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Cyclic Nucleotide Analogues

Second Messenger and Signal Transduction Research
High Purity Nucleotide & Nucleoside Analogues

- *Unique Collection of Cyclic Nucleotides*
- *Inhibitors and Activators of Protein Kinases A and G*
- *Specific Epac Modulators*
- *Widest Selection of NAD^+ and cADPR Analogues*
- *c-diGMP and c-diAMP, Derivatives and Metabolites*
- *Nucleoside Mono-, Di-, Tri- and Polyphosphates*
- *Fluorescent and Biotinylated Analogues*
- *Affinity Chromatography Gels*
- *Bulk and Custom Syntheses*

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Catalogue Number Index

Cat. No.	Page
A	
A 001	27, 69
A 002	16, 69
A 003	18, 69
A 006	49, 69
A 007	63
A 008	63
A 009	66
A 010	66
A 011	57
A 012	65
A 013	65
A 014	28, 58
A 015	28, 44, 69
A 016	55
A 017	54
A 019	66
A 020	62
A 022	27
A 023	27, 69
A 024	49
A 027	44, 49, 69
A 028	64
A 029	60, 69
A 031	57
A 032	37
A 033	55
A 035	18
A 036	64
A 041	37
A 046	58
A 048	61
A 049	65
A 050	65
A 051	67
A 052	67
A 053	57, 69
A 054	64
A 055	61
A 056	67
A 057	26, 65
A 058	65
A 059	67
A 065	27
A 066	58
A 067	61
A 068	57
A 069	64
A 071	57
A 075	60
A 076	49, 69
A 077	28, 44, 59
A 085	57
A 087	62
A 088	54, 69
A 089	57
A 092	55
A 093	55
A 094	56
A 095	56
A 096	55
A 097	55
A 098	56
A 099	21, 57
A 100	28, 44, 49
A 101	56
A 102	37, 49, 61
A 108	64
A 109	62
A 110	62
A 111	62
A 112	63
A 119	56

Cat. No.	Page
A 120	58
A 122	63
A 123	61
A 126	63
A 127	28, 49, 58
A 136	54
A 141	56
A 142	21, 56, 69
A 143	42, 60
A 145	58
A 146	54
A 147	66
A 154	60
A 156	42, 60
A 158	66
A 167	61
A 180	55
A 186	37, 50, 61
A 193	63
A 195	25, 64
A 196	66
A 198	60
A 199	27
A 307	49
B	
B 001	16, 69
B 002	18, 69
B 004	38, 69
B 005	35, 69
B 006	36, 69
B 007	30, 69
B 008	24, 29, 69
B 009	23, 28, 69
B 010	16
B 014	38
B 015	29
B 016	29
B 017	38
B 018	29
B 019	38
B 020	30
B 022	21, 69
B 025	37, 50
B 028	22
B 029	19
B 030	29, 50
B 031	22
B 032	37, 50
B 037	24, 50
B 040	18, 24, 69
B 041	29, 50
B 046	21
B 055	29
B 056	21
B 079	24, 28
B 133	25
B 280	51
C	
C 001	42, 69
C 002	51, 69
C 003	17, 69
C 004	19, 69
C 007	30, 69
C 009	38, 69
C 010	31, 69
C 011	17, 69
C 012	19, 69
C 013	35, 69
C 014	36, 69
C 020	30, 69
C 029	50

Cat. No.	Page
C 033	38
C 041	22, 69
C 043	31
C 045	38
C 046	35
C 047	36
C 048	24, 69
C 050	30
C 051	22
C 052	22
C 056	31
C 065	42
C 066	42
C 067	42
C 071	30
C 073	16, 69
C 074	19, 69
C 080	30, 69
C 082	50
C 083	19, 51, 69
C 136	25
C 109	59
D	
D 001	52, 69
D 008	31
D 009	31, 69
D 010	39, 69
D 011	32
D 013	52, 69
D 014	19, 69
D 015	51, 69
D 020	51, 69
D 021	31, 69
D 042	32
D 043	39
D 051	68
D 052	68
D 073	51, 69
D 075	42
D 087	39, 45
D 089	22, 45
D 090	39, 45
D 099	39, 69
D 109	32, 44
D 110	68
D 135	44
E	
E 001	32, 45, 69
E 010	26, 67
F	
F 001	39, 45
F 002	32, 45
F 003	45, 51
F 004	46, 52
F 012	39, 46
G	
G 001	40, 69
G 002	40
G 016	35, 69
G 017	36, 69
G 025	52
H	
H 003	32
H 004	17
H 005	20
H 006	32, 69
H 010	23
H 013	23

Cat. No.	Page
I	
I 001	52, 69
K	
K 002	69
M	
M 001	33, 69
M 003	25, 33, 69
M 004	17
M 005	20
M 006	40, 69
M 007	33, 69
M 008	46, 53, 69
M 009	46, 53, 69
M 010	40
M 011	59, 69
M 012	24, 33, 69
M 015	62
M 016	33, 46
M 017	33, 46
M 022	59
M 023	62
M 034	23
M 036	24, 52
M 050	23, 52, 69
M 053	43, 46
M 075	45
M 080	59
M 082	45
M 092	25
N	
N 001	40, 47
N 002	33, 47
N 007	53
P	
P 001	41, 69
P 002	34, 69
P 003	41, 69
P 004	17, 69
P 005	20, 69
P 006	25, 34, 69
P 007	35, 69
P 008	36, 69
P 010	53, 69
P 018	20, 25
P 019	34, 47
P 020	40, 47
P 021	23, 47
P 024	34, 47
P 025	40, 47
T	
T 005	43, 69
T 017	48
T 018	48
U	
U 001	43, 54, 69
U 004	43, 53, 69
U 012	43
W	
W 001	68
X	
X 001	54, 69

Catalogue Content

Content	Page
Catalogue Number Index	2
Catalog Content	3
Categorical Index	4
Calculation of Stock Solutions	13
Synergistic Pairs of Analogues for Selective Activation of Protein Kinase A	14
Biolog's Homepage	15
Product listing	
○ PDE- resistant Inhibitors of Protein Kinase A	16
○ PDE- resistant Activators of Protein Kinase A	18
○ Epac- related Research Tools	21
○ Activators of Protein Kinase A	27
○ PDE- resistant Inhibitors of Protein Kinase G	35
○ PDE- resistant Activators of Protein Kinase G	36
○ Activators of Protein Kinase G	37
○ Cyclic Nucleotides with Pyrimidine Nucleobases	42
○ Fluorescent Cyclic Nucleotides	44
○ Special Task Cyclic Nucleotides	49
○ Precursors for Labelling and Immobilization	54
○ Affinity Chromatography with Cyclic Nucleotide Ligands	62
○ Peptide-based Inhibitors of Protein Kinase G / Miscellaneous	68
○ Ko-*Libri* Libraries	69
Alphabetical Index	70
Ordering Information	75
Terms & Conditions	76

BIOLOG Product List

PDE- resistant Protein Kinase A Inhibitors

	Cat. No.	Page
Adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-cAMPS)	A 002	16
8- Bromoadenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-Br-cAMPS)	B 001	16
8- Bromo- 2'- O- monobutyryladenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-Br-2'-O-MB-cAMPS)	B 010	16
2- Chloroadenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-2-Cl-cAMPS)	C 073	16
8- Chloroadenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-Cl-cAMPS)	C 003	17
8- (4- Chlorophenylthio)adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-CPT-cAMPS)	C 011	17
8- Hydroxyadenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-OH-cAMPS)	H 004	17
2'- O- Monobutyryladenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-2'-O-MB-cAMPS)	M 004	17
8- Piperidinoadenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-PIP-cAMPS)	P 004	17
Additional analogues of Rp-cAMPS under "Precursors for Labelling and Immobilization", for special structures please inquire.	inquire	17

PDE- resistant Protein Kinase A Activators

	Cat. No.	Page
Adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-cAMPS)	A 003	18
Adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer, acetoxymethyl ester (Sp-cAMPS-AM)	A 035	18
N^6- Benzoyladenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-6-Bnz-cAMPS)	B 040	18
8- Bromoadenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-Br-cAMPS)	B 002	18
8- Bromoadenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer, acetoxymethyl ester (Sp-8-Br-cAMPS-AM)	B 029	19
2- Chloroadenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-2-Cl-cAMPS)	C 074	19
8- Chloroadenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-Cl-cAMPS)	C 004	19
8- (4- Chlorophenylthio)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-CPT-cAMPS)	C 012	19
6- Chloropurine riboside- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-6-Cl-cPuMPS)	C 083	19
5, 6- Dichloro-1- β- D- ribofuranosylbenzimidazole - 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-5,6-DCl-cBIMPS)	D 014	19
8- Hydroxyadenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-OH-cAMPS)	H 005	20
2'- O- Monobutyryladenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-2'-O-MB-cAMPS)	M 005	20
N^6- Phenyladenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-6-Phe-cAMPS)	P 018	20
8- Piperidinoadenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-PIP-cAMPS)	P 005	20
Additional analogues of Sp-cAMPS under "Precursors for Labelling and Immobilization", for special structures please inquire.	inquire	20

Epac- relevant Structures

	Cat. No.	Page
Epac- selective Agonists		
8- (2- Aminoethylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-AET-2'-O-Me-cAMP)	A 142	21
8- (6- Aminohexylamino)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-AHA-2'-O-Me-cAMP)	A 099	21
8- Bromo- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-Br-2'-O-Me-cAMP)	B 022	21
8- Bromo- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (8-Br-2'-O-Me-cAMP-AM)	B 028	22
8- Bromo- 2'- O- methyladenosine- 3', 5'- cyclic monophosphorothioate, Sp-isomer (Sp-8-Br-2'-O-Me-cAMPS)	B 031	22
8- (4- Chlorophenylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-pCPT-2'-O-Me-cAMP)	C 041	22
8- (4- Chlorophenylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate, AM ester (8-pCPT-2'-O-Me-cAMP-AM)	C 051	22
8- (4- CPT)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-pCPT-2'-O-Me-cAMPS)	C 052	22
8- (2- [DY-547]- aminoethylthio)- 2'- O-methyladenosine- 3', 5'- cyclic monophosphate (8-[DY-547]-AET-2'-O-Me-cAMP)	D 089	22
8- Hydroxy- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-OH-2'-O-Me-cAMP)	H 013	23
8- (4- Hydroxyphenylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-pHPT-2'-O-Me-cAMP)	H 010	23
8- (4- Methoxyphenylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-pMeOPT-2'-O-Me-cAMP)	M 034	23
2'- O- Methyladenosine- 3', 5'- cyclic monophosphate (2'-O-Me-cAMP)	M 050	23
2'- O- Me-cAMP, immobilized on agarose via a hexyl spacer to adenine C-8 (8-AHA-2'-O-Me-cAMP-Agarose)	A 057	23
8- [Pharos-575]- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-[φ-575]-2'-O-Me-cAMP)	P 021	23
Epac 2- selective Agonists		
8- Benzylthioadenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-BnT-cAMPS / "S-220")	B 046	21
8-Benzylthio-2'-O-methyladenosine-3',5'-cyclic monophosphorothioate, Sp-isomer (Sp-8-BnT-2'-O-Me-cAMPS / "S-223")	B 056	21

Epac- relevant Structures *(continued)*

	Cat. No.	Page
PKA- selective agonists that do not activate Epac *(continued)*		
N^6- Benzoyladenosine- 3', 5'- cyclic monophosphate (6-Bnz-cAMP)	B 009	23
N^6- Benzoyladenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (6-Bnz-cAMP-AM)	B 079	24
N^6- Benzoyladenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-6-Bnz-cAMPS)	B 040	24
N^6- Benzyladenosine- 3', 5'- cyclic monophosphate (6-Bn-cAMP)	B 008	24
N^6- Mono- tert.- butylcarbamoyladenosine- 3', 5'- cyclic monophosphate (6-MBC-cAMP)	M 012	24
N^6- Monobutyryladenosine- 3', 5'- cyclic monophosphate (6-MB-cAMP)	M 003	25
N^6- Phenyladenosine- 3', 5'- cyclic monophosphate (6-Phe-cAMP)	P 006	25
N^6- Phenyladenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-6-Phe-cAMPS)	P 018	25
Epac- negative Controls		
8- Bromo- 2'- O- methylguanosine- 3', 5'- cyclic monophosphate (8-Br-2'-O-Me-cGMP)	B 037	24
8- (4- Chlorophenylthio)- 2'- O- methylguanosine- 3', 5'- cyclic monophosphate (8-pCPT-2'-O-Me-cGMP)	C 048	24
2'- O- Methylguanosine- 3', 5'- cyclic monophosphate (2'-O-Me-cGMP)	M 036	24
Selective Epac Inhibitors		
3- [5- (tert.- Butyl)isoxazol- 3- yl]- 2- [2- (3- chlorophenyl)hydrazono]- 3- oxopropanenitrile (ESI-09)	B 133	25
4- Cyclopentyl- 2- (2, 5- dimethylbenzylsulfanyl)- 6- oxo- 1, 6- dihydropyrimidine- 5- carbonitrile (HJC0197)	C 136	25
4- Methylphenyl- 2, 4, 6- trimethylphenylsulfone (ESI-05)	M 092	25
Affinity gels with Epac activator ligands		
2'-O-Me-cAMP, immobilized on agarose via ethyl spacer to adenine C-8 (8-AET-2'-O-Me-cAMP-Agarose)	A 195	25, 64
2'- O- Me-cAMP, immobilized on agarose via a hexyl spacer to adenine C-8 (8-AHA-2'-O-Me-cAMP-Agarose)	A 057	26
Potential Metabolites of Epac- relevant Structures		
8- Bromoadenine (8-Br-Ade)	B 052	Inquire
8- (4- Chlorophenylthio)adenine (8-pCPT-Ade)	C 069	Inquire
8- (4- Chlorophenylthio)guanine (8-pCPT-Gua)	C 076	Inquire
8- (4- Chlorophenylthio)- 2'- O- methyladenosine (8-pCPT-2'-O-Me-Ado)	C 070	Inquire
8- (4- Chlorophenylthio)- 2'- O- methylguanosine (8-pCPT-2'-O-Me-Guo)	C 102	Inquire
8- (4- Methoxyphenylthio)adenine (8-pMeOPT-Ade)	M 061	Inquire
2'- O- Methyladenosine (2'-O-Me-Ado)	M 054	Inquire
For Epac analogues not listed please inquire.	Inquire	

Other Activators of Protein Kinase A

	Cat. No.	Page
Adenosine- 3', 5'- cyclic monophosphate (cAMP)	A 001	27
Adenosine- 3', 5'- cyclic monophosphate, free acid (cAMP)	A 001 H	27
Adenosine- 1- N -oxide- 3', 5'- cyclic monophosphate (1-NO-cAMP)	A 023	26
8- (6- Aminohexylamino)- 2- chloroadenosine- 3', 5'- cyclic monophosphate (8-AHA-2-Cl-cAMP)	A 199	26
2- Aza- 1, N^6- ethenoadenosine- 3', 5'- cyclic monophosphate (2-Aza-ε-cAMP)	A 015	27
8- Azidoadenosine- 3', 5'- cyclic monophosphate (8-N_3-cAMP)	A 014	27
8- Azido- N^6- (6- [biotinyl]aminoethyl)adenosine- 3', 5'- cyclic monophosphate (8-N_3-6-[Biotin]-AE-cAMP)	A 127	27
8- Azido- N^6- (2- [DY-547]- aminoethyl)adenosine- 3', 5'- cyclic monophosphate (8-N_3-6-[DY-547]-AE-cAMP)	A 100	27
8- Azido- 1, N^6- ethenoadenosine- 3', 5'- cyclic monophosphate (8-N_3-ε-cAMP)	A 077	27
N^6- Benzoyladenosine- 3', 5'- cyclic monophosphate (6-Bnz-cAMP)	B 009	27
N^6- Benzoyl- 8- piperidinoadenosine- 3', 5'- cyclic monophosphate (6-Bnz-8-PIP-cAMP)	B 055	28
N^6- Benzyladenosine- 3', 5'- cyclic monophosphate (6-Bn-cAMP)	B 008	28
8- Benzylthioadenosine- 3', 5'- cyclic monophosphate (8-BT-cAMP)	B 015	28
8- (2- [Biotinyl]aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-[Biotin]-AET-cAMP)	B 030	28
2- (6- [Biotinyl]aminohexylamino)adenosine- 3', 5'- cyclic monophosphate (2-[Biotin]-AHA-cAMP)	B 041	28
8- Bromoadenosine- 3', 5'- cyclic monophosphate (8-Br-cAMP)	B 007	29
2- Chloroadenosine- 3', 5'- cyclic monophosphate (2-Cl-cAMP)	C 020	30
8- Chloroadenosine- 3', 5'- cyclic monophosphate (8-Cl-cAMP)	C 007	30
2- Chloro- 8- n- hexylaminoadenosine- 3', 5'- cyclic monophosphate (2-Cl-8-HA-cAMP)	C 071	30
2- Chloro- 8- methylaminoadenosine- 3', 5'- cyclic monophosphate (2-Cl-8-MA-cAMP)	C 080	30
8- (4- Chlorophenylthio)adenosine- 3', 5'- cyclic monophosphate (8-CPT-cAMP)	C 010	31
8- (4- Chlorophenylthio)- N^6- phenyladenosine- 3', 5'- cyclic monophosphate (8-CPT-6-Phe-cAMP)	C 043	31

Other Activators of Protein Kinase A (*continued*)

	Cat. No.	Page
7- Deazaadenosine- 3', 5'- cyclic monophosphate (7-CH-cAMP/cTuMP)	D 021	31
N^6, 2'- O- Dibutyryladenosine- 3', 5'- cyclic monophosphate (DB-cAMP)	D 009	31
5, 6- Dichloro-1- β- D- ribofuranosylbenzimidazole - 3', 5'- cyclic monophosphate (5,6-DCl-cBIMP)	D 011	32
8- (2- [DY-547]- aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-[DY-547]-AET-cAMP)	D 109	32
1, N^6- Ethenoadenosine- 3', 5'- cyclic monophosphate (ε-cAMP)	E 001	32
8- (2- [Fluoresceinyl]aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-[Fluo]-cAMP / 8-[Fluo]-AET-cAMP)	F 002	32
8- Hexylaminoadenosine- 3', 5'- cyclic monophosphate (8-HA-cAMP)	H 006	32
8- Hydroxyadenosine- 3', 5'- cyclic monophosphate (8-OH-cAMP)	H 003	32
8- Methylaminoadenosine- 3', 5'- cyclic monophosphate (8-MA-cAMP)	M 001	33
8- (4- [N'- Methylanthraniloyl]aminobutylamino)adenosine- 3', 5'- cyclic monophosphate (8-MABA-cAMP)	M 016	33
N^6- (6- [N'- Methylanthraniloyl]aminohexyl)adenosine- 3', 5'- cyclic monophosphate (6-MAH-cAMP)	M 017	33
N^6- Mono- tert.- butylcarbamoyladenosine- 3', 5'- cyclic monophosphate (6-MBC-cAMP)	M 012	24
2'- O- Monobutyryladenosine- 3', 5'- cyclic monophosphate (2'-O-MB-cAMP)	M 007	32
N^6- Monobutyryladenosine- 3', 5'- cyclic monophosphate (6-MB-cAMP)	M 003	33
8- (2- [7- Nitro- 4- benzofurazanyl]aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-NBD-cAMP)	N 002	33
8- [Pharos-450]- adenosine- 3', 5'- cyclic monophosphate (8-[φ-450]-cAMP)	P 024	33
8- [Pharos-575]- adenosine- 3', 5'- cyclic monophosphate (8-[φ-575]-cAMP)	P 019	33
N^6- Phenyladenosine- 3', 5'- cyclic monophosphate (6-Phe-cAMP)	P 006	34
8- Piperidinoadenosine- 3', 5'- cyclic monophosphate (8-PIP-cAMP)	P 002	34
Many additional analogues of cAMP modified to be "Precursors for Labelling and Immobilization".	inquire	33

PDE- resistant Protein Kinase G Inhibitors

	Cat. No.	Page
8- Bromoguanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-Br-cGMPS)	B 005	35
8- (4- Chlorophenylthio)guanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-pCPT-cGMPS)	C 013	34
8- (4- CPT)- β- phenyl- 1, N^2- ethenoguanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-pCPT-PET-cGMPS)	C 046	35
Guanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-cGMPS)	G 016	34
β- Phenyl- 1, N^2- etheno- 8- bromoguanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-Br-PET-cGMPS)	P 007	35
For analogues of Rp-cGMPS not listed please inquire.	inquire	35

Peptide-based Inhibitors of Protein Kinase G

	Cat. No.	Page
LRKKKKKH-amide (W45)	W 001	68
RQIKIWFQNRRMKWKK-LRK$_5$H-amide (DT-3)	D 052	68
YGRKKRRQRRRPP-LRK$_5$H-amide (DT-2)	D 051	68
ygrkkrrqrrrpp-lrk$_5$h-amide ((D)-DT-2)	D 110	68

PDE- resistant Protein Kinase G Activators

	Cat. No.	Page
8- Bromoguanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-Br-cGMPS)	B 006	36
8- (4- Chlorophenylthio)guanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-pCPT-cGMPS)	C 014	35
8- (4- CPT)- β- phenyl- 1, N^2- ethenoguanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-pCPT-PET-cGMPS)	C 047	36
Guanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-cGMPS)	G 017	35
β- Phenyl- 1, N^2- etheno- 8- bromoguanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-Br-PET-cGMPS)	P 008	36
For analogues of Sp-cGMPS not listed please inquire.	inquire	35

Other Activators of Protein Kinase G

	Cat. No.	Page
1- Aminoguanosine- 3', 5'- cyclic monophosphate (1-NH_2-cGMP)	A 041	36
8- (2- Aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-AET-cGMP)	A 029	59
N^2- (6- Aminohexyl)guanosine- 3', 5'- cyclic monophosphate (2-AH-cGMP)	A 055	59
8- (6- Aminohexylthio)guanosine- 3', 5'- cyclic monophosphate (8-AHT-cGMP)	A 167	59
8- (2- Aminophenylthio)guanosine- 3', 5'- cyclic monophosphate (8-APT-cGMP)	A 032	36
β- (4- Azidophenyl)- 1, N^2- etheno- 8- (2- [biotinyl]aminoethylthio)-cGMP (4-N_3-PET-8-[Biotin]-AET-cGMP)	A 186	36
β- (4- Azidophenyl)- 1, N^2- etheno- 8- bromoguanosine- 3', 5'- cyclic monophosphate (4-N_3-PET-8-Br-cGMP)	A 102	36
8- (2- [Biotinyl]aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-[Biotin]-AET-cGMP)	B 025	36
N^2- (6- [Biotinyl]aminohexyl)guanosine- 3', 5'- cyclic monophosphate (2-[Biotin]-AH-cGMP)	B 032	36

Other Activators of Protein Kinase G (*continued*)

	Cat. No.	Page
8- Bromoguanosine- 3', 5'- cyclic monophosphate (8-Br-cGMP)	B 004	37
8- (4- Chlorophenylthio)guanosine- 3', 5'- cyclic monophosphate (8-pCPT-cGMP)	C 009	38
8- (4- Chlorophenylthio)- β- phenyl- 1, N^2- ethenoguanosine- 3', 5'- cyclic monophosphate (8-pCPT-PET-cGMP)	C 045	38
7- Deazaguanosine- 3', 5'- cyclic monophosphate (7-CH-cGMP)	D 099	39
N^2, 2'- O- Dibutyrylguanosine- 3', 5'- cyclic monophosphate (DB-cGMP)	D 010	39
8- (2- [DY-547]- aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-[DY-547]-AET-cGMP / f-cGMP)	D 087	39
8- (2- [DY-647]- aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-[DY-647]-AET-cGMP)	D 090	39
8- (2- [Fluoresceinyl]aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-[Fluo]-cGMP / 8-[Fluo]-AET-cGMP)	F 001	39
8- (6- [Fluoresceinyl]aminohexylthio)- β- PET-guanosine- 3', 5'- cyclic monophosphate (8-[Fluo]-AHT-PET-cGMP)	F 012	38
Guanosine- 3', 5'- cyclic monophosphate (cGMP)	G 001	40
N^2- Methylguanosine- 3', 5'- cyclic monophosphate (2-Me-cGMP)	M 010	40
8- (2- [7- Nitro- 4- benzofurazanyl]aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-NBD-cGMP)	N 001	40
8- [Pharos-450]- guanosine- 3', 5'- cyclic monophosphate (8-[φ-450]-cGMP)	P 025	40
8- [Pharos-575]- guanosine- 3', 5'- cyclic monophosphate (8-[φ-575]-cGMP)	P 020	40
β- Phenyl- 1, N^2 - etheno- 8- bromoguanosine- 3', 5'- cyclic monophosphate (8-Br-PET-cGMP)	P 003	41
β- Phenyl- 1, N^2 - ethenoguanosine- 3', 5'- cyclic monophosphate (PET-cGMP)	P 001	41
For cGMP analogues not listed please inquire.	inquire	40

Activators of CNG Channels

	Cat. No.	Page
8- Bromoguanosine- 3', 5'- cyclic monophosphate (8-Br-cGMP)	B 004	37
8- (4- Chlorophenylthio)guanosine- 3', 5'- cyclic monophosphate (8-pCPT-cGMP)	C 009	37
8- (4- Chlorophenylthio)guanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-pCPT-cGMPS)	C 013	34
8- (4- Chlorophenylthio)guanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-pCPT-cGMPS)	C 014	35
8- (2- [DY-547]- aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-[DY-547]-AET-cGMP / f-cGMP)	D 087	38, 43
8- (2- [DY-547]- aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-[DY-547]-AET-cAMP)	D 109	31, 43
8- (2- [DY-647]- aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-[DY-647]-AET-cGMP)	D 090	38, 44
8- (2- [Fluoresceinyl]aminoethylthio)guanosine- 3', 5'- monophosphate (8-[Fluo]-cGMP / 8-[Fluo]-AET-cGMP)	F 001	38, 44
For CNG channel activators not listed please inquire.	Inquire	

Inhibitors of CNG Channels

	Cat. No.	Page
8- (4- Chlorophenylthio)- β- phenyl- 1, N^2- ethenoguanosine- 3', 5'- cyclic monophosphate (8-pCPT-PET-cGMP)	C 045	37
8- (4- CPT)- β- phenyl- 1, N^2- ethenoguanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-pCPT-PET-cGMPS)	C 046	34
8- (4- CPT)- β- phenyl- 1, N^2- ethenoguanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-pCPT-PET-cGMPS)	C 047	35
8- (6- [Fluoresceinyl]aminohexylthio)- β- PET-guanosine- 3', 5'- cyclic monophosphate (8-[Fluo]-AHT-PET-cGMP)	F 012	38, 45
β- Phenyl- 1, N^2- etheno- 8- bromoguanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-Br-PET-cGMPS)	P 007	34
β- Phenyl- 1, N^2- etheno- 8- bromoguanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-Br-PET-cGMPS)	P 008	35
For CNG channel inhibitors not listed please inquire.	Inquire	

Cyclic Nucleotides with Pyrimidine Nucleobases

	Cat. No.	Page
2'- O- (6- Aminohexylcarbamoyl)cytidine- 3', 5'- cyclic monophosphate (2'-AHC-cCMP)	A 156	41, 58
N^4- (6- Aminohexyl)cytidine- 3', 5'- cyclic monophosphate (4-AH-cCMP)	A 143	41, 58
Cytidine- 3', 5'- cyclic monophosphate (cCMP)	C 001	42
Cytidine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (cCMP-AM)	C 067	42
Cytidine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-cCMPS)	C 065	42
Cytidine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-cCMPS)	C 066	42
N^4, 2'- O- Dibutyrylcytidine- 3', 5'- cyclic monophosphate (DB-cCMP)	D 075	42
2'- O- (N'- Methylanthraniloyl)cytidine- 3', 5'- cyclic monophosphate (MANT-cCMP)	M 053	43, 46
2'- O- Monobutyrylcytidine- 3', 5'- cyclic monophosphate (2'-O-MB-cCMP)	M 082	45
N^4- Monobutyrylcytidine- 3', 5'- cyclic monophosphate (4-MB-cCMP)	M 075	45
Thymidine- 3', 5'- cyclic monophosphate (cTMP)	T 005	43
Uridine- 2', 3'- cyclic monophosphate (2',3'-cUMP)	U 004	43, 53
Uridine- 3', 5'- cyclic monophosphate (cUMP)	U 001	43, 53
Uridine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (cUMP-AM)	U 012	43
For special analogues of cyclic nucleotides with pyrimidine nucleobases not listed please inquire.	Inquire	42

Metabolically Activatable and Caged Cyclic Nucleotides

	Cat. No.	Page
Cyclic AMP Analogues		
Adenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (cAMP-AM)	A 022	26
Adenosine- 3', 5'- cyclic monophosphate, benzyl ester (cAMP-Bn)	A 065	26
Adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer, acetoxymethyl ester (Sp-cAMPS-AM)	A 035	18
N^6- Benzoyladenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (6-Bnz-cAMP-AM)	B 079	23, 27
[6, 7- Bis(carboxymethoxy)coumarin- 4- yl]methyl- adenosine- 3', 5'- cyclic monophosphate (BCMCM-caged cAMP)	B 016	28
[6, 7- Bis(carboxymethoxy)coumarin- 4- yl]methyl- 8- bromoadenosine- 3', 5'- monophosphate (BCMCM-caged 8-Br-cAMP)	B 018	28
8- Bromoadenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (8-Br-cAMP-AM)	B 020	29
8- Bromoadenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer, acetoxymethyl ester (Sp-8-Br-cAMPS-AM)	B 029	19
8- Bromo- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (8-Br-2'-O-Me-cAMP-AM)	B 028	21
8- Bromo- 2'- O- monobutyryladenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-Br-2'-O-MB-cAMPS)	B 010	16
8- Chloroadenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (8-Cl-cAMP-AM)	C 050	30
8- (4- Chlorophenylthio)adenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (8-CPT-cAMP-AM)	C 056	31
8- (4- Chlorophenylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate, AM ester (8-pCPT-2'-O-Me-cAMP-AM)	C 051	22
N^6, 2'- O- Dibutyryladenosine- 3', 5'- cyclic monophosphate (DB-cAMP)	D 009	31
N^6, 2'- O- Dibutyryladenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (DB-cAMP-AM)	D 008	31
(7- Diethylaminocoumarin- 4- yl)methyl- adenosine- 3', 5'- cyclic monophosphate (DEACM-caged cAMP)	D 042	32
2'- O- Monobutyryladenosine- 3', 5'- cyclic monophosphate (2'-O-MB-cAMP)	M 007	33
2'- O- Monobutyryladenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-2'-O-MB-cAMPS)	M 004	17
2'- O- Monobutyryladenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-2'-O-MB-cAMPS)	M 005	20
[6, 7- Bis(carboxymethoxy)coumarin- 4- yl]methyl- 8- bromoguanosine- 3', 5'- monophosphate (BCMCM-caged 8-Br-cGMP)	B 019	37
Cyclic GMP Analogues		
[6, 7- Bis(carboxymethoxy)coumarin- 4- yl]methyl- guanosine- 3', 5'- cyclic monophosphate (BCMCM-caged cGMP)	B 017	37
8- Bromoguanosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (8-Br-cGMP-AM)	B 014	37
8- (4- Chlorophenylthio)guanosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (8-pCPT-cGMP-AM)	C 033	37
N^2, 2'- O- Dibutyrylguanosine- 3', 5'- cyclic monophosphate (DB-cGMP)	D 010	39
(7- Diethylaminocoumarin- 4- yl)methyl- guanosine- 3', 5'- cyclic monophosphate (DEACM-caged cGMP)	D 043	39
Guanosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (cGMP-AM)	G 002	40
2'- O- Monobutyrylguanosine- 3', 5'- cyclic monophosphate (2'-O-MB-cGMP)	M 006	40
Cyclic CMP & UMP Analogues		
Cytidine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (cCMP-AM)	C 067	41
N^4, 2'- O- Dibutyrylcytidine- 3', 5'- cyclic monophosphate (DB-cCMP)	D 075	42
Uridine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (cUMP-AM)	U 012	42
For other metabolically activatable or caged cyclic nucleotides not listed please inquire.	inquire	

Fluorescent Cyclic Nucleotides

	Cat. No.	Page
2- Aminopurine riboside- 3', 5'- cyclic monophosphate (2-NH_2-cPuMP)	A 027	43, 48
2- Aza- 1, N^6- ethenoadenosine- 3', 5'- cyclic monophosphate (2-Aza-ε-cAMP)	A 015	27, 43
8- Azido- N^6- (2- [DY-547]- aminoethyl)adenosine- 3', 5'- cyclic monophosphate (8-N_3-6-[DY-547]-AE-cAMP)	A 100	43, 48
8- Azido- 1, N^6- ethenoadenosine- 3', 5'- cyclic monophosphate (8-N_3-ε-cAMP)	A 077	27, 43
2'- O- (6- [DY-505-05]- aminohexylcarbamoyl))guanosine- 3', 5'- cyclic monophosphate (2'- [DY-505-05]-AHC-cGMP)	D 135	44
8- (2- [DY-547]- aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-[DY-547]-AET-cAMP / f-cAMP)	D 109	32, 44
8- (2- [DY-547]- aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-[DY-547]-AET-cGMP / f-cGMP)	D 087	39, 45
8- (2- [DY-647]- aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-[DY-647]-AET-cGMP)	D 090	39, 45
8- (2- [DY-547]- aminoethylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-[DY-547]-AET-2'-O-Me-cAMP)	D 089	22, 45
1, N^6- Ethenoadenosine- 3', 5'- cyclic monophosphate (ε-cAMP)	E 001	32, 45
8- (2- [Fluoresceinyl]aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-[Fluo]-cAMP / 8-[Fluo]-AET-cAMP)	F 002	32, 45
8- (2- [Fluoresceinyl]aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-[Fluo]-cGMP / 8-[Fluo]-AET-cGMP)	F 001	39, 45
2'- (6- [Fluoresceinyl]aminohexylcarbamoyl)adenosine- 3', 5'- cyclic monophosphate (2'-Fluo-AHC-cAMP / FAM-cAMP)	F 003	45, 51
2'- (6- [Fluoresceinyl]aminohexylcarbamoyl)guanosine- 3', 5'- cyclic monophosphate (2'-Fluo-AHC-cGMP / FAM-cGMP)	F 004	46, 52
8- (6- [Fluoresceinyl]aminohexylthio)- β- PET-guanosine- 3', 5'- cyclic monophosphate (8-[Fluo]-AHT-PET-cGMP)	F 012	39, 46
2'- O- (N'- Methylanthraniloyl)adenosine- 3', 5'- cyclic monophosphate (MANT-cAMP)	M 008	46, 53
8- (4- [N'- Methylanthraniloyl]aminobutylamino)adenosine- 3', 5'- cyclic monophosphate (8-MABA-cAMP)	M 016	33, 46
N^6- (6- [N'- Methylanthraniloyl]aminohexyl)adenosine- 3', 5'- cyclic monophosphate (6-MAH-cAMP)	M 017	33, 46
2'- O- (N'- Methylanthraniloyl)cytidine- 3', 5'- cyclic monophosphate (MANT-cCMP)	M 053	43, 46

Fluorescent Cyclic Nucleotides (*continued*)

	Cat. No.	Page
2'- O- (N'- Methylanthraniloyl)guanosine- 3', 5'- cyclic monophosphate (MANT-cGMP)	M 009	46, 52
8- (2- [7- Nitro- 4- benzofurazanyl]aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-NBD-cAMP)	N 002	33, 47
8- (2- [7- Nitro- 4- benzofurazanyl]aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-NBD-cGMP)	N 001	40, 47
8- [Pharos-450]- adenosine- 3', 5'- cyclic monophosphate (8-[φ-450]-cAMP)	P 024	34, 47
8- [Pharos-575]- adenosine- 3', 5'- cyclic monophosphate (8-[φ-575]-cAMP)	P 019	34, 47
8- [Pharos-450]- guanosine- 3', 5'- cyclic monophosphate (8-[φ-450]-cGMP)	P 025	40, 47
8- [Pharos-575]- guanosine- 3', 5'- cyclic monophosphate (8-[φ-575]-cGMP)	P 020	40, 47
8- [Pharos-575]- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-[φ-575]-2'-O-Me-cAMP)	P 021	23, 47
2'- O- (2- [TAMRA]- aminoethylcarbamoyl)guanosine- 3', 5'- cyclic monophosphate (2'-TAMRA-AEC-cGMP)	T 018	48
2'- O- (6- [TAMRA]- aminohexylcarbamoyl)guanosine- 3', 5'- cyclic monophosphate (2'-TAMRA-AHC-cGMP)	T 017	48
Additional fluorescent cyclic nucleotide analogues not listed.	inquire	47

