

Transcriptional Regulation

Non-hydrolyzable nucleotides

See standard Nucleotides page D.25

Non-hydrolyzable nucleotides contain a modified phosphate unit and thus allow trapping of nucleotides-binding proteins in their "ON" (triphosphate-bound) state for crystallization or enzyme kinetics experiments.

AppNHp (AMPPNP)

Adenosine-5'-[(β,γ -imido)triphosphate, Triethylammonium salt
MW : 503.17 (Anion)

Description	Cat.#	Qty
AppNHp (AMPPNP)	FQ6350	150 u
Shi, et al., "EDC cross-linking of actin and myosin S1. II. AMPPNP induces an allosteric transition from pre-hydrolysis state to posthydrolysis state.", Biophys. J., 76 (1), A163 (1999)		
Shimizu, et al., "Hydrolysis of AMPPNP by the motor domain of NCD, a kinesin-related protein.", Mol. Biol. Cell 8, 1497 (1997)		
Williams, et al., "Binding of H-3-adenyl-5'-imidodiphosphate (AppNHp) to rat-brain synaptic-membranes.", Fed. Proc. 39 (3), 1009 (1980)		

ATP α S

Adenosine-5'-(α -thio)-triphosphate, Sodium salt
(1 : 1 Mixture of R_p and S_p isomers)
MW : 520.22 (Anion)

Description	Cat.#	Qty
ATP α S	FQ2011	150 u
	FQ2010	750 u

Vohringer, et al, "Pharmacological characterization of the rat brain P2Y(1) receptor expressed in HEK293 cells : Ca²⁺ signaling and receptor regulation.", Drug Develop. Res, 53 (2-3), 172 (2001)
OsumiDavis, et al., "Effect of alpha-Thio-ATP on the steady-state kinetics of nucleotide incorporation catalyzed by the wildtype and active-site mutant T7 RNA polymerases.", Biophys. J., 70 (2), SU480, Part 2 (1996)

ATP γ S

Adenosine-5'-(γ -thio)-triphosphate, Triethylammonium salt
MW : 520.22 (Anion)

Description	Cat.#	Qty
ATP γ S	FQ5610	20 u
	FQ5611	200 u

Yengo, et al., "(Myosin V is weakly bound to actin in the presence of ATP γ S.", Biophys. J., 80 (1), 2609, Part 2 (2001)
Buchbinder, et al., "Stereochemistry of metal-ion coordination to the terminal thiophosphoryl group of adenosine 5'-o-(3-thiotriphosphate) at the active-site of pyruvate-kinase.", Biochemistry-US, 32 (51), 14111 (1993)

1 u = 1 μ l at 10 mM

EDA-AppNHp (EDA-AMPPNP)

MW : 589.26 (Anion)

Description	Cat.#	Qty
EDA-AppNHp (EDA-AMPPNP)	FQ5690	20 u

β -methylene-APS

β -Methylene-adenosine-5'-phosphosulfate, Triethylammonium salt
MW : 423.29 (Anion)

Description	Cat.#	Qty
β -methylene-APS	FQ2820	50 u
	FQ2821	250 u

Kanno, et al., "Adenosine 5'-phosphosulfate sulfotransferase from the marine macroalga Porphyra yezoensis Ueda (Rhodophyta): Stabilization, purification, and properties.", Planta 198 (3), 440 (1996)
Lyle, et al., "Kinetic mechanism of ATP-sulfurylase from rat chondrosarcoma.", Biochem. J. 301:349 (1994)

ϵ -AppNHp (ϵ -AMPPNP)

1,N⁶-Etheno-adenosine-5'-[(β,γ -imido)triphosphate, Sodium salt
MW : 527.19 (Anion)

Description	Cat.#	Qty
ϵ -AppNHp (ϵ -AMPPNP)	FQ3660	5 u
	FQ3661	25 u

Yanagida, "Angles of nucleotides bound to cross-bridges in glycerinated muscle-fiber at various concentrations of Epsilon-ATP, Epsilon-ADP and Epsilon-AMPPNP detected by polarized fluorescence.", J. Mol. Biol. 146 (4), 539 (1981)

GpCp (GMPCP)

Guanosine-5'-[(α,β)-methylene]diphosphate, Sodium salt

MW : 439.21 (Anion)

Description	Cat.#	Qty
GpCp (GMPCP)	FQ2031	150 u
	FQ2030	750 u

Muller-Reichert, et al, "Structural changes at microtubule ends accompanying GTP hydrolysis: information from a slowly hydrolyzable analogue of GTP, guanylyl (α,β)methylenediphosphonate.", Proc. Natl. Acad. Sci. USA, 95 (7), 3661 (1998)

