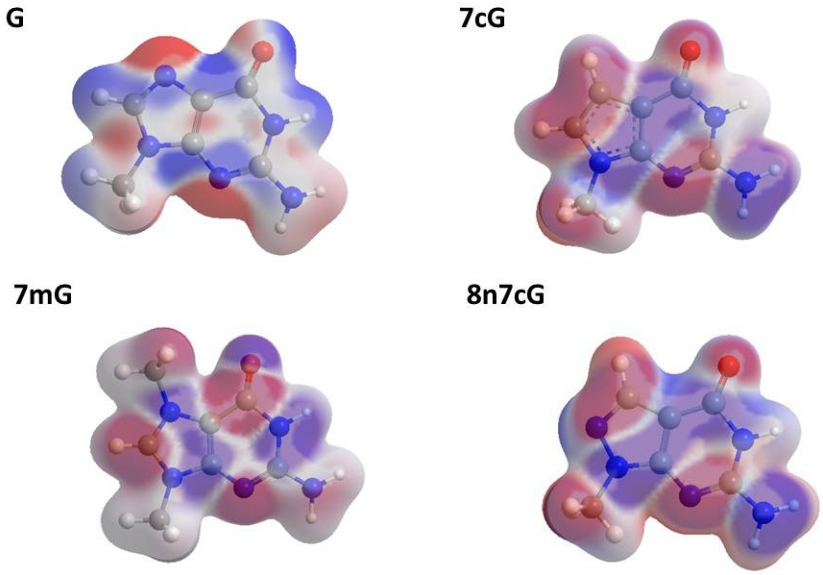


SUPPLEMENTAL FIGURE 2. Total charge density on guanosine analogs. Calculated total charge density, corresponding to the HOMO molecular orbital, with positive density in red and negative density in blue, for 9-methylguanine and its analogs. 9-Methylguanine, which is identical to guanosine except for the methyl group that replaces the ribose ring, was used to simplify the calculations.



SUPPLEMENTAL FIGURE 3. Total charge density on inosine analogs. Calculated total charge density, corresponding to the HOMO molecular orbital, with positive density in red and negative density in blue, for 9-methylhypoxanthine and its analogs. 9-Methylhypoxanthine, which is identical to inosine except for the methyl group that replaces the ribose ring, was used to simplify the calculations.