Additional and Special Task Cyclic Nucleotides

	Cat. No.	Page
Adenosine- 2', 3'- cyclic monophosphate (2',3'-cAMP)	A 307	49
Adenosine- 2', 3'- cyclic monophosphorothioate, endo / Rp- isomer (Rp-2',3'-cAMPS)	A 006	48
Adenosine- 2', 3'- cyclic monophosphorothioate, exo / Sp- isomer (Sp-2',3'-cAMPS)	A 024	48
2- Aminopurine riboside- 3', 5'- cyclic monophosphate (2-NH_2-cPuMP)	A 027	43, 48
Arabinoadenosine- 3', 5'- cyclic monophosphate (*ara*-cAMP)	A 076	48
8- Azido- N^6- (2- [biotinyl]aminoethyl)adenosine- 3', 5'- cyclic monophosphate (8-N_3-6-[Biotin]-AE-cAMP)	A 127	27, 48
8- Azido- N^6- (2- [DY-547]- aminoethyl)adenosine- 3', 5'- cyclic monophosphate (8-N_3-6-[DY-547]-AE-cAMP)	A 100	43, 48
β- (4- Azidophenyl)- 1, N^2- etheno- 8- (2- [biotinyl]aminoethylthio)-cGMP (4-N_3-PET-8-[Biotin]-AET-cGMP)	A 186	36, 50
β- (4- Azidophenyl)- 1, N^2- etheno- 8- bromoguanosine- 3', 5'- cyclic monophosphate (4-N_3-PET-8-Br-cGMP)	A 102	36, 48
8- (2- [Biotinyl]aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-[Biotin]-AET-cAMP)	B 030	28, 49
8- (2- [Biotinyl]aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-[Biotin]-AET-cGMP)	B 025	36, 49
2- (6- [Biotinyl]aminohexylamino)adenosine- 3', 5'- cyclic monophosphate (2-[Biotin]-AHA-cAMP)	B 041	28, 49
N^2- (6- [Biotinyl]aminohexyl)guanosine- 3', 5'- cyclic monophosphate (2-[Biotin]-AH-cGMP)	B 032	36, 49
8- Bromo- 2'- O- methylguanosine- 3', 5'- cyclic monophosphate (8-Br-2'-O-Me-cGMP)	B 037	24, 49
8- Bromoadenosine- 2', 3'- cyclic monophosphate (8-Br-2',3'-cAMP)	B 280	51
2- Chloroinosine- 3', 5'- cyclic monophosphate (2-Cl-cIMP)	C 029	50
6- Chloropurine riboside- 3', 5'- cyclic monophosphate (6-Cl-cPuMP)	C 002	51
6- Chloropurine riboside- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-6-Cl-cPuMPS)	C 082	50
6- Chloropurine riboside- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-6-Cl-cPuMPS)	C 083	19, 51
2'- Deoxyadenosine- 3', 5'- cyclic monophosphate (2'-dcAMP)	D 015	51
2'- Deoxy- 2'- fluoroadenosine- 3', 5'- cyclic monophosphate (2'-F-dcAMP)	D 073	51
2'- Deoxyguanosine- 3', 5'- cyclic monophosphate (2'-dcGMP)	D 020	51
5, 6- Dichloro-1- β- D- ribofuranosylbenzimidazole- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-5,6-DCl-cBIMPS)	D 013	52
5, 6- Dimethyl-1- β- D- ribofuranosylbenzimidazole- 3', 5'- cyclic monophosphate (5,6-DM-cBIMP)	D 001	52
2'- (6- [Fluoresceinyl]aminohexylcarbamoyl)adenosine- 3', 5'- cyclic monophosphate (2'-Fluo-AHC-cAMP / FAM-cAMP)	F 003	44, 50
2'- (6- [Fluoresceinyl]aminohexylcarbamoyl)guanosine- 3', 5'- cyclic monophosphate (2'-Fluo-AHC-cGMP / FAM-cGMP)	F 004	45, 51
Guanosine- 2', 3'- cyclic monophosphate (2',3'-cGMP)	G 025	52
Inosine- 3', 5'- cyclic monophosphate (cIMP)	I 001	52
2'- O- Methyladenosine- 3', 5'- cyclic monophosphate (2'-O-Me-cAMP)	M 050	23, 52
2'- O- (N'- Methylanthraniloyl)adenosine- 3', 5'- cyclic monophosphate (MANT-cAMP)	M 008	45, 52
2'- O- (N'- Methylanthraniloyl)guanosine- 3', 5'- cyclic monophosphate (MANT-cGMP)	M 009	45, 53
2'- O- Methylguanosine- 3', 5'- cyclic monophosphate (2'-O-Me-cGMP)	M 036	24, 52
4- Nitrobenzimidazole riboside- 3', 5'- cyclic monophosphate (4-NO_2 -cBIMP)	N 007	53
Purine riboside- 3', 5'- cyclic monophosphate (cPuMP)	P 010	53, 69
Uridine- 2', 3'- cyclic monophosphate (2',3'-cUMP)	U 004	42, 53
Uridine- 3', 5'- cyclic monophosphate (cUMP)	U 001	42, 54
Xanthosine- 3', 5'- cyclic monophosphate (cXMP)	X 001	54, 69
Ko-*Libri* Library Collection of different cyclic nucleotides	K 002	68

Cyclic Nucleotide-based Precursors for Labelling & Immobilization

	Cat. No.	Page
Cyclic AMP Analogues		
8- (4- Aminobutylamino)adenosine- 3', 5'- cyclic monophosphate (8-ABA-cAMP)	A 017	54
2'- Amino- 2'- deoxyadenosine- 3', 5'- cyclic monophosphate (2'-NH_2 -cAMP)	A 088	54

Cyclic Nucleotide-based Precursors for Labelling & Immobilization *(continued)*

	Cat. No.	Page
2- (8- Amino- 3, 6- dioxaoctylamino)adenosine- 3', 5'- cyclic monophosphate (2-ADOA-cAMP)	A 136	54
2'- O- (8- Amino- 3, 6- dioxaoctylcarbamoyl)adenosine- 3', 5'- cyclic monophosphate (2'-ADOC-cAMP)	A 146	54
8- (8- Amino- 3, 6- dioxaoctylamino)adenosine- 3', 5'- cyclic monophosphate (8-ADOA-cAMP)	A 033	55
N^6- (2- Aminoethyl)adenosine- 3', 5'- cyclic monophosphate (6-AE-cAMP)	A 096	55
N^6- (2- Aminoethyl)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-6-AE-cAMPS)	A 092	55
2- (2- Aminoethylamino)adenosine- 3', 5'- cyclic monophosphate (2-AEA-cAMP)	A 097	55
2- (2- Aminoethylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-2-AEA-cAMPS)	A 093	55
8- (2- Aminoethylamino)adenosine- 3', 5'- cyclic monophosphate (8-AEA-cAMP)	A 016	55
8- (2- Aminoethylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-AEA-cAMPS)	A 180	55
8- (2- Aminoethylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-AEA-cAMPS)	A 094	56
N^6- (2- Aminoethyl)- 8- azidoadenosine- 3', 5'- cyclic monophosphate (6-AE-8-N_3-cAMP)	A 101	56
2'- O- (2- Aminoethylcarbamoyl)adenosine- 3', 5'- cyclic monophosphate (2'-AEC-cAMP / 2'-EDA-cAMP)	A 098	56
2'- O- (2- Aminoethylcarbamoyl)adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-2'-AEC-cAMPS)	A 119	56
2'- O- (2- Aminoethylcarbamoyl)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-2'-AEC-cAMPS)	A 095	56
8- (2- Aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-AET-cAMP)	A 141	56
8- (2- Aminoethylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-AET-2'-O-Me-cAMP)	A 142	21, 56
N^6- (6- Aminohexyl)adenosine- 3', 5'- cyclic monophosphate (6-AH-cAMP)	A 031	57
N^6- (6- Aminohexyl)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-6-AH-cAMPS)	A 089	57
2- (6- Aminohexylamino)adenosine- 3', 5'- cyclic monophosphate (2-AHA-cAMP)	A 053	57
2- (6- Aminohexylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-2-AHA-cAMPS)	A 068	57
8- (6- Aminohexylamino)adenosine- 3', 5'- cyclic monophosphate (8-AHA-cAMP)	A 011	57
8- (6- Aminohexylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-AHA-cAMPS)	A 085	57
8- (6- Aminohexylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-AHA-cAMPS)	A 071	57
8- (6- Aminohexylamino)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-AHA-2'-O-Me-cAMP)	A 099	21, 57
2'- O- (6- Aminohexylcarbamoyl)adenosine- 3', 5'- cyclic monophosphate (2'-AHC-cAMP)	A 046	58
2'- O- (6- Aminohexylcarbamoyl)adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-2'-AHC-cAMPS)	A 120	58
2'- O- (6- Aminohexylcarbamoyl)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-2'-AHC-cAMPS)	A 066	58
2'-O-(19-Amino-4,7,10,13,16-pentaoxanonadecylcarbamoyl)adenosine-3',5'-cyclic monophosphate (2'-APNC-cAMP)	A 145	58
8- Azidoadenosine- 3', 5'- cyclic monophosphate (8-N_3-cAMP)	A 014	27, 58
8- Azido- N^6- (2- [biotinyl]aminoethyl)adenosine- 3', 5'- cyclic monophosphate (8-N_3-6-[Biotin]-AE-cAMP)	A 127	27, 48
8- Azido- N^6- (2- [DY-547]-aminoethyl)adenosine- 3', 5'- cyclic monophosphate (8-N_3-6-[DY-547]-AE-cAMP)	A 100	27, 48
8- Azido- 1, N^6- ethenoadenosine- 3', 5'- cyclic monophosphate (8-N_3-ε-cAMP)	A 077	27, 59
2'- (5- Carboxypentylcarbamoyl)adenosine-3', 5'-cyclic monophosphate (2'-CPC-cAMP)	C 109	59
8- (4- Mercaptobutylthio)adenosine-3', 5'-cyclic monophosphate (8-MBT-cAMP)	M 080	59
2'- O- Monosuccinyladenosine- 3', 5'- cyclic monophosphate (2'-O-MS-cAMP)	M 011	59
2'- O- Monosuccinyladenosine- 3', 5'- cyclic monophosphate, tyrosylmethyl ester (2'-O-MS-TME-cAMP)	M 022	59
Cyclic CMP Analogues		
2'- O- (6- Aminohexylcarbamoyl)cytidine- 3', 5'- cyclic monophosphate (2'-AHC-cCMP)	A 156	41, 60
N^4- (6- Aminohexyl)cytidine- 3', 5'- cyclic monophosphate (4-AH-cCMP)	A 143	41, 60
Cyclic GMP Analogues		
2'- O- (2- Aminoethylcarbamoyl)guanosine- 3', 5'- cyclic monophosphate (2'-AEC-cGMP / 2'-EDA-cGMP)	A 075	60
8- (2- Aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-AET-cGMP)	A 029	60
8- (2- Aminoethylthio)guanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-AET-cGMPS)	A 154	60
8- (2- Aminoethylthio)guanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-AET-cGMPS)	A 198	60
2'- O- (6- Aminohexylcarbamoyl)guanosine- 3', 5'- cyclic monophosphate (2'-AHC-cGMP)	A 048	61
2'- O- (6- Aminohexylcarbamoyl)guanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-2'-AHC-cGMPS)	A 123	61
2'- O- (6- Aminohexylcarbamoyl)guanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-2'-AHC-cGMPS)	A 067	61
N^2- (6- Aminohexyl)guanosine- 3', 5'- cyclic monophosphate (2-AH-cGMP)	A 055	61
8- (6- Aminohexylthio)guanosine- 3', 5'- cyclic monophosphate (8-AHT-cGMP)	A 167	61
β- (4- Azidophenyl)- 1, N^2- etheno- 8- (2- [biotinyl]aminoethylthio)-cGMP (4-N_3-PET-8-[Biotin]-AET-cGMP)	A 186	36, 48
β- (4- Azidophenyl)- 1, N^2- etheno- 8- bromoguanosine- 3', 5'- cyclic monophosphate (4-N_3-PET-8-Br-cGMP)	A 102	36, 48
2'- O- Monosuccinylguanosine- 3', 5'- cyclic monophosphate (2'-O-MS-cGMP)	M 015	62
2'- O- Monosuccinylguanosine- 3', 5'- cyclic monophosphate, tyrosylmethyl ester (2'-O-MS-TME-cGMP)	M 023	62
Additional cyclic nucleotide analogues for labelling and immobilization	inquire	62

Cyclic Nucleotide Affinity Chromatography Gels

	Cat. No.	Page
Gels with phosphodiesterase-resistant cAMPS ligands		
Sp-cAMPS, immobilized on agarose via ethyl spacer to adenine C-2 (Sp-2-AEA-cAMPS-Agarose)	A 087	62
Sp-cAMPS, immobilized on agarose via hexyl spacer to adenine C-2 (Sp-2-AHA-cAMPS-Agarose)	A 069	64
Sp-cAMPS, immobilized on agarose via ethyl spacer to adenine N^6 (Sp-6-AE-cAMPS-Agarose)	A 109	62
Sp-cAMPS, immobilized on agarose via hexyl spacer to adenine N^6 (Sp-6-AH-cAMPS-Agarose)	A 108	64
Rp-cAMPS, immobilized on agarose via ethyl spacer to adenine C-8 (Rp-8-AEA-cAMPS-Agarose)	A 007	63
Sp-cAMPS, immobilized on agarose via ethyl spacer to adenine C-8 (Sp-8-AEA-cAMPS-Agarose)	A 008	63
Rp-cAMPS, immobilized on agarose via hexyl spacer to adenine C-8 (Rp-8-AHA-cAMPS-Agarose)	A 012	65
Sp-cAMPS, immobilized on agarose via hexyl spacer to adenine C-8 (Sp-8-AHA-cAMPS-Agarose)	A 013	65
Rp-cAMPS, immobilized on agarose via ethyl spacer to ribose 2'-O (Rp-2'-AEC-cAMPS-Agarose)	A 126	63
Sp-cAMPS, immobilized on agarose via ethyl spacer to ribose 2'-O (Sp-2'-AEC-cAMPS-Agarose)	A 122	63
Rp-cAMPS, immobilized on agarose via hexyl spacer to ribose 2'-O (Rp-2'-AHC-cAMPS-Agarose)	A 049	65
Sp-cAMPS, immobilized on agarose via hexyl spacer to ribose 2'-O (Sp-2'-AHC-cAMPS-Agarose)	A 050	65
Gels with cAMP ligands		
cyclic AMP, immobilized on agarose via ethyl spacer to adenine C-2 (2-AEA-cAMP-Agarose)	A 110	62
cyclic AMP, immobilized on agarose via hexyl spacer to adenine C-2 (2-AHA-cAMP-Agarose)	A 054	64
cyclic AMP, immobilized on agarose via ethyl spacer to adenine N^6 (6-AE-cAMP-Agarose)	A 111	62
cyclic AMP, immobilized on agarose via hexyl spacer to adenine N^6 (6-AH-cAMP-Agarose)	A 036	64
cyclic AMP, immobilized on agarose via ethyl spacer to adenine C-8 (8-AEA-cAMP-Agarose)	A 020	62
cyclic AMP, immobilized on agarose via ethyl spacer to adenine C-8 (8-AET-cAMP-Agarose)	A 193	63
cyclic AMP, immobilized on agarose via hexyl spacer to adenine C-8 (8-AHA-cAMP-Agarose)	A 028	64
cyclic AMP, immobilized on agarose via ethyl spacer to ribose 2'-O (2'-AEC-cAMP-Agarose)	A 112	63
cyclic AMP, immobilized on agarose via hexyl spacer to ribose 2'-O (2'-AHC-cAMP-Agarose)	A 058	65
2'-O-Me-cAMP, immobilized on agarose via ethyl spacer to adenine C-8 (8-AET-2'-O-Me-cAMP-Agarose)	A 195	25, 64
2'-O-Me-cAMP, immobilized on agarose via hexyl spacer to adenine C-8 (8-AHA-2'-O-Me-cAMP-Agarose)	A 057	26, 65
Gels with cCMP ligands		
cyclic CMP, immobilized on agarose via hexyl spacer to cytosine N^4 (4-AH-cCMP-Agarose)	A 147	66
cyclic CMP, immobilized on agarose via hexyl spacer to ribose 2'-O (2'-AHC-cCMP-Agarose)	A 158	66
Gels with phosphodiesterase-resistant cGMPS ligands		
Rp-cGMPS, immobilized on agarose via ethyl spacer to guanine C-8 (Rp-8-AET-cGMPS-Agarose)	A 009	65
Sp-cGMPS, immobilized on agarose via ethyl spacer to guanine C-8 (Sp-8-AET-cGMPS-Agarose)	A 010	66
Rp-cGMPS, immobilized on agarose via hexyl spacer to ribose 2'-O (Rp-2'-AHC-cGMPS-Agarose)	A 051	67
Sp-cGMPS, immobilized on agarose via hexyl spacer to ribose 2'-O (Sp-2'-AHC-cGMPS-Agarose)	A 052	67
Gels with cGMP ligands		
cyclic GMP, immobilized on agarose via hexyl spacer to guanine N^2 (2-AH-cGMP-Agarose)	A 056	67
cyclic GMP, immobilized on agarose via ethyl spacer to guanine C-8 (8-AET-cGMP-Agarose)	A 019	66
cyclic GMP, immobilized on agarose via ethyl spacer to ribose 2'-O (2'-AEC-cGMP-Agarose)	A 196	66
cyclic GMP, immobilized on agarose via hexyl spacer to ribose 2'-O (2'-AHC-cGMP-Agarose)	A 059	67
Unmodified control gel		
Ethanolamine, immobilized on agarose (EtOHNH-Agarose)	E 010	26, 67
Additional cyclic nucleotide affinity gels, different ligands, spacers and gel matrices not listed.	Inquire	67

Analogues for Characterization of cAMP Binding Proteins

	Pages
Adenine **N-1**: 1-NO-cAMP	27
Adenine **C-2**: 2-Cl-cAMP	30
Adenine **N-3**: 3-CH-cAMP (inquire)	Inquire
Adenine **N^6**: cPuMP (cIMP, 6-Cl-cPuMP, 6-Phe-cAMP)	53 (52, 50, 34)
Adenine **N-7**: 7-CH-cAMP	31
Adenine **C-8**: 8-Br-cAMP(8-CPT-cAMP)	30 (31)
Ribose **2'-O**: 2'-dcAMP (2'-F-dcAMP, 2'-NH_2-cAMP, 2'-O-Me-cAMP)	51 (51, 52)
Ribose **3'-O**: 3'-NH-cAMP (inquire)	Inquire
Ribose **5'-O**: 5'-NH-cAMP (inquire)	Inquire
Phosphate **O_{Rp}**: Rp-cAMPS	16
Phosphate **O_{Sp}**: Sp-cAMPS	18
Phosphate **O^-**: cAMP-Bn	27

Analogues for Characterization of cGMP Binding Proteins

	Pages
Guanine **N-1**: 1-NH_2-cGMP	37
Guanine **N^2**: cIMP, cXMP, 2-Me-cGMP, 2-dimethyl-cGMP (inquire)	52, 53, 40
Guanine **O^6**: 2-NH_2-cPuMP	49
Guanine **N-3**: 3-CH-cGMP (inquire)	Inquire
Guanine **N-7**: 7-CH-cGMP	39
Guanine **C-8**: 8-Br-cGMP (8-pCPT-cGMP)	38 (38)
Ribose **2'-O**: 2'-dcGMP, 2'-O-Me-cGMP	51, 52
Ribose **3'-O**: 3'-NH-cGMP (inquire)	Inquire
Ribose **5'-O**: 5'-NH-cGMP (inquire)	Inquire
Phosphate **O_{Rp}**: Rp-cGMPS	35
Phosphate **O_{Sp}**: Sp-cGMPS	36

Paired Analogues for Synergistic Activation of PKA & PKG *(examples)*

	Cat. No.	Page
Analogue Combinations for Protein Kinase A Type I		
N^6- Benzoyl- 8- piperidinoadenosine- 3', 5'- cyclic monophosphate (6-Bnz-8-PIP-cAMP)	B 055	29
2- Chloro- 8- n- hexylaminoadenosine- 3', 5'- cyclic monophosphate (2-Cl-8-HA-cAMP)	C 071	30
N^6- Monobutyryladenosine- 3', 5'- cyclic monophosphate (6-MB-cAMP) ***recommended for systems with Epac contribution***	M 003	25, 33
8- (4- Aminobutylamino)adenosine- 3', 5'- cyclic monophosphate (8-ABA-cAMP)	A 017	54
Analogue Combinations for Protein Kinase A Type II		
N^6- Mono- tert.- butylcarbamoyladenosine- 3', 5'- cyclic monophosphate (6-MBC-cAMP)	M 012	24, 33
5, 6- Dichloro-1- β- D- ribofuranosylbenzimidazole- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-5,6-DCl-cBIMPS)	D 014	19
N^6- Mono- tert.- butylcarbamoyladenosine- 3', 5'- cyclic monophosphate (6-MBC-cAMP)	M 012	24, 33
8- Piperidinoadenosine- 3', 5'- cyclic monophosphate (8-PIP-cAMP)	P 002	34
Analogue Combination for Protein Kinase G Type I α		
1- Aminoguanosine- 3', 5'- cyclic monophosphate (1-NH_2-cGMP)	A 041	37
8- Bromoguanosine- 3', 5'- cyclic monophosphate (8-Br-cGMP)	B 004	38
Fore more detailed information please compare "Selective Activation of Protein Kinase A Isozymes I or II"		14

Miscellaneous

	Cat. No.	Page
Phosphate tris(acetoxymethyl)ester (PO_4-AM_3)	P 030	68

Ko-*Libri* Libraries

	Cat. No.	Page
Collection of different cyclic nucleotides	K 002	69

Preparation of Stock Solutions

Most BIOLOG products are sold in micromol quantities in order to assist customers with the preparation of stock solutions. In contrast to often troublesome calculations regarding molecular weight, salt form, water content and purity percentages, simply add certain volumes of solvent (mostly water or buffer) and end up already with stock solutions of defined concentrations.
The following table shows how to dissolve the content of a vial with water or buffer in order to obtain defined stock solutions:

Concentration of stock solution	Content of vial					
	1 µmol	**5 µmol**	**10 µmol**	**25 µmol**	**50 µmol**	**100 µmol**
	⇓	⇓	⇓	⇓	⇓	⇓
	Water or buffer volumes to be added to achieve stock concentrations on the left					
	⇓	⇓	⇓	⇓	⇓	⇓
100 mM (1 x 10^{-1} M)	10 µl	50 µl	100 µl	250 µl	500 µl	1 ml
50 mM (5 x 10^{-2} M)	20 µl	100 µl	200 µl	500 µl	1 ml	2 ml
20 mM (2 x 10^{-2} M)	50 µl	250 µl	500 µl	1.25 ml	2.5 ml	5 ml
10 mM (1 x 10^{-2} M)	100 µl	500 µl	1 ml	2.5 ml	5 ml	10 ml
5 mM (5 x 10^{-3} M)	200 µl	1 ml	2 ml	5 ml	10 ml	20 ml
1 mM (1 x 10^{-3} M)	1 ml	5 ml	10 ml	25 ml	50 ml	100 ml
500 µM (5 x 10^{-4} M)	2 ml	10 ml	20 ml	50 ml	100 ml	200 ml

If a typical dilution series (1 mM, 100 µM, 10 µM, 1 µM ...) is prepared, respective final end volumes will be 90% of the starting stock solution. For example: The content of a 10 µmol vial that has been dissolved in 10 ml of water to result in a 1 mM stock solution, yields 9 ml of each concentration level after dilution.

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- phosphodiesterase hydrolysis data
- protein kinase binding, activation and inhibition data
- application references
- potential analogue pitfalls
- selection of suitable structures for respective biological systems

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They are intended for *in vitro* and nonhuman *in vivo* laboratory applications.
Contents of vials are not sterile and have not been tested for endotoxins.

Selective Activation of Protein Kinase A Isozymes I or II

Taking Advantage of Synergistic Pairs of cAMP Analogues with Opposite Site Selectivity

Examples for pairs of analogues suitable for preferential activation of cAK I / PKA I:

Some of the pairs shown were either already used successfully or are suggested due to their site selectivity data. Of course, other combinations can be formed, however, selectivity, metabolic stability as well as membrane permeability should be considered. Data are from references cited below and are relative to cAMP (1.0 for all sites). Since many of these analogues also activate Epac, it is rather difficult to find a synergistic pair that does not contain an Epac agonist. The pair B 055/A 017 has probably the best selectivity here, since it combines an Epac inactive compound (B 055) with a poor Epac1 agonist (5, 6). The analogues of the last pair (B 055/C 071) have the highest lipophilicity and hence posess corresponding membrane permeability. Additional pairs are shown on our website (www.biolog.de/technical-info/synergistic-activation-of-pka/).

Analogue Pairs	Log K_w*	BIOLOG Cat. No.	Rel. Affinity for Site A of cAK I	Rel. Affinity for Site B of cAK I	Rel. Affinity for Site A of cAK II	Rel. Affinity for Site B of cAK II	Selectivity ** cAK I / cAK II	References
6-Bnz-8-PIP-cAMP	2.97	B 055	**1.70**	0.018	0.0011	0.065	**105 : 1**	19
2-Cl-8-AHA-cAMP	1.62	A 199	0.0052	**3.9**	0.0012	0.5		19
6-Bnz-8-PIP-cAMP	2.97	B 055	**1.70**	0,018	0.0011	0.065	**41 : 1**	19
2-Cl-8-MA-cAMP	1.2	C 080	0.04	**6.7**	0.0095	0.72		7, 10
6-Bnz-8-PIP-cAMP	2.97	B 055	**1.70**	0,018	0.0011	0.065	**40 : 1**	19
8-ABA-cAMP	0.93	A 017	0.03	**3.23**	0.01	0.34		4, 6
6-Bnz-8-PIP-cAMP	2.97	B 055	**1.70**	0,018	0.0011	0.065	**36 : 1**	19
2-Cl-8-HA-cAMP	2.63	C 071	0.0032	**2.2**	0.0013	2.2		20

*) Lipophilicity parameter determined by chromatography. Logarithmic scale, cAMP = 1.0
**) Prediction, calculated by $(A\ I \times B\ I)^{1/2} : (A\ II \times B\ II)^{1/2}$, equal intracellular concentrations provided

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Examples for pairs of analogues suitable for preferential activation of cAK II / PKA II:

The pairs shown were either already used successfully or are suggested due to their site selectivity data. Of course, other combinations can be formed, however, selectivity, metabolic stability as well as membrane permeability should be considered. Data are from references cited below and are relative to cAMP (1.0 for all sites). Additional pairs are suggested on our website (www.biolog.de/technical-info/synergistic-activation-of-pka/). Both pairs shown have sufficient lipophilicity to pass cellular membranes. The pair 6-MBC-cAMP/8-PIP-cAMP is especially suited for selective kinase activation in presence of Epac. The pair 6-MBC-cAMP/Sp-5,6-DCl-cBIMPS has the best mebrane permeability.

Analogue Pairs	Log K_w*	BIOLOG Cat. No.	Rel. Affinity for Site A of cAK I	Rel. Affinity for Site B of cAK I	Rel. Affinity for Site A of cAK II	Rel. Affinity for Site B of cAK II	Selectivity ** cAK I / cAK II	References
6-MBC-cAMP	2.67	M 012	0.48	0.068	**16.0**	0.13	**1 : 60**	7, 17
Sp-5,6-DCl-cBIMPS	2.99	D 014	0.022	0.13	0.034	**14.0**		7, 10, 16 - 18
6-MBC-cAMP	2.67	M 012	0.48	0.068	**16.0**	0.13	**1 : 18**	7, 17
8-PIP-cAMP	2.17	P 002	2.3	0.065	0.046	**3.2**		7, 9, 14, 15

*) Lipophilicity parameter determined by chromatography. Logarithmic scale, cAMP = 1.0
**) Prediction, calculated by $(A\ I \times B\ I)^{1/2} : (A\ II \times B\ II)^{1/2}$, equal intracellular concentrations provided

References:

1 Øgreid et al., *J. Biol. Chem*, **258**, 1041 - 1049 (1983)
2 Robinson-Steiner & Corbin, *J. Biol. Chem*, **258**, 1032 - 1040 (1983)
3 Øgreid et al., *Eur. J. Biochem*, **150**, 219 - 227 (1985)
4 Schwede et al., *Biochemistry*, **39**, 8803 - 8812 (2000)
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17 Maronde et al., *J. Pineal Res.*, **27**, 170 - 182 (1999)
18 Kopperud et al., *FEBS Lett.*, **546**, 121 - 126 (2003)
19 Huseby et al., *Cell Death Dis.*, e-pub, Dec 8;2:e237. doi: 10.1038 /cddis.2011.124
20 Gausdal et al., Cell Death Dis., e-pub, Feb 28;4:e516. doi: 10.1038/cddis.2013.39

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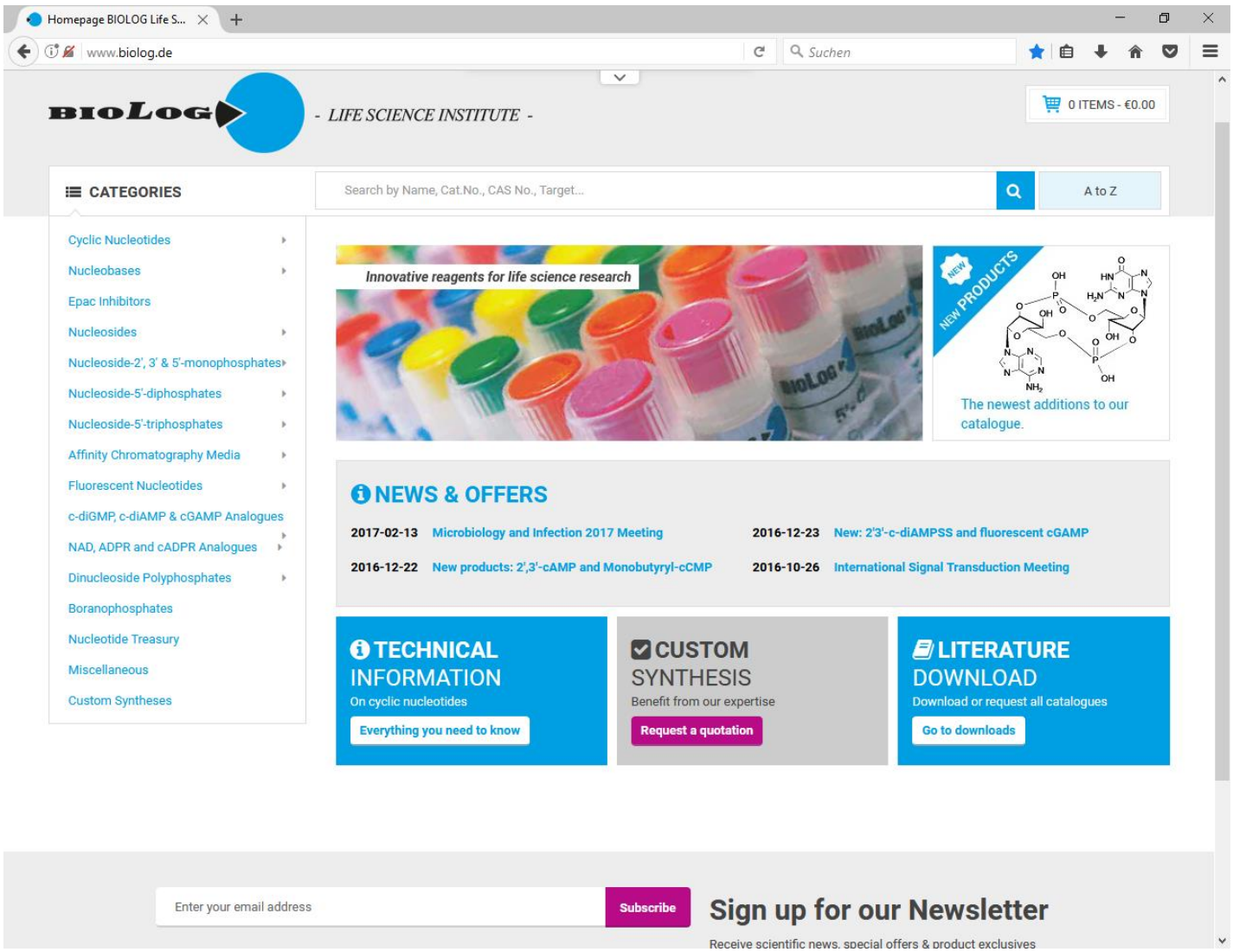
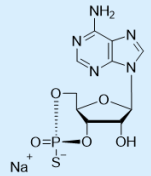


PDE- resistant Inhibitors of Protein Kinase A

A 002 S

High Purity Grade



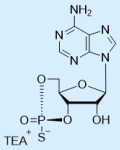
Adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-cAMPS)

[73208-40-9]; $C_{10}H_{11}N_5O_5PS{\cdot}Na$; MW 367.3; λ_{max} 259 nm; ε 15200; sodium salt; purity > 99% HPLC.
Specially purified from adenosine, cAMP and Sp-cAMPS. For other salt forms please inquire. Competitive inhibitor of protein kinase A type I and II (cyclic AMP antagonist). Prefers type II of protein kinase A. Resistant against mammalian cyclic nucleotide-dependent phosphodiesterases. Significantly more lipophilic compared to cAMP. Detailed technical information and updated reference list available. Rp-cAMPS is also available in an inexpensive lower purity form (A 002 T *Economy Grade*) and as bulk ware. Reference: Gjertsen et al., *J. Biol. Chem.*, **270**, 20599 - 20607 (1995).

5 µmol / ~1.8 mg € 191.- (A 002 - 05 S)	5 x 5 µmol € 717.- (A 002 - 25 S)	**Inquiries for bulk quantities welcome!**

A 002 T

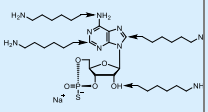
Economy Grade



Adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-cAMPS)

[151837-09-1]; $C_{10}H_{11}N_5O_5PS{\cdot}C_6H_{16}N$; MW 446.5; λ_{max} 259 nm; ε 15200; triethyl ammonium salt; purity > 98% HPLC.
Competitive inhibitor of protein kinase A type I and II (cyclic AMP antagonist). Prefers type II of protein kinase A. Resistant against mammalian cyclic nucleotide-dependent phosphodiesterases. This product corresponds to common quality offered elsewhere. Rp-cAMPS is also available in a highly purified form as sodium salt (A 002 S *High Purity Grade*).

5 µmol / ~2.2 mg € 140.- (A 002 - 05 T)	5 x 5 µmol € 574.- (A 002 - 25 T)	**Inquiries for bulk quantities welcome!**

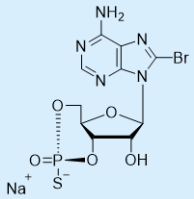


Adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer, functionalized with different aminoalkylamino spacers

We offer a selection of PDE-resistant Rp-cAMPS analogues functionalized with aminoalkylamino spacers of different lengths at the adenine positions C-8, N^6, 2 and at ribose 2' for immobilization on agarose or chip surfaces and for conjugation with biomarkers or fluorescent dyes. Corresponding analogues immobilized to agarose gel are available as well.

Please refer to chapters “Precursors for Labelling and Immobilization” (p. 54) and “Affinity Chromatography” (p. 62), respectively.

B 001

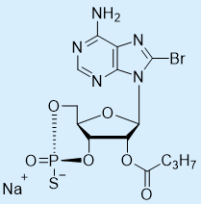


8- Bromoadenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-Br-cAMPS)

[129735-00-8]; $C_{10}H_{10}BrN_5O_5PS{\cdot}Na$; MW 446.2; λ_{max} 264 nm; ε 17000; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Lipophilic analogue of the cyclic AMP antagonist Rp-cAMPS. Prefers type I of protein kinase A. Resistant against mammalian cyclic nucleotide-dependent phosphodiesterases. Significantly more lipophilic and membrane-permeant compared to Rp-cAMPS (Cat. No. A 002, above) or 8-Br-cAMP (Cat. No. B 007). Detailed technical information and updated reference list available. References: Gjertsen et al., *J. Biol. Chem.*, **270**, 20599 - 20607 (1995); Aandahl et al., *FASEB J.*, **12**, 855 - 863 (1998).

5 µmol / ~2.2 mg € 202.- (B 001 - 05)	5 x 5 µmol € 758.- (B 001 - 25)	**Inquiries for bulk quantities welcome!**

B 010

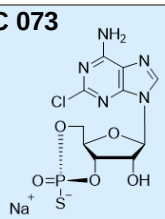


8- Bromo- 2'- O- monobutyryladenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-Br-2'-O-MB-cAMPS)

[788807-32-9]; $C_{14}H_{16}BrN_5O_6PS{\cdot}Na$; MW 516.2; λ_{max} 264 nm; ε 17000; sodium salt; purity > 97% HPLC.
For other salt forms please inquire. Lipophilic precursor of the protein kinase A inhibitor Rp-8-Br-cAMPS (Cat. No. B 001, above). During metabolic activation by esterases the inhibitor and butyrate are released. **Caution:** Butyrate was shown to have distinct biological effects! Significantly more lipophilic and membrane-permeant compared to Rp-8-Br-cAMPS. Detailed technical information and updated reference list available for Rp-8-Br-cAMPS. Reference: Ruiz-Velasco et al., *Circ. Res.*, **82**, 557 - 565 (1998).

5 µmol / ~2.6 mg € 241.- (B 010 - 05)	5 x 5 µmol € 969.- (B 010 - 25)

C 073

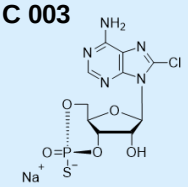


2- Chloroadenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-2-Cl-cAMPS)

[124844-92-4]; $C_{10}H_{10}ClN_5O_5PS{\cdot}Na$; MW 401.7; λ_{max} 262 nm; ε 14300; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Analogue of the protein kinase A inhibitor Rp-cAMPS (Cat. No. A 002, above) with increased lipophilicity and phosphodiesterase stability. The halogen in position 2 of the adenine nucleobase can be used for various substitutions including spacers and labels. Detailed technical information available. Reference: Gjertsen et al., *J. Biol. Chem.*, **270**, 20599 - 20607 (1995).

5 µmol / ~2 mg € 254.- (C 073 - 05)	5 x 5 µmol € 1,062.- (C 073 - 25)

C 003



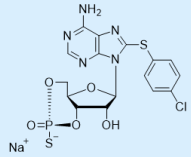
8- Chloroadenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-Cl-cAMPS)

[142754-27-6]; $C_{10}H_{10}ClN_5O_5PS \cdot Na$; MW 401.7; λ_{max} 262 nm; ε 17000; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Site-selective, competitive inhibitor of protein kinase A (cyclic AMP antagonist) with preference for type I of protein kinase A. Resistant against mammalian cyclic nucleotide-dependent phosphodiesterases. Significantly more lipophilic and membrane-permeant compared to Rp-cAMPS (Cat. No. A 002). Detailed technical information and updated reference list available. Reference: Yokozaki et al., *Cancer Res.*, **52**, 2504 - 2508 (1992).

5 µmol / ~2 mg € 202.- (C 003 - 05)	5 x 5 µmol € 758.- (C 003 - 25)	**Inquiries for bulk quantities welcome!**

C 011

Fluorescence Grade

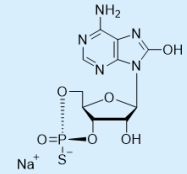


8- (4- Chlorophenylthio) adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-CPT-cAMPS)

[129735-01-9]; $C_{16}H_{14}ClN_5O_5PS_2 \cdot Na$; MW 509.8; λ_{max} 282 nm; ε 16000; sodium salt; purity > 99% HPLC, highly purified, fluorescent impurities removed. For other salt forms please inquire. Lipophilic analogue of Rp-cAMPS (Cat. No. A 002). Potent competitive inhibitor of protein kinase A type I and II (cyclic AMP antagonist). Resistant against mammalian cyclic nucleotide-dependent phosphodiesterases. Considerably more lipophilic and membrane-permeant compared to Rp-8-Br-cAMPS (Cat. No. B 001). Detailed technical information and updated reference list available. Reference: Weisskopf et al., *Science*, **265**, 1878 - 1882 (1994).

5 µmol / ~2.5 mg € 214.- (C 011 - 05)	5 x 5 µmol € 803.- (C 011 - 25)

H 004

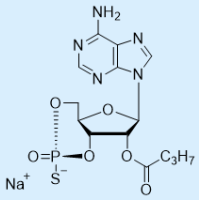


8- Hydroxyadenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-OH-cAMPS)

[475084-30-1]; $C_{10}H_{11}N_5O_6PS \cdot Na$; MW 383.3; λ_{max} 268 nm; ε 11000; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Polar, membrane-impermeant analogue of the protein kinase A inhibitor Rp-cAMPS (Cat. No. A 002), e.g. for the study of extracellular cAMP receptors. If applied by patch clamp techniques, Rp-8-OH-cAMPS should remain trapped inside the cell. Resistant against mammalian cyclic nucleotide-dependent phosphodiesterases. Detailed technical information available.