Vulevic, et al., "Role of guanine nucleotides in the vinblastine-induced self-association of tubulin: effects of guanosine α,β -methylenetriphosphate and guanosine α,β -methylenediphosphate.", Biochemistry-US 36 (42): 12828(1997)

1 u = 1 μ l at 10 mM

GpCpp (GMPCPP)

Guanosine-5'-[(α,β)-methylene]triphosphate, Sodium salt

MW : 518.8 (Anion)

Description	Cat.#	Qty
GpCpp (GMPCPP)	FQ6570	100 u

Meurer-Grob, et al., "Microtubule structure at improved resolution.", Biochemistry-US, 40 (27), 8000 (2001)

Lowe, et al., "Helical tubes of ftsz from Methanococcus jannaschii.", Biol. Chem., 381 (9-10), 993 (2000)

GppCp (GMPPCP)

Guanosine-5'-[(β,γ)-methylene]triphosphate, Sodium salt

MW : 518.18 (Anion)

Description	Cat.#	Qty
GppCp (GMPPCP)	FQ6400	100 u

Loh, et al., "An increase in side chain entropy facilitates effector binding : NMR characterization of the side chain methyl group dynamics is Cdc42Hs.", Biochemistry-US, 40 (15), 4590 (2001)

Dye, et al., "Assembly of microtubules from tubulin bearing the nonhydrolyzable guanosine triphosphate analogue GMPPCP [Guanylyl 5'-(β,γ -methylene)diphosphonate] : Variability of growth rates and the hydrolysis of GTP.", Biochemistry-US 35 (45):14331 (1996).

GppNHp (GMPPNP)

Guanosine-5'-[(β,γ)-imido]triphosphate, Triethylammonium salt

MW : 519.17 (Anion)

Description	Cat.#	Qty
GppNHp (GMPPNP)	FQ2341	100 u
	FQ2340	500 u

Esters, et al., "High-resolution crystal structure of S. cerevisiae Ypt51(Delta C15)-GppNHp, a small GTP-binding protein involved in regulation of endocytosis.", J. Mol. Biol., 298 (1), 111 (2001)

Chook, et al. "Structure of the nuclear transport complex karyopherin-beta 2-Ran center dot GppNHp.", Nature, 399 (6733), 230 (1999)

GTP α S

Guanosine-(α -thio)-triphosphate, Sodium salt

(1 : 1 Mixture of R_p and S_p isomers)

MW : 536.22 (Anion)

Description	Cat.#	Qty
GTP α S	FQ2351	100 u
	FQ2350	500 u

Strobel, "A chemogenetic approach to RNA function/structure analysis.", Curr. Opin. Struc. Biol. 9 (3), 346 (1999)

Ryder, et al., "Nucleotide analog interference mapping.", Methods 18 (1): 38 (1999)

GTP γ S

Guanosine-5'-(γ -thio)-triphosphate, Sodium salt

MW : 536.22 (Anion)

Description	Cat.#	Qty
GTP γ S	FQ5790	20 u
	FQ5791	10 u

Noel, et al., "The 2.2 Å crystal structure of transducin- α complexed with GTP γ S.", Nature 366:654 (1993)

Shiba, et al. ; "Hypocretin stimulates [(35)]GTP gamma S binding in Hcrt 2-transfected cell lines and in brain homogenate. », Biochem. Bioph. Res. Co., 294 (3), 615 (2002)

Transcriptional Regulation

Non-hydrolyzable nucleotides

1 u = 1 µl at 10 mM

6-Thio-GpCp (6-Thio-GMPCP)

6-Thio-guanosine-5'-[(α,β)-methylene]diphosphate, Sodium salt

MW : 455.27 (Anion)

Description	Cat.#	Qty
6-Thio-GpCp (6-Thio-GMPCP)	FQ4590	30 u
	FQ4591	150 u

6-Thio-GppCp (6-Thio-GMPPCP)

6-Thio-guanosine-5'-[(β,γ)-methylene]triphosphate, Sodium salt

MW : 534.24 (Anion)

Description	Cat.#	Qty
6-Thio-GppCp (6-Thio-GMPPCP)	FQ2620	50 u
	FQ2621	250 u

6-Thio-GppNHp (6-Thio-GMPPNP)

6-Thio-guanosine-5'-[(β,γ)-imido]triphosphate, Sodium salt

MW : 535.23 (Anion)

Description	Cat.#	Qty
6-Thio-GppNHp (6-Thio-GMPPNP)	FQ4600	30 u
	FQ4601	150 u

XppNHp (XMPPNP)

Xanthosine-5'-[(β,γ)-imido]triphosphate, Triethylammonium salt

MW : 520.15 (Anion)