1 µmol / ~0.4 mg € 62.- (H 004 - 01)	5 x 1 µmol € 232.- (H 004 - 05)

M 004

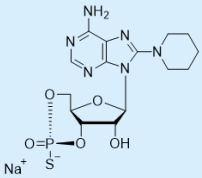


2'- O- Monobutyryladenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-2'-O-MB-cAMPS)

[152218-23-0]; $C_{14}H_{17}N_5O_6PS \cdot Na$; MW 437.4; λ_{max} 258 nm; ε 15200; sodium salt; purity > 97% HPLC.
Lipophilic precursor of Rp-cAMPS (Cat. No. A 002), a competitive inhibitor of protein kinase A. During metabolic activation by esterases the inhibitor and butyrate are released. **Caution:** Butyrate was shown to have distinct biological effects! Significantly more lipophilic and membrane-permeant compared to Rp-cAMPS. Resistant against mammalian phosphodiesterases. Detailed technical information and updated reference list available for Rp-cAMPS. References: Vischer et al., *Blood*, **91**, 118 - 127 (1998); Ouyang et al., *Proc. Natl. Acad. Sci. USA*, **105**, 11993 - 11997 (2008).

5 µmol / ~2.2 mg € 225.- (M 004 - 05)	5 x 5 µmol € 917.- (M 004 - 25)

P 004



8- Piperidinoadenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-PIP-cAMPS)

[156816-36-3]; $C_{15}H_{20}N_6O_5PS \cdot Na$; MW 450.4; λ_{max} 273 nm; ε 15000; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Lipophilic site-selective analogue of the protein kinase A inhibitor Rp-cAMPS (Cat. No. A 002) with extremely high preference for site B of cAK type II. Resistant against mammalian cyclic nucleotide-dependent phosphodiesterases. Significantly more lipophilic and membrane-permeant compared to Rp-cAMPS. Detailed technical information and updated reference list available. Reference: Øgreid et al., *Eur. J. Biochem.*, **221**, 1089 - 1094 (1994).

5 µmol / ~2.3 mg € 208.- (P 004 - 05)	5 x 5 µmol € 778.- (P 004 - 25)

Inquire

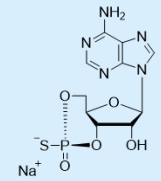
Special analogues of Rp-cAMPS not listed as regular products

We are constantly synthesizing new PDE-resistant inhibitors of protein kinase A isozymes (Rp-cAMPS analogues)! Please inquire regarding special structures not listed here, or check out our website (www.biolog.de). Custom syntheses and purifications are offered.

PDE- resistant Activators of Protein Kinase A

A 003 S

High Purity Grade



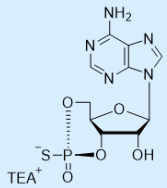
Adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-cAMPS)

[71774-13-5]; $C_{10}H_{11}N_5O_5PS{\cdot}Na$; MW 367.3; λ_{max} 259 nm; ε 15200; sodium salt; purity > 99% HPLC, specially purified: Corresponding Rp- isomer below detection limits. For other salt forms please inquire. Activator of protein kinase A (cyclic AMP agonist). Considerably higher resistance against cyclic nucleotide phosphodiesterases compared to dibutyryl- or 8-Br-cAMP (Cat. No. D 009 & B 007), no, no metabolic side effects. Membrane permeability comparable to 8-Br-cAMP. Detailed technical information and updated reference list available.
Reference: Tsien et al., *J. Cell Biol.*, **117**, 57 - 72 (1992).

10 µmol / ~3.7 mg € 210.- (A 003 - 10 S)	5 x 10 µmol € 891.- (A 003 - 50 S)	**Inquiries for bulk quantities welcome!**

A 003 T

Economy Grade

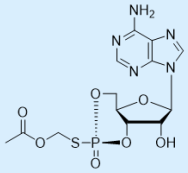


Adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-cAMPS)

[93602-66-5]; $C_{10}H_{11}N_5O_5PS{\cdot}C_6H_{16}N$; MW 446.5; λ_{max} 259 nm; ε 15200; triethyl ammonium salt; purity > 98% HPLC. Activator of protein kinase A (cyclic AMP agonist). Considerably higher resistance against cyclic nucleotide phosphodiesterases compared to dibutyryl- or 8-Br-cAMP (Cat. No. D 009 & B 007), no metabolic side effects. Membrane permeability comparable to 8-Br-cAMP. This specification corresponds to normal quality offered elsewhere. Sp-cAMPS is also available in a highly purified form as sodium salt (A 003 S *High Purity Grade*). Detailed technical information and updated reference list available.

10 µmol / ~4.5 mg € 180.- (A 003 - 10 T)	5 x 10 µmol € 767.- (A 003 - 50 T)	**Inquiries for bulk quantities welcome!**

A 035

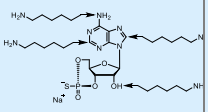


Adenosine- 3', 5'- cyclic monophosphorothioate, acetoxymethyl ester, Sp- isomer (Sp-cAMPS-AM)

[152218-24-1]; $C_{13}H_{16}N_5O_7PS$; MW 417.3; λ_{max} 259 nm; ε 15200; purity > 97% HPLC for mixture of isomers. Membrane-permeant precursor of the PDE-resistant protein kinase A activator Sp-cAMPS. Metabolic bioactivation by esterases releases the active analogue, which is trapped inside the cell. Chemical hydrolysis can produce some cyclic AMP as well. Detailed technical information available. References: Maronde et al., *J. Pineal Res.*, **31**, 183 - 185 (2001); Vanhoose et al., *J. Neurosci.*, **26**, 1138 - 1145 (2006).

Control reagent for nucleotide AM-ester applications: PO_4-AM_3, Cat. No. P 030

1 µmol / ~0.4 mg € 101.- (A 035 - 01)	5 x 1 µmol € 430.- (A 035 - 05)

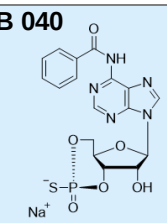


Adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer, functionalized with different aminoalkylamino spacers

We offer a selection of PDE-resistant Sp-cAMPS analogues functionalized with aminoalkylamino spacers of different lengths at adenine positions C-2, N^6, C-8 and at ribose 2' for immobilization on agarose or chip surfaces and for conjugation with biomarkers or fluorescent dyes. Corresponding analogues immobilized to agarose gel are available as well.

Please refer to chapters “Precursors for Labelling and Immobilization” (p. 54) and “Affinity Chromatography” (p. 62), respectively.

B 040

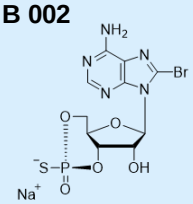


N^6- Benzoyladenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-6-Bnz-cAMPS)

[152218-18-3]; $C_{17}H_{15}N_5O_6PS{\cdot}Na$; MW 471.4; λ_{max} 279 nm; ε 17000; sodium salt; purity > 98% HPLC.
PDE-resistant form of 6-Bnz-cAMP (Cat. No. B 009), a site-selective and membrane-permeant activator of cAMP-dependent protein kinase. Sp-6-Bnz-cAMPS does not activate Epac and thus can be used as an Epac-negative control. Detailed technical information available. Reference: Lim et al., *Neurosci. Lett.*, **479**, 13 - 17 (2010).

5 µmol / ~2.4 mg € 164.- (B 040 - 05)	5 x 5 µmol € 692.- (B 040 - 25)

B 002

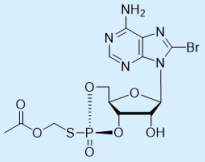


8- Bromoadenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-Br-cAMPS)

[127634-20-2]; $C_{10}H_{10}BrN_5O_5PS{\cdot}Na$; MW 446.2; λ_{max} 264 nm; ε 17000; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Metabolically resistant activator of protein kinase A (cyclic AMP agonist). No metabolic side effects as observed with dibutyryl-cAMP or 8-Br-cAMP. Significantly more lipophilic and membrane-permeant compared to Sp-cAMPS (Cat. No. A 003). Detailed technical information and updated reference list available. References: Schaap et al., *J. Biol. Chem.*, **268**, 6323 - 6331 (1993); Sandnes et al., *Pharmacol. Toxicol.*, **79**, 15 - 22 (1996).

5 µmol / ~2.2 mg € 104.- (B 002 - 05)	5 x 5 µmol € 389.- (B 002 - 25)	**Inquiries for bulk quantities welcome!**

B 029



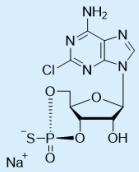
8- Bromoadenosine- 3', 5'- cyclic monophosphorothioate, acetoxymethyl ester, Sp-isomer (Sp-8-Br-cAMPS-AM)

$C_{13}H_{15}BrN_5O_7PS$; MW 496.2; λ_{max} 264 nm; ε 17000; purity > 97% HPLC for mixture of isomers.
Membrane-permeant precursor of the PDE-resistant protein kinase A activator Sp-8-Br-cAMPS (Cat. No. B 002). Metabolic bioactivation by esterases releases the active analogue, which is trapped inside the cell. Chemical hydrolysis can produce some 8-Br-cAMP as well. Detailed technical information available. Compare: Maronde et al., *J. Pineal Res.*, **31**, 183 - 185 (2001).

Control reagent for nucleotide AM-ester applications: PO_4-AM_3, Cat. No. P 030, p. 68

1 µmol / ~0.5 mg € 101.- (B 029 - 01)	5 x 1 µmol € 430.- (B 029 - 05)

C 074

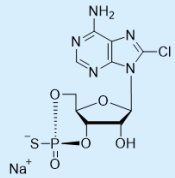


2- Chloroadenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-2-Cl-cAMPS)

[124854-63-3]; $C_{10}H_{10}ClN_5O_5PS \cdot Na$; MW 401.7; λ_{max} 262 nm; ε 14300; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Analogue of the protein kinase A activator Sp-cAMPS (Cat. No. A 003) with increased lipophilicity and phosphodiesterase stability. The halogen in position 2 of the adenine nucleobase can be used for various substitutions including spacers and labels. Detailed technical information available. References: Yokozaki et al., *Cancer Res.*, **52**, 2504 - 2508 (1992); Ruchaud et al., *Cell. Pharmacol.*, **2**, 127 - 140 (1995).

5 µmol / ~2 mg € 194.- (C 074 - 05)	5 x 5 µmol € 823.- (C 074 - 25)

C 004



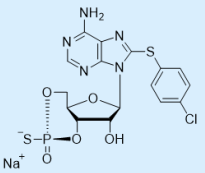
8- Chloroadenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-Cl-cAMPS)

[142754-28-7]; $C_{10}H_{10}ClN_5O_5PS \cdot Na$; MW 401.7; λ_{max} 262 nm; ε 17000; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Metabolically resistant activator of protein kinase A (cyclic AMP agonist). No metabolic side effects as observed with 8-Cl-cAMP (Cat. No. C 007) and significantly more lipophilic and membrane-permeant. Detailed technical information and updated reference list available. References: Yokozaki et al., *Cancer Res.*, **52**, 2504 - 2508 (1992); Beaver et al., *Nature Neurosci.*, **4**, 159 - 163 (2001).

5 µmol / ~2 mg € 109.- (C 004 - 05)	5 x 5 µmol € 408.- (C 004 - 25)

C 012

Fluorescence Grade

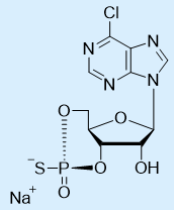


8- (4- Chlorophenylthio)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-CPT-cAMPS)

[129693-13-6]; $C_{16}H_{14}ClN_5O_5PS_2 \cdot Na$; MW 509.8; λ_{max} 282 nm; ε 16000; sodium salt; purity > 99% HPLC.
Specially purified quality, fluorescent impurities removed. Lipophilic site-selective activator of protein kinase A (cyclic AMP agonist). Resistant against mammalian cyclic nucleotide-dependent phosphodiesterases, no metabolic side effects. Highly membrane-permeant. Detailed technical information and updated reference list available. References: Dostmann et al., *J. Biol. Chem.*, **265**, 10484 - 10491 (1990); Linden & Ahn, *J. Neurosci.*, **19**, 10221 - 10227 (1999); O'Neill et al., *Science*, **320**, 949 - 953 (2008).

5 µmol / ~2.5 mg € 157.- (C 012 - 05)	5 x 5 µmol € 670.- (C 012 - 25)

C 083

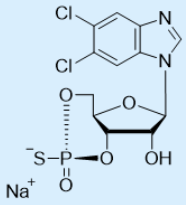


6- Chloropurine riboside- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-6-Cl-cPuMPS)

[129693-12-5]; $C_{10}H_9ClN_4O_5PS \cdot Na$; MW 386.7; λ_{max} 263 nm; ε 8900; sodium salt; purity > 98% HPLC.
PDE-resistant activator of protein kinase A (cyclic AMP agonist) with reactive functional group allowing further chemical modifications. Significantly more lipophilic and membrane-permeant compared to Sp-cAMPS (Cat. No. A 003). Detailed technical information and updated reference list available. References: Dostmann et al., *J. Biol. Chem.*, **265**, 10484 - 10491 (1990); Schaap et al., *J. Biol. Chem.*, **268**, 6323 – 6331 (1993); Ruchaud et al., *Cell. Pharmacol.*, **2**, 127 - 140 (1995).

5 µmol / ~1.9 mg € 181.- (C 083 - 05)	5 x 5 µmol € 770.- (C 083 - 25)

D 014

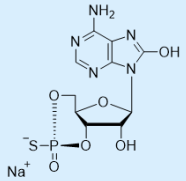


5, 6- Dichloro-1- β- D- ribofuranosylbenzimidazole- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-5,6-DCl-cBIMPS)

[120912-54-1]; $C_{12}H_{10}Cl_2N_2O_5PS \cdot Na$; MW 419.2; λ_{max} 254 nm; ε 6400; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Potent site-selective activator of cAMP-dependent protein kinases especially suitable for intact cells showing preference for site B of type II isozyme. Completely stable against mammalian PDE types I & III and only extremely slowly hydrolized by cPDE type II. Surpasses the widely used but problematic dibutyryl cAMP or 8-CPT-cAMP in terms of metabolic stability, membrane permeability and potency. The corresponding Rp-isomer is available as well (Cat. No. D 013). Detailed technical information and updated reference list available. References: Sandberg et al., *Biochemistry*, **279**, 521 - 527 (1991); Maronde et al., *J. Pineal Res.*, **27**, 170 - 182 (1999); Poppe et al., *Nature Methods*, **5**, 277 - 278 (2008).

5 µmol / ~2.1 mg € 124.- (D 014 - 05)	5 x 5 µmol € 434.- (D 014 - 25)

H 005

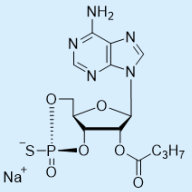


8- Hydroxyadenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-OH-cAMPS)

[749843-87-6]; $C_{10}H_{11}N_5O_6PS{\cdot}Na$; MW 383.3; λ_{max} 268 nm; ε 11000; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Polar, membrane-impermeant analogue of the protein kinase A activator Sp-cAMPS (Cat. No. A 003), e.g. for the study of extracellular cAMP receptors. If applied by patch clamp techniques, Sp-8-OH-cAMPS should remain trapped inside the cell. Highly resistant against mammalian cyclic nucleotide-dependent phosphodiesterases. Detailed technical information available. Reference: Otmakhov & Lisman, *J. Neurophysiol.*, **87**, 3018 - 3032 (2002).

5 µmol / ~1.9 mg € 116.- (H 005 - 05)	5 x 5 µmol € 494.- (H 005 - 25)

M 005

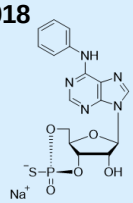


2'- O- Monobutyryladenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-2'-O-MB-cAMPS)

[152218-23-0]; $C_{14}H_{17}N_5O_6PS{\cdot}Na$; MW 437.4; λ_{max} 259 nm; ε 15200; sodium salt; purity > 97% HPLC.
For other salt forms please inquire. Sp-2'-O-MB-cAMPS is a lipophilic precursor of Sp-cAMPS (Cat. No. A 003), a PDE-resistant activator of protein kinase A. During metabolic activation by esterases Sp-cAMPS and butyrate are released. **Caution:** Butyrate was shown to have distinct biological effects! Significantly more lipophilic and membrane-permeant compared to Sp-cAMPS. Detailed technical information available. References: Hügl et al., *J. Biol. Chem.*, **273**, 17771 - 17779 (1998); Ouyang et al., *Proc. Natl. Acad. Sci. USA*, **105**, 11993 - 11997 (2008).

5 µmol / ~2.2 mg € 124.- (M 005 - 05)	5 x 5 µmol € 527.- (M 005 - 25)

P 018

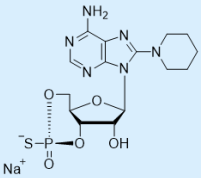


N^6- Phenyladenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-6-Phe-cAMPS)

[169335-92-6]; $C_{16}H_{15}N_5O_5PS{\cdot}Na$; MW 443.4; λ_{max} 288 nm; ε 20800; sodium salt; purity > 98% HPLC.
PDE-resistant form of 6-Phe-cAMP (Cat. No. P 006), a potent site-selective, membrane-permeant activator of protein kinase A. Sp-6-Phe-cAMPS does not activate Epac and thus can be used as an Epac-negative control. For more details on site selectivity please inquire. Detailed technical information available. References: Gjertsen et al., *J. Biol. Chem.*, **270**, 20599 - 20607 (1995); Ouyang et al., *Proc. Natl. Acad. Sci. USA*, **105**, 11993 - 11997 (2008).

5 µmol / ~2.2 mg € 142.- (P 018 - 05)	5 x 5 µmol € 600.- (P 018 - 25)

P 005



8- Piperidinoadenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-PIP-cAMPS)

[156816-35-2]; $C_{15}H_{20}N_6O_5PS{\cdot}Na$; MW 450.4; λ_{max} 273 nm; ε 15000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Lipophilic site-selective cyclic AMP analogue with extremely high selectivity for site B of protein kinase A type II. Acts synergistically with site A activating analogues for selective activation of type II. Metabolically stable and good membrane permeability. Detailed technical information and updated reference list available. Reference: Øgreid et al., *Eur. J. Biochem.*, **221**, 1089 - 1094 (1994).

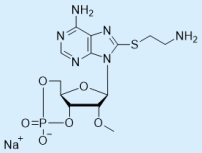
5 µmol / ~2.3 mg € 101.- (P 005 - 05)	5 x 5 µmol € 430.- (P 005 - 25)

Inquire	We are constantly synthesizing new PDE-resistant activators of protein kinase A isozymes (Sp-cAMPS analogues)! Please inquire regarding special structures not listed here, or check out our website (www.biolog.de). Custom syntheses and purifications are offered.

Specific Epac Activators, negative Controls, Inhibitors and Affinity Gels

Specific Epac Activators

A 142



8- (2- Aminoethylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-AET-2'-O-Me-cAMP)

[634207-89-9]; $C_{13}H_{18}N_6O_6PS{\cdot}Na$; MW 440.4; λ_{max} 279 nm; ε 17000; sodium salt; purity > 98% HPLC.
8-AET-2'-O-Me-cAMP has only poor affinity towards protein kinases A and G and is thus suitable as a ligand in affinity chromatography of cAMP binding proteins that do not require an intact 2'-OH group, such as the exchange protein activated by cyclic AMP (Epac) and certain phosphodiesterases, and for conjugation with fluorophores, etc.. Detailed technical information available. For reference please compare: Borland et al., *Mol. Pharmacol.*, **69**, 374 - 384 (2006).

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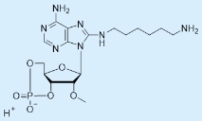
5 µmol / ~2.2 mg € 164.- (A 142 - 05)	5 x 5 µmol € 692.- (A 142 - 25)

A 099



8- (6- Aminohexylamino)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-AHA-2'-O-Me-cAMP)

$C_{17}H_{28}N_7O_6P$; MW 457.4; λ_{max} 273 nm; ε 17000; free acid; purity > 98% HPLC.
8-AHA-2'-O-Me-cAMP has only poor affinity towards protein kinases A and G and is thus suitable as a ligand in affinity chromatography of cAMP binding proteins that do not require an intact 2'-OH group, such as the exchange protein activated by cyclic AMP (Epac) and certain phosphodiesterases, and for conjugation with fluorophores, etc.. Detailed technical information available. Reference: Borland et al., *Mol. Pharmacol.*, **69**, 374 - 384 (2006).

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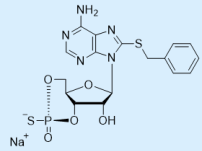
5 µmol / ~2.3 mg € 164.- (A 099 - 05)	5 x 5 µmol € 692.- (A 099 - 25)

B 046



8- Benzylthioadenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-BnT-cAMPS / "S-220")

$C_{17}H_{17}N_5O_5PS_2{\cdot}Na$; MW 489.5; λ_{max} 283 nm; ε 17100; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. According to Schwede et al. (2015), Sp-8-BnT-cAMPS potently and selectively activates Epac2 over Epac1 both in vitro and in vivo (in vitro AC_{50} Epac2 = 0.1 µM (1.8 µM for cAMP) and rel. k_{max} = 7.7 (1 for cAMP)). At concentrations of 25 to 100 µM, it potentiates glucose-induced insulin secretion from primary human islets. Sp-8-BnT-cAMPS has reduced potency to activate PKA. Detailed technical information available. Reference: Schwede et al., *PLoS Biol.*, **13**(1): e1002038 (2015) (Link to PLoS Biology).

Related products: Biolog also offers Sp-8-BnT-2'-O-Me-cAMPS (Cat. No. B 056 / "S-223") which has reduced potency compared to Sp-8-BnT-cAMPS, but efficiently discriminates against PKA, as well as the well-established Epac agonist 8-pCPT-2'-O-Me-cAMP (Cat. No. C 041) which selectively activates Epac1 over Epac2 (Schwede et al. 2015).

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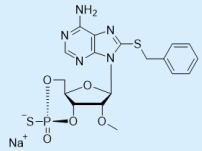
5 µmol / ~2.4 mg € 194.- (B 046 - 05)	5 x 5 µmol € 823.- (B 046 - 25)

B 056



8- Benzylthio- 2'- O- methyladenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-BnT-2'-O-Me-cAMPS / "S-223")

$C_{18}H_{19}N_5O_5PS_2{\cdot}Na$; MW 503.5; λ_{max} 283 nm; ε 17100; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. According to Schwede et al. (2015), Sp-8-BnT-2'-O-Me-cAMPS is the most potent 2'-substituted activator of Epac2 that efficiently discriminates against Epac1 in vitro (AC_{50} Epac2 = 1.5 µM (1.8 µM for cAMP) and rel. k_{max} = 4.3 (1 for cAMP)). Due to the 2'-substitution it is an extremely poor PKA activator and thus allows for specific activation of Epac2 over PKA. In human osteosarcoma U2OS cell lines stably expressing Epac1 or Epac2, Sp-8-BnT-2'-O-Me-cAMPS does not induce Epac signalling at 100 µM, which may be due to inefficient cellular uptake in this biosystem. Detailed technical information available. Reference: Schwede et al., *PLoS Biol.*, **13**(1): e1002038 (2015) (Link to PLoS Biology).

Related products: Biolog also offers Sp-8-BnT-cAMPS (Cat. No. B 046 / "S-220") which has increased in vitro and in vivo potency compared to Sp-8-BnT-2'-O-Me-cAMPS, but slight potency to activate PKA, as well as the well-established Epac agonist 8-pCPT-2'-O-Me-cAMP (Cat. No. C 041) which selectively activates Epac1 over Epac2 (Schwede et al. 2015).

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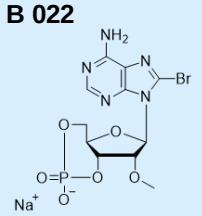
1 µmol / ~0.5 mg € 169.- (B 056 - 01)	5 x 1 µmol € 716.- (B 056 - 05)

B 022



8- Bromo- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-Br-2'-O-Me-cAMP)

[612513-13-0]; $C_{11}H_{12}BrN_5O_6P{\cdot}Na$; MW 444.1; λ_{max} 264 nm; ε 17000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Specific activator of the exchange protein activated by cyclic AMP (Epac) or cAMP-GEF, respectively, while protein kinase A is not affected. Suitable for direct comparison with common 8-Br-cAMP, which activates both, PKA and Epac. Detailed technical information and updated reference list available. References: Christensen et al., *J. Biol. Chem.*, **278**, 35394 - 35402 (2003); Traver et al., *Mol. Pharmacol.*, **70**, 30 - 40 (2006).

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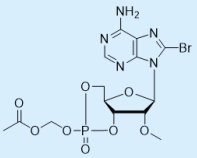
5 µmol / ~2.2 mg € 124.- (B 022 - 05)	5 x 5 µmol € 527.- (B 022 - 25)

B 028



8- Bromo- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (8-Br-2'-O-Me-cAMP-AM)

$C_{14}H_{17}BrN_5O_8P$; MW 494.2; λ_{max} 264 nm; ε 17000; purity > 97% HPLC for mixture of isomers. Extremely membrane-permeant precursor of the specific Epac agonist 8-Br-2'-O-Me-cAMP (Cat. No. B 022, above). After permeation and metabolic activation by esterases the active compound is released. Detailed technical information available. Reference: Börner et al., *Nat. Protoc.*, **6**, 427 - 438 (2011). The control reagent (PO_4-AM_3, Cat. No. P 030) is recommended.

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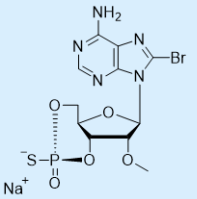
1 µmol / ~0.5 mg € 136.- (B 028 - 01)	5 x 1 µmol € 578.- (B 028 - 05)

B 031



8- Bromo- 2'- O- methyladenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-Br-2'-O-Me-cAMPS)

[634208-34-7]; $C_{11}H_{12}BrN_5O_5PS \cdot Na$; MW 460.2; λ_{max} 264 nm; ε 17000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Hydrolysis-resistant form of 8-Br-2'-O-Me-cAMP (Cat. No. B 022, above), which is a specific membrane-permeant activator of the exchange protein directly activated by cyclic AMP (Epac) or cAMP-GEF, respectively. Detailed technical information available. References for 8-Br-2'-O-Me-cAMP: Christensen et al., *J. Biol. Chem.*, **278**, 35394 - 35402 (2003); Traver et al., *Mol. Pharmacol.*, **70**, 30 - 40 (2006).

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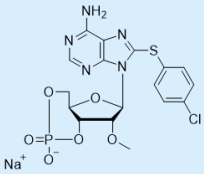
1 µmol / ~0.5 mg € 169.- (B 031 - 01)	5 x 1 µmol € 716.- (B 031 - 05)

C 041



8- (4- Chlorophenylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-pCPT-2'-O-Me-cAMP / 8-CPT-2'-O-Me-cAMP / "007")

[634207-53-7]; $C_{17}H_{16}ClN_5O_6PS \cdot Na$; MW 507.8; λ_{max} 282 nm; ε 16000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Specific activator of the exchange protein activated by cyclic AMP (Epac) or cAMP-GEF, respectively, which does not activate protein kinase A. High lipophilicity and membrane permeability, as well as increased PDE stability. Detailed technical information and updated references available. Metabolites are offered as well (Cat. No. C 069, Cat. No. C 070, inquire). References: Enserink et al., *Nature Cell Biol.*, **4**, 901 - 906 (2002); Kang et al., *J. Biol. Chem.*, **278**, 8279 - 8285 (2003); Christensen et al., *J. Biol. Chem.*, **278**, 35394 - 35402 (2003).

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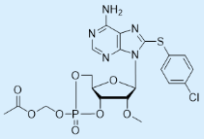
5 µmol / ~2.5 mg € 136.- (C 041 - 05)	5 x 5 µmol € 578.- (C 041 - 25)	**Inquiries for bulk quantities welcome!**

C 051



8- (4- Chlorophenylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (8-pCPT-2'-O-Me-cAMP-AM / 8-CPT-2'-O-Me-cAMP-AM)

[1152197-23-3]; $C_{20}H_{21}ClN_5O_8PS$; MW 557.9; λ_{max} 282 nm; ε 16000; purity > 97% HPLC for mixture of isomers. Extremely membrane-permeant precursor of the specific Epac agonist 8-CPT-2'-O-Me-cAMP (Cat. No. C 041). After permeation and metabolic activation by esterases the active compound is released. Detailed technical information available. References: Vliem et al., *ChemBioChem*, **9**, 2052 - 2054 (2008); Chepurny et al., *J. Biol. Chem.*, **284**, 10728 - 10736 (2009); Chepurny et al., *Am. J.Physiol.*, **298**, E622 - E633 (2010).
Biolog also offers phosphate tris(acetoxymethyl)ester (PO_4-AM_3, Cat. No. P 030) which is recommended as control reagent in nucleotide-AM ester applications.

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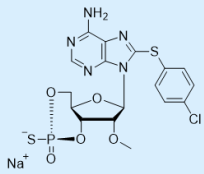
1 µmol / ~0.6 mg € 136.- (C 051 - 01)	5 x 1 µmol € 578.- (C 051 - 05)

C 052



8- (4- Chlorophenylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-pCPT-2'-O-Me-cAMPS / Sp-8-CPT-2'-O-Me-cAMPS)

[634208-37-0]; $C_{17}H_{16}ClN_5O_5PS_2 \cdot Na$; MW 523.9; λ_{max} 282 nm; ε 16000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Hydrolysis-resistant form of 8-pCPT-2'-O-Me-cAMP (Cat. No. C 041), a specific activator of the exchange protein directly activated by cyclic AMP (Epac) or cAMP-GEF, respectively. The compound does not activate protein kinase A, has high lipophilicity and membrane permeability and is not metabolized by phosphodiesterases. Detailed technical information available. References: Laxman et al., *Proc. Natl. Acad. Sci. USA*, **103**, 19194 - 19199 (2006); Ouyang et al., *Proc. Natl. Acad. Sci. USA*, **105**, 11993 - 11997 (2008).

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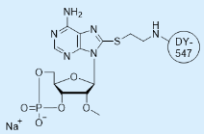
1 µmol / ~0.5 mg € 169.- (C 052 - 01)	5 x 1 µmol € 716.- (C 052 - 05)

D 089



8- (2- [DY-547]- aminoethylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-[DY-547]-AET-2'-O-Me-cAMP)

$C_{43}H_{51}N_8O_{13}PS_2 \cdot Na_2$; MW 1061.1; λ_{max} 559 nm; ε 150000 (EtOH); sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Fluorescent activator of the exchange protein directly activated by cyclic AMP (Epac) or cAMP-GEF, respectively, which does not activate PKA (λ_{exc} 557 nm, λ_{em} 574 nm). Detailed technical information available.

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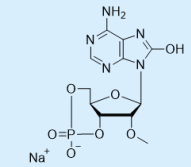
0.1 µmol / ~0.1 mg € 185.- (D 089 - 001)	5 x 0.1 µmol € 786.- (D 089 - 005)

H 013



8- Hydroxy- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-OH-2'-O-Me-cAMP)

$C_{11}H_{13}N_5O_7P{\cdot}Na$; MW 381.2; λ_{max} 268 nm; ε 11000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Specific activator of the exchange protein activated by cyclic AMP (Epac) or cAMP-GEF, respectively, which does not activate protein kinase A. Due to its low lipophilicity and membrane permeability, 8-OH-2'-O-Me-cAMP can be used in patch clamp applications. Detailed technical information available.

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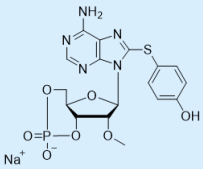
5 µmol / ~1.9 mg € 136.- (H 013 - 05)	5 x 5 µmol € 578.- (H 013 - 25)

H 010



8- (4- Hydroxyphenylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-pHPT-2'-O-Me-cAMP)

[612513-15-2]; $C_{17}H_{17}N_5O_7PS{\cdot}Na$; MW 489.4; λ_{max} 282 nm; ε 16000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Specific activator of the exchange protein activated by cyclic AMP (Epac) or cAMP-GEF, respectively, which does not activate protein kinase A. High lipophilicity and membrane permeability, as well as increased PDE stability. Detailed technical information and updated references available. References: Christensen et al., *J. Biol. Chem.*, **278**, 35394 - 35402 (2003); Holz et al., *J. Physiol.*, **577**, 5 - 15 (2006).

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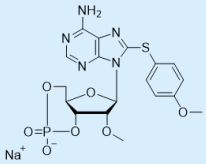
5 µmol / ~2.4 mg € 136.- (H 010 - 05)	5 x 5 µmol € 578.- (H 010 - 25)

M 034



8- (4- Methoxyphenylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-pMeOPT-2'-O-Me-cAMP)

[612513-16-3]; $C_{18}H_{19}N_5O_7PS{\cdot}Na$; MW 503.4; λ_{max} 282 nm; ε 16000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Very potent and specific activator of the exchange protein activated by cyclic AMP (Epac) or cAMP-GEF, respectively, which does not activate protein kinase A. High lipophilicity and membrane permeability, as well as increased PDE stability. Detailed technical information and updated references available. A potential metabolite of 8-pMeOPT-2'-O-Me-cAMP is offered as well (Cat. No. M 061, inquire). References: Christensen et al., *J. Biol. Chem.*, **278**, 35394 - 35402 (2003); Holz et al., *J. Physiol.*, **577**, 5 - 15 (2006).

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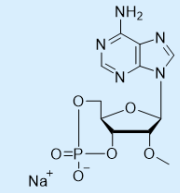
5 µmol / ~2.5 mg € 136.- (M 034 - 05)	5 x 5 µmol € 578.- (M 034 - 25)

M 050

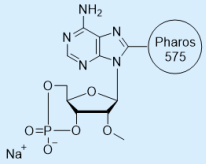


2'- O- Methyladenosine- 3', 5'- cyclic monophosphate (2'-O-Me-cAMP)

[40269-29-2]; $C_{11}H_{13}N_5O_6P{\cdot}Na$; MW 365.2; λ_{max} 259 nm; ε 15000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Relatively polar analogue of cyclic AMP which does not activate protein kinase A. Suitable for Epac activation by patch clamp application techniques and for receptor mapping studies. The structurally related cGMP-based analogue 2'-O-Me-cGMP is offered as well (Cat. No. M 036). Detailed technical information available. Reference: Kang et. al., *J. Physiol.*, **573**, 595 - 609 (2006).

5 µmol / ~1.8 mg € 80.- (M 050 - 05)	5 x 5 µmol € 338.- (M 050 - 25)	**Inquiries for bulk quantities welcome!**

P 021
Membrane-permeant !



8- [Pharos-575]- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-[φ-575]-2'-O-Me-cAMP)

Sodium salt; purity > 98% HPLC; λ_{max} 575 nm; ε 20960. For other salt forms please inquire.
The EPAC activator 2'-O-Me-cAMP connected to the relatively small Pharos 575 dye (λ_{exc} 577 nm, λ_{em} 605 nm). The fluorophore can be excited e.g. by a Kr/Ar-laser. Due to its high lipophilicity and bright red fluorescence, 8-[φ-575]-2'-O-Me-cAMP is especially suitable for studies with intact cells. Detailed technical information available. For reference compare: Moll et al., *BMC Biochemistry*, **9**:18 (2008).

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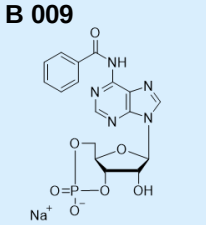
0.1 µmol / ~74 µg € 238.- (P 021 - 001)	5 x 0.1 µmol € 998.- (P 021 - 005)

PKA- selective agonists that do not activate Epac & Epac- negative Controls

B 009

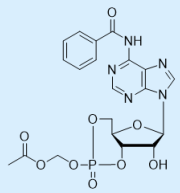


N^6- Benzoyladenosine- 3', 5'- cyclic monophosphate (6-Bnz-cAMP)

[30275-80-0]; $C_{17}H_{15}N_5O_7P{\cdot}Na$; MW 455.3; λ_{max} 279 nm; ε 19700; sodium salt; purity > 98% HPLC.
For other salt forms or metabolites of 6-Bnz-cAMP please inquire. Site-selective and membrane-permeant activator of cAMP-dependent protein kinase. 6-Bnz-cAMP does not activate Epac and thus can be used as an Epac-negative control. For more details on site selectivity please see p. 14. Detailed technical information and updated reference list available. References: Christensen et al., *J. Biol. Chem.*, **278**, 35394 - 35402 (2003); Bos, *Trends Biochem. Sci.*, **31**, 680 - 686 (2006).

10 µmol / ~4.6 mg € 80.- (B 009 - 10)	5 x 10 µmol € 338.- (B 009 - 50)	**Inquiries for bulk quantities welcome!**

B 079



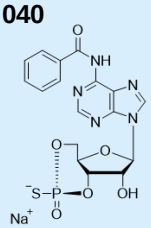
N^6- Benzoyladenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (6-Bnz-cAMP-AM)

$C_{20}H_{20}N_5O_9P$; MW 505.4; λ_{max} 279 nm; ε 17000; purity > 97% HPLC for mixture of isomers.
Extremely membrane-permeant precursor of the specific PKA agonist 6-Bnz-cAMP (Cat. No. B 009, above). After permeation and metabolic activation by esterases the active compound is released. 6-Bnz-cAMP-AM does not activate Epac and thus can be used as an Epac-negative control. Reference: Leech et al., *Islets*, **2**, 72 - 81 (2010).

Control reagent for nucleotide AM-ester applications: PO_4-AM_3, Cat. No. P 030

1 µmol / ~0.5 mg € 101.- (B 079 - 01)	5 x 1 µmol € 430.- (B 079 - 05)

B 040



N^6- Benzoyladenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-6-Bnz-cAMPS)

[152218-18-3]; $C_{17}H_{15}N_5O_6PS{\cdot}Na$; MW 471.4; λ_{max} 279 nm; ε 17000; sodium salt; purity > 98% HPLC.
Site-selective, PDE-resistant and membrane-permeant activator of cAMP-dependent protein kinase. Sp-6-Bnz-cAMPS does not activate Epac and thus can be used as an Epac-negative control. For more details on site selectivity please inquire. Detailed technical information available. Reference: Lim et al., *Neurosci. Lett.*, **479**, 13 - 17 (2010).

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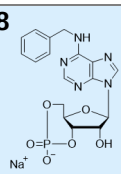
5 µmol / ~2.4 mg € 164.- (B 040 - 05)	5 x 5 µmol € 692.- (B 040 - 25)

B 008

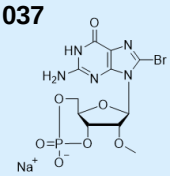


N^6- Benzyladenosine- 3', 5'- cyclic monophosphate (6-Bn-cAMP)

[32115-08-5]; $C_{17}H_{17}N_5O_6P{\cdot}Na$; MW 441.3; λ_{max} 268 nm; ε 20500; sodium salt; purity > 98% HPLC.
Site-selective activator of cAMP-dependent protein kinase which is considered not to activate Epac. Increased hydrolytic stability against PDE, esterases, amidases and considerably higher membrane permeability compared to cAMP. Detailed technical information and updated reference list available. Reference: Pepe et al., *Cancer Res.*, **51**, 6263 - 6267 (1991).

10 µmol / ~4.4 mg € 99.- (B 008 - 10)	5 x 10 µmol € 420.- (B 008 - 50)

B 037



8- Bromo- 2'- O- methylguanosine- 3', 5'- cyclic monophosphate (8-Br-2'-O-Me-cGMP)

$C_{11}H_{12}BrN_5O_7P{\cdot}Na$; MW 460.1; λ_{max} 260 nm; ε 15000; sodium salt; purity > 98% HPLC. For other salt forms please inquire. Analogue of cyclic GMP which does not activate both, protein kinase G and Epac. 8-Br-2'-O-Me-cGMP can be used as an inactive control versus 8-Br-cGMP (Cat. No. B 004). Detailed technical information available.

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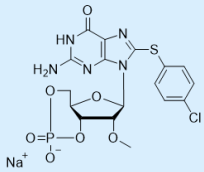
5 µmol / ~2.3 mg € 98.- (B 037 - 05)	5 x 5 µmol € 416.- (B 037 - 25)

C 048



8- (4- Chlorophenylthio)- 2'- O- methylguanosine- 3', 5'- cyclic monophosphate (8-pCPT-2'-O-Me-cGMP)

[625112-42-7]; $C_{17}H_{16}ClN_5O_7PS{\cdot}Na$; MW 523.8; λ_{max} 276 nm; ε 21500; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. The membrane-permeant 8-pCPT-2'-O-Me-cGMP neither activate protein kinase G nor Epac and can thus be used as a control. Characterized by high lipophilicity and membrane permeability, as well as increased PDE stability. Detailed technical information available. Reference: Haag et al., *Naunyn-Schmiedeberg's Arch. Pharmacol.*, **378**, 617 - 630 (2008).

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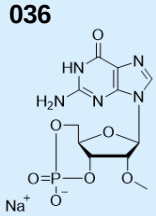
5 µmol / ~2.6 mg € 136.- (C 048 - 05)	5 x 5 µmol € 578.- (C 048 - 25)

M 036



2'- O- Methylguanosine- 3', 5'- cyclic monophosphate (2'-O-Me-cGMP)

[949909-73-3]; $C_{11}H_{13}N_5O_7P{\cdot}Na$; MW 381.2; λ_{max} 252 nm; ε 13500; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Relatively polar analogue of cyclic GMP which activates neither protein kinase G nor Epac. 2'-O-Me-cGMP can be used as an inactive control in patch clamp applications. Also suitable for receptor mapping studies. The structurally related cAMP-based analogue 2'-O-Me-cAMP is offered as well (Cat. No. M 050). Detailed technical information available. Reference: Kang et. al., *J. Physiol.*, **573**, 595 - 609 (2006).

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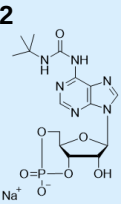
5 µmol / ~1.9 mg € 83.- (M 036 - 05)	5 x 5 µmol € 353.- (M 036 - 25)

M 012

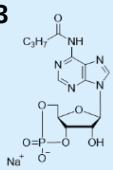


N^6- Mono- tert.- butylcarbamoyladenosine- 3', 5'- cyclic monophosphate (6-MBC-cAMP)

[84433-46-5]; $C_{15}H_{20}N_6O_7P{\cdot}Na$; MW 450.3; λ_{max} 268 nm; ε 23700; sodium salt; purity > 98% HPLC. For other salt forms please inquire. Site-selective activator of protein kinase A (cyclic AMP agonist) strongly preferring the A site of cAK II. Together with e.g. Sp-5,6-DCl-cBIMPS (Cat. No. D 014) selective stimulation of type II can be achieved. 6-MBC-cAMP is considered not to activate Epac. Detailed technical information and updated reference list available. References: Maronde et al., *J. Pineal Res.*, **27**, 170 - 182 (1999); Fricke et al., *Endocrinology*, **145**, 4940 - 4947 (2004).

5 µmol / ~2.3 mg € 65.- (M 012 - 05)	5 x 5 µmol € 277.- (M 012 - 25)

M 003

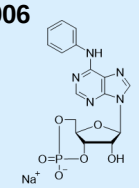


N^6- Monobutyryladenosine- 3', 5'- cyclic monophosphate (6-MB-cAMP)

[70253-67-7]; $C_{14}H_{17}N_5O_7P{\cdot}Na$; MW 421.3; λ_{max} 273 nm; ε 19000; sodium salt; purity > 97% HPLC. For other salt forms or metabolites please inquire. Membrane-permeant, site-selective activator of protein kinase A (cyclic AMP agonist). 6-MB-cAMP does not activate Epac and thus can be used as an Epac-negative control. Detailed technical information and selected references available. Reference: Kopperud et al., *FEBS Lett.*, **546**, 121 - 126 (2003).

50 µmol / ~21 mg € 62.- (M 003 - 50)	5 x 50 µmol € 264.- (M 003 - 250)

P 006

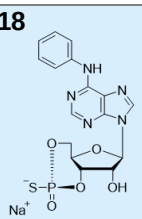


N^6- Phenyladenosine- 3', 5'- cyclic monophosphate (6-Phe-cAMP)

[34051-30-4]; $C_{16}H_{15}N_5O_6P{\cdot}Na$; MW 427.3; λ_{max} 288 nm; ε 20800; sodium salt; purity > 98% HPLC.
Potent site-selective and highly membrane-permeant activator of protein kinase A. 6-Phe-cAMP is considered not to activate Epac and thus can be used as an Epac-negative control. For more details on site selectivity please see p. 14. Detailed technical information and updated reference list available. Reference: Kloss et al., *Mol. Pharmacol.*, **65**, 1440 - 1451 (2004).

5 µmol / ~2.1 mg € 60.- (P 006 - 05)	5 x 5 µmol € 254.- (P 006 - 25)

P 018



N^6- Phenyladenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-6-Phe-cAMPS)

[169335-92-6]; $C_{16}H_{15}N_5O_5PS{\cdot}Na$; MW 443.4; λ_{max} 288 nm; ε 20800; sodium salt; purity > 98% HPLC.
Potent site-selective, highly membrane-permeant and PDE-resistant activator of protein kinase A. Sp-6-Phe-cAMPS does not activate Epac and thus can be used as an Epac-negative control. For more details on site selectivity please inquire. Detailed technical information available. References: Gjertsen et al., *J. Biol. Chem.*, **270**, 20599 - 20607 (1995); Ouyang et al., *Proc. Natl. Acad. Sci. USA*, **105**, 11993 - 11997 (2008).

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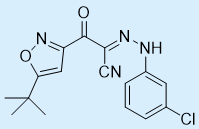
5 µmol / ~2.2 mg € 142.- (P 018 - 05)	5 x 5 µmol € 600.- (P 018 - 25)

Selective Epac Inhibitors

B 133



3- [5- (tert.- Butyl)isoxazol- 3- yl]- 2- [2- (3- chlorophenyl)hydrazono]- 3- oxopropanenitrile (ESI-09)

[263707-16-0]; $C_{16}H_{15}ClN_4O_2$; MW 330.8; λ_{max} 384 nm; ε 25300; purity > 95% HPLC.
Membrane-permeant inhibitor of Epac 1 and Epac 2. Detailed technical information available. Reference: Almahariq et al., *Mol. Pharmacol.*, **83**, 122 - 128 (2013).

Subject to patent application n° US 61/597,369 and foreign equivalents.
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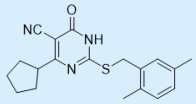
5 µmol / ~1.7 mg € 128.- (B 133 - 05)	5 x 5 µmol € 545.- (B 133 - 25)

C 136



4- Cyclopentyl- 2- (2, 5- dimethylbenzylsulfanyl)- 6- oxo- 1, 6- dihydropyrimidine- 5- carbonitrile (HJC0197)

[1383539-73-8]; $C_{19}H_{21}N_3OS$; MW 339.5; λ_{max} 304 nm; ε 14700; purity > 95% HPLC.
Membrane-permeant inhibitor of Epac 1 and Epac 2. Detailed technical information available. Reference: Chen et. al., *Bioorg. Med. Chem. Lett.*, **22**, 4038 - 4043 (2012).

Subject to patent application n° US 61/597,369 and foreign equivalents.
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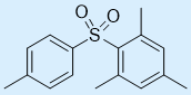
5 µmol / ~1.7 mg € 128.- (C 136 - 05)	5 x 5 µmol € 545.- (C 136 - 25)

M 092



4- Methylphenyl- 2, 4, 6- trimethylphenylsulfone (ESI-05)

[5184-64-5]; $C_{16}H_{18}O_2S$; MW 274.4; λ_{max} 244 nm; ε 19000; purity > 95% HPLC.
Membrane-permeant selective inhibitor of Epac 2. Detailed technical information available. Reference: Tsalkova et al., *Proc. Natl. Acad. Sci. USA*, **109**, 18613 - 18618 (2012).

Subject to patent application n° US 61/597,369 and foreign equivalents.
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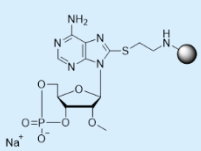
5 µmol / ~1.4 mg € 128.- (M 092 - 05)	5 x 5 µmol € 545.- (M 092 - 25)

Epac Affinity Gels

A 195



8- (2- Aminoethylthio)- 2'-O- methyladenosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (8-AET-2'-O-Me-cAMP-Agarose)

The second messenger cyclic AMP with a methylated ribose 2'-hydroxyl group immobilized on agarose by an aminoethylthio spacer attached to position 8 of the ligand. Considered to be suitable for affinity chromatography of various cAMP-responsive proteins, especially those which tolerate modification of the ribose 2'-hydroxyl group, such as the exchange protein activated by cyclic AMP (Epac) and certain phosphodiesterases. Detailed technical information available. Also available as free beads (without column).

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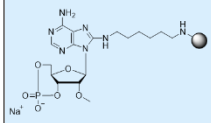
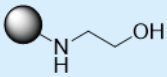
Columns:	0.6 ml € 186.- (A 195 - 06)	2.5 ml € 583.- (A 195 - 25)	6 ml € 1,134.- (A 195 - 60)

A 057 	**8- (6- Aminohexylamino)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (8-AHA-2'-O-Me-cAMP-Agarose)** cAMP with a methylated ribose 2'-hydroxy group immobilized on agarose by an aminohexylamino spacer attached to position 8 of the ligand. Suitable for affinity chromatography of various cAMP-responsive proteins, especially those which tolerate modification of the ribose 2'-hydroxy group, such as the exchange protein activated by cyclic AMP (Epac) and certain phosphodiesterases. Detailed technical information available. Reference: Borland et al., *Mol. Pharmacol.*, **69**, 374 - 384 (2006). Also available as free beads (without column). Protected by patent n° EP 02077219.0 and foreign equivalents, exclusively licensed to BIOLOG LSI for research purposes only		
Columns:	0.6 ml € 186.- (A 057 - 06)	2.5 ml € 583.- (A 057 - 25)	6 ml € 1,134.- (A 057 - 60)

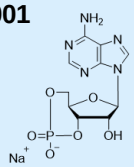
Inquire	**Special Epac-related analogues not listed** The product line of Epac-specific modulators will be extended. For structures not yet listed please inquire. An updated list of products will be published on our website (www.biolog.de).

Control for Affinity Chromatography Gels

E 010 	**Ethanolamine; immobilized on agarose gel (EtOH-NH-Agarose)** Agarose gel without nucleotide ligands, as negative control in affinity chromatography experiments. This agarose matrix is identical to the material used for the synthesis of the affinity gels listed above. The reactive groups on the bead surface normally used to immobilize the functionalized nucleotide, have been deactivated with ethanolamine. Reference: Antl et al., *Blood*, **109**, 552 - 559 (2007); Hammerschmidt et al., *PLoS One* **7**(7): e39848 (2012).		
Columns:	0.6 ml € 82.- (E 010 - 06)	2.5 ml € 255.- (E 010 - 25)	6 ml € 513.- (E 010 - 60)

Activators of Protein Kinase A

A 001

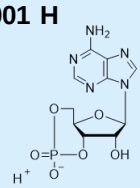


Adenosine- 3', 5'- cyclic monophosphate (cAMP)

[37839-81-9]; $C_{10}H_{11}N_5O_6P{\cdot}Na$; MW 351.2; λ_{max} 259 nm; ε 15000; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. The second messenger cyclic AMP activates protein kinase A, cAMP-gated ion channels, HCN channels, the Epac receptor (cAMP-GEF), the CAP protein and some other target receptors. It is metabolized rapidly by cyclic nucleotide-dependent phosphodiesterases. Detailed technical information available.

500 µmol / ~176 mg € 49.- (A 001 - 500)	5 x 500 µmol € 208.- (A 001 - 2500)	**Inquiries for bulk quantities welcome!**

A 001 H

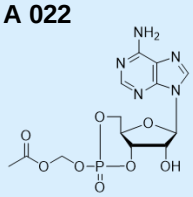


Adenosine- 3', 5'- cyclic monophosphate (cAMP)

[60-92-4]; $C_{10}H_{12}N_5O_6P$; MW 329.2; λ_{max} 259 nm; ε 15000.
Free acid form with decreased solubility in aqueous systems; purity > 99% HPLC. Suitable for preparation of lipophilic salt forms. The second messenger cyclic AMP activates protein kinase A, cAMP-gated ion channels, HCN channels, the Epac receptor (cAMP-GEF), the CAP protein and some other target receptors. It is metabolized rapidly by cyclic nucleotide-dependent phosphodiesterases. Detailed technical information available.

500 mg / ~1.5 mmol € 47.- (A 001 - 500 H)	5 x 500 mg € 198.- (A 001 - 2500 H)	**Inquiries for bulk quantities welcome!**

A 022



Adenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (cAMP-AM)

[159764-93-9]; $C_{13}H_{16}N_5O_8P$; MW 401.3; λ_{max} 259 nm; ε 15000; purity > 97% HPLC for mixture of isomers.
Highly membrane-permeant precursor of the second messenger cyclic AMP. After permeation and metabolic activation by esterases the polar cAMP is released which is trapped inside the cell and subsequently metabolized quickly, resulting in a pulse-type signal. Detailed technical information and updated reference list available. Reference: Schultz et al., *J. Biol. Chem.*, **268**, 6316 - 6322 (1993).

Control reagent for nucleotide AM-ester applications: PO_4-AM_3, Cat. No. P 030

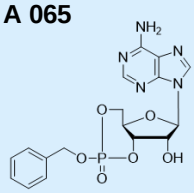
1 µmol / ~0.4 mg € 80.- (A 022 - 01)	5 x 1 µmol € 337.- (A 022 - 05)

A 076

ara-Adenosine- 3', 5'- cyclic monophosphate (*ara*-cAMP)

Please refer to "Special Task Cyclic Nucleotides", p. 49.

A 065



Adenosine- 3', 5'- cyclic monophosphate, benzyl ester (cAMP-Bn)

[62742-71-6]; $C_{17}H_{18}N_5O_6P$; MW 419.3; λ_{max} 259 nm; ε 15000; purity > 95% HPLC for mixture of isomers.
Highly membrane-permeant precursor of the second messenger cyclic AMP. Hydrolysis slowly releases the polar cAMP which is trapped inside the cell and subsequently metabolized, resulting in an elevated cAMP level for a prolonged period. Detailed technical information and updated reference list available. Reference: Engels et al., *J. Med. Chem.*, **20**, 907 - 911 (1977).

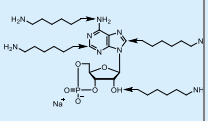
1 µmol / ~0.4 mg € 90.- (A 065 - 01)	5 x 1 µmol € 383.- (A 065 - 05)

A 023

Adenosine- 1- N- oxide- 3', 5'- cyclic monophosphate (1-NO-cAMP)

[75912-25-3]; $C_{10}H_{11}N_5O_7P{\cdot}Na$; MW 367.2; λ_{max} 231/260 nm; ε 10100/9500; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Polar cAMP analogue with modified N-1 moiety for receptor mapping studies. Detailed technical information available. References: Jastorff in *Cyclic Nucleotides and Therapeutic Perspectives*, Cehovic & Robison (eds.), pp. 85 - 95; Pergamon Press, Oxford/New York 1979; Jäger et al., *J. Biol. Chem.*, **287**, 1210 - 1219 (2012).

5 µmol / ~1.8 mg € 93.- (A 023 - 05)	5 x 5 µmol € 397.- (A 023 - 25)	**Inquiries for bulk quantities welcome!**

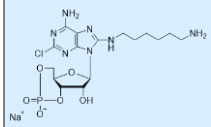


Adenosine- 3', 5'- cyclic monophosphate, functionalized with different aminoalkylamino spacers

We offer a selection of cyclic AMP analogues functionalized with aminoalkylamino and PEG-type spacers, respectively, of different lengths at adenine positions C-2, N^6, C-8 and at ribose 2' for immobilization on agarose or chip surfaces and for conjugation with biomarkers or fluorescent dyes.

Please refer to chapter "Precursors for Labelling and Immobilization", p. 54.

A 199

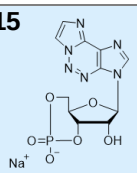


8- (6- Aminohexylamino)- 2- chloroadenosine- 3', 5'- cyclic monophosphate (8-AHA-2-Cl-cAMP)

$C_{16}H_{25}ClN_7O_6P$; MW 477.8; λ_{max} 281 nm; ε 17000; free acid; purity > 98% HPLC.
For other salt forms please inquire. Cyclic AMP analogue with high selectivity for site B I of PKA. Combined with AI-selective analogues such as 6-Bnz-8-PIP-cAMP (Cat. No. B 055) synergistic activation of PKA type I is achieved. Detailed technical information available. Reference: Huseby et al., *Cell Death Dis.*, e-pub, Dec 8;2:e237. doi: 10.1038/cddis.2011.124

5 µmol / ~2.4 mg € 164.- (A 199 - 05)	5 x 5 µmol € 692.- (A 199 - 25)

A 015

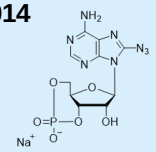


2- Aza- 1, N^6- ethenoadenosine- 3', 5'- cyclic monophosphate (2-Aza-ε-cAMP)

[50663-90-6]; $C_{11}H_{10}N_6O_6P{\cdot}Na$; MW 376.2; λ_{max} 290 nm; ε 5000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Fluorescent cAMP analogue (λ_{exc} 358 nm, λ_{em} 494 nm). Detailed technical information available. References: Tsou et al., *Anal. Biochem.*, **60**, 163 - 169 (1974); Kraemer et al., *J. Mol. Biol.*, **306**, 1167 - 1177 (2001).

5 µmol / ~1.9 mg € 105.- (A 015 - 05)	5 x 5 µmol € 443.- (A 015 - 25)

A 014

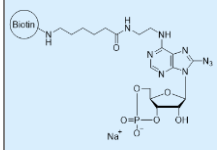


8- Azidoadenosine- 3', 5'- cyclic monophosphate (8-N_3-cAMP)

[31966-52-6]; $C_{10}H_{10}N_8O_6P{\cdot}Na$; MW 392.2; λ_{max} 281 nm; ε 13000 (pH 6). Soluble sodium salt; purity > 95% HPLC.
For other salt forms please inquire. Analogue for photoaffinity labelling of cAMP binding proteins. Detailed technical information available. Reference: Haley, *Methods Enzymol.*, **46**, 339 - 346 (1977).

10 µmol / ~3.9 mg € 63.- (A 014 - 10)	5 x 10 µmol € 269.- (A 014 - 50)	**Inquiries for bulk quantities welcome!**

A 127

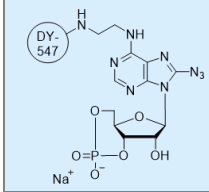


8- Azido- N^6- (2- [biotinyl]aminoethyl)adenosine- 3', 5'- cyclic monophosphate (8-N_3-6-[Biotin]-AE-cAMP)

$C_{28}H_{40}N_{12}O_9PS{\cdot}Na$; MW 774.7; λ_{max} 290 nm; ε 17000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Analogue for photoaffinity labelling of cAMP binding proteins which can be immobilized by UV light. The biotin label is connected to position 6 of cyclic AMP via a 10 atom spacer. Detailed technical information available.

0.1 µmol / ~80 µg € 152.- (A 127 - 001)	5 x 0.1 µmol € 647.- (A 127 - 005)

A 100

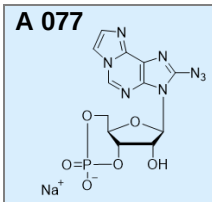


8- Azido- N^6- (2- [DY-547]- aminoethyl)adenosine- 3', 5'- cyclic monophosphate (8-N_3-6-[DY-547]-AE-cAMP)

$C_{42}H_{48}N_{11}O_{13}PS_2{\cdot}Na_2$; MW 1056.0; λ_{max} 559 nm; ε 150000 (EtOH); sodium salt; purity > 95% HPLC.
For other salt forms please inquire. 8-N_3-6-[DY-547]-AE-cAMP is a light sensitive analogue for photoaffinity labelling. It can be immobilized within a cyclic AMP binding site by illumination with UV light. The fluorescent reporter group connected to position 6 of the adenine nucleobase can be excited at 557 nm and emits with 574 nm. Detailed technical information available. Reference: Park et al., *Cell*, **148**, 421 - 433 (2012).

0.1 µmol / ~0.1 mg € 217.- (A 100 - 001)	5 x 0.1 µmol € 924.- (A 100 - 005)

A 077

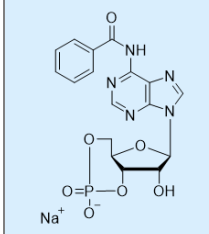


8- Azido- 1, N^6- ethenoadenosine- 3', 5'- cyclic monophosphate (8-N_3-ε-cAMP)

[60902-12-7]; $C_{12}H_{10}N_8O_6P{\cdot}Na$; MW 416.2; λ_{max} 237, 290 & 313 nm; ε 10000/290 nm; sodium salt; purity > 98% HPLC.
For other salt forms or metabolites please inquire. Nonfluorescent cAMP analogue, that can be used for labelling of cAMP receptors. Upon UV-light-induced immobilization the ethenoadenine moiety starts to fluoresce, providing a label for tracing the receptor protein. Detailed technical information available. References: Keeler & Campbell, *Biochem. Biophys. Res. Commun.*, **72**, 575 - 580 (1976); Dreyfuss et al., *Proc. Nat. Acad. Sci. USA*, **75**, 1199 - 1203 (1978).

1 µmol / ~0.4 mg € 164.- (A 077 - 01)	5 x 1 µmol € 692.- (A 077 - 05)

B 009

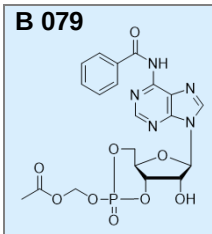


N^6- Benzoyladenosine- 3', 5'- cyclic monophosphate (6-Bnz-cAMP)

[30275-80-0]; $C_{17}H_{15}N_5O_7P{\cdot}Na$; MW 455.3; λ_{max} 279 nm; ε 19700; sodium salt; purity > 98% HPLC.
Membrane-permeant activator of protein kinase A which does not activate Epac. Increased metabolic stability. Selects the A sites of cAK I and II and thus can be used for synergistic activation of type II when combined with site B II- selective analogues such as Sp-8-CPT-cAMPS (Cat. No. C 012) or 8-PIP-cAMP (Cat. No. P 002). For preferential stimulation of cAK type I a combination with the site B I-selective analogue 2-Cl-8-HA-cAMP (Cat. No. C 071), 2-Cl-8-MA-cAMP (Cat. No. C 080) or 8-HA-cAMP (Cat. No. H 006) can be used. Detailed technical information and updated reference list available. Reference: Døskeland et al., *Biochim. Biophys. Acta*, **1178**, 249 - 258 (1993). The corresponding PDE-stable Sp-6-Bnz-cAMPS (Cat. No. B 040) is available as well.

10 µmol / ~4.6 mg € 80.- (B 009 - 10)	5 x 10 µmol € 338.- (B 009 - 50)	**Inquiries for bulk quantities welcome!**

B 079



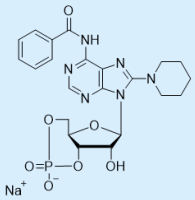
N^6- Benzoyladenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (6-Bnz-cAMP-AM)

$C_{20}H_{20}N_5O_9P$; MW 505.4; λ_{max} 279 nm; ε 17000; purity > 97% HPLC for mixture of isomers.
Extremely membrane-permeant precursor of the specific PKA agonist 6-Bnz-cAMP (Cat. No. B 009, above). After permeation and metabolic activation by esterases the active compound is released. 6-Bnz-cAMP-AM does not activate Epac and thus can be used as an Epac-negative control. Reference: Leech et al., *Islets*, **2**, 72 - 81 (2010).

Control reagent for nucleotide AM-ester applications: PO_4-AM_3, Cat. No. P 030, p. 68

1 µmol / ~0.5 mg € 101.- (B 079 - 01)	5 x 1 µmol € 430.- (B 079 - 05)

B 055

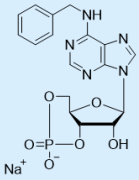


N^6- Benzoyl- 8- piperidinoadenosine- 3', 5'- cyclic monophosphate (6-Bnz-8-PIP-cAMP)

$C_{22}H_{26}N_6O_7P{\cdot}Na$; MW 540.4; λ_{max} 263 nm; ε 14000; sodium salt; purity > 98% HPLC.
Membrane-permeant activator of protein kinase A which does not activate Epac. Increased metabolic stability. Selects the A site of cAK I and thus can be used for synergistic activation when combined with the site B I-selective analogues 2-Cl-8-HA-cAMP (Cat. No. C 071), 2-Cl-8-AHA-cAMP (Cat. No. A 199), 2-Cl-8-MA-cAMP (Cat. No. C 080) or 8-HA-cAMP (Cat. No. H 006), for details please compare p. 14. Detailed technical information available. Reference: Huseby et al., *Cell Death Dis.*, e-pub, Dec 8;2:e237. doi: 10.1038/cddis.2011.124.

5 µmol / ~2.7 mg € 148.- (B 055 - 05)	5 x 5 µmol € 629.- (B 055 - 25)

B 008

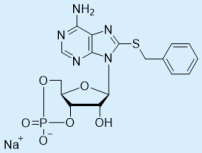


N^6- Benzyladenosine- 3', 5'- cyclic monophosphate (6-Bn-cAMP)

[32115-08-5]; $C_{17}H_{17}N_5O_6P{\cdot}Na$; MW 441.3; λ_{max} 268 nm; ε 20500; sodium salt; purity > 98% HPLC.
For other salt forms or metabolites of 6-Bn-cAMP please inquire. Site-selective activator of cAMP-dependent protein kinase which does not activate Epac. Increased hydrolytic stability against PDE, esterases, amidases and considerably higher membrane permeability compared to cAMP. Detailed technical information and updated reference list available. Reference: Pepe et al., *Cancer Res.*, **51**, 6263 - 6267 (1991).

10 µmol / ~4.4 mg € 99.- (B 008 - 10)	5 x 10 µmol € 420.- (B 008 - 50)

B 015

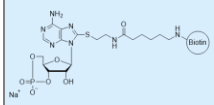


8- Benzylthioadenosine- 3', 5'- cyclic monophosphate (8-BT-cAMP)

[50655-17-9]; $C_{17}H_{17}N_5O_6PS{\cdot}Na$; MW 473.4; λ_{max} 283 nm; ε 17100; sodium salt; purity > 98% HPLC.
Site-selective activator of cAMP-dependent protein kinase. Increased hydrolytic stability against PDE and considerably higher membrane permeability compared to cAMP. Activates membrane excitability in peptidergic neurons. Detailed technical information and updated reference list available. Reference: Eskin, *J. Neurobiol.*, **13**, 241 - 249 (1982).

10 µmol / ~4.7 mg € 65.- (B 015 - 10)	5 x 10 µmol € 277.- (B 015 - 50)

B 030

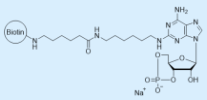


8- (2- [Biotinyl]aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-[Biotin]-AET-cAMP)

$C_{28}H_{41}N_9O_9PS_2{\cdot}Na$; MW 765.8; λ_{max} 280 nm; ε ~17000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. The biotin label is connected to the 8-position of cyclic AMP via an 11 atom spacer. Detailed technical information available.

1 µmol / ~0.8 mg € 135.- (B 030 - 01)	5 x 1 µmol € 572.- (B 030 - 05)

B 041

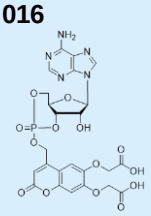


2- (6- [Biotinyl]aminohexylamino)adenosine- 3', 5'- cyclic monophosphate (2-[Biotin]-AHA-cAMP)

$C_{32}H_{50}N_{10}O_9PS{\cdot}Na$; MW 804.8; λ_{max} 258 nm; ε ~14000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. The biotin label is connected to the 2-position of cyclic AMP via a 15 atom spacer. Detailed technical information available.

1 µmol / ~0.8 mg € 207.- (B 041 - 01)	5 x 1 µmol € 878.- (B 041 - 05)

B 016



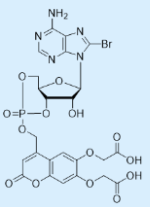
[6, 7- Bis(carboxymethoxy)coumarin- 4- yl]methyl- adenosine- 3', 5'- cyclic monophosphate (BCMCM-caged cAMP)

[339291-51-9]; $C_{24}H_{22}N_5O_{14}P$ x 2.5 H_2O; MW 680.5; λ_{max} 347 nm; ε 12400; purity > 98% HPLC.
Equatorial isomer. BCMCM-caged cAMP is an only weakly fluorescent, caged precursor of the second messenger cyclic AMP, which upon irradiation, releases both cAMP and a fluorescent coumarin analogue. Excellent solubility in water or buffers. Detailed technical information available. Reference: Hagen et al., *Angew. Chem. Int. Ed.*, **40**, 1045 - 1048 (2001).

Protected by patent DE 100 21 256.5 and foreign equivalents

0.1 µmol / ~68 µg temporarily discontinued (B 016 - 001)	5 x 0.1 µmol temporarily discontinued (B 016 - 005)

B 018



[6, 7- Bis(carboxymethoxy)coumarin- 4- yl]methyl- 8- bromoadenosine- 3', 5'- cyclic monophosphate (BCMCM-caged 8-Br-cAMP)

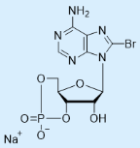
[370091-64-8]; $C_{24}H_{21}BrN_5O_{14}P$ x 2.5 H_2O; MW 759.4; λ_{max} 346 nm; ε 10300; purity > 98% HPLC.
Equatorial isomer. BCMCM-caged 8-Br-cAMP is an only weakly fluorescent, caged precursor of 8-bromo cyclic cAMP (Cat. No. B 007), which upon irradiation, releases both 8-Br-cAMP and a fluorescent coumarin analogue. Excellent solubility in water or buffers. Detailed technical information available. Reference: Hagen et al., *Angew. Chem. Int. Ed.*, **40**, 1045 - 1048 (2001).

Protected by patent DE 100 21 256.5 and foreign equivalents

0.1 µmol / ~76 µg € 71.- (B 018 - 001)	5 x 0.1 µmol € 305.- (B 018 - 005)

B 007

Fluorescence Grade

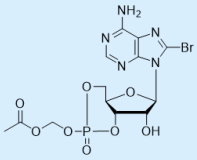


8- Bromoadenosine- 3', 5'- cyclic monophosphate (8-Br-cAMP)

[76939-46-3]; $C_{10}H_{10}BrN_5O_6P{\cdot}Na$; MW 430.1; λ_{max} 264 nm; ε 17000; sodium salt; purity > 99% HPLC.
Highly purified, typical fluorescent impurities removed. For other salt forms or metabolites of 8-Br-cAMP please inquire. Activator of cAMP-dependent protein kinase and of Epac. Increased hydrolytic stability and membrane permeability compared to cAMP. Detailed technical information and selected references available. Reference: Kroeber et al., *J. Neurochem.*, **74**, 2478 - 2489 (2000).

100 µmol / ~43 mg € 47.- (B 007 - 100)	5 x 100 µmol € 175.- (B 007 - 500)	**Inquiries for bulk quantities welcome!**

B 020



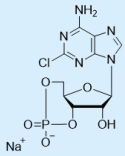
8- Bromoadenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (8-Br-cAMP-AM)

[190522-24-8]; $C_{13}H_{15}BrN_5O_8P$; MW 480.2; λ_{max} 264 nm; ε 17000; purity > 97% HPLC for mixture of isomers.
Highly membrane-permeant precursor of the PKA activator 8-Br-cAMP (Cat. No. B 007). Metabolic activation by esterases releases the more polar active analogue, which is trapped inside the cell. Detailed technical information available. References: Kruppa et al., *Bioorg. Med. Chem. Lett.*, **7**, 945 - 948 (1997); Krakstad et al., *J. Leukocyte Biol.*, **76**, 641 - 647 (2004); Moll et al., *J. Neural. Transm.*, **113**, 1015 - 1032 (2006).

Control reagent for nucleotide AM-ester applications: PO_4-AM_3, Cat. No. P 030

1 µmol / ~0.5 mg € 88.- (B 020 - 01)	5 x 1 µmol € 374.- (B 020 - 05)

C 020

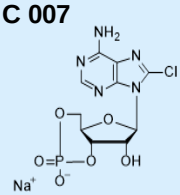


2- Chloroadenosine- 3', 5'- cyclic monophosphate (2-Cl-cAMP)

[39023-65-9]; $C_{10}H_{10}ClN_5O_6P{\cdot}Na$; MW 385.6; λ_{max} 262 nm; ε 14300; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Site-selective cyclic AMP analogue with high selectivity for the B sites of both protein kinase A type I and II. Detailed technical information and updated reference list available. References: Hoffmann et al., *Cell. Pharmacol.*, **3**, 417 - 427 (1996); Jäger et al., *J. Biol. Chem.*, **287**, 1210 - 1219 (2012).

5 µmol / ~1.9 mg € 124.- (C 020 - 05)	5 x 5 µmol € 527.- (C 020 - 25)

C 007

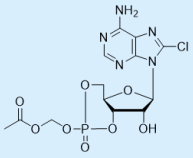


8- Chloroadenosine- 3', 5'- cyclic monophosphate (8-Cl-cAMP)

[124705-03-9]; $C_{10}H_{10}ClN_5O_6P{\cdot}Na$; MW 385.6; λ_{max} 262 nm; ε 17000. Soluble sodium salt; purity > 99% HPLC.
For metabolites of 8-Cl-cAMP or other salt forms please inquire. Site-selective cyclic AMP analogue with high selectivity for protein kinase A type I. Induces growth inhibition and differentiation in cultured cancer cell lines and has been in several clinical trials already. Detailed technical information and updated reference list available. Reference: Schwede et al., *Pharmacol. Ther.*, **87**, 199 - 226 (2000).

10 µmol / ~3.9 mg € 91.- (C 007 - 10)	5 x 10 µmol € 387.- (C 007 - 50)	**Considerable discounts on bulk quantities!**

C 050



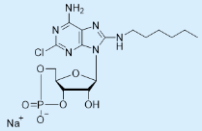
8- Chloroadenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (8-Cl-cAMP-AM)

$C_{13}H_{15}ClN_5O_8P$; MW 435.7; λ_{max} 262 nm; ε 17000; purity > 97% HPLC for mixture of isomers.
Membrane-permeant precursor of the PKA activator 8-Cl-cAMP (Cat. No. C 007, above). Metabolic activation by esterases releases the polar active analogue, which is trapped inside the cell. Detailed technical information available. Reference: J. Kruppa, Ph.D. thesis, University of Bremen, Germany, 1996.

Control reagent for nucleotide AM-ester applications: PO_4-AM_3, Cat. No. P 030

1 µmol / ~0.4 mg € 88.- (C 050 - 01)	5 x 1 µmol € 374.- (C 050 - 05)

C 071



2- Chloro- 8- n- hexylaminoadenosine- 3', 5'- cyclic monophosphate (2-Cl-8-HA-cAMP)

$C_{16}H_{23}ClN_6O_6P{\cdot}Na$; MW 484.8; λ_{max} 282 nm; ε 17000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Cyclic AMP analogue with high selectivity for site B I of PKA and good membrane permeability. Combined with AI-selective analogues synergistic activation of PKA type I is achieved; for details please compare p. 14. Detailed technical information available. Reference: Gausdal et al., *Cell Death Dis.*, e-pub, Feb 28;4:e516. doi: 10.1038/cddis.2013.39.

5 µmol / ~2.4 mg € 164.- (C 071 - 05)	5 x 5 µmol € 692.- (C 071 - 25)

C 080

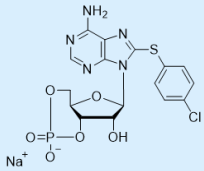
2- Chloro- 8- methylaminoadenosine- 3', 5'- cyclic monophosphate (2-Cl-8-MA-cAMP)

[96990-16-8]; $C_{11}H_{13}ClN_6O_6P{\cdot}Na$; MW 414.7; λ_{max} 279 nm; ε 16600; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Cyclic AMP analogue with high selectivity for site B I of PKA. Combined with AI-selective analogues synergistic activation of PKA type I is achieved; for details please compare p. 14. Detailed technical information available. Reference: Krakstad et al., *J. Leukocyte Biol.*, **76**, 641 - 647 (2004).

5 µmol / ~2.1 mg € 164.- (C 080 - 05)	5 x 5 µmol € 692.- (C 080 - 25)

C 010

Fluorescence Grade

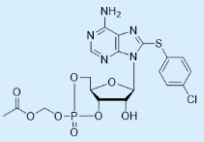


8- (4- Chlorophenylthio)adenosine- 3', 5'- cyclic monophosphate (8-CPT-cAMP)

[93882-12-3]; $C_{16}H_{14}ClN_5O_6PS \cdot Na$; MW 493.8; λ_{max} 282 nm; ε 16000; sodium salt; purity > 99% HPLC; highly purified, typical fluorescent impurities removed. For other salt forms or metabolites of 8-CPT-cAMP please inquire. Lipophilic activator of both cAMP- and cGMP- dependent protein kinase and of Epac. Higher activation potential compared to cAMP; excellent cell membrane permeability, improved phosphodiesterase stability and high site selectivity preferring site B of PKA type II. Detailed technical information and selected references available. Reference: Geiger et al.: *Proc. Natl. Acad. Sci. USA*, **89**, 1031 - 1035 (1992). **Caution:** Despite its name this analogue is not selective, but activates cGMP-dependent protein kinase as well! In addition, it increases the basal cGMP level by inhibition of PDE V (Murray et al.: *Biochem. Pharmacol.*, **44**, 2303 - 2306 (1992)).

100 µmol / ~49 mg € 78.- (C 010 - 100)	5 x 100 µmol € 291.- (C 010 - 500)	**Inquiries for bulk quantities welcome!**

C 056



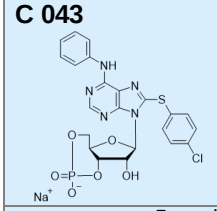
8- (4- Chlorophenylthio)adenosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (8-CPT-cAMP-AM)

[663941-66-0]; $C_{19}H_{19}ClN_5O_8PS$; MW 543.9; λ_{max} 282 nm; ε 16000; purity > 97% HPLC for mixture of isomers. Membrane-permeant precursor of the PKA / Epac activator 8-CPT-cAMP (Cat. No. C 010, above). Metabolic activation by esterases releases the active analogue. Detailed technical information available. Reference: Kruppa et al., *Bioorg. Med. Chem. Lett.*, **7**, 945 - 948 (1997).

Control reagent for nucleotide AM-ester applications: PO_4-AM_3, Cat. No. P 030

1 µmol / ~0.5 mg € 90.- (C 056 - 01)	5 x 1 µmol € 383.- (C 056 - 05)

C 043



8- (4- Chlorophenylthio)- N^6- phenyladenosine- 3', 5'- cyclic monophosphate (8-CPT-6-Phe-cAMP)

[72549-36-1]; $C_{22}H_{18}ClN_5O_6PS \cdot Na$; MW 569.9; λ_{max} 309 nm; ε 25000; sodium salt; purity > 98% HPLC.
Highly lipophilic site-selective activator of protein kinase A (cyclic AMP agonist). Resistant against mammalian cyclic nucleotide-dependent phosphodiesterases, no metabolic side effects. Detailed technical information and updated reference list available. Reference: Miller et al., *J. Med. Chem.*, **23**, 242 - 251 (1980).

5 µmol / ~2.8 mg € 164.- (C 043 - 05)	5 x 5 µmol € 692.- (C 043 - 25)

D 021

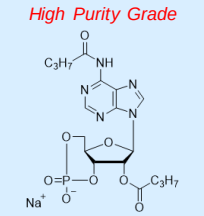
7- Deazaadenosine- 3', 5'- cyclic monophosphate / Tubercidine- 3', 5'- cyclic monophosphate (7-CH-cAMP / cTuMP)

[16719-36-1]; $C_{11}H_{12}N_4O_6P \cdot Na$; MW 350.2; λ_{max} 269 nm; ε 12000; sodium salt; purity > 98% HPLC. Cyclic AMP analogue with lacking purine N-7 nitrogen for receptor mapping studies. Detailed technical information and references available. References: Zimmerman et al., *J. Biol. Chem.*, **253**, 8792 - 8797 (1978); Ruchaud et al., *Cell. Pharmacol.*, **2**, 127 - 140 (1995); Jäger et al., *J. Biol. Chem.*, **287**, 1210 - 1219 (2012).

5 µmol / ~1.8 mg € 94.- (D 021 - 05)	5 x 5 µmol € 402.- (D 021 - 25)

D 009

High Purity Grade

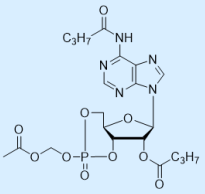


N^6, 2'- O- Dibutyryladenosine- 3', 5'- cyclic monophosphate (DB-cAMP / Bucladesine)

[16980-89-5]; $C_{18}H_{23}N_5O_8P \cdot Na$; MW 491.4; λ_{max} 273 nm; ε 17000; sodium salt; purity > 98% HPLC.
Membrane-permeant activator of protein kinase A (cyclic AMP agonist). Detailed technical information including hints about potential pitfalls and selected references available. Reference: Posternak et al., *Methods Enzymol.*, **38**, 399 - 409 (1974). **Caution:** This analogue releases butyrate due to intracellular and extracellular esterase action. Butyrate was shown to have distinct biological effects! We offer numerous more recommendable cAMP agonists.

100 µmol / ~49 mg € 41.- (D 009 - 100)	5 x 100 µmol € 174.- (D 009 - 500)	**Inquiries for bulk quantities welcome!**

D 008



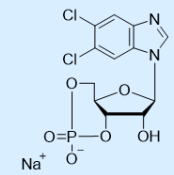
N^6, 2'- O- Dibutyryladenosine- 3', 5' - cyclic monophosphate, acetoxymethyl ester (DB-cAMP-AM)

[159910-48-2]; $C_{21}H_{28}N_5O_{10}P$; MW 541.5; λ_{max} 273 nm; ε 17000; purity > 97% HPLC for mixture of isomers. Highly potent and membrane-permeant precursor of DB-cAMP. Releases dibutyryl cAMP after metabolic activation by esterases. Due to further degradation to the much more polar monobutyryl cAMP and cAMP the kinase activators are trapped inside the cell. Detailed technical information and references available. Reference: Schultz et al., *J. Biol. Chem.*, **268**, 6316 - 6322 (1993).
Caution: This analogue releases butyrate due to intracellular and extracellular esterase action. Butyrate was shown to have distinct biological effects!

Control reagent for nucleotide AM-ester applications: PO_4-AM_3, Cat. No. P 030

1 µmol / ~0.5 mg € 80.- (D 008 - 01)	5 x 1 µmol € 337.- (D 008 - 05)

D 011

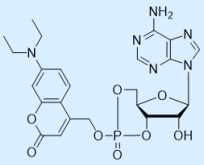


5, 6- Dichloro-1- β- D- ribofuranosylbenzimidazole- 3', 5'- cyclic monophosphate (5,6-DCl-cBIMP, cDRBMP)

[129693-10-3]; $C_{12}H_{10}Cl_2N_2O_6P{\cdot}Na$; MW 403.1; λ_{max} 254 nm; ε 6400; sodium salt; purity > 98% HPLC.
For other salt forms or metabolites please inquire. Potent and lipophilic activator of protein kinase A, type I & II. Ten times more active compared to cyclic AMP but rapidly degraded by cyclic nucleotide-dependent phosphodiesterases. Detailed technical information available. Reference: Dostmann et al., *J. Biol. Chem.*, **265**, 10484 - 10491 (1990).

10 µmol / ~4 mg € 174.- (D 011 - 10)	5 x 10 µmol € 739.- (D 011 - 50)

D 042

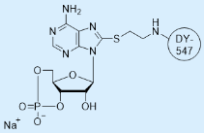


(7- Diethylaminocoumarin- 4- yl)methyl- adenosine- 3', 5'- cyclic monophosphate (DEACM-caged cAMP)

[339291-37-1]; $C_{24}H_{27}N_6O_8P$ x H_2O; MW 576.5; λ_{max} 401 nm; ε 18600; purity > 98% HPLC.
Axial isomer. DEACM-caged cAMP is an only weakly fluorescent, caged precursor of the second messenger cyclic AMP, which upon irradiation, releases both cAMP and a fluorescent coumarin analogue. High lipophilicity but still reasonable solubility in aqueous systems. Detailed technical information available. Reference: Hagen et al., *Angew. Chem. Int. Ed.*, **40**, 1046 - 1048 (2001).

0.1 µmol / ~58 µg € 68.- (D 042 - 001)	5 x 0.1 µmol € 291.- (D 042 - 005)

D 109

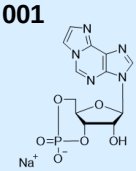


8- (2- [DY-547]- aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-[DY-547]-AET-cAMP / f-cAMP)

$C_{42}H_{40}N_8O_{13}PS_2{\cdot}Na_2$; MW 1047.1; sodium salt; λ_{max} 559 nm; ε 150000 in EtOH; purity > 98% HPLC. For other salt forms or metabolites please inquire. Fluorescent cAMP analogue (λ_{exc} 557 nm, λ_{em} 574 nm) e.g. for research focussed on activation studies of HCN2 channels and other cAMP-reponsive binding proteins. Detailed technical information available. Reference: Kusch et al., *Neuron*, **67**, 75 - 85 (2010).

0.1 µmol / ~0.1 mg € 157.- (D 109 - 001)	5 x 0.1 µmol € 670.- (D 109 - 005)

E 001

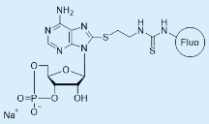


1, N^6- Ethenoadenosine- 3', 5'- cyclic monophosphate (ε-cAMP)

[103213-51-0]; $C_{12}H_{11}N_5O_6P{\cdot}Na$; MW 375.2; λ_{max} 275 nm; ε 6000; sodium salt; purity > 98% HPLC. For other salt forms or metabolites please inquire. Fluorescent cAMP analogue (λ_{exc} 300 nm, λ_{em} 415 nm). Detailed technical information and references available. References: Secrist et al., *Biochemistry,* **11**, 3499 - 3506 (1972); White et al., *Methods Enzymol.*, **99**, 162 - 167 (1983).

10 µmol / ~3.8 mg € 63.- (E 001 - 10)	5 x 10 µmol € 266.- (E 001 - 50)	**Inquiries for bulk quantities welcome!**

F 002

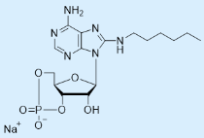


8- (2- [Fluoresceinyl]aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-[Fluo]-cAMP / 8-[Fluo]-AET-cAMP)

[293296-57-8]; $C_{33}H_{27}N_7O_{11}PS_2{\cdot}Na$; MW 815.7; λ_{max} ~494 nm; ε ~79000/pH 9; sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cAMP analogue (λ_{exc} 494 nm, λ_{em} 517 nm). Detailed technical information available. References: Schwede et al., *Biochemistry,* **39**, 8803 - 8812 (2000); Wu et al., *Biophys.* J., **100**, 1226 - 1232 (2011); Lolicato et al., *J. Biol. Chem.*, **286**, 44811 - 44820 (2011).

1 µmol / ~0.8 mg € 94.- (F 002 - 01)	5 x 1 µmol € 402.- (F 002 - 05)

H 006

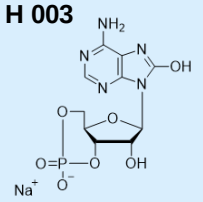


8- n- Hexylaminoadenosine- 3', 5'- cyclic monophosphate (8-HA-cAMP)

[59212-44-1]; $C_{16}H_{24}N_6O_6P{\cdot}Na$; MW 450.4; λ_{max} 273 nm; ε 17000; sodium salt; purity > 98% HPLC.
Site-selective analogue of cyclic AMP which prefers site B of PKA I. High membrane permeability and improved stability towards phosphodiesterases. Detailed technical information available. Reference: Schwede et al., *Biochemistry,* **39**, 8803 - 8812 (2000).

5 µmol / ~2.3 mg € 60.- (H 006 - 05)	5 x 5 µmol € 254.- (H 006 - 25)

H 003

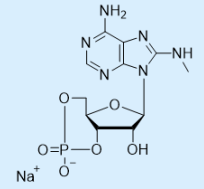


8- Hydroxyadenosine- 3', 5'- cyclic monophosphate (8-OH-cAMP)

[31356-95-3]; $C_{10}H_{11}N_5O_7P{\cdot}Na$; MW 367.2; λ_{max} 268 nm; ε 11000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Polar, membrane-impermeant analogue of cyclic AMP, e.g. for the study of extracellular cAMP receptors. If applied by patch clamp techniques, 8-OH-cAMP should remain trapped inside the cell. Increased resistance against mammalian cyclic nucleotide-dependent phosphodiesterases. Detailed technical information available. Reference: Bhatt et al., *Science,* **305**, 254 - 258 (2004).

5 µmol / ~1.8 mg € 80.- (H 003 - 05)	5 x 5 µmol € 338.- (H 003 - 25)

M 001

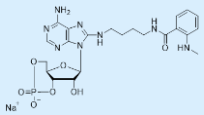


8- Methylaminoadenosine- 3', 5'- cyclic monophosphate (8-MA-cAMP)

[33823-18-6]; $C_{11}H_{14}N_6O_6P{\cdot}Na$; MW 380.2; λ_{max} 273 nm; ε 15000; sodium salt; purity > 98% HPLC.
For other salt forms or metabolites please inquire. Site-selective cyclic AMP analogue with similar affinity to site B of both protein kinase A type I and II. Priming analogue which acts synergistically together with analogues showing site A preference. Together with e.g. 8-piperidino cAMP (Cat. No. P 002) selective stimulation of type I can be achieved. Detailed technical information and selected references available; for details please compare p. 14. Reference: Skalhegg et al., *J. Biol. Chem.*, **267**, 15707 - 15714 (1992).

10 µmol / ~3.8 mg € 65.- (M 001 - 10)	5 x 10 µmol € 277.- (M 001 - 50)	**Inquiries for bulk quantities welcome!**

M 016

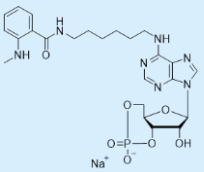


8- (4- [N'- Methylanthraniloyl]aminobutylamino)adenosine- 3', 5'- cyclic monophosphate (8-MABA-cAMP)

[909782-76-9]; $C_{22}H_{28}N_8O_7P{\cdot}Na$; MW 570.5; λ_{max} 261 nm / 278 nm; sodium salt; purity > 98% HPLC.
Fluorescent, membrane-permeant cyclic AMP analogue (λ_{exc} 352 nm, λ_{em} 436 nm). Detailed technical information available. Reference: Kraemer et al., *J. Mol. Biol.*, **306**, 1167 - 1177 (2001).

5 µmol / ~2.9 mg € 101.- (M 016 - 05)	5 x 5 µmol € 430.- (M 016 - 25)

M 017

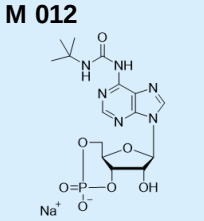


N^6- (6- [N'- Methylanthraniloyl]aminohexyl)adenosine- 3', 5'- cyclic monophosphate (6-MAH-cAMP)

[723313-27-7]; $C_{24}H_{31}N_7O_7P{\cdot}Na$; MW 583.5; λ_{max} 261 nm; sodium salt; purity > 98% HPLC.
Fluorescent, membrane-permeant cyclic AMP analogue (λ_{exc} 333 nm, λ_{em} 437 nm). Detailed technical information available. References: Kraemer et al., *J. Mol. Biol.*, **306**, 1167 - 1177 (2001); Moll et al., *J. Neural Transm.*, **113**, 1015 - 1032 (2006). For modifications with the methylanthraniloyl group please compare: Theyssen, *J. Mol. Biol.*, **263**, 657 - 670 (1996).

5 µmol / ~2.9 mg € 113.- (M 017 - 05)	5 x 5 µmol € 480.- (M 017 - 25)

M 012

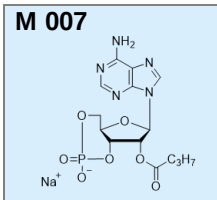


N^6- Mono- tert.- butylcarbamoyladenosine- 3', 5'- cyclic monophosphate (6-MBC-cAMP)

[84433-46-5]; $C_{15}H_{20}N_6O_7P{\cdot}Na$; MW 450.3; λ_{max} 268 nm; ε 23700; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Site-selective activator of protein kinase A (cyclic AMP agonist) strongly preferring the A site of cAK II. Together with e.g. Sp-5,6-DCl-cBIMPS (Cat. No. D 014) selective stimulation of type II can be achieved. For details please compare p. 14. 6-MBC-cAMP is considered not to activate Epac. Detailed technical information and updated reference list available. References: Maronde et al., *J. Pineal Res.*, **27**, 170 - 182 (1999); Fricke et al., *Endocrinology*, **145**, 4940 - 4947 (2004).

5 µmol / ~2.3 mg € 65.- (M 012 - 05)	5 x 5 µmol € 277.- (M 012 - 25)

M 007

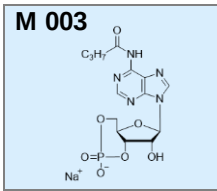


2'- O- Monobutyryladenosine- 3', 5'- cyclic monophosphate (2'-O-MB-cAMP)

[55443-13-5]; $C_{14}H_{17}N_5O_7P{\cdot}Na$; MW 421.3; λ_{max} 259 nm; ε 15000; sodium salt; purity > 97% HPLC.
For other salt forms or metabolites please inquire. 2'-O-MB-cAMP is a lipophilic precursor of cAMP. During metabolic activation by esterases cAMP and butyrate are released. **Caution:** Butyrate was shown to have distinct biological effects! Significantly more lipophilic and membrane-permeant compared to cAMP. Detailed technical information and references available. Reference: Schaeffer et al., *J. Pharmaceut. Sci.*, **72**, 1255 - 1259 (1983).

50 µmol / ~21 mg € 87.- (M 007 - 50)	5 x 50 µmol € 374.- (M 007 - 250)

M 003

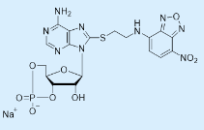


N^6- Monobutyryladenosine- 3', 5'- cyclic monophosphate (6-MB-cAMP)

[70253-67-7]; $C_{14}H_{17}N_5O_7P{\cdot}Na$; MW 421.3; λ_{max} 273 nm; ε 19000; sodium salt; purity > 97% HPLC.
For other salt forms or metabolites please inquire. Membrane-permeant, site-selective activator of protein kinase A (cyclic AMP agonist). 6-MB-cAMP does not activate Epac and thus can be used as an Epac-negative control. Detailed technical information and selected references available. Reference: Kopperud et al., *FEBS Lett.*, **546**, 121 - 126 (2003).

50 µmol / ~21 mg € 62.- (M 003 - 50)	5 x 50 µmol € 264.- (M 003 - 250)	**Inquiries for bulk quantities welcome!**

N 002



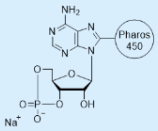
8- (2- [7- Nitro- 4- benzofurazanyl]aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-NBD-cAMP)

[221905-51-7]; $C_{18}H_{17}N_9O_9PS{\cdot}Na$; MW 589.4; λ_{max} 463 nm (MeOH); ε 22000; sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Potent membrane-permeant fluorescent activator (λ_{exc} 471 nm, λ_{em} 536 nm) of cAMP-dependent protein kinase. While 8-NBD-cAMP is almost non-fluorescent in aqueous solutions, it fluoresces strongly in hydrophobic environments such as hydrophobic protein binding sites. Detailed technical information available. References: Kraemer et al., *J. Mol. Biol.*, **306**, 1167 - 1177 (2001); Wu et al., Biophys. J., **100**, 1226 - 1232 (2011); Chen et. al., *Bioorg. Med. Chem. Lett.*, **22**, 4038 - 4043 (2012).

1 µmol / ~0.6 mg € 109.- (N 002 - 01)	5 x 1 µmol € 462.- (N 002 - 05)

P 024

Membrane-permeant !



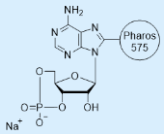
8- [Pharos-450]- adenosine- 3', 5'- cyclic monophosphate (8-[φ-450]-cAMP)

Sodium salt; purity > 98% HPLC; λ_{max} 450 nm; ε 14000. For other salt forms please inquire.
Cyclic AMP connected to the relatively small Pharos 450 fluorophore (λ_{exc} 450 nm, λ_{em} 534 nm) by a spacer. The fluorophore can be excited e.g. by a He/Cd laser. Due to its high lipophilicity and bright green fluorescence 8-[φ-450]-cAMP is especially suitable for studies with intact cells. Detailed technical information available.

0.1 µmol / ~72 µg € 207.- (P 024 - 001)	5 x 0.1 µmol € 878.- (P 024 - 005)

P 019

Membrane-permeant !

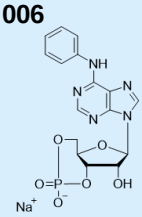


8- [Pharos-575]- adenosine- 3', 5'- cyclic monophosphate (8-[φ-575]-cAMP)

Sodium salt; purity > 98% HPLC; λ_{max} 575 nm; ε 20960. For other salt forms please inquire.
Cyclic AMP connected to the relatively small Pharos 575 dye (λ_{exc} 577 nm, λ_{em} 605 nm) by a spacer. The fluorophore can be excited e.g. by a Kr/Ar laser. Due to its high lipophilicity and bright red fluorescence 8-[φ-575]-cAMP is especially suitable for studies with intact cells. Upon binding to PKA a small hypsochromatic shift is observed. Detailed technical information available. Reference: Moll et al., *BMC Biochemistry*, **9**:18 (2008).

0.1 µmol / ~72 µg € 207.- (P 019 - 001)	5 x 0.1 µmol € 878.- (P 019 - 005)

P 006

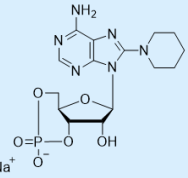


N^6- Phenyladenosine- 3', 5'- cyclic monophosphate (6-Phe-cAMP)

[34051-30-4]; $C_{16}H_{15}N_5O_6P{\cdot}Na$; MW 427.3; λ_{max} 288 nm; ε 20800; sodium salt; purity > 98% HPLC.
For other salt forms or metabolites please inquire. Potent site-selective activator of protein kinase A showing strong preference for site A of both isozymes. Together with e.g. Sp-5,6-DCl-cBIMPS (Cat. No. D 014) selective stimulation of type II can be achieved. For details please compare p. 14. Highly membrane-permeant analogue. Available with phosphorothioate modification (Cat. No. P 018) as well. Detailed technical information and updated references available. Reference: Kloss et al., *Mol. Pharmacol.*, **65**, 1440 - 1451 (2004).

5 µmol / ~2.1 mg € 60.- (P 006 - 05)	5 x 5 µmol € 254.- (P 006 - 25)

P 002



8- Piperidinoadenosine- 3', 5'- cyclic monophosphate (8-PIP-cAMP)

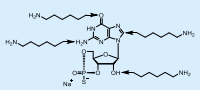
[31357-06-9]; $C_{15}H_{20}N_6O_6P{\cdot}Na$; MW 434.3; λ_{max} 273 nm; ε 15000; sodium salt; purity > 98% HPLC.
For other salt forms or metabolites please inquire. Site-selective cyclic AMP analogue with high selectivity for site A of protein kinase A type I and for site B of type II. Acts synergistically together with analogues having opposite site selectivity. Combination with e.g. 2-Cl-8-HA-cAMP (Cat. No. C 071) preferentially activates type I, while e.g. with 6-MBC-cAMP (Cat. No. M 012) selects type II. For details please compare p.14. Increased metabolic stability and membrane permeability compared to cAMP. Detailed technical information and updated references available. Reference: Skalhegg et al., *J. Biol. Chem.*, **267**, 15707 - 15714 (1992).

10 µmol / ~4.3 mg € 90.- (P 002 - 10)	5 x 10 µmol € 383.- (P 002 - 50)

Inquire

We are constantly synthesizing new selective activators of protein kinase A isozymes (cAMP analogues)! Please inquire regarding special structures not listed here, or check out our website (www.biolog.de). Custom syntheses and purifications are offered.

PDE- resistant Inhibitors of Protein Kinase G

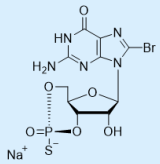


Guanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer, functionalized with different aminoalkylamino spacers

We offer a selection of PDE-resistant Rp-cGMPS analogues functionalized with aminoalkylamino spacers of different lengths at guanine position C-8 and at ribose 2' for immobilization on agarose or chip surfaces and for conjugation with biomarkers or fluorescent dyes. For corresponding modifications at N^2 and C-6 please inquire.

Please refer to chapter "Precursors for Labelling and Immobilization", p. 54

B 005



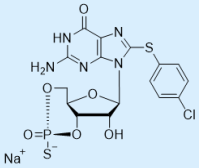
8- Bromoguanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-Br-cGMPS)

[150418-07-8]; $C_{10}H_{10}BrN_5O_6PS{\cdot}Na$; MW 462.2; λ_{max} 260 nm; ε 16200; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Inhibitor of protein kinase G I α and I β. Resistant against mammalian cyclic nucleotide-dependent phosphodiesterases, no metabolic side effects. Significantly more lipophilic and membrane-permeant compared to cyclic GMP or Rp-cGMPS (Cat. No. G 016). Detailed technical information and updated reference list available. Reference: Zhuo et al., *Nature,* **368**, 635 - 639 (1994).

5 µmol / ~2.3 mg € 198.- (B 005 - 05)	5 x 5 µmol € 742.- (B 005 - 25)

C 013

Fluorescence Grade



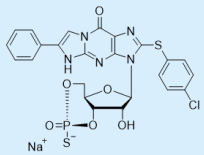
8- (4- Chlorophenylthio)guanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-pCPT-cGMPS)

[153660-04-9]; $C_{16}H_{14}ClN_5O_6PS_2{\cdot}Na$; MW 525.9; λ_{max} 276 nm; ε 21500; sodium salt; purity > 99% HPLC.
Specially purified grade, fluorescent impurities removed. For other salt forms please inquire. Potent selective inhibitor of protein kinase G I α, I β and especially of type II. Activates retinal cGMP channels and thus discriminates between kinase and channel effects. Absolutely resistant against mammalian cyclic nucleotide-dependent phosphodiesterases, no metabolic side effects. Significantly more lipophilic and membrane-permeant compared to Rp-cGMPS (Cat. No. G 016) or Rp-8-Br-cGMPS (Cat. No. B 005). Detailed technical information and updated reference list available. References: Butt et al., *Eur. J. Pharmacol.*, **269**, 265 - 268 (1994); Gamm et al., *J. Biol. Chem.*, **270**, 27380 - 27388 (1996); Kramer et al., *J. Neurosci.*, **16**, 1285 - 1293 (1996).

Protected under patents US 5,625,056 and DE 42 17679 issued to BIOLOG LSI

1 µmol / ~0.5 mg € 62.- (C 013 - 01)	5 x 1 µmol € 232.- (C 013 - 05)

C 046



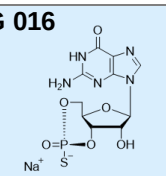
8- (4- Chlorophenylthio)- β- phenyl- 1, N^2- ethenoguanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-pCPT-PET-cGMPS)

[1262749-62-1]; $C_{24}H_{18}ClN_5O_6PS_2{\cdot}Na$; MW 626.0; λ_{max} 276 nm; ε 40000; sodium salt; purity > 99% HPLC.
Potent inhibitor of protein kinase G. Most probably retinal cGMP-gated ion channels are inhibited as well. Resistant against mammalian cyclic nucleotide-dependent phosphodiesterases. Significantly more lipophilic and membrane-permeant compared to all other cGK inhibitors offered. Detailed technical information available. References: Broderick et al., *Mol. Endocrinol.*, **21**, 1148 - 1162 (2007); Zhang et al., *J. Biol. Chem.*, **282**, 33367 - 33380 (2007).

Protected under patents US 5,625,056 and DE 42 17679 issued to BIOLOG LSI

1 µmol / ~0.6 mg € 108.- (C 046 - 01)	5 x 1 µmol € 457.- (C 046 - 05)

G 016

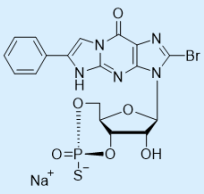


Guanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-cGMPS)

[86562-09-6]; $C_{10}H_{11}N_5O_6PS{\cdot}Na$; MW 383.3; λ_{max} 252 nm; ε 14300; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Inhibitor of protein kinase G I. Resistant against mammalian cyclic nucleotide-dependent phosphodiesterases. Detailed technical information and updated reference list available. Reference: Butt et al, *FEBS Lett.*, **263**, 47 - 50 (1990).

5 µmol / ~1.9 mg € 180.- (G 016 - 05)	5 x 5 µmol € 677.- (G 016 - 25)

P 007



β- Phenyl- 1, N^2- etheno- 8- bromoguanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-Br-PET-cGMPS)

[172806-20-1]; $C_{18}H_{14}BrN_5O_6PS{\cdot}Na$; MW 562.3; λ_{max} 256 nm; ε 40000; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Selective and membrane-permeant inhibitor of both cyclic GMP-dependent protein kinase I α and I β and of retinal cGMP-gated ion channels. Resistant against mammalian cyclic nucleotide-dependent phosphodiesterases, no metabolic side effects. More lipophilic and membrane-permeant compared to Rp-8-pCPT-cGMPS (Cat. No. C 013, above). Detailed technical information and updated reference list available. Reference: Butt et. al., *Br. J. Pharmacol.*, **116**, 3110 - 3116 (1995).

Protected under patents US 5,625,056 and DE 42 17679 issued to BIOLOG LSI

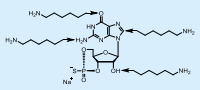
1 µmol / ~0.6 mg € 71.- (P 007 - 01)	5 x 1 µmol € 287.- (P 007 - 05)

Inquire

Special analogues of Rp-cGMPS not listed as regular products

We are constantly synthesizing new PDE-resistant inhibitors of protein kinase G isozymes (Rp-cGMPS analogues)! Please inquire regarding special structures not listed here, or check out our website (www.biolog.de). Custom syntheses and purifications are offered.

PDE- resistant Activators of Protein Kinase G

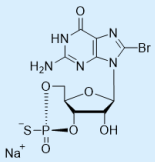


Guanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer, functionalized with different aminoalkylamino spacers

We offer a selection of PDE-resistant Sp-cGMPS analogues functionalized with aminoalkylamino spacers of different lengths at guanine position C-8 and at ribose 2' for immobilization on agarose or chip surfaces and for conjugation with biomarkers or fluorescent dyes. For corresponding modifications at N^2 and C-6 please inquire.

Please refer to chapter "Precursors for Labelling and Immobilization", p. 54

B 006



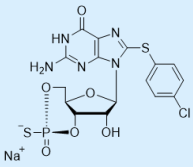
8- Bromoguanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-Br-cGMPS)

[153660-03-8]; $C_{10}H_{10}BrN_5O_6PS{\cdot}Na$; MW 462.2; λ_{max} 260 nm; ε 16200; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Unspecific activator of both protein kinase G I α and protein kinase A. Resistant against cyclic nucleotide phosphodiesterases. Much more lipophilic and membrane-permeant compared to cyclic GMP or Sp-cGMPS (Cat. No. G 017). Detailed technical information and updated reference list available. Reference: Flaadt et al., *J. Cell Sci.*, **105**, 255 - 261 (1993).

10 µmol / ~4.6 mg € 87.- (B 006 - 10)	5 x 10 µmol € 348.- (B 006 - 50)	**Inquiries for bulk quantities welcome!**

C 014

Fluorescence Grade



8- (4- Chlorophenylthio)guanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-pCPT-cGMPS)

[160385-87-5]; $C_{16}H_{14}ClN_5O_6PS_2{\cdot}Na$; MW 525.9; λ_{max} 276 nm; ε 21500; sodium salt; purity > 99% HPLC.
Specially purified grade, fluorescent impurities removed. For other salt forms please inquire. Activator of protein kinase G type I α and type II. **Caution:** Protein kinase A type II is activated as well. Excellent cell membrane permeability and phosphodiesterase stability. Detailed technical information and updated reference list available. References: Butt et al., *Eur. J. Pharmacol.*, **269**, 265 - 268 (1994); Gamm et al., *J. Biol. Chem.*, **270**, 27380 - 27388 (1996).

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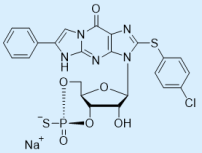
5 µmol / ~2.6 mg € 149.- (C 014 - 05)	5 x 5 µmol € 595.- (C 014 - 25)

C 047



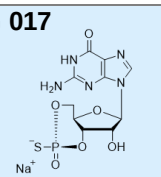
8- (4- Chlorophenylthio)- β- phenyl- 1, N^2- ethenoguanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-pCPT-PET-cGMPS)

[1262749-63-2]; $C_{24}H_{18}ClN_5O_6PS_2{\cdot}Na$; MW 626.0; λ_{max} 276 nm; ε 40000; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Membrane-permeant activator of cyclic GMP-dependent protein kinase, but most probably inhibitor of the retinal type cGMP-gated ion channel, thus suitable to distinguish between kinase and ion channel mediated effects. Resistant against mammalian cyclic nucleotide-dependent phosphodiesterases. More lipophilic and membrane-permeant compared to Sp-8-Br-PET-cGMPS (Cat. No. P 008). Detailed technical information available. Reference: Jäger et al., *Br. J. Pharmacol.*, **161**, 1645 - 1660 (2010).

Protected under patents US 5,625,056 and DE 42 17679 issued to BIOLOG LSI

1 µmol / ~0.6 mg € 83.- (C 047 - 01)	5 x 1 µmol € 351.- (C 047 - 05)

G 017

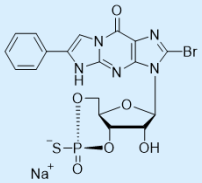


Guanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-cGMPS)

[86562-10-9]; $C_{10}H_{11}N_5O_6PS{\cdot}Na$; MW 383.3; λ_{max} 252 nm; ε 14300; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Metabolically resistant activator of cGMP-dependent protein kinases. Useful for in vitro kinase and phosphodiesterase mapping studies as well as for permeabilized cells or injection techniques. Detailed technical information and updated reference list available. Reference: Butt et al., *FEBS Lett.*, **263**, 47 - 50 (1990).

5 µmol / ~1.9 mg € 117.- (G 017 - 05)	5 x 5 µmol € 440.- (G 017 - 25)

P 008



β- Phenyl- 1, N^2- etheno- 8- bromoguanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-Br-PET-cGMPS)

[172806-21-2]; $C_{18}H_{14}BrN_5O_6PS{\cdot}Na$; MW 562.3; λ_{max} 256 nm; ε 40000; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. Membrane-permeant inhibitor of the retinal type cGMP-gated ion channel (cGMP antagonist) but activator of cyclic GMP-dependent protein kinase I α and I β (cGMP agonist). Suitable to distinguish between kinase and ion channel mediated effects. Resistant against mammalian cyclic nucleotide-dependent phosphodiesterases, no metabolic side effects. More lipophilic and membrane-permeant compared to Sp-8-pCPT-cGMPS (Cat. No. C 014). Detailed technical information and updated reference list available. Reference: Butt et. al., *Br. J. Pharmacol.*, **116**, 3110 - 3116 (1995).

Protected under patents US 5,625,056 and DE 42 17679 issued to BIOLOG LSI

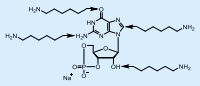
5 µmol / ~2.8 mg € 152.- (P 008 - 05)	5 x 5 µmol € 609.- (P 008 - 25)

Inquire

Special analogues of Sp-cGMPS not listed as regular products

We are constantly synthesizing new PDE-resistant activators of protein kinase G isozymes (Sp-cGMPS analogues)! Please inquire regarding special structures not listed here, or check out our website (www.biolog.de). Custom syntheses and purifications are offered.

Activators of Protein Kinase G

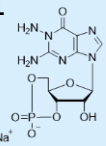


Guanosine- 3', 5'- cyclic monophosphate, functionalized with different aminoalkylamino spacers

We offer a selection of cyclic GMP analogues functionalized with aminoalkylamino and PEG-type spacers, respectively, of different lengths at guanine positions 2-NH_2, O^6, C-8 and at ribose 2' for immobilization on agarose or chip surfaces and for conjugation with biomarkers or fluorescent dyes.

Please refer to chapter "Precursors for Labelling and Immobilization", p. 54

A 041

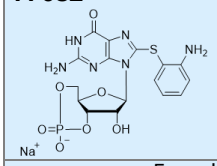


1- Aminoguanosine- 3', 5'- cyclic monophosphate (1-NH_2-cGMP)

[78033-42-8]; $C_{10}H_{12}N_6O_7P{\cdot}Na$; MW 382.2; λ_{max} 253 nm; ε 13500 (est.); sodium salt; purity > 98% HPLC.
For other salt forms or metabolites please inquire. Site-selective cyclic GMP analogue prefering site A of cGK, suitable for synergism studies. Reference: Corbin et al., *J. Biol. Chem.*, **261**, 1208 - 1214 (1986).

5 µmol / ~1.9 mg € 71.- (A 041 - 05)	5 x 5 µmol € 302.- (A 041 - 25)

A 032

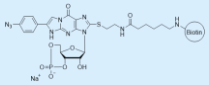


8- (2- Aminophenylthio)guanosine- 3', 5'- cyclic monophosphate (8-APT-cGMP)

[144509-87-5]; $C_{16}H_{16}N_6O_7PS{\cdot}Na$; MW 490.4; λ_{max} 278 nm; ε 18000; sodium salt; purity > 98% HPLC.
For other salt forms or metabolites of 8-APT-cGMP please inquire. Isozyme-selective activator of cGMP-dependent protein kinase I which prefers type I α over I β by a factor of 200. Detailed technical information with references available. References: Haynes, *Br. J. Pharmacol.*, **130**, 685 - 691 (2000); Cook & Haynes, *Cell. Signal.*, **16**, 253 - 261 (2004).

5 µmol / ~2.5 mg € 101.- (A 032 - 05)	5 x 5 µmol € 430.- (A 032 - 25)

A 186

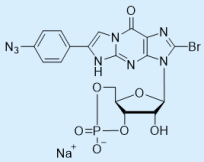


β- (4- Azidophenyl)- 1, N^2- etheno- 8- (2- [biotinyl]aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (4-N_3-PET-8-[Biotin]-AET-cGMP)

$C_{36}H_{44}N_{12}O_{10}PS_2{\cdot}Na$; MW 922.9; λ_{max} 287 nm; ε 40000; sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Biotinylated cGMP analogue for photoaffinity labelling of cGMP-responsive receptors. Detailed technical information available.

0.1 µmol / ~92 µg € 124.- (A 186 - 001)	5 x 0.1 µmol € 528.- (A 186 - 005)

A 102

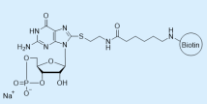


β- (4- Azidophenyl)- 1, N^2- etheno- 8- bromoguanosine- 3', 5'- cyclic monophosphate (4-N_3-PET-8-Br-cGMP)

$C_{18}H_{13}BrN_8O_7P{\cdot}Na$; MW 587.2; λ_{max} 278 nm; ε 40000; sodium salt; purity > 97% HPLC.
For other salt forms or metabolites please inquire. Analogue for photoaffinity labelling of cGMP-responsive receptors, considered to be an isozyme-selective activator of cGMP-dependent protein kinase I α and β. Detailed technical information available.

1 µmol / ~0.6 mg € 152.- (A 102 - 01)	5 x 1 µmol € 647.- (A 102 - 05)

B 025

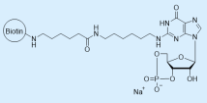


8- (2- [Biotinyl]aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-[Biotin]-AET-cGMP)

$C_{28}H_{41}N_9O_{10}PS_2{\cdot}Na$; MW 781.8; λ_{max} 275 nm; ε ~14000; sodium salt; purity > 98% HPLC.
Biotin connected to the 8-position of cyclic GMP via an 11 atom spacer. A similar analogue but with a different position of attachment is described below (Cat. No. B 032, below). Detailed technical information available.

1 µmol / ~0.8 mg € 164.- (B 025 - 01)	5 x 1 µmol € 692.- (B 025 - 05)

B 032

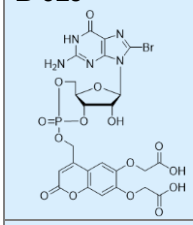


N^2- (6- [Biotinyl]aminohexyl)guanosine- 3', 5'- cyclic monophosphate (2-[Biotin]-AH-cGMP)

$C_{32}H_{49}N_9O_{10}PS{\cdot}Na$; MW 805.8; λ_{max} 255 nm; ε ~15000; sodium salt; purity > 98% HPLC.
Biotin connected to the 2-position of cyclic GMP via a 14 atom spacer. A similar analogue but with a different position of attachment is described above (Cat. No. B 025, above). Detailed technical information available.

1 µmol / ~0.8 mg € 164.- (B 032 - 01)	5 x 1 µmol € 692.- (B 032 - 05)

B 019



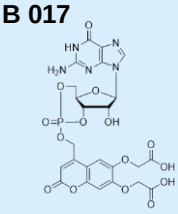
[6, 7- Bis(carboxymethoxy)coumarin- 4- yl]methyl- 8- bromoguanosine- 3', 5'- cyclic monophosphate (BCMCM-caged 8-Br-cGMP)

[370091-68-2]; $C_{24}H_{21}BrN_5O_{15}P$ x 3 H_2O; MW 784.4; λ_{max} 346 nm; ε 11200; purity > 98% HPLC. Equatorial isomer. BCMCM-caged 8-Br-cGMP is an only weakly fluorescent, caged precursor of 8-bromo cyclic cGMP (Cat. No. B 004), which upon irradiation, releases both 8-Br-cGMP and a fluorescent coumarin analogue. Excellent solubility in water or buffers. Detailed technical information available. For reference please compare: Hagen et al., *Angew. Chem. Int. Ed.*, **40**, 1046 - 1048 (2001).

Protected by patent DE 100 21 256.5 and foreign equivalents

0.1 µmol / ~78 µg € 82.- (B 019 - 001)	5 x 0.1 µmol € 326.- (B 019 - 005)

B 017



[6, 7- Bis(carboxymethoxy)coumarin- 4- yl]methyl- guanosine- 3', 5'- cyclic monophosphate (BCMCM-caged cGMP)

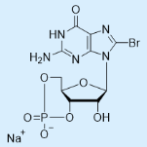
[339291-52-0]; $C_{24}H_{22}N_5O_{15}P$ x 3 H_2O; MW 705.5; λ_{max} 347 nm; ε 11200; purity > 98% HPLC. Equatorial isomer. BCMCM-caged cGMP is an only weakly fluorescent, caged precursor of the second messenger cGMP (Cat. No. G 001), which upon irradiation, releases both cGMP and a fluorescent coumarin analogue. Excellent solubility in water or buffers. Reference: Hagen et al., *Angew. Chem. Int. Ed.*, **40**, 1046 - 1048 (2001).

Protected by patent DE 100 21 256.5 and foreign equivalents

0.1 µmol / ~71 µg € 73.- (B 017 - 001)	5 x 0.1 µmol € 296.- (B 017 - 005)

B 004

Fluorescence Grade

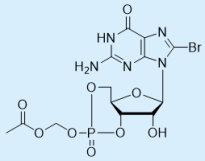


8- Bromoguanosine- 3', 5'- cyclic monophosphate (8-Br-cGMP)

[51116-01-9]; $C_{10}H_{10}BrN_5O_7P{\cdot}Na$; MW 446.1; λ_{max} 260 nm; ε 16200; sodium salt; purity > 99% HPLC. Specially purified, typical fluorescent impurities removed. For other salt forms or metabolites of 8-Br-cGMP please inquire. Activator of cGMP-dependent protein kinases I α, I β & type II and cGMP-gated ion channels. Increased metabolic stability compared to cGMP, but not completely stable as often stated. 8-pCPT-cGMP (Cat. No. C 009), a highly membrane-permeant and metabolically resistant cGMP-agonist is superior for most applications. Detailed technical information and reference list available. Reference: Rapoport et al., *Proc. Natl. Acad. Sci. USA*, **79**, 6470 - 6474 (1982).

50 µmol / ~22 mg € 49.- (B 004 - 50)	5 x 50 µmol € 208.- (B 004 - 250)	**Inquiries for bulk quantities welcome!**

B 014



8- Bromoguanosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (8-Br-cGMP-AM)

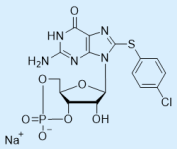
[272445-71-3]; $C_{13}H_{15}BrN_5O_9P$; MW 496.2; λ_{max} 260 nm; ε 16200; purity > 97% HPLC for mixture of isomers. Membrane-permeant precursor of the PKG activator 8-Br-cGMP (Cat. No. B 004, above). Metabolic activation by esterases releases the more polar active analogue, which is trapped inside the cell. Detailed technical information available. Reference: Schwede et al., *Bioorg. Med. Chem. Lett.*, **10**, 571 - 573 (2000).

Control reagent for nucleotide AM-ester applications: PO_4-AM_3, Cat. No. P 030

1 µmol / ~0.5 mg € 113.- (B 014 - 01)	5 x 1 µmol € 480.- (B 014 - 05)

C 009

Fluorescence Grade

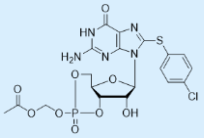


8- (4- Chlorophenylthio)guanosine- 3', 5'- cyclic monophosphate (8-pCPT-cGMP)

[51239-26-0]; $C_{16}H_{14}ClN_5O_7PS{\cdot}Na$; MW 509.8; λ_{max} 276 nm; ε 21500; sodium salt; purity > 99% HPLC; specially purified quality, fluorescent impurities removed. For other salt forms please inquire. Selective activator of both, cGMP-dependent protein kinase type I α and type II, as well as of cGMP-gated ion channels. Higher activation potential compared to cGMP; excellent cell membrane permeability and phosphodiesterase stability. Recommendable alternative to unsuitable analogues such as dibutyryl cGMP. Detailed technical information and updated reference list available. Reference: Geiger et al., *Proc. Natl. Acad. Sci. USA*, **89**, 1031 - 1035 (1992).

10 µmol / ~5 mg € 35.- (C 009 - 10)	5 x 10 µmol € 122.- (C 009 - 50)	**Inquiries for bulk quantities welcome!**

C 033



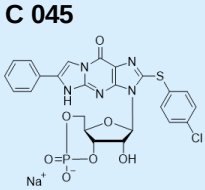
8- (4- Chlorophenylthio)guanosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (8-pCPT-cGMP-AM)

[272445-72-4]; $C_{19}H_{19}ClN_5O_9PS$; MW 559.9; λ_{max} 276 nm; ε 21500; purity > 97% HPLC for mixture of isomers. Highly membrane-permeant precursor of the PKG activator 8-pCPT-cGMP (Cat. No. C 009, above). Metabolic activation by esterases releases the active analogue. Reference: Schwede et al., *Bioorg. Med. Chem. Lett.*, **10**, 571 - 573 (2000).

Control reagent for nucleotide AM-ester applications: PO_4-AM_3, Cat. No. P 030

1 µmol / ~0.6 mg € 135.- (C 033 - 01)	5 x 1 µmol € 572.- (C 033 - 05)

C 045

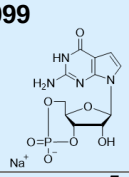


8- (4- Chlorophenylthio)- β- phenyl- 1, N^2- ethenoguanosine- 3', 5'- cyclic monophosphate (8-pCPT-PET-cGMP)

$C_{24}H_{18}ClN_5O_7PS{\cdot}Na$; MW 609.9; λ_{max} 276 nm; ε 40000; sodium salt; purity > 98% HPLC. For other salt forms please inquire. Highly membrane-permeant activator of cyclic GMP-dependent protein kinase, and most probably inhibitor of the retinal type cGMP-gated ion channel, thus suitable to distinguish between kinase and ion channel mediated effects. Resistant against mammalian cyclic nucleotide-dependent phosphodiesterases. Detailed technical information available.

5 µmol / ~3 mg € 113.- (C 045 - 05)	5 x 5 µmol € 480.- (C 045 - 25)

D 099



7- Deazaguanosine- 3', 5'- cyclic monophosphate (7-CH-cGMP)

[81611-03-2]; $C_{11}H_{12}N_4O_7P{\cdot}Na$; MW 366.2; λ_{max} 260 nm; ε 10600; sodium salt; purity > 98% HPLC.
Cyclic GMP analogue lacking purine N-7 nitrogen for receptor mapping studies. Detailed technical information and references available. References: Tran-Thi et al., *Angew. Chem.*, **94**, 366 (1982); Hebert et al., *J. Biol. Chem.*, **273**, 5557 - 5565 (1998).

5 µmol / ~1.8 mg € 90.- (D 099 - 05)	5 x 5 µmol € 383.- (D 099 - 25)

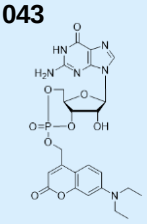
D 010

N^2, 2'- O- Dibutyrylguanosine- 3', 5'- cyclic monophosphate (DB-cGMP)

[51116-00-8]; $C_{18}H_{23}N_5O_9P{\cdot}Na$; MW 507.4; λ_{max} 256 nm; ε 16700; sodium salt; purity > 97% HPLC.
For other salt forms please inquire. **Caution:** We do not recommend to use this cGMP analogue due to its lacking potency and selectivity. The metabolically released N^2-monobutyryl cGMP is only a poor activator of cGMP-dependent protein kinase, and released butyrate can have its own side effects leading to misinterpretation of experimental results. Reference: Butt et al., *Biochem. Pharmacol.*, **43**, 2591 - 2600 (1992). We offer numerous more recommendable cGMP agonists; e.g. 8-pCPT-cGMP (Cat. No. C 009), is a much better choice. Detailed technical information available.

50 µmol / ~25 mg € 153.- (D 010 - 50)	5 x 50 µmol € 653.- (D 010 - 250)	**Inquiries for bulk quantities welcome!**

D 043

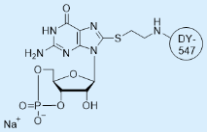


(7- Diethylaminocoumarin- 4- yl)methyl- guanosine- 3', 5'- cyclic monophosphate (DEACM-caged cGMP)

[339291-42-8]; $C_{24}H_{27}N_6O_9P$ x 3 H_2O; MW 628.5; λ_{max} 403 nm; ε 19300; purity > 98% HPLC. Axial isomer.
DEACM-caged cGMP is an only weakly fluorescent, caged precursor of the second messenger cyclic cGMP, which upon irradiation, releases both cGMP and a strongly fluorescent coumarin analogue. High lipophilicity but still reasonable solubility in aqueous systems. Detailed technical information available. Reference: Hagen et al., *Angew. Chem. Int. Ed.*, **40**, 1046 - 1048 (2001).

0.1 µmol / ~63 µg € 73.- (D 043 - 001)	5 x 0.1 µmol € 314.- (D 043 - 005)

D 087

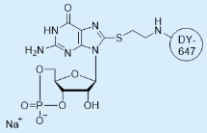


8- (2- [DY-547]- aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-[DY-547]-AET-cGMP / f-cGMP)

$C_{42}H_{49}N_8O_{14}PS_3{\cdot}Na_2$; MW 1063.0; λ_{max} 559 nm; ε 150000 (EtOH); sodium salt; purity > 98% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cGMP analogue (λ_{exc} 557 nm, λ_{em} 574 nm), e.g. for research focussed on kinetic studies of CNG ion channels and other cGMP-reponsive binding proteins. Detailed technical information available. Reference: Biskup et al., *Nature*, **446**, 440 - 443 (2007).

0.1 µmol / ~0.1 mg € 157.- (D 087 - 001)	5 x 0.1 µmol € 670.- (D 087 - 005)

D 090

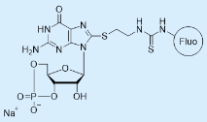


8- (2- [DY-647]- aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-[DY-647]-AET-cGMP)

$C_{44}H_{51}N_8O_{14}PS_3{\cdot}Na_2$; MW 1089.1; λ_{max} 653 nm; ε 250000 (EtOH); sodium salt; purity > 98% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cGMP analogue (λ_{exc} 649 nm, λ_{em} 666 nm), e.g. for research focussed on kinetic studies of CNG ion channels and other cGMP-reponsive binding proteins. Detailed technical information available.

0.1 µmol / ~0.1 mg € 157.- (D 090 - 001)	5 x 0.1 µmol € 670.- (D 090 - 005)

F 001

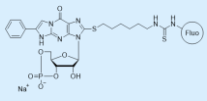


8- (2- [Fluoresceinyl]aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-[Fluo]-cGMP / 8-[Fluo]-AET-cGMP)

$C_{33}H_{27}N_7O_{12}PS_2{\cdot}Na$; MW 831.7; λ_{max} ~494 nm; ε ~79000 (pH 9); sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cGMP analogue (λ_{exc} 494 nm, λ_{em} 517 nm). A similar compound has been described to be the most potent channel activator tested so far: Tanaka et al, *Biochemistry*, **28**, 2776 - 2784 (1989). Detailed technical information available. References: Pena & Dominguez, *J. Biol. Screen.*, **15**, 1281 - 1286 (2010); Lolicato et al., *J. Biol. Chem.*, **286**, 44811 - 44820 (2011).

1 µmol / ~0.8 mg € 94.- (F 001 - 01)	5 x 1 µmol € 402.- (F 001 - 05)

F 012

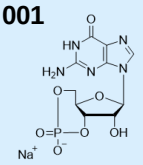


8- (6- [Fluoresceinyl]aminohexylthio)- ß- phenyl- 1, N^2- ethenoguanosine- 3', 5'- cyclic monophosphate (8-[Fluo]-AHT-PET-cGMP)

$C_{45}H_{39}N_7O_{12}PS_2{\cdot}Na$; MW 987.9; λ_{max} ~494 nm; ε ~79000/pH 9; sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cGMP analogue (λ_{exc} 494 nm, λ_{em} 517 nm), suitable for receptor studies. Considered to be a CNG channel inhibitor due to its PET group. Detailed technical information available.

1 µmol / ~1 mg € 181.- (F 012 -01)	5 x 1 µmol € 770.- (F 012 - 05)

G 001

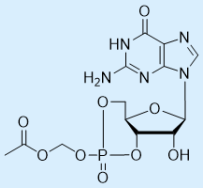


Guanosine- 3', 5'- cyclic monophosphate (cGMP)

[40732-48-7]; $C_{10}H_{11}N_5O_7P{\cdot}Na$; MW 367.2; λ_{max} 252 nm; ε 13500; sodium salt; purity > 98% HPLC.
For other salt forms or metabolites please inquire. Target receptors for the second messenger cyclic GMP include protein kinase G isozymes, cGMP-gated ion channels as well as cGMP-responsive phosphodiesterases. cGMP is metabolized rapidly by phosphodiesterases. Detailed technical information available.

100 µmol / ~37 mg € 31.- (G 001 - 100)	5 x 100 µmol € 133.- (G 001 - 500)	**Inquiries for bulk quantities welcome!**

G 002



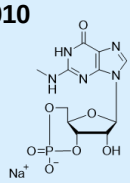
Guanosine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (cGMP-AM)

[164007-71-0]; $C_{13}H_{16}N_5O_9P$; MW 417.3; λ_{max} 252 nm; ε 13500; purity > 95% HPLC for mixture of isomers.
Membrane-permeant precursor of the second messenger cGMP. Metabolic activation by esterases releases the polar active analogue, which is trapped inside the cell. In contrast to other membrane-permeant and PDE-resistant cGMP analogues, cGMP-AM yields a transient increase (pulse) of cGMP. Especially suitable for external triggering of cGMP-regulated phosphodiesterases (PDE II, III & V) where most cGMP analogues are not accepted. Detailed technical information available. Reference: Schwede et al., *Bioorg. Med. Chem. Lett.*, **10**, 571 - 573 (2000).

Control reagent for nucleotide AM-ester applications: PO_4-AM_3, Cat. No. P 030

1 µmol / ~0.4 mg € 117.- (G 002 - 01)	5 x 1 µmol € 499.- (G 002 - 05)

M 010

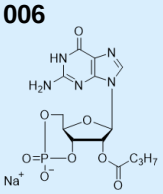


N^2- Methylguanosine- 3', 5'- cyclic monophosphate (2-Me-cGMP)

[205368-54-3]; $C_{11}H_{13}N_5O_7P{\cdot}Na$; MW 381.2; λ_{max} 253 nm; ε 15000; sodium salt; purity > 99% HPLC.
For other salt forms or metabolites please inquire. Analogue of cyclic GMP with modified 2-amino moiety for cGMP receptor mapping studies. Detailed technical information available. Reference: Hebert et al., *J. Biol. Chem.*, **273**, 5557 - 5565 (1998).

5 µmol / ~1.9 mg € 124.- (M 010 - 05)	5 x 5 µmol € 528.- (M 010 - 25)

M 006

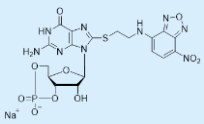


2'- O- Monobutyrylguanosine- 3', 5'- cyclic monophosphate (2'-O-MB-cGMP)

[58329-72-9]; $C_{14}H_{17}N_5O_8P{\cdot}Na$; MW 437.3; λ_{max} 252 nm; ε 13500; sodium salt; purity > 97% HPLC.
For other salt forms or metabolites please inquire. 2'-O-MB-cGMP is a lipophilic precursor of cyclic GMP. During metabolic activation by esterases cGMP and butyrate are released. **Caution**: Butyrate was shown to have distinct biological effects. Significantly more lipophilic and membrane-permeant compared to cGMP. Detailed technical information available. Reference: Hebert et al., *J. Biol. Chem.*, **273**, 5557 - 5565 (1998).

10 µmol / ~4.4 mg € 97.- (M 006 - 10)	5 x 10 µmol € 412.- (M 006 - 50)

N 001



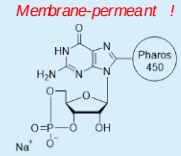
8- (2- [7- Nitro- 4- benzofurazanyl]aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-NBD-cGMP)

[115993-88-9]; $C_{18}H_{17}N_9O_{10}PS{\cdot}Na$; MW 605.4; λ_{max} 463 nm; ε 22000 (MeOH); sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Potent membrane-permeant fluorescent activator of both isozymes I α and I β of cGMP-dependent protein kinase. While 8-NBD-cGMP is almost nonfluorescent in aqueous solutions, it fluoresces strongly in hydrophobic environments such as hydrophobic protein binding sites (λ_{exc} 475 nm, λ_{em} 525 nm). Detailed technical information available. Reference: Salowe et al., *Biochemistry*, **41**, 4385 - 4391 (2002).

1 µmol / ~0.6 mg € 109.- (N 001 - 01)	5 x 1 µmol € 462.- (N 001 - 05)

P 025

Membrane-permeant !



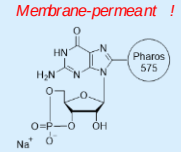
8- [Pharos-450]- guanosine- 3', 5'- cyclic monophosphate (8-[φ-450]-cGMP)

Sodium salt; purity > 98% HPLC; λ_{max} 449 nm; ε 14000. For other salt forms please inquire.
Cyclic GMP connected to the relatively small Pharos 450 fluorophore (λ_{exc} 450 nm, λ_{em} 534 nm). The fluorophore can be excited e.g. by a He/Cd laser. Due to its high lipophilicity and bright green fluorescence, 8-[φ-450]-cGMP is especially suitable for studies with intact cells. Detailed technical information available.

0.1 µmol / ~74 µg € 207.- (P 025 - 001)	5 x 0.1 µmol € 878.- (P 025 - 005)

P 020

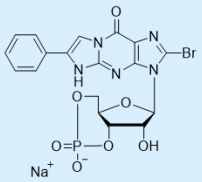
Membrane-permeant !

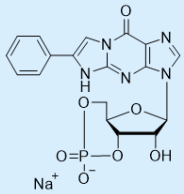


8- [Pharos-575]- guanosine- 3', 5'- cyclic monophosphate (8-[φ-575]-cGMP)

Sodium salt; purity > 98% HPLC; λ_{max} 575 nm; ε 20960. For other salt forms or metabolites please inquire.
Cyclic GMP connected to the relatively small Pharos 575 dye (λ_{exc} 577 nm, λ_{em} 605 nm). The fluorophore can be excited e.g. by a Kr/Ar laser. Due to its high lipophilicity and bright red fluorescence, 8-[φ-575]-cGMP is especially suitable for studies with intact cells. Detailed technical information available.

0.1 µmol / ~74 µg € 207.- (P 020 - 001)	5 x 0.1 µmol € 878.- (P 020 - 005)

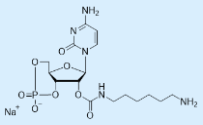
P 003 	**β- Phenyl- 1, N^2- etheno- 8- bromoguanosine- 3', 5'- cyclic monophosphate (8-Br-PET-cGMP)** [144510-04-3]; $C_{18}H_{14}BrN_5O_7P{\cdot}Na$; MW 546.2; λ_{max} 256 nm; ε 40000; sodium salt; purity > 98% HPLC. For other salt forms or metabolites please inquire. Potent membrane-permeant activator of both isozymes I α and I β of cGMP-dependent protein kinase while only a poor stimulator of type II. Common agonists such as 8-Br-cGMP (Cat. No. B 004) or 8-pCPT-cGMP (Cat. No. C 009) mainly activate kinase subtypes I α and II. 8-Br-PET-cGMP is one of the best activators of isozyme I β and one of the best cyclic nucleotide muscle relaxants. Detailed technical information and updated reference list available. Reference: Sekhar et al., *Mol. Pharmacol.*, **42**, 103 - 108 (1992).
10 µmol / ~5.5 mg € 157.- (P 003 - 10)	5 x 10 µmol € 670.- (P 003 - 50)

P 001 	**β- Phenyl- 1, N^2- ethenoguanosine- 3', 5'- cyclic monophosphate (PET-cGMP)** [78080-27-0]; $C_{18}H_{15}N_5O_7P{\cdot}Na$; MW 467.3; λ_{max} 252 nm; ε 37400; sodium salt; purity > 98% HPLC. For other salt forms or metabolites please inquire. Potent membrane-permeant activator of both isozymes I α and I β of cGMP-dependent protein kinase while only a poor stimulator of type II. Common agonists such as 8-Br-cGMP (Cat. No. B 004) or 8-pCPT-cGMP (Cat. No. C 009) mainly activate kinase subtypes I α and II. Detailed technical information and updated reference list available. References: Gamm et al., *J. Biol. Chem.*, **270**, 27380 - 27388 (1996); Vaandrager et al., *J. Biol. Chem.*, **272**, 11816 - 11823 (1997).
10 µmol / ~4.7 mg € 150.- (P 001 - 10)	5 x 10 µmol € 600.- (P 001 - 50) **Inquiries for bulk quantities welcome!**

Inquire	We are constantly synthesizing new activators of protein kinase G isozymes (cGMP analogues) such as acetoxymethyl ester (AM esters) and fluorescently labelled analogues of many regular structures offered. Custom syntheses are offered as well. Please inquire regarding special structures not listed here, or check out our website (www.biolog.de). Custom syntheses and purifications are offered.

Cyclic Nucleotides with Pyrimidine Nucleobases

A 156

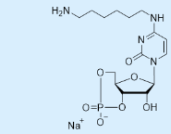


2'- O- (6- Aminohexylcarbamoyl)cytidine- 3', 5'- cyclic monophosphate (2'-AHC-cCMP)

$C_{16}H_{26}N_5O_8P$; MW 447.4; λ_{max} 270 nm; ε 9000; free acid; purity > 98% HPLC.
Analogue of cCMP (Cat. No. C 001), suitable as a ligand for affinity chromatography of cCMP binding proteins or for coupling of various labelling structures including fluorophores. This ligand is also available immobilized on agarose gel (2'-AHC-cCMP-Agarose; Cat. No. A 158). Detailed technical information available.

5 µmol / ~2.2 mg € 138.- (A 156 - 05)	5 x 5 µmol € 585.- (A 156 - 25)

A 143

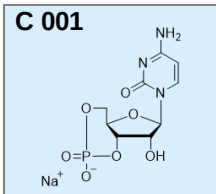


N^4- (6- Aminohexyl)cytidine- 3', 5'- cyclic monophosphate (4-AH-cCMP)

$C_{15}H_{25}N_4O_7P$; MW 404.4; λ_{max} 270 nm; ε 13300; free acid; purity > 98% HPLC.
Analogue of cCMP (Cat. No. C 001), suitable as a ligand for affinity chromatography of cCMP binding proteins or for coupling of various labelling structures including fluorophores. Detailed technical information available.

5 µmol / ~2 mg € 152.- (A 143 - 05)	5 x 5 µmol € 647.- (A 143 - 25)

C 001

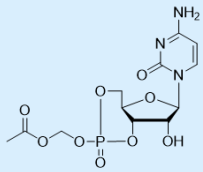


Cytidine- 3', 5'- cyclic monophosphate (cCMP)

[54925-33-6]; $C_9H_{11}N_3O_7P{\cdot}Na$; MW 327.2; λ_{max} 270 nm; ε 9000; sodium salt; purity > 98% HPLC.
For other salt forms, more PDE-resistant and membrane-permeant analogues please inquire. Potential further second messenger. Detailed technical information available. References: Newton, *Nucleosides & Nucleotides*, **14**, 743 - 747 (1995); Desch et al., *FEBS Lett.*, **584**, 3979 - 3984 (2010); Reinecke et al., *FEBS Lett.*, **585**, 3259 - 3262 (2011).

50 µmol / ~16 mg € 104.- (C 001 - 50)	5 x 50 µmol € 440.- (C 001 - 250)

C 067



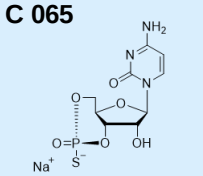
Cytidine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (cCMP-AM)

$C_{12}H_{16}N_3O_9P$; MW 377.2; λ_{max} 270 nm; ε 9000; purity > 95% HPLC for mixture of isomers.
Membrane-permeant, metabolically activatable prodrug form of the potential further second messenger cyclic CMP. After permeation and metabolic activation by esterases the polar cCMP is released, which is trapped inside the cell. Detailed technical information available.

Control reagent for nucleotide AM-ester applications: PO_4-AM_3, Cat. No. P 030

1 µmol / ~0.4 mg € 109.- (C 067 - 01)	5 x 1 µmol € 462.- (C 067 - 05)

C 065

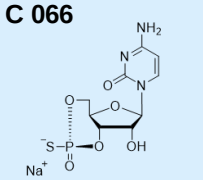


Cytidine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-cCMPS)

[87063-79-4]; $C_9H_{11}N_3O_6PS{\cdot}Na$; MW 343.2; λ_{max} 270 nm; ε 9000; sodium salt; purity > 99% HPLC.
For other salt forms please inquire. PDE-resistant, sulfur-modified form of the potential second messenger cyclic CMP and inhibitor of cCMP-binding proteins. Detailed technical information available. Reference: Eckstein & Kutzke, *Tetrahedr. Lett.*, **27**, 1657 - 1660 (1986).

1 µmol / ~0.3 mg € 87.- (C 065 - 01)	5 x 1 µmol € 369.- (C 065 - 05)

C 066

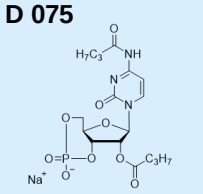


Cytidine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-cCMPS)

[87063-81-8]; $C_9H_{11}N_3O_6PS{\cdot}Na$; MW 343.2; λ_{max} 270 nm; ε 9000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. PDE-resistant, sulfur-modified form of the potential second messenger cyclic CMP and potential activator of cCMP-binding proteins. Detailed technical information available. Reference: Eckstein & Kutzke, *Tetrahedr. Lett.*, **27**, 1657 - 1660 (1986).

5 µmol / ~1.7 mg € 207.- (C 066 - 05)	5 x 5 µmol € 878.- (C 066 - 25)

D 075

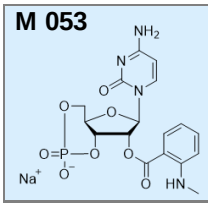


N^4, 2'- O- Dibutyrylcytidine- 3', 5'- cyclic monophosphate (DB-cCMP)

[64649-87-2]; $C_{17}H_{23}N_3O_9P{\cdot}Na$; MW 467.3; λ_{max} 248 nm; ε 17100; sodium salt; purity > 97% HPLC.
For other salt forms please inquire. Membrane-permeant, metabolically activatable prodrug form of the potential second messenger cyclic CMP. Detailed technical information available. References: Yanagida et al., *Neurosci. Lett.*, **114**, 323 - 328 (1990); Desch et al., *FEBS Lett.*, **584**, 3979 - 3984 (2010).

10 µmol / ~4.7 mg € 147.- (D 075 - 10)	5 x 10 µmol € 623.- (D 075 - 50)

M 053

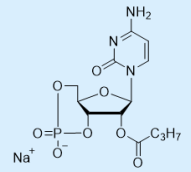


2'- O- (N'- Methylanthraniloyl)cytidine- 3', 5'- cyclic monophosphate (MANT-cCMP)

[1477570-24-3]; $C_{17}H_{18}N_4O_8P{\cdot}Na$; MW 460.3; λ_{max} 253 nm; ε 15000 ; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Fluorescent, membrane-permeant cyclic CMP analogue (λ_{exc} 350 nm and λ_{em} 441 nm), potentially suitable for phosphodiesterase studies. The compound is expected to show a decrease in fluorescence when cleaved by PDE. Detailed technical information available. Reference for related cyclic nucleotides: Hiratsuka, *J. Biol. Chem.*, **257**, 13354 - 13358 (1982).

5 µmol / ~2.3 mg € 109.- (M 053 - 05)	5 x 5 µmol € 462.- (M 053 - 25)

M 082 ***New !***

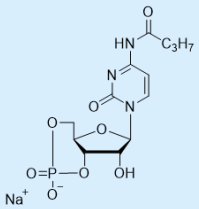


2'- O- Monobutyrylcytidine- 3', 5'- cyclic monophosphate (2'-O-MB-cCMP)

$C_{13}H_{17}N_3O_8P{\cdot}Na$; MW 397.3; λ_{max} 270 nm; ε 9000; sodium salt; purity > 97% HPLC.
For other salt forms please inquire. 2'-O-MB-cCMP is a precursor and biologically inactive analogue of the putative second messenger nucleotide cCMP (Cat. No. C 001). During metabolic activation by esterases both cCMP and butyrate are released. Detailed technical information available. Reference: Wolter et al., *Naunyn Schmiedebergs Arch. Pharmacol.*, **387**, 1163 - 1175 (2014).

5 µmol / ~2 mg € 138.- (M 082 - 05)	5 x 5 µmol € 585.- (M 082 - 25)

M 075 ***New !***

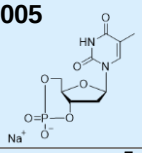


N^4- Monobutyrylcytidine- 3', 5'- cyclic monophosphate (4-MB-cCMP)

$C_{13}H_{17}N_3O_8P{\cdot}Na$; MW 397.3; λ_{max} 248 nm; ε 16400; sodium salt; purity > 97% HPLC.
For other salt forms please inquire. 4-MB-cCMP is an analogue of the putative second messenger nucleotide cCMP (Cat. No. C 001) and main cellular metabolite of DB-cCMP (Cat. No. D 075), generated by unspecific esterases attacking the 2'-O-butyryl group of DB-cCMP. 4-MB-cCMP was found to be a low-potency partial activator of PKG Iα both in vitro and in vivo. It was also reported to display full and moderate activation of PKA RIα and PKA RIIα in vitro, while showing no evidence for PKA activation in vivo. Detailed technical information available. Reference: Wolter et al., Naunyn Schmiedebergs Arch. Pharmacol., 387, 1163 - 1175 (2014).

5 µmol / ~2 mg € 138.- (M 075 - 05)	5 x 5 µmol € 585.- (M 075 - 25)

T 005

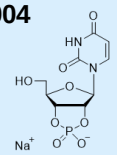


Thymidine- 3', 5'- cyclic monophosphate (cTMP)

[76567-90-3]; $C_{10}H_{12}N_2O_7P{\cdot}Na$; MW 326.2; λ_{max} 267 nm; ε 9600; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Cyclic nucleotide analogue for receptor mapping studies. Detailed technical information available. Reference: Riegel et al., *J. Exp. Biol.*, **201**, 3411 - 3418 (1998).

5 µmol / ~1.6 mg € 52.- (T 005 - 05)	5 x 5 µmol € 181.- (T 005 - 25)

U 004

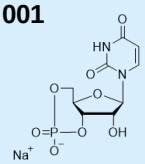


Uridine- 2', 3'- cyclic monophosphate (2',3'-cUMP)

[15718-50-0]; $C_9H_{10}N_2O_8P{\cdot}Na$; MW 328.2; λ_{max} 260 nm; ε 10000; sodium salt; purity > 97% HPLC.
For other salt forms please inquire. Detailed technical information available. References: Cheung & Abrash, *Biochemistry*, **3**, 1883 - 1889 (1964); Tomasz, *Nucleic Acid Chem.*, **2**, 875 - 879 (1978).

50 µmol / ~16 mg € 86.- (U 004 - 50)	5 x 50 µmol € 367.- (U 004 - 250)

U 001

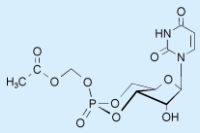


Uridine- 3', 5'- cyclic monophosphate (cUMP)

[56632-58-7]; $C_9H_{10}N_2O_8P{\cdot}Na$; MW 328.2; λ_{max} 262 nm; ε 10000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Detailed technical information available. References: Blecher et al., *Arch. Biochem. Biophys.*, **142**, 351 - 362 (1971); Moll et al., *J. Neural Transm.*, **113**, 1015 - 1032 (2006); Göttle et al., *Biochemistry*, **49**, 5494 - 5503 (2010).

50 µmol / ~16 mg € 86.- (U 001 - 50)	5 x 50 µmol € 367.- (U 001 - 250)

U 012



Uridine- 3', 5'- cyclic monophosphate, acetoxymethyl ester (cUMP-AM)

$C_{12}H_{15}N_2O_{10}P$; MW 378.2; λ_{max} 260 nm; ε 10000; sodium salt; purity > 95% HPLC for mixtures of isomers.
Membrane-permeant, metabolically activatable prodrug form of the potential further second messenger cyclic UMP (cUMP, Cat. No. U 001). After permeation and metabolic activation by esterases the polar cUMP is released which is trapped inside the cell and subsequently metabolized quickly, resulting in a pulse-type signal. Detailed technical information available. Reference: Beckert et al., *Biochem. Biophys. Res. Commun.*, **451**, 497 - 502 (2014).

Control reagent for nucleotide AM-ester applications: PO_4-AM_3, Cat. No. P 030

1 µmol / ~0.4 mg € 117.- (U 012 - 01)	5 x 1 µmol € 499.- (U 012 - 05)

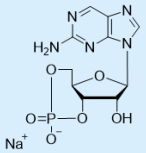
Inquire

Special analogues of pyrimidine cyclic nucleotides not listed as regular products

We are constantly synthesizing new pyrimidine nucleotide analogues! Please inquire regarding special structures not listed here, or check out our website (www.biolog.de). Custom syntheses and purifications are offered.

Fluorescent Cyclic Nucleotides

A 027

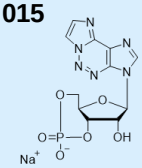


2- Aminopurine riboside- 3', 5'- cyclic monophosphate (2-NH_2-cPuMP)

[42467-66-3]; $C_{10}H_{11}N_5O_6P{\cdot}Na$; MW 351.2; λ_{max} 243 nm; ε 8000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Fluorescent cyclic nucleotide (λ_{exc} 305 nm, λ_{em} 370 nm), useful for receptor mapping studies. Detailed technical information available. References: Scheit, *J. Carbohydr. Nucleosides Nucleotides*, **1**, 385 - 399 (1974); Matthiesen & Nielsen, *Biochemical J.*, **423**, 401 - 409 (2009); Jäger et al., *Br. J. Pharmacol.*, **161**, 1645 - 1660 (2010).

5 µmol / ~1.8 mg € 75.- (A 027 - 05)	5 x 5 µmol € 319.- (A 027 - 25)

A 015

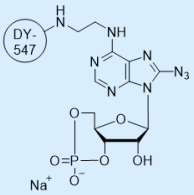


2- Aza- 1, N^6- ethenoadenosine- 3', 5'- cyclic monophosphate (2-Aza-ε-cAMP)

[50663-90-6]; $C_{11}H_{10}N_6O_6P{\cdot}Na$; MW 376.2; λ_{max} 290 nm, ε 5000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Fluorescent cAMP analogue (λ_{exc} 358 nm, λ_{em} 494 nm). Detailed technical information available. References: Tsou et al., *Anal. Biochem.*, **60**, 163 - 169 (1974); Kraemer et al., *J. Mol. Biol.*, **306**, 1167 - 1177 (2001).

5 µmol / ~1.9 mg € 105.- (A 015 - 05)	5 x 5 µmol € 443.- (A 015 - 25)

A 100

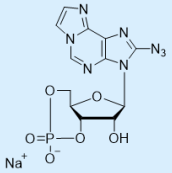


8- Azido- N^6- (2- [DY- 547]- aminoethyl)adenosine- 3', 5'- cyclic monophosphate (8-N_3-6-[DY-547]-AE-cAMP)

$C_{42}H_{48}N_{11}O_{13}PS_2{\cdot}Na_2$; MW 1056.0; λ_{max} 559 nm; ε 150000 (EtOH); sodium salt; purity > 95% HPLC.
For other salt forms please inquire. 8-N_3-6-[DY-547]-AE-cAMP is a light sensitive analogue for photoaffinity labelling. It can be immobilized within a cyclic AMP binding site by illumination with UV light. The fluorescent reporter group connected to position 6 of the adenine nucleobase can be excited at 557 nm and emits with 574 nm. Detailed technical information available. Reference: Park et al., *Cell*, **148**, 421 - 433 (2012).

0.1 µmol / ~0.1 mg € 217.- (A 100 - 001)	5 x 0.1 µmol € 924.- (A 100 - 005)

A 077



8- Azido- 1, N^6- ethenoadenosine- 3', 5'- cyclic monophosphate (8-N_3-ε-cAMP)

[60902-12-7]; $C_{12}H_{10}N_8O_6P{\cdot}Na$; MW 416.2; λ_{max} 290 nm; ε 10000; sodium salt; purity > 98% HPLC.
For other salt forms or metabolites please inquire. Nonfluorescent cAMP analogue, that can be used for labelling of cAMP receptors. Upon UV-light-induced immobilization the ethenoadenine moiety starts to fluoresce, providing a label for tracing the receptor protein. Detailed technical information available. References: Keeler & Campbell, *Biochem. Biophys. Res. Commun.*, **72**, 575 - 580 (1976); Dreyfuss et al., *Proc. Nat. Acad. Sci. USA*, **75**, 1199 - 1203 (1978).

1 µmol / ~0.4 mg € 164.- (A 077 - 01)	5 x 1 µmol € 692.- (A 077 - 05)

B 016 - B 019

[6, 7- Bis(carboxymethoxy)coumarin- 4- yl]methyl- caged cAMP and cGMP analogues

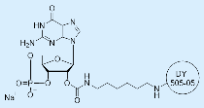
Please refer to "Activators of Protein Kinase A", p. 29 and "Activators of Protein Kinase G", p. 38, respectively

D 042, D 043

(7- Diethylaminocoumarin- 4- yl)methyl- caged cAMP and cGMP analogues

Please refer to "Activators of Protein Kinase A", p. 32 and "Activators of Protein Kinase G", p. 39, respectively

D 135

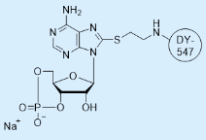


2'-O-(6-[DY505-05]-aminohexylcarbamoyl))guanosine-3',5'-cyclic monophosphate (2'-[DY-505-05]-AHC-cGMP)

$C_{38}H_{37}N_9O_{12}P{\cdot}Na$; MW 865.7; λ_{max} 505 nm; ε 85000 (EtOH); sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cGMP analogue (λ_{exc} 505 nm, λ_{em} 530 nm), suitable for phosphodiesterase studies. Detailed technical information available.

0.1 µmol / ~0.09 mg € 150.- (D 135 - 001)	5 x 0.1 µmol € 638.- (D 135 - 005)

D 109

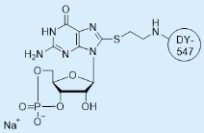


8- (2- [DY-547]- aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-[DY-547]-AET-cAMP / f-cAMP)

$C_{42}H_{49}N_8O_{13}PS_2{\cdot}Na_2$; MW 1047.1; sodium salt; λ_{max} 559 nm; ε 150000 in EtOH; purity > 98% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cAMP analogue (λ_{exc} 557 nm, λ_{em} 574 nm), e.g. for research focussed on activation studies of HCN2 channels and other cAMP-reponsive binding proteins. Detailed technical information available. Reference: Kusch et al., *Neuron*, **67**, 75 - 85 (2010).

0.1 µmol / ~0.1 mg € 157.- (D 109 - 001)	5 x 0.1 µmol € 670.- (D 109 - 005)

D 087

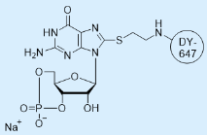


8- (2- [DY-547]- aminoethylthio)guanosine- 3', 5'- cyclic monophosphate
(8-[DY-547]-AET-cGMP / f-cGMP)

$C_{42}H_{49}N_8O_{14}PS_2 \cdot Na_2$; MW 1063.0; λ_{max} 559 nm; ε 150000 in EtOH; sodium salt; purity > 98% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cGMP analogue (λ_{exc} 557 nm, λ_{em} 574 nm) e.g. for research focussed on kinetic studies of CNG ion channels and other cGMP-reponsive binding proteins. Detailed technical information available. Reference: Biskup et al., *Nature*, **446**, 440 - 443 (2007).

0.1 µmol / ~0.1 mg € 157.- (D 087 - 001)	5 x 0.1 µmol € 670.- (D 087 - 005)

D 090

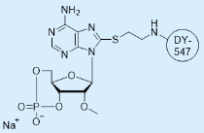


8- (2- [DY-647]- aminoethylthio)guanosine- 3', 5'- cyclic monophosphate
(8-[DY-647]-AET-cGMP)

$C_{44}H_{51}N_8O_{14}PS_2 \cdot Na_2$; MW 1089.1; λ_{max} 653 nm; ε 250000 (EtOH); sodium salt; purity > 98% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cGMP analogue (λ_{exc} 649 nm, λ_{em} 666 nm) e.g. for research focussed on kinetic studies of CNG ion channels and other cGMP-reponsive binding proteins. Detailed technical information available.

0.1 µmol / ~0.1 mg € 157.- (D 090 - 001)	5 x 0.1 µmol € 670.- (D 090 - 005)

D 089



8- (2- [DY-547]- aminoethylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate
(8-[DY-547]-AET-2'-O-Me-cAMP)

$C_{43}H_{51}N_8O_{13}PS_2 \cdot Na_2$; MW 1061.1; λ_{max} 559 nm; ε 150000 (EtOH); sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Fluorescent activator (λ_{exc} 557 nm, λ_{em} 574 nm) of the exchange protein directly activated by cyclic AMP (Epac) or cAMP-GEF, respectively, which does not activate PKA. Detailed technical information available.

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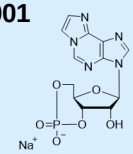
0.1 µmol / ~0.1 mg € 185.- (D 089 - 001)	5 x 0.1 µmol € 786.- (D 089 - 005)

E 001

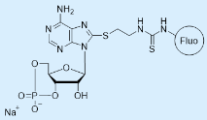


1, N^6- Ethenoadenosine- 3', 5'- cyclic monophosphate (ε-cAMP)

[103213-51-0]; $C_{12}H_{11}N_5O_6P \cdot Na$; MW 375.2; λ_{max} 275 nm; ε 6000; sodium salt; purity > 98% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cAMP analogue (λ_{exc} 300 nm, λ_{em} 415 nm). Detailed technical information and references available. Reference: Secrist et al., *Biochemistry,* **11**, 3499 - 3506 (1972).

10 µmol / ~3.8 mg € 63.- (E 001 - 10)	5 x 10 µmol € 266.- (E 001 - 50)

F 002

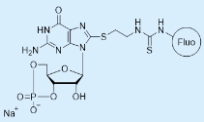


8- (2- [Fluoresceinyl]aminoethylthio)adenosine- 3', 5'- cyclic monophosphate
(8-[Fluo]-cAMP / 8-[Fluo]-AET-cAMP)

[293296-57-8]; $C_{33}H_{27}N_7O_{11}PS_2 \cdot Na$; MW 815.7; λ_{max} ~494 nm; ε ~79000/pH 9; sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cAMP analogue (λ_{exc} 494 nm, λ_{em} 517 nm). Detailed technical information available. References: Schwede et al., *Biochemistry,* **39**, 8803 - 8812 (2000); Wu et al., Biophys. J., 100, 1226 - 1232 (2011); Lolicato et al., *J. Biol. Chem.*, **286**, 44811 - 44820 (2011).

1 µmol / ~0.8 mg € 94.- (F 002 - 01)	5 x 1 µmol € 402.- (F 002 - 05)

F 001

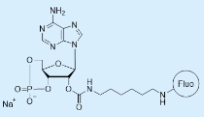


8- (2- [Fluoresceinyl]aminoethylthio)guanosine- 3', 5'- cyclic monophosphate
(8-[Fluo]-cGMP / 8-[Fluo]-AET-cGMP)

$C_{33}H_{27}N_7O_{12}PS_2 \cdot Na$; MW 831.7; λ_{max} ~494 nm; ε ~79000/pH 9; sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cGMP analogue (λ_{exc} 494 nm, λ_{em} 517 nm). A similar compound has been described to be the most potent channel activator tested so far: Tanaka et al, *Biochemistry,* **28**, 2776 - 2784 (1989). Detailed technical information available. References: Pena & Dominguez, *J. Biol. Screen.*, **15**, 1281 - 1286 (2010); Lolicato et al., *J. Biol. Chem.*, **286**, 44811 - 44820 (2011).

1 µmol / ~0.8 mg € 94.- (F 001 - 01)	5 x 1 µmol € 402.- (F 001 - 05)

F 003

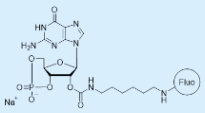


2'- (6- [Fluoresceinyl]aminohexylcarbamoyl)adenosine- 3', 5'- cyclic monophosphate
(2'-Fluo-AHC-cAMP / FAM-cAMP)

$C_{38}H_{35}N_7O_{13}P \cdot Na$; MW 851.7; λ_{max} ~494 nm; ε ~79000/pH 9; sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cAMP analogue (λ_{exc} 494 nm, λ_{em} 517 nm). Suitable for phosphodiesterase studies. Detailed technical information available. For reference compare: Huang et al., *J. Biomol. Screen.*, **7**, 215 - 222 (2002).

1 µmol / ~0.9 mg € 109.- (F 003 - 01)	5 x 1 µmol € 462.- (F 003 - 05)

F 004

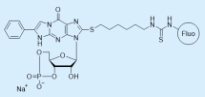


2'- (6- [Fluoresceinyl]aminohexylcarbamoyl)guanosine- 3', 5'- cyclic monophosphate (2'-Fluo-AHC-cGMP / FAM-cGMP)

$C_{38}H_{35}N_7O_{14}P{\cdot}Na$; MW 867.7; λ_{max} ~494 nm; ε ~79000/pH 9; sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cGMP analogue (λ_{exc} 494 nm, λ_{em} 517 nm). Suitable for phosphodiesterase studies. Detailed technical information available. For reference compare: Huang et al., *J. Biomol. Screen.*, **7**, 215 - 222 (2002).

1 µmol / ~0.9 mg € 109.- (F 004 -01)	5 x 1 µmol € 462.- (F 004 - 05)

F 012

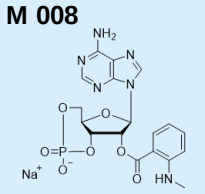


8- (6- [Fluoresceinyl]aminohexylthio)- ß- phenyl- 1, N²- ethenoguanosine- 3', 5'- cyclic monophosphate (8-[Fluo]-AHT-PET-cGMP)

$C_{45}H_{39}N_7O_{12}PS_2{\cdot}Na$; MW 987.9; λ_{max} ~494 nm; ε ~79000/pH 9; sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cGMP analogue (λ_{exc} 494 nm, λ_{em} 517 nm), suitable for receptor studies. Considered to be a CNG channel inhibitor due to its PET group. Detailed technical information available.

1 µmol / ~1 mg € 181.- (F 012 -01)	5 x 1 µmol € 770.- (F 012 - 05)

M 008

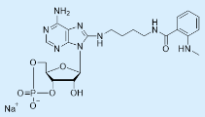


2'- O- (N'- Methylanthraniloyl)adenosine- 3', 5'- cyclic monophosphate (MANT-cAMP)

[83707-14-6]; $C_{18}H_{18}N_6O_7P{\cdot}Na$; MW 484.3; λ_{max} 255 / 355 nm; ε 22200 / 5400 (pH 8); sodium salt; purity > 98% HPLC.
For other salt forms, metabolites or anthraniloyl-cAMP please inquire. Fluorescent cyclic AMP analogue (λ_{exc} 350 nm, λ_{em} 445 nm), suitable for phosphodiesterase studies. The compound shows a decrease in fluorescence when cleaved by PDE. Detailed technical information available. References: Hiratsuka, *J. Biol. Chem.*, **257**, 13354 - 13358 (1982); Kraemer et al., *J. Mol. Biol.*, **306**, 1167 - 1177 (2001).

10 µmol / ~4.8 mg € 109.- (M 008 - 10)	5 x 10 µmol € 462.- (M 008 - 50)

M 016

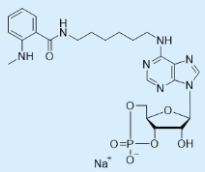


8- (4- [N'- Methylanthraniloyl]aminobutylamino)adenosine- 3', 5'- cyclic monophosphate (8-MABA-cAMP)

[909782-76-9]; $C_{22}H_{28}N_8O_7P{\cdot}Na$; MW 570.5; λ_{max} 261 nm / 278 nm; sodium salt; purity > 98% HPLC.
Fluorescent, membrane-permeant cyclic AMP analogue (λ_{exc} 352 nm, λ_{em} 436 nm). Detailed technical information available. Reference: Kraemer et al., *J. Mol. Biol.*, **306**, 1167 - 1177 (2001).

5 µmol / ~2.9 mg € 101.- (M 016 - 05)	5 x 5 µmol € 430.- (M 016 - 25)

M 017

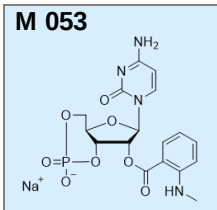


N⁶- (6- [N'- Methylanthraniloyl]aminohexyl)adenosine- 3', 5'- cyclic monophosphate (6-MAH-cAMP)

[723313-27-7]; $C_{24}H_{31}N_7O_7P{\cdot}Na$; MW 583.5; λ_{max} 261 nm; sodium salt; purity > 98% HPLC.
Fluorescent, membrane-permeant cyclic AMP analogue (λ_{exc} 333 nm, λ_{em} 437 nm). Detailed technical information available. References: Kraemer et al., *J. Mol. Biol.*, **306**, 1167 - 1177 (2001); Moll et al., *J. Neural Transm.*, **113**, 1015 - 1032 (2006). For modifications with the methylanthraniloyl group please compare: Theyssen, *J. Mol. Biol.*, **263**, 657 - 670 (1996).

5 µmol / ~2.9 mg € 113.- (M 017 - 05)	5 x 5 µmol € 480.- (M 017 - 25)

M 053



2'- O- (N'- Methylanthraniloyl)cytidine- 3', 5'- cyclic monophosphate (MANT-cCMP)

[1477570-24-3]; $C_{17}H_{18}N_4O_8P{\cdot}Na$; MW 460.3; λ_{max} 253 nm; ε 15000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Fluorescent, membrane-permeant cyclic CMP analogue with λ_{exc} 350 nm and λ_{em} 441 nm, potentially suitable for phosphodiesterase studies. The compound is expected to show a decrease in fluorescence when cleaved by PDE. Detailed technical information available. Reference for related cyclic nucleotides: Hiratsuka, *J. Biol. Chem.*, **257**, 13354 - 13358 (1982).

5 µmol / ~2.3 mg € 109.- (M 053 - 05)	5 x 5 µmol € 462.- (M 053 - 25)

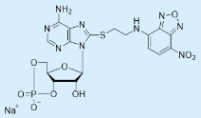
M 009

2'- O- (N'- Methylanthraniloyl)guanosine- 3', 5'- cyclic monophosphate (MANT-cGMP)

[83707-15-7]; $C_{18}H_{18}N_6O_8P{\cdot}Na$; MW 500.3; λ_{max} 252 / 350 nm; ε 21500 / 5300 (pH 8); sodium salt; purity > 98% HPLC.
For other salt forms, metabolites or anthraniloyl-cGMP please inquire. Fluorescent cyclic GMP analogue (λ_{exc} 350 nm, λ_{em} 441 nm), suitable for phosphodiesterase studies. The compound shows a decrease in fluorescence when cleaved by PDE. Detailed technical information available. References: Hiratsuka, *J. Biol. Chem.*, **257**, 13354 - 13358 (1982); Johnson, *Anal. Biochem.*, **162**, 291 - 295 (1987); Brown et al., *Biochem. Biophys. Res. Commun.*, **224**, 684 - 689 (1996).

10 µmol / ~5 mg € 109.- (M 009 - 10)	5 x 10 µmol € 462.- (M 009 - 50)

N 002
Membrane-permeant !

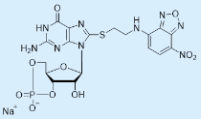


8- (2- [7- Nitro- 4- benzofurazanyl]aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-NBD-cAMP)

[221905-51-7]; $C_{18}H_{17}N_9O_9PS \cdot Na$; MW 589.4; λ_{max} 463 nm (MeOH); ε 22000; sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Potent membrane-permeant fluorescent activator (λ_{exc} 471 nm, λ_{em} 536 nm) of cAMP-dependent protein kinase. While 8-NBD-cAMP is almost non-fluorescent in aqueous solutions, it fluoresces strongly in hydrophobic environments such as hydrophobic protein binding sites. Detailed technical information available. References: Kraemer et al., *J. Mol. Biol.*, **306**, 1167 - 1177 (2001); Wu et al., Biophys. J., 100, 1226 - 1232 (2011); Chen et. al., *Bioorg. Med. Chem. Lett.*, **22**, 4038 - 4043 (2012).

1 µmol / ~0.6 mg € 109.- (N 002 - 01)	5 x 1 µmol € 462.- (N 002 - 05)

N 001
Membrane-permeant !

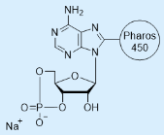


8- (2- [7- Nitro- 4- benzofurazanyl]aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-NBD-cGMP)

[115993-88-9]; $C_{18}H_{17}N_9O_{10}PS \cdot Na$; MW 605.4; λ_{max} 463 nm (MeOH); ε 22000; sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Potent membrane-permeant fluorescent activator (λ_{exc} 475 nm, λ_{em} 525 nm) of both isozymes I α and I β of cGMP-dependent protein kinase. While 8-NBD-cGMP is almost nonfluorescent in aqueous solutions, it fluoresces strongly in hydrophobic environments such as hydrophobic protein binding sites. Detailed technical information available. Reference: Salowe et al., *Biochemistry*, **41**, 4385 - 4391 (2002).

1 µmol / ~0.6 mg € 109.- (N 001 - 01)	5 x 1 µmol € 462.- (N 001 - 05)

P 024
Membrane-permeant !

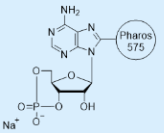


8- [Pharos-450]- adenosine- 3', 5'- cyclic monophosphate (8-[φ-450]-cAMP)

Sodium salt; purity > 98% HPLC; λ_{max} 450 nm; ε 14000. For other salt forms please inquire.
Cyclic AMP connected to the relatively small Pharos 450 fluorophore (λ_{exc} 450 nm, λ_{em} 534 nm) by a spacer. The fluorophore can be excited e.g. by a He/Cd laser. Due to its high lipophilicity and bright green fluorescence 8-[φ-450]-cAMP is especially suitable for studies with intact cells. Detailed technical information available.

0.1 µmol / ~72 µg € 207.- (P 024 - 001)	5 x 0.1 µmol € 878.- (P 024 - 005)

P 019
Membrane-permeant !

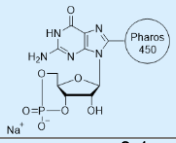


8- [Pharos-575]- adenosine- 3', 5'- cyclic monophosphate (8-[φ-575]-cAMP)

Sodium salt; purity > 98% HPLC; λ_{max} 575 nm; ε 20960. For other salt forms please inquire.
Cyclic AMP connected to the relatively small Pharos 575 dye (λ_{exc} 577 nm, λ_{em} 605 nm) by a spacer. The fluorophore can be excited e.g. by a Kr/Ar laser. Due to its high lipophilicity and bright red fluorescence 8-[φ-575]-cAMP is especially suitable for studies with intact cells. Upon binding to PKA a small hypsochromatic shift is observed. Detailed technical information available. Reference: Moll et al., *BMC Biochemistry*, **9**:18 (2008).

0.1 µmol / ~72 µg € 207.- (P 019 - 001)	5 x 0.1 µmol € 878.- (P 019 - 005)

P 025
Membrane-permeant !

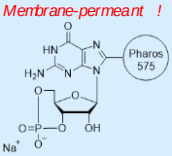


8- [Pharos-450]- guanosine- 3', 5'- cyclic monophosphate (8-[φ-450]-cGMP)

Sodium salt; purity > 98% HPLC; λ_{max} 449 nm; ε 14000. For other salt forms please inquire.
Cyclic GMP connected to the relatively small Pharos 450 fluorophore (λ_{exc} 450 nm, λ_{em} 534 nm). The fluorophore can be excited e.g. by a He/Cd laser. Due to its high lipophilicity and bright green fluorescence, 8-[φ-450]-cGMP is especially suitable for studies with intact cells. Detailed technical information available.

0.1 µmol / ~74 µg € 207.- (P 025 - 001)	5 x 0.1 µmol € 878.- (P 025 - 005)

P 020
Membrane-permeant !

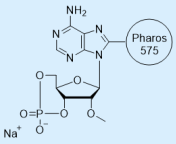


8- [Pharos-575]- guanosine- 3', 5'- cyclic monophosphate (8-[φ-575]-cGMP)

Sodium salt; purity > 98% HPLC; λ_{max} 575 nm; ε 20960. For other salt forms or metabolites please inquire.
Cyclic GMP connected to the relatively small Pharos 575 dye (λ_{exc} 577 nm, λ_{em} 605 nm). The fluorophore can be excited e.g. by a Kr/Ar laser. Due to its high lipophilicity and bright red fluorescence, 8-[φ-575]-cGMP is especially suitable for studies with intact cells. Detailed technical information available.

0.1 µmol / ~74 µg € 207.- (P 020 - 001)	5 x 0.1 µmol € 878.- (P 020 - 005)

P 021
Membrane-permeant !



8- [Pharos-575]- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-[φ-575]-2'-O-Me-cAMP)

Sodium salt; purity > 98% HPLC; λ_{max} 575 nm; ε 20960. For other salt forms please inquire.
The Epac activator 2'-O-Me-cAMP connected to the relatively small Pharos 575 dye (λ_{exc} 577 nm, λ_{em} 605 nm). The fluorophore can be excited e.g. by a Kr/Ar laser. Due to its high lipophilicity and bright red fluorescence, 8-[φ-575]-2'-O-Me-cAMP is especially suitable for studies with intact cells. Detailed technical information available.

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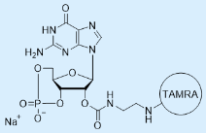
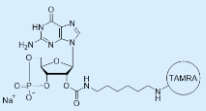
0.1 µmol / ~74 µg € 238.- (P 021 - 001)	5 x 0.1 µmol € 998.- (P 021 - 005)

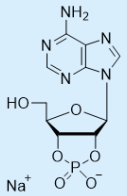
T 018 	**2'- O- (2- [Tetramethylrhodaminyl]aminoethylcarbamoyl)guanosine- 3', 5'- cyclic mono-phosphate (2'-TAMRA-AEC-cGMP)** $C_{38}H_{37}N_9O_{12}P{\cdot}Na$; MW 865.7; λ_{max} 543 nm; ε 95000 (MeOH); sodium salt; purity > 95% HPLC. For other salt forms or metabolites please inquire. Fluorescent cGMP analogue (λ_{exc} 555 nm, λ_{em} 580 nm), suitable for phosphodiesterase studies. The dye is connected to the 2'-hydroxy group of cGMP via a 5-atom spacer. This type of fluorescent analogue is also available with a longer 9-atom spacer (2'-TAMRA-AHC-cGMP, Cat. No. T 017, below). Detailed technical information available. Reference for tetramethylrhodamine-labelled cGMP: Abadi et al., *Eur. J. Med. Chem.*, **45**, 1278 - 1286 (2010).
0.5 µmol / ~0.4 mg € 124.- (T 018 - 005)	5 x 0.5 µmol € 528.- (T 018 - 025)

T 017 	**2'- O- (6- [Tetramethylrhodaminyl]aminohexylcarbamoyl)guanosine- 3', 5'- cyclic mono-phosphate (2'-TAMRA-AHC-cGMP)** $C_{42}H_{45}N_9O_{12}P{\cdot}Na$; MW 921.8; λ_{max} 543 nm; ε 95000 (MeOH); sodium salt; purity > 95% HPLC. For other salt forms or metabolites please inquire. Fluorescent cGMP analogue (λ_{exc} 555 nm, λ_{em} 580 nm), suitable for phosphodiesterase studies. The dye is connected to the 2'-hydroxy group of cGMP via a 9-atom spacer. This type of fluorescent analogue is also available with a shorter 5-atom spacer (2'-TAMRA-AEC-cGMP, Cat. No. T 018, above). Detailed technical information available. Reference for tetramethylrhodamine-labelled cGMP: Abadi et al., *Eur. J. Med. Chem.*, **45**, 1278 - 1286 (2010).
0.5 µmol / ~0.5 mg € 124.- (T 017 - 005)	5 x 0.5 µmol € 528.- (T 017 - 025)

Inquire	We are constantly synthesizing new fluorescent cyclic nucleotide analogues! Conjugates with many different fluorescent dyes and various spacers are possible as well. Please inquire regarding special structures not listed here or visit our website (www.biolog.de). Custom syntheses and purifications are offered.

Special Task Cyclic Nucleotides

A 307

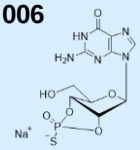


Adenosine- 2', 3'- cyclic monophosphate (2',3'-cAMP)

[37063-35-7]; $C_{10}H_{11}N_5O_6P{\cdot}Na$; MW 351.2; λ_{max} 259 nm; ε 15000; sodium salt; purity > 97% HPLC.
For other salt forms please inquire. 2',3'-cAMP is a positional isomer of 3',5'-cAMP (Cat. No. A 001) which was found to be produced by organ systems such as rat and mouse kidney and mouse brain from RNA degradation. The production and release into the extracellular compartment seems to mainly occur in response to injury. 2',3'-cAMP is metabolized to 2'-AMP and 3'-AMP, and these monophosphates are subsequently converted to adenosine. Detailed technical information available. Reference: Forman et al., *Dig. Dis. Sci.*, **59**, 2118 - 2125 (2014).

50 µmol / ~18 mg € 31.- (A 307 - 50)	5 x 50 µmol € 132.- (A 307 - 250)

A 006

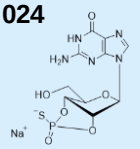


Adenosine- 2', 3'- cyclic monophosphorothioate, *endo* / Rp- isomer (Rp-2',3'-cAMPS)

[118275-99-3]; $C_{10}H_{11}N_5O_5PS{\cdot}Na$; MW 367.3; λ_{max} 259 nm; ε 15200; sodium salt; purity > 97% HPLC.
For other salt forms please inquire. Detailed technical information and references available. References: Lowe & Thelin, *J. Chem. Soc. Chem. Commun.*, 1947 - 1948 (1994); Heaton & Eckstein, *Nucleic Acids Res.*, **24**, 850 - 853 (1996).

5 µmol / ~1.8 mg € 152.- (A 006 - 05)	5 x 5 µmol € 647.- (A 006 - 25)

A 024



Adenosine- 2', 3'- cyclic monophosphorothioate, *exo* / Sp- isomer (Sp-2',3'-cAMPS)

[118276-00-9]; $C_{10}H_{11}N_5O_5PS{\cdot}Na$; MW 367.3; λ_{max} 259 nm; ε 15200; sodium salt; purity > 97% HPLC.
For other salt forms please inquire. Detailed technical information and references available. References: Lowe & Thelin, *J. Chem. Soc. Chem. Commun.*, 1947 - 1948 (1994); Heaton & Eckstein, *Nucleic Acids Res.*, **24**, 850 - 853 (1996).

5 µmol / ~1.8 mg € 152.- (A 024 - 05)	5 x 5 µmol € 647.- (A 024 - 25)

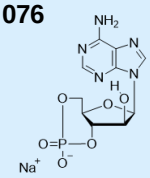
A 027

2- Aminopurine riboside- 3', 5'- cyclic monophosphate (2-NH_2-cPuMP)

[42467-66-3]; $C_{10}H_{11}N_5O_6P{\cdot}Na$; MW 351.2; λ_{max} 243 nm; ε 8000; sodium salt; purity > 98% HPLC. For other salt forms please inquire. Fluorescent cyclic nucleotide (λ_{exc} 305 nm; λ_{em} 370 nm), useful for receptor mapping studies. Detailed technical information available. References: Scheit, *J. Carbohydr. Nucleosides Nucleotides*, **1**, 385 - 399 (1974); Matthiesen & Nielsen, *Biochemical J.*, **423**, 401 - 409 (2009); Jäger et al., *Br. J. Pharmacol.*, **161**, 1645 - 1660 (2010).

5 µmol / ~1.8 mg € 75.- (A 027 - 05)	5 x 5 µmol € 319.- (A 027 - 25)

A 076

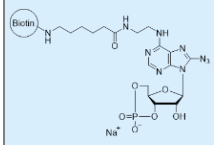


Arabinoadenosine- 3', 5'- cyclic monophosphate (*ara*-cAMP)

[32465-18-2]; $C_{10}H_{11}N_5O_6P{\cdot}Na$; MW 351.2; λ_{max} 259 nm; ε 15000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Analogue of the second messenger cyclic AMP with an inverted configuration at the 2'-hydroxy group. Useful for receptor mapping studies and negative controls. Detailed technical information available. References: Miller, *Adv. Cyclic Nucleot. Res.*,**14**, 335 - 344 (1981); Jäger et al., *J. Biol. Chem.*, **287**, 1210 - 1219 (2012).

5 µmol / ~1.8 mg € 114.- (A 076 - 05)	5 x 5 µmol € 484.- (A 076 - 25)

A 127

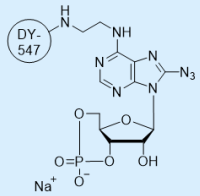


8- Azido- N^6- (2- [biotinyl]aminoethyl)adenosine- 3', 5'- cyclic monophosphate (8-N_3-6-[Biotin]-AE-cAMP)

$C_{28}H_{40}N_{12}O_9PS{\cdot}Na$; MW 774.7; λ_{max} 290 nm; ε 17000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Analogue for photoaffinity labelling of cAMP binding proteins which can be immobilized by UV light. The biotin label is connected to position 6 of cyclic AMP via a 10 atom spacer. Detailed technical information available.

0.1 µmol / ~80 µg € 152.- (A 127 - 001)	5 x 0.1 µmol € 647.- (A 127 - 005)

A 100

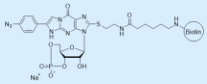


8- Azido- N^6- (2- [DY-547]- aminoethyl)adenosine- 3', 5'- cyclic monophosphate (8-N_3-6-[DY-547]-AE-cAMP)

$C_{42}H_{48}N_{11}O_{13}PS_2{\cdot}Na_2$; MW 1056.0; λ_{max} 559 nm; ε 150000 (EtOH); sodium salt; purity > 95% HPLC.
For other salt forms please inquire. 8-N_3-6-[DY-547]-AE-cAMP is a light sensitive analogue for photoaffinity labelling. It can be immobilized within a cyclic AMP binding site by illumination with UV light. The fluorescent reporter group connected to position 6 of the adenine nucleobase can be excited at 557 nm and emits with 574 nm. Detailed technical information available. Reference: Park et al., *Cell*, **148**, 421 - 433 (2012).

0.1 µmol / ~0.1 mg € 217.- (A 100 - 001)	5 x 0.1 µmol € 924.- (A 100 - 005)

A 186

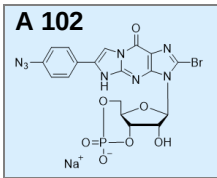


β- (4- Azidophenyl)- 1, N^2- etheno- 8- (2- [biotinyl]aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (4-N_3-PET-8-[Biotin]-AET-cGMP)

$C_{36}H_{44}N_{12}O_{10}PS_2 \cdot Na$; MW 922.9; λ_{max} 287 nm; ε 40000; sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Biotinylated cGMP analogue for photoaffinity labelling of cGMP-responsive receptors. Detailed technical information available.

0.1 µmol / ~92 µg € 124.- (A 186 - 001)	5 x 0.1 µmol € 528.- (A 186 - 005)

A 102

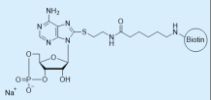


β- (4- Azidophenyl)- 1, N^2- etheno- 8- bromoguanosine- 3', 5'- cyclic monophosphate (4-N_3-PET-8-Br-cGMP)

$C_{18}H_{13}BrN_8O_7P \cdot Na$; MW 587.2; λ_{max} 278 nm; ε 40000; sodium salt; purity > 97% HPLC. For other salt forms or metabolites please inquire. Analogue for photoaffinity labelling of cGMP-responsive receptors, considered to be an isozyme-selective activator of cGMP-dependent protein kinase I α and β. Detailed technical information available.

1 µmol / ~0.6 mg € 152.- (A 102 - 01)	5 x 1 µmol € 647.- (A 102 - 05)

B 030

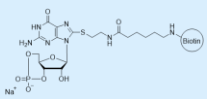


8- (2- [Biotinyl]aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-[Biotin]-AET-cAMP)

$C_{28}H_{41}N_9O_9PS_2 \cdot Na$; MW 765.8; λ_{max} 280 nm; ε ~17000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. The biotin label is connected to the 8-position of cyclic AMP via an 11 atom spacer. Detailed technical information available.

1 µmol / ~0.8 mg € 135.- (B 030 - 01)	5 x 1 µmol € 572.- (B 030 - 05)

B 025

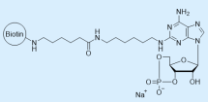


8- (2- [Biotinyl]aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-[Biotin]-AET-cGMP)

$C_{28}H_{41}N_9O_{10}PS_2 \cdot Na$; MW 781.8; λ_{max} 275 nm; ε ~14000; sodium salt; purity > 98% HPLC.
Biotin connected to the 8-position of cyclic GMP via an 11 atom spacer. A similar analogue but with a different position of attachment is described (Cat. No. B 032, below). Detailed technical information available.

1 µmol / ~0.8 mg € 164.- (B 025 - 01)	5 x 1 µmol € 692.- (B 025 - 05)

B 041

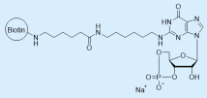


2- (6- [Biotinyl]aminohexylamino)adenosine- 3', 5'- cyclic monophosphate (2-[Biotin]-AHA-cAMP)

$C_{32}H_{50}N_{10}O_9PS \cdot Na$; MW 804.8; λ_{max} 258 nm; ε ~14000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. The biotin label is connected to the 2-position of cyclic AMP via a 15 atom spacer. Detailed technical information available.

1 µmol / ~0.8 mg € 207.- (B 041 - 01)	5 x 1 µmol € 878.- (B 041 - 05)

B 032

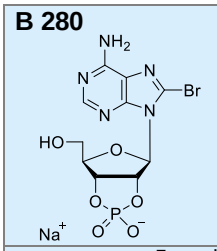


N^2- (6- [Biotinyl]aminohexyl)guanosine- 3', 5'- cyclic monophosphate (2-[Biotin]-AH-cGMP)

$C_{32}H_{49}N_9O_{10}PS \cdot Na$; MW 805.8; λ_{max} 255 nm; ε 15000; sodium salt; purity > 98% HPLC.
Biotin connected to the 2-position of cyclic GMP via a 14 atom spacer. A similar analogue but with a different position of attachment is described above (Cat. No. B 025). Detailed technical information available.

1 µmol / ~0.8 mg € 164.- (B 032 - 01)	5 x 1 µmol € 692.- (B 032 - 05)

B 280

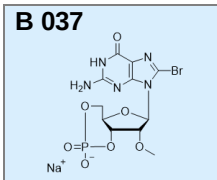


8- Bromoadenosine- 2', 3'- cyclic monophosphate (8-Br-2',3'-cAMP)

[42391-15-1]; $C_{10}H_{10}BrN_5O_6P \cdot Na$; MW 430.1; λ_{max} 264 nm; ε 17000; sodium salt; purity > 97% HPLC.
For other salt forms please inquire. 8-Br-2',3'-cAMP is considered to be a membrane-permeable analogue of 2',3'-cAMP (BIOLOG Cat. No. A 307) (Kosmacz et al. 2018). 2',3'-cAMP is a positional isomer of the natural second messenger 3',5'-cAMP (BIOLOG Cat. No. A 001) and was found to be produced by organ systems such as rat and mouse kidney and mouse brain from RNA degradation. It was also recently reported to promote the formation of stress granules in Arabidopsis thaliana. Reference: Kosmacz et al., Plant Physiol., 177, 411 - 421 (2018).

5 µmol / ~2.2 mg € 130.- (B 280 - 05)	5 x 5 µmol € 553.- (B 280 - 25)

B 037



8- Bromo- 2'- O- methylguanosine- 3', 5'- cyclic monophosphate (8-Br-2'-O-Me-cGMP)

$C_{11}H_{12}BrN_5O_7P \cdot Na$; MW 460.1; λ_{max} 260 nm; ε 15000; sodium salt; purity > 98% HPLC. For other salt forms please inquire. Analogue of cyclic GMP which does not activate both, protein kinase G and Epac. 8-Br-2'-O-Me-cGMP can be used as an inactive control versus 8-Br-cGMP (Cat. No. B 004). Detailed technical information available.

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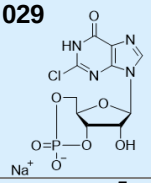
5 µmol / ~2.3 mg € 98.- (B 037 - 05)	5 x 5 µmol € 416.- (B 037 - 25)

C 029

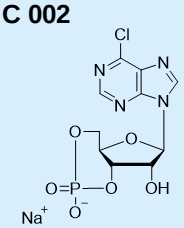


2- Chloroinosine- 3', 5'- cyclic monophosphate (2-Cl-cIMP)

[52301-30-1]; $C_{10}H_9ClN_4O_7P \cdot Na$; MW 386.6; λ_{max} 255 nm; ε 13100; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Detailed technical information available. Reference: Hebert et al., *J. Biol. Chem.*, **273**, 5557 - 5565 (1998).

5 µmol / ~1.9 mg € 125.- (C 029 - 05)	5 x 5 µmol € 531.- (C 029 - 25)

C 002

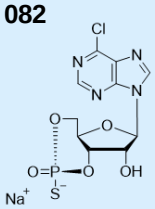


6- Chloropurine riboside- 3', 5'- cyclic monophosphate (6-Cl-cPuMP)

[94200-58-5]; $C_{10}H_9ClN_4O_6P \cdot Na$; MW 370.6; λ_{max} 263 nm; ε 8900; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Analogue of cyclic AMP showing better membrane permeability and higher stability against phosphodiesterases. Suitable for nucleophilic substitutions at the 6-position with affinity spacers or various labels and for receptor mapping studies. Detailed technical information and references available.
Reference: Peters et al., *Proc. Nat. Acad. Sci. USA*, **88**, 9219 - 9223 (1991); Hofbauer et al., *J. Biol. Chem.*, **283**, 25164 - 25170 (2008).

5 µmol / ~1.9 mg € 68.- (C 002 - 05)	5 x 5 µmol € 291.- (C 002 - 25)	**Inquiries for bulk quantities welcome!**

C 082

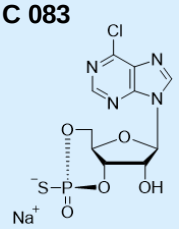


6- Chloropurine riboside- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-6-Cl-cPuMPS)

[129693-15-8]; $C_{10}H_9ClN_4O_5PS \cdot Na$; MW 386.7; λ_{max} 263 nm; ε 8900; sodium salt; purity > 98% HPLC.
PDE-resistant modulator of protein kinase A with reactive functional group allowing further chemical modifications. Significantly more lipophilic and membrane-permeant compared to Rp-cAMPS (Cat. No. A 002).
Detailed technical information available. Reference: Dostmann et al., *J. Biol. Chem.*, **265**, 10484 - 10491 (1990).

5 µmol / ~1.9 mg € 202.- (C 082 - 05)	5 x 5 µmol € 858.- (C 082 - 25)

C 083

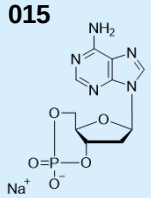


6- Chloropurine riboside- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-6-Cl-cPuMPS)

[129693-12-5]; $C_{10}H_9ClN_4O_5PS \cdot Na$; MW 386.7; λ_{max} 263 nm; ε 8900; sodium salt; purity > 98% HPLC.
PDE-resistant activator of protein kinase A (cyclic AMP agonist) with reactive functional group allowing further chemical modifications. Significantly more lipophilic and membrane-permeant compared to Sp-cAMPS (Cat. No. A 003). Detailed technical information available. References: Dostmann et al., *J. Biol. Chem.*, **265**, 10484 - 10491 (1990); Schaap et al., *J. Biol. Chem.*, **268**, 6323 - 6331 (1993); Ruchaud et al., *Cell. Pharmacol.*, **2**, 127 - 140 (1995).

5 µmol / ~1.9 mg € 181.- (C 083 - 05)	5 x 5 µmol € 770.- (C 083 - 25)

D 015

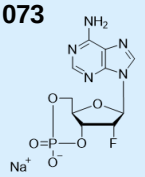


2'- Deoxyadenosine- 3', 5'- cyclic monophosphate (2'-dcAMP)

[93839-95-3]; $C_{10}H_{11}N_5O_5P \cdot Na$; MW 335.2; λ_{max} 259 nm; ε 15000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Protein kinase A inactive analogue of cyclic AMP with modified 2'-moiety for cAMP receptor mapping studies. Detailed technical information and references available.
References: Muhonen & Shabb, *Protein Sci.*, **9**, 2446 - 2456 (2000); Hofbauer et al., *J. Biol. Chem.*, **283**, 25164 - 25170 (2008).

10 µmol / ~3.4 mg € 109.- (D 015 - 10)	5 x 10 µmol € 462.- (D 015 - 50)

D 073

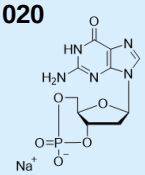


2'- Deoxy- 2'- fluoroadenosine- 3', 5'- cyclic monophosphate (2'-F-dcAMP)

[81356-81-2]; $C_{10}H_{10}FN_5O_5P \cdot Na$; MW 353.2; λ_{max} 259 nm; ε 15000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Protein kinase A inactive analogue of cyclic AMP with modified 2'- moiety for cAMP receptor mapping studies. Detailed technical information available.
Reference: Ikehara, *Heterocycles*, **21**, 75 - 90 (1984).

5 µmol / ~1.8 mg € 114.- (D 073 - 05)	5 x 5 µmol € 484.- (D 073 - 25)

D 020

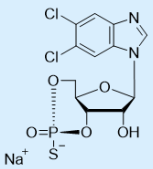


2'- Deoxyguanosine- 3', 5'- cyclic monophosphate (2'-dcGMP)

[93919-42-7]; $C_{10}H_{11}N_5O_6P \cdot Na$; MW 351.2; λ_{max} 252 nm; ε 13500; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Protein kinase G inactive analogue of cyclic GMP with modified 2'-moiety for cGMP receptor mapping studies. Detailed technical information available. Reference: Hebert et al., *J. Biol. Chem.*, **273**, 5557 - 5565 (1998).

10 µmol / ~3.5 mg € 81.- (D 020 - 10)	5 x 10 µmol € 344.- (D 020 - 50)

D 013

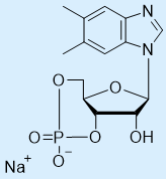


5, 6- Dichloro-1- β- D- ribofuranosylbenzimidazole- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-5,6-DCl-cBIMPS)

[120912-55-2]; $C_{12}H_{10}Cl_2N_2O_5PS \cdot Na$; MW 419.2; λ_{max} 254 nm; ε 6400; sodium salt; purity > 99% HPLC.
Lipophilic and phosphodiesterase-resistant modulator of cAMP-dependent protein kinase. The corresponding Sp isomer is available as well (Cat. No. D 014). Detailed technical information and references available. Reference: Dostmann et al., *J. Biol. Chem.*, **265**, 10484 - 10491 (1990).

5 µmol / ~2.1 mg € 112.- (D 013 - 05)	5 x 5 µmol € 474.- (D 013 - 25)

D 001

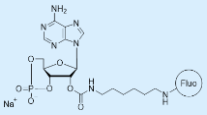


5, 6- Dimethyl- 1- β- D- ribofuranosylbenzimidazole- 3', 5'- cyclic monophosphate (5,6-DM-cBIMP)

[142754-31-2]; $C_{14}H_{16}N_2O_6P \cdot Na$; MW 362.3; λ_{max} 279 nm; ε 7500 (MeOH); sodium salt; purity > 98% HPLC.
Membrane-permeant activator of phosphodiesterase type II with only very poor activation potential for protein kinase G. Detailed technical information available. References: Genieser et al., *Carbohydr. Res.*, **234**, 217 - 235 (1992); Jäger et al., *Br. J. Pharmacol.*, **161**, 1645 - 1660 (2010).

5 µmol / ~1.8 mg € 147.- (D 001 - 05)	5 x 5 µmol € 623.- (D 001 - 25)

F 003

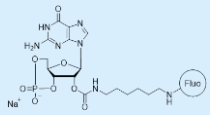


2'- (6- [Fluoresceinyl]aminohexylcarbamoyl)adenosine- 3', 5'- cyclic monophosphate (2'-Fluo-AHC-cAMP / FAM-cAMP)

$C_{38}H_{35}N_7O_{13}P \cdot Na$; MW 851.7; λ_{max} ~494 nm; ε ~79000/pH 9 sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cAMP analogue; λ_{exc} 494 nm, λ_{em} 517 nm. Suitable for phosphodiesterase studies. Detailed technical information available. Reference: Schafer et al., *Br. J. Pharmacol.*, **159**, 842 - 855 (2010).

1 µmol / ~0.9 mg € 109.- (F 003 - 01)	5 x 1 µmol € 462.- (F 003 - 05)

F 004

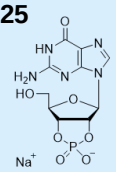


2'- (6- [Fluoresceinyl]aminohexylcarbamoyl)guanosine- 3', 5'- cyclic monophosphate (2'-Fluo-AHC-cGMP / FAM-cGMP)

$C_{38}H_{35}N_7O_{14}P \cdot Na$; MW 867.7; λ_{max} ~494 nm; ε ~79000/pH 9 sodium salt; purity > 95% HPLC.
For other salt forms or metabolites please inquire. Fluorescent cGMP analogue; λ_{exc} 494 nm, λ_{em} 517 nm. Suitable for phosphodiesterase studies. Detailed technical information available. Reference: Schafer et al., *Br. J. Pharmacol.*, **159**, 842 - 855 (2010).

1 µmol / ~0.9 mg € 109.- (F 004 - 01)	5 x 1 µmol € 462.- (F 004 - 05)

G 025

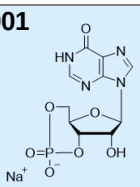


Guanosine- 2', 3'- cyclic monophosphate (2',3'-cGMP)

[15718-49-7]; $C_{10}H_{11}N_5O_7P \cdot Na$; MW 367.2; λ_{max} 252 nm; ε 13500; sodium salt; purity > 97% HPLC.
For other salt forms please inquire. Detailed technical information available. Reference: Francis et al., *J. Biol. Chem.*, **255**, 620 - 626 (1980).

50 µmol / ~18 mg € 97.- (G 025 - 50)	5 x 50 µmol € 412.- (G 025 - 250)

I 001

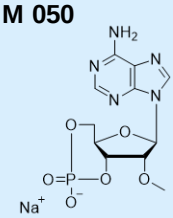


Inosine- 3', 5'- cyclic monophosphate (cIMP)

[41092-64-2]; $C_{10}H_{10}N_4O_7P \cdot Na$; MW 352.2; λ_{max} 249 nm; ε 12000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Detailed technical information available.
References: Poteet-Smith et al., *J. Biol. Chem.*, **272**, 379 - 388 (1997); Matthiesen & Jacob, *Biochem. J.*, **423**, 401 - 409 (2009).

50 µmol / ~18 mg € 62.- (I 001 - 50)	5 x 50 µmol € 264.- (I 001 - 250)	**Inquiries for bulk quantities welcome!**

M 050

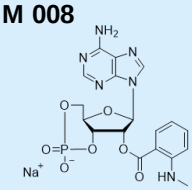


2'- O- Methyladenosine- 3', 5'- cyclic monophosphate (2'-O-Me-cAMP)

[40269-29-2]; $C_{11}H_{13}N_5O_6P \cdot Na$; MW 365.2; λ_{max} 259 nm; ε 15000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Relatively polar analogue of cyclic AMP which does not activate protein kinase A. Suitable for Epac activation by patch clamp application techniques and for receptor mapping studies. The structurally related cGMP-based analogue 2'-O-Me-cGMP is offered as well (Cat. No. M 036, below). Detailed technical information available. Reference: Kang et. al., *J. Physiol.*, **573**, 595 - 609 (2006).

5 µmol / ~1.8 mg € 80.- (M 050 - 05)	5 x 5 µmol € 338.- (M 050 - 25)	**Inquiries for bulk quantities welcome!**

M 008

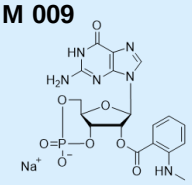


2'- O- (N'- Methylanthraniloyl)adenosine- 3', 5'- cyclic monophosphate (MANT-cAMP)

[83707-14-6]; $C_{18}H_{18}N_6O_7P{\cdot}Na$; MW 484.4; λ_{max} 255 / 355 nm; ε 22200 / 5400; sodium salt; purity > 98% HPLC. For other salt forms, metabolites or anthraniloyl-cAMP please inquire. Fluorescent cyclic AMP analogue (λ_{exc} 350 nm, λ_{em} 445 nm), suitable for phosphodiesterase studies. The compound shows a decrease in fluorescence when cleaved by PDE. Detailed technical information available. References: Hiratsuka, *J. Biol. Chem.*, **257**, 13354 - 13358 (1982); Kraemer et al., *J. Mol. Biol.*, **306**, 1167 - 1177 (2001).

10 µmol / ~4.8 mg € 109.- (M 008 - 10)	5 x 10 µmol € 462.- (M 008 - 50)	**Inquiries for bulk quantities welcome!**

M 009



2'- O- (N'- Methylanthraniloyl)guanosine- 3', 5'- cyclic monophosphate (MANT-cGMP)

[83707-15-7]; $C_{18}H_{18}N_6O_8P{\cdot}Na$; MW 500.3; λ_{max} 252 / 350 nm; ε 21500 / 5300; sodium salt; purity > 98% HPLC. For other salt forms, metabolites or anthraniloyl-cGMP please inquire. Fluorescent cyclic GMP analogue (λ_{exc} 350 nm, λ_{em} 441 nm), suitable for phosphodiesterase studies. The compound shows a decrease in fluorescence when cleaved by PDE. Detailed technical information available. References: Hiratsuka, *J. Biol. Chem.*, **257**, 13354 - 13358 (1982); Johnson, *Anal. Biochem.*, **162**, 291 - 295 (1987); Brown et al., *Biochem. Biophys. Res. Commun.*, **224**, 684 - 689 (1996).

10 µmol / ~5 mg € 109.- (M 009 - 10)	5 x 10 µmol € 462.- (M 009 - 50)	**Inquiries for bulk quantities welcome!**

M 036

2'- O- Methylguanosine- 3', 5'- cyclic monophosphate (2'-O-Me-cGMP)

[949909-73-3]; $C_{11}H_{13}N_5O_7P{\cdot}Na$; MW 381.2; λ_{max} 252 nm; ε 13500; sodium salt; purity > 98% HPLC. For other salt forms or metabolites please inquire. Protein kinase G inactive analogue of cyclic GMP with modified 2'- moiety for cGMP receptor mapping studies. Detailed technical information available. The structurally related cAMP-based analogue 2'-O-Me-cAMP (Cat. No. M 050, above) is offered as well. References: Strassmaier & Karpen, *J. Med. Chem.*, **50**, 4186 - 4194 (2007); Matthiesen & Nielsen, *Biochem. J.*, **423**, 401 - 409 (2009); Jäger et al., *Br. J. Pharmacol.*, **161**, 1645 - 1660 (2010).

5 µmol / ~1.9 mg € 83.- (M 036 - 05)	5 x 5 µmol € 353.- (M 036 - 25)

M 011

2'- O- Monosuccinyladenosine- 3', 5'- cyclic monophosphate (2'-O-MS-cAMP)

Please refer to "Precursors for Labelling and Immobilization", p. 59.

M 022

2'- O- Monosuccinyladenosine- 3', 5'- cyclic monophosphate, tyrosylmethyl ester (2'-MS-TME-cAMP)

Please refer to "Precursors for Labelling and Immobilization", p. 59.

M 015

2'- O- Monosuccinylguanosine- 3', 5'- cyclic monophosphate (2'-O-MS-cGMP)

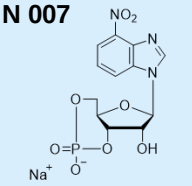
Please refer to "Precursors for Labelling and Immobilization", p. 61.

M 023

2'- O- Monosuccinylguanosine- 3', 5'- cyclic monophosphate, tyrosylmethyl ester (2'-MS-TME-cGMP)

Please refer to "Precursors for Labelling and Immobilization", p. 61.

N 007

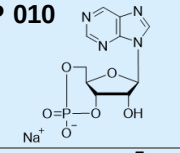


4- Nitrobenzimidazole riboside- 3', 5'- cyclic monophosphate (4-NO_2-cBIMP)

[127634-21-3]; $C_{12}H_{11}N_3O_8P{\cdot}Na$; MW 379.2; λ_{max} 314 nm; ε 7500; sodium salt; purity > 98% HPLC. For other salt forms or metabolites please inquire. Analogue of the second messenger cyclic AMP, lacking the pyrimidine ring nitrogens and offering a changed interaction potential at position 6 (adenine nomenclature). Suitable for receptor mapping studies. Detailed technical information available. References: Van Lookeren Campagne et al., *J. Biol. Chem.*, **265**, 5847 - 5854 (1990); Genieser et al., *Carbohydr. Res.*, **234**, 217 - 235 (1992).

5 µmol / ~1.9 mg € 164.- (N 007 - 05)	5 x 5 µmol € 692.- (N 007 - 25)

P 010

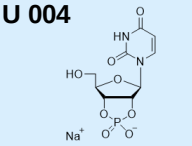


Purine riboside- 3', 5'- cyclic monophosphate (cPuMP)

[53303-84-7]; $C_{10}H_{10}N_4O_6P{\cdot}Na$; MW 336.2; λ_{max} 263 nm; ε 8000; sodium salt; purity > 98% HPLC. For other salt forms please inquire. Cyclic nucleotide analogue for receptor mapping studies. Detailed technical information available. Reference: Hebert et al., *J. Biol. Chem.*, **273**, 5557 - 5565 (1998).

5 µmol / ~1.7 mg € 79.- (P 010 - 05)	5 x 5 µmol € 334.- (P 010 - 25)

U 004

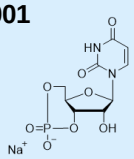


Uridine- 2', 3'- cyclic monophosphate (2',3'-cUMP)

[15718-50-0]; $C_9H_{10}N_2O_8P{\cdot}Na$; MW 328.2; λ_{max} 260 nm; ε 10000; sodium salt; purity > 97% HPLC. For other salt forms please inquire. Detailed technical information available. References: Tomasz, *Nucleic Acid Chem.*, **2**, 875 - 879 (1978); Cheung & Abrash, *Biochemistry*, **3**, 1883 - 1889 (1964).

50 µmol / ~16 mg € 86.- (U 004 - 50)	5 x 50 µmol € 367.- (U 004 - 250)

U 001

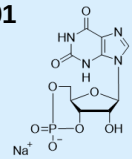


Uridine- 3', 5'- cyclic monophosphate (cUMP)

[56632-58-7]; $C_9H_{10}N_2O_8P{\cdot}Na$; MW 328.2; λ_{max} 262 nm; ε 10000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Detailed technical information available. References: Blecher et al., *Arch. Biochem. Biophys.*, **142**, 351 - 362 (1971); Moll et al., *J. Neural Transm.*, **113**, 1015 - 1032 (2006); Göttle et al., *Biochemistry*, **49**, 5494 - 5503 (2010).

50 µmol / ~16 mg € 86.- (U 001 - 50)	5 x 50 µmol € 367.- (U 001 - 250)

X 001



Xanthosine- 3', 5'- cyclic monophosphate (cXMP)

[31319-70-7]; $C_{10}H_{10}N_4O_8P{\cdot}Na$; MW 368.2; λ_{max} 252 nm; ε 11000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Detailed technical information available. Reference: Meyer et al., *J. Cyclic Nucl. Res.*, **1**, 159 - 167 (1975); Spangler et al., *J. Pharmacol. Exp. Ther.*, **336**, 234 - 241 (2011).

5 µmol / ~1.8 mg € 94.- (X 001 - 05)	5 x 5 µmol € 402.- (X 001 - 25)	**Inquiries for bulk quantities welcome!**

Inquire

Special cyclic nucleotides not listed as regular products

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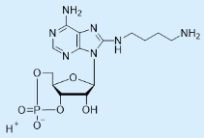
Cyclic AMP- based Precursors for Labelling and Immobilization

A 017

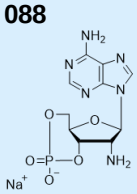


8- (4- Aminobutyl)aminoadenosine- 3', 5'- cyclic monophosphate (8-ABA-cAMP)

[82927-68-2]; $C_{14}H_{22}N_7O_6P$; MW 415.4; λ_{max} 273 nm; ε 17000; free acid; purity > 98% HPLC.
Site-selective cAMP analogue with preference for site B of R I of cAMP-dependent protein kinase. Can be combined with A-site selective analogues for selective activation of cAK I. Also suitable as a ligand in affinity chromatography and for modification with fluorophores or other markers. Detailed technical information and references available. References: Schwede et al., *Biochemistry,* **39**, 8803 - 8812 (2000); Dao et al., *J. Biol. Chem.*, **281**, 21500 - 21511 (2006).

5 µmol / ~2.1 mg € 48.- (A 017 - 05)	5 x 5 µmol € 203.- (A 017 - 25)	**Inquiries for bulk quantities welcome!**

A 088

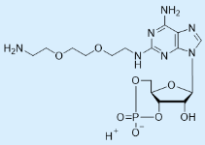


2'- Amino- 2'- deoxyadenosine- 3', 5'- cyclic monophosphate (2'-NH_2-cAMP)

[85819-83-6]; $C_{10}H_{12}N_6O_5P{\cdot}Na$; MW 350.2; λ_{max} 259 nm; ε 15000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. 2'-NH_2-cAMP has a reactive amino group in 2'-position suitable for modification with fluorophores and other markers or spacers, can be used as ligand for affinity chromatography of cAMP and cGMP binding proteins that do not require an intact 2'-OH group and for receptor mapping studies. Detailed technical information available. Reference: Jäger et al., *J. Biol. Chem.*, **287**, 1210 - 1219 (2012).

5 µmol / ~1.8 mg € 137.- (A 088 - 05)	5 x 5 µmol € 581.- (A 088 - 25)

A 136

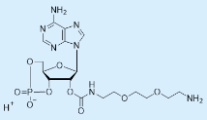


2- (8- Amino- 3, 6- dioxaoctylamino)adenosine- 3', 5'- cyclic monophosphate (2-ADOA-cAMP)

$C_{16}H_{26}N_7O_8P$; MW 475.4; λ_{max} 258 nm; ε 12600; free acid; purity > 98% HPLC.
cAMP analogue with a hydrophilic spacer for improved solubility in water, suitable as a ligand in affinity chromatography and for modification with fluorophores or other markers. Detailed technical information available. Reference: Moll et al., *J. Neural Transm.*, **113**, 1015 - 1032 (2006).

5 µmol / ~2.4 mg € 136.- (A 136 - 05)	5 x 5 µmol € 578.- (A 136 - 25)

A 146

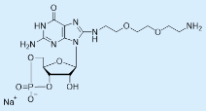


2'- O- (8- Amino- 3, 6- dioxaoctylcarbamoyl)adenosine- 3', 5'- cyclic monophosphate (2'-ADOC-cAMP)

$C_{17}H_{26}N_7O_9P$; MW 503.4; λ_{max} 259 nm; ε 15000; free acid; purity > 98% HPLC.
cAMP analogue with a hydrophilic spacer for improved solubility in water, suitable as a ligand in affinity chromatography and for modification with fluorophores or other markers. Detailed technical information available.

5 µmol / ~2.5 mg € 122.- (A 146 - 05)	5 x 5 µmol € 520.- (A 146 - 25)

A 033

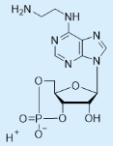


8- (8- Amino- 3, 6- dioxaoctylamino)adenosine- 3', 5'- cyclic monophosphate (8-ADOA-cAMP)

[214272-05-6]; $C_{16}H_{26}N_7O_8P$; MW 475.4; λ_{max} 274 nm; ε 17000; free acid; purity > 98% HPLC.
Site-selective cAMP analogue with a hydrophilic spacer for improved solubility in water, suitable as a ligand in affinity chromatography and for modification with fluorophores or other markers. Detailed technical information available. Reference: Moll et al., *J. Neural Transm.*, **113**, 1015 - 1032 (2006).

5 µmol / ~2.4 mg € 61.- (A 033 - 05)	5 x 5 µmol € 261.- (A 033 - 25)

A 096

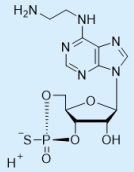


N^6- (2- Aminoethyl)adenosine- 3', 5'- cyclic monophosphate (6-AE-cAMP)

[66311-08-8]; $C_{12}H_{17}N_6O_6P$; MW 372.3; λ_{max} 266 nm; ε 16200; free acid; purity > 98% HPLC.
Ligand for affinity chromatography of cAMP and cGMP binding proteins and suitable for modification with fluorophores and other markers. Detailed technical information and references available. This ligand is also available with a longer spacer (6-AH-cAMP; Cat. No. A 031). Reference: Dills et al., *Biochemistry*, **15**, 3724 - 3731 (1976).

5 µmol / ~1.9 mg € 82.- (A 096 - 05)	5 x 5 µmol € 347.- (A 096 - 25)	**Inquiries for bulk quantities welcome!**

A 092

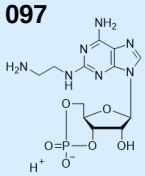


N^6- (2- Aminoethyl)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-6-AE-cAMPS)

$C_{12}H_{17}N_6O_5PS$; MW 388.4; λ_{max} 266 nm; ε 16200; free acid; purity > 98% HPLC.
Phosphodiesterase-resistant ligand for affinity chromatography of cAMP and cGMP binding proteins and suitable for modification with fluorophores and other markers. Detailed technical information available. This ligand is also available with a longer spacer (Sp-6-AH-cAMPS; Cat. No. A 089).

5 µmol / ~1.9 mg € 160.- (A 092 - 05)	5 x 5 µmol € 683.- (A 092 - 25)

A 097

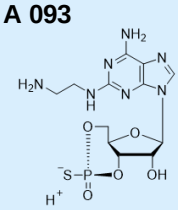


2- (2- Aminoethylamino)adenosine- 3', 5'- cyclic monophosphate (2-AEA-cAMP)

[66311-12-4]; $C_{12}H_{18}N_7O_6P$; MW 387.3; λ_{max} 258 nm; ε 12600; free acid; purity > 98% HPLC.
Ligand for affinity chromatography of cAMP and cGMP binding proteins and suitable for modification with fluorophores and other markers. Detailed technical information available. This ligand is also available with a longer spacer (2-AHA-cAMP; Cat. No. A 053). Reference: Rieke et al., *Eur. J. Biochem.*, **83**, 419 - 426 (1978).

5 µmol / ~1.9 mg € 136.- (A 097 - 05)	5 x 5 µmol € 578.- (A 097 - 25)

A 093

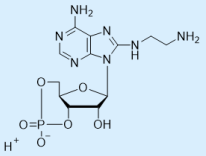


2- (2- Aminoethylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-2-AEA-cAMPS)

$C_{12}H_{18}N_7O_5PS$; MW 403.4; λ_{max} 258 nm; ε 12600; free acid; purity > 98% HPLC.
Phosphodiesterase-resistant ligand for affinity chromatography of cAMP and cGMP binding proteins and suitable for modification with fluorophores and other markers. Detailed technical information available. This ligand is also available with a longer spacer (Sp-2-AHA-cAMPS; Cat. No. A 068).

5 µmol / ~2 mg € 272.- (A 093 - 05)	5 x 5 µmol € 1,116.- (A 093 - 25)

A 016

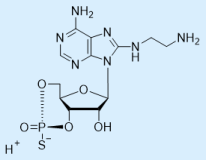


8- (2- Aminoethylamino)adenosine- 3', 5'- cyclic monophosphate (8-AEA-cAMP)

[61363-29-9]; $C_{12}H_{18}N_7O_6P$; MW 387.3; λ_{max} 273 nm; ε 17000; free acid; purity > 98% HPLC.
Ligand for affinity chromatography of cAMP and cGMP binding proteins and suitable for modification with fluorophores and other markers. Detailed technical information and references available. This ligand is also available with a longer spacer (8-AHA-cAMP; Cat. No. A 011) and as PDE-resistant form (Sp-8-AEA-cAMPS; Cat. No. A 094, below). Reference: Ramseyer et al., *Biochim. Biophys. Acta*, **446**, 358 - 370 (1976).

5 µmol / ~1.9 mg € 50.- (A 016 - 05)	5 x 5 µmol € 213.- (A 016 - 25)	**Inquiries for bulk quantities welcome!**

A 180

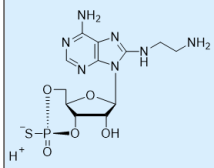


8- (2- Aminoethylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-AEA-cAMPS)

[221904-78-5]; $C_{12}H_{18}N_7O_5PS$; MW 403.4; λ_{max} 273 nm; ε 17000; free acid; purity > 98% HPLC.
Phosphodiesterase-resistant ligand for affinity chromatography of cAMP and cGMP binding proteins and suitable for modification with fluorophores and other markers. Detailed technical information available. This ligand is also available with a longer spacer (Rp-8-AHA-cAMPS; Cat. No. A 085), and immobilized on agarose gel (Rp-8-AEA-cAMPS-Agarose; Cat. No. A 007).

5 µmol / ~2 mg € 239.- (A 180 - 05)	5 x 5 µmol € 1,002.- (A 180 - 25)

A 094

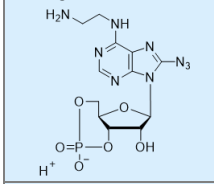


8- (2- Aminoethylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-AEA-cAMPS)

[221904-84-3]; $C_{12}H_{18}N_7O_5PS$; MW 403.4; λ_{max} 273 nm; ε 17000; free acid; purity > 98% HPLC.
Phosphodiesterase-resistant ligand for affinity chromatography of cAMP and cGMP binding proteins and suitable for modification with fluorophores and other markers. Detailed technical information available. This ligand is also available with a longer spacer (Sp-8-AHA-cAMPS; Cat. No. A 071), and immobilized on agarose gel (Sp-8-AEA-cAMPS-Agarose; Cat. No. A 008). Reference: Bertinetti et al., *BMC Chem. Biol.*, **9**: 3 (2009).

5 µmol / ~2 mg € 130.- (A 094 - 05)	5 x 5 µmol € 555.- (A 094 - 25)

A 101

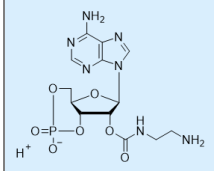


N^6- (2- Aminoethyl)- 8- azidoadenosine- 3', 5'- cyclic monophosphate (6-AE-8-N_3-cAMP)

$C_{12}H_{16}N_9O_6P$; MW 413.3; λ_{max} 284 nm; ε 17000 (est.); free acid; purity > 97% HPLC.
6-AE-8-N_3-cAMP is a light sensitive analogue for photoaffinity labelling. It can be immobilized within a cyclic AMP binding site by illumination with UV light. The reactive amino group connected to position 6 of the adenine nucleobase can be used to form a conjugate with suitable reporter groups, such as fluorescent dyes, biotin, etc. Detailed technical information available.

1 µmol / ~0.4 mg € 87.- (A 101 - 01)	5 x 1 µmol € 369.- (A 101 - 05)

A 098

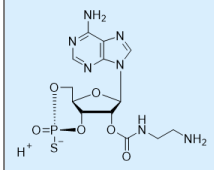


2'- O- (2- Aminoethylcarbamoyl)adenosine- 3', 5'- cyclic monophosphate (2'-AEC-cAMP / 2'-EDA-cAMP)

[403497-54-1]; $C_{13}H_{18}N_7O_7P$; MW 415.3; λ_{max} 259 nm; ε 15000; free acid; purity > 98% HPLC.
Ligand for affinity chromatography of cAMP and cGMP binding proteins and suitable for modification with fluorophores or other markers. Detailed technical information available. This ligand is also available with a longer spacer (2'-AHC-cAMP; Cat. No. A 046). Compare: Corrie et al., *Prot. Expr. Purif.*, **3**, 417 - 420 (1992).

5 µmol / ~2.1 mg € 70.- (A 098 - 05)	5 x 5 µmol € 300.- (A 098 - 25)	**Inquiries for bulk quantities welcome!**

A 119

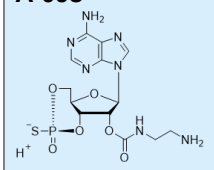


2'- O- (2- Aminoethylcarbamoyl)adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-2'-AEC-cAMPS / Rp-2'-EDA-cAMPS)

$C_{13}H_{18}N_7O_6PS$; MW 431.4; λ_{max} 259 nm; ε 15200; free acid; purity > 98% HPLC.
Analogue of the PKA inhibitor Rp-cAMPS (Cat. No. A 002), suitable for immobilization as affinity ligand (e.g. for purification of phosphodiesterases) or for coupling of various labelling structures including fluorophores. PDE-resistant form of 2'-AEC-cAMP (Cat. No. A 098). Detailed technical information available.

5 µmol / ~2.2 mg € 196.- (A 119 - 05)	5 x 5 µmol € 831.- (A 119 - 25)

A 095

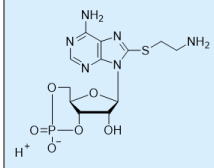


2'- O- (2- Aminoethylcarbamoyl)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-2'-AEC-cAMPS / Sp-2'-EDA-cAMPS)

$C_{13}H_{18}N_7O_6PS$; MW 431.4; λ_{max} 259 nm; ε 15200; free acid; purity > 98% HPLC. Phosphodiesterase-resistant ligand for affinity chromatography of cAMP and cGMP binding proteins and suitable for modification with fluorophores or other markers. Detailed technical information available. This ligand is also available with a longer spacer (Sp-2'-AHC-cAMPS; Cat. No. A 066). Compare: Corrie et al., *Prot. Expr. Purif.*, **3**, 417 - 420 (1992).

5 µmol / ~2.2 mg € 152.- (A 095 - 05)	5 x 5 µmol € 647.- (A 095 - 25)	**Inquiries for bulk quantities welcome!**

A 141

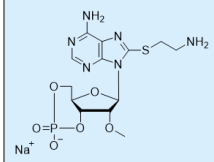


8- (2- Aminoethylthio)adenosine- 3', 5'- cyclic monophosphate (8-AET-cAMP)

[53546-96-6]; $C_{12}H_{17}N_6O_6PS$; MW 404.3; λ_{max} 279 nm; ε 17000; free acid; purity > 98% HPLC.
Ligand for affinity chromatography of cAMP and cGMP binding proteins and suitable for modification with fluorophores or other markers. Detailed technical information and references available. References: Kochetkova et al., *Biokhimiya*, **46**, 353 - 360 (1981); Grivennikov et al., *Biokhimiya*, **49**, 1395 - 1406 (1984); Marcussen et al., *Anal. Biochem. Acta,* **198**, 324 - 329 (1991).

5 µmol / ~2 mg € 78.- (A 141 - 05)	5 x 5 µmol € 330.- (A 141 - 25)

A 142



8- (2- Aminoethylthio)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-AET-2'-O-Me-cAMP)

[634207-89-9]; $C_{13}H_{18}N_6O_6PS{\cdot}Na$; MW 440.4; λ_{max} 279 nm; ε 17000; sodium salt, purity > 98% HPLC.
8-AET-2'-O-Me-cAMP has only poor affinity towards protein kinases A and G and is thus suitable as a ligand in affinity chromatography of cAMP binding proteins that do not require an intact 2'-OH group, such as the exchange protein activated by cyclic AMP (Epac) and certain phosphodiesterases. Detailed technical information available. For reference please compare: Borland et al., *Mol. Pharmacol.*, **69**, 374 - 384 (2006).

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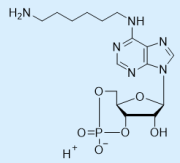
5 µmol / ~2.2 mg € 164.- (A 142 - 05)	5 x 5 µmol € 692.- (A 142 - 25)

A 031

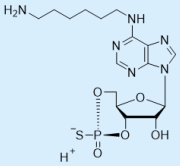


N^6- (6- Aminohexyl)adenosine- 3', 5'- cyclic monophosphate (6-AH-cAMP)

[66311-09-9]; $C_{16}H_{25}N_6O_6P$; MW 428.4; λ_{max} 266 nm; ε 16200; free acid; purity > 98% HPLC.
Suitable as a ligand in affinity chromatography of cAMP and cGMP binding proteins and for modification with fluorophores or other markers. Detailed technical information and references available. This ligand is also available with a shorter spacer (6-AE-cAMP; Cat. No. A 096); as well as in a PDE-resistant form (Sp-6-AH-cAMPS, Cat. No. A 089, below). References: Dills et al., *Biochemistry*, **15**, 3724 - 3730 (1976); Moll et al., *J. Neural Transm.*, **113**, 1015 - 1032 (2006).

5 µmol / ~2.1 mg € 82.- (A 031 - 05)	5 x 5 µmol € 347.- (A 031 - 25)

A 089

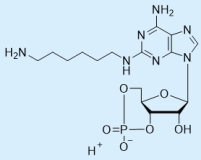


N^6- (6- Aminohexyl)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-6-AH-cAMPS)

$C_{16}H_{25}N_6O_5PS$; MW 444.5; λ_{max} 266 nm; ε 16200; free acid; purity > 98% HPLC.
Phosphodiesterase-resistant ligand for affinity chromatography of cAMP and cGMP binding proteins and suitable for modification with fluorophores or other markers. Detailed technical information available. This ligand is also available with a shorter spacer (Sp-6-AE-cAMPS; Cat. No. A 092).

5 µmol / ~2.2 mg € 160.- (A 089 - 05)	5 x 5 µmol € 683.- (A 089 - 25)

A 053

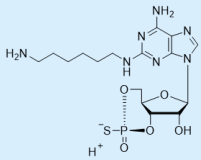


2- (6- Aminohexylamino)adenosine- 3', 5'- cyclic monophosphate (2-AHA-cAMP)

[214276-80-9]; $C_{16}H_{26}N_7O_6P$; MW 443.4; λ_{max} 258 nm; ε 12600; free acid; purity > 98% HPLC.
Suitable as a ligand in affinity chromatography of cAMP and cGMP binding proteins and for modification with fluorophores and other markers. Detailed technical information available. Reference: Moll et al., *J. Neural Transm.*, **113**, 1015 - 1032 (2006). This ligand is also available with a shorter spacer (2-AEA-cAMP; Cat. No. A 097) as well as in a PDE-resistant form (Sp-2-AHA-cAMPS, Cat. No. A 068).

5 µmol / ~2.2 mg € 136.- (A 053 - 05)	5 x 5 µmol € 578.- (A 053 - 25)

A 068

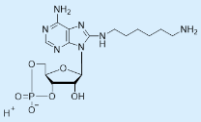


2- (6- Aminohexylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-2-AHA-cAMPS)

[214276-94-5]; $C_{16}H_{26}N_7O_5PS$; MW 459.5; λ_{max} 258 nm; ε 12600; free acid; purity > 98% HPLC.
PDE-resistant ligand for affinity chromatography of cAMP and cGMP binding proteins and suitable for modification with fluorophores and other markers. PDE-resistant form of 2-AHA-cAMP (Cat. No. A 053). Detailed technical information available. This ligand is also available with a shorter spacer (Sp-2-AEA-cAMPS, Cat. No. A 093).

5 µmol / ~2.3 mg € 272.- (A 068 - 05)	5 x 5 µmol € 1,116.- (A 068 - 25)

A 011

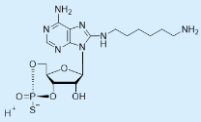


8- (6- Aminohexylamino)adenosine- 3', 5'- cyclic monophosphate (8-AHA-cAMP)

[39824-30-1]; $C_{16}H_{26}N_7O_6P$; MW 443.4; λ_{max} 273 nm; ε 17000; free acid; purity > 98% HPLC.
Site-selective cAMP analogue with preference for site B of R I of cAMP-dependent protein kinase. In combination with 8-piperidino-cAMP (Cat. No. P 002), which selects site A of R I and site B of R II, specific synergistic activation of kinase type I can be obtained. Reference: Skalhegg et al., *J. Biol. Chem.*, **267**, 15707 - 15714 (1992). Also suitable as a ligand in affinity chromatography (8-AHA-cAMP-Agarose; Cat. No. A 028) or surface plasmon resonance chip technology (Herberg et al., *J. Mol. Biol.*, **298**, 329 - 339 (2000); Moll et al., *J. Neural Transm.*, **113**, 1015 - 1032 (2006)) and for modification with fluorophores. Detailed technical information and selected references available.

10 µmol / ~4.4 mg € 67.- (A 011 - 10)	5 x 10 µmol € 286.- (A 011 - 50)	**Inquiries for bulk quantities welcome!**

A 085

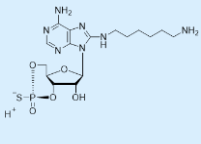


8- (6- Aminohexylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-AHA-cAMPS)

[214272-02-3]; $C_{16}H_{26}N_7O_5PS$; MW 459.5; λ_{max} 273 nm; ε 17000; free acid; purity > 98% HPLC.
Analogue of Rp-cAMPS (Cat. No. A 002), suitable for immobilization as affinity ligand (e.g. for purification of phosphodiesterases or proteinkinase A) or for coupling