Description	Cat.#	Qty
XppNHp (XMPPNP)	FQ2990	50 u

Gille, et al., 3GDP-affinity and order state of the catalytic site are critical for function of xanthine nucleotide-selective Galphas proteins.3, J. Biol. Chem., 278, 7822 (2003)

Yanachkov, et al., 3Synthesis and effect of nonhydrolyzable xanthosine triphosphate derivatives on prenylation of Rab5(D136N).3, Mol. Pharmacol., 51 (1):47 (1997)

XTP γ S

Xanthosine-5'-(γ -thio)-triphosphate, Triethylammonium salt

MW : 537.2 (Anion)

Description	Cat.#	Qty
XTP γ S	FQ3640	5 u
	FQ3641	25 u

Yu, et al., "Interaction of the xanthine nucleotide binding Go alpha mutant with G protein-coupled receptors.", J. Biol.Chem., 273 (46), 30183 (1998)

Jones, et al., "Inhibition of endosome fusion by wortmannin persists in the presence of activated rab5.", Molecular Biology of the Cell 9 (2):323 (1998)

IppNHp (IMPPNP)

Inosine-5'-[(β,γ)-imido]triphosphate, Triethylammonium salt

MW : 504.16 (Anion)

Description	Cat.#	Qty
IppNHp (IMPPNP)	FQ2890	50 u

Schuster, et al., "Effect of inosine 5'-(beta,gamma-imido) triphosphate and other nucleotides on beef-heart mitochondrial ATPase.", J. Biol. Chem. 251 (21), 6705 (1976)

Gille, et al., "GDP-affinity and order state of the catalytic site are critical for function of xanthine nucleotide-selective Galphas proteins.", J. Biol. Chem., 278, 7822 (2003)

ITP γ S

Inosine-5'-(γ -thio)-triphosphate, Sodium salt

MW : 521.2 (Anion)

Description	Cat.#	Qty
ITP γ S	FQ5800	20u
	FQ5801	100 u

UTP α S

Uridine-5'-(α -thio)-triphosphate, Sodium salt
(1 : 1 Mixture of R_p and S_p isomers)
MW : 497.18 (Anion)

1 u = 1 μ l at 10 mM

Description	Cat.#	Qty
UTP α S	FQ2980	50 u
	FQ2981	250 u

Oyelere, et al., "pKa perturbation in genomic hepatitis delta virus ribozyme catalysis evidenced by nucleotide analogue interference mapping.", *Biochemistry-US* 41 (11), 3667 (2002)

Basu, et al., "Biochemical detection of monovalent metal ion binding sites within RNA.", *Methods* 23 (3):264 (2001)

UppNHp (UMPPNP)

2'-Deoxy-uridine-5'-[(β , γ)-imido]triphosphate, Sodium salt
MW : 480.13 (Anion)

Description	Cat.#	Qty
UppNHp (UMPPNP)	FQ2391	100 u
	FQ2390	500 u

UTP γ S

Uridine-5'-(γ -thio)-triphosphate, Sodium salt
MW : 497.18 (Anion)

Description	Cat.#	Qty
UTP γ S	FQ5950	20 u
	FQ5951	100 u

dUpNHp (dUMPNP)

2'-Deoxy-uridine-5'-[(α , β)-imido]diphosphate, Sodium salt
MW : 385.16 (Anion)

Description	Cat.#	Qty
dUpNHp (dUMPNP)	FQ2311	100 u
	FQ2310	500 u

Persson, et al., "Synthesis of 2'-deoxyuridine 5'-(alpha,beta-imido)triphosphate : A substrate analogue and potent inhibitor of dUTPase.", *Bioorgan. Med. Chem.*, 4(4), 553 (1996)

dUpNHpp (dUMPNPP)

2'-Deoxy-uridine-5'-[(β , γ)-imido]triphosphate, Sodium salt
MW : 480.13 (Anion)

Description	Cat.#	Qty
dUpNHpp (dUMPNPP)	FQ2880	50 u
	FQ2881	250 u

Persson, et al., "Synthesis of 2'-deoxyuridine 5'-(alpha,beta-imido)triphosphate: A substrate analogue and potent inhibitor of dUTPase.", *Bioorgan. Med. Chem.*, 4(4), 553 (1996)

DTTP α S

2'-Deoxy-thymidine-(α -thio)-triphosphate, Sodium salt
(1 : 1 Mixture of R_p and S_p isomers)
MW : 495.20 (Anion)

Description	Cat.#	Qty
DTTP α S	FQ2870	50 u
	FQ2871	250 u

Strobel, "A chemogenetic approach to RNA function/structure analysis.", *Curr. Opin. Struc. Biol.*, 9(3), 346 (1999)

Tong, et al., "Nucleotide-induced stable complex formation by HIV-1 reverse transcriptase.", *Biochemistry-US* 36(19):5749 (1997)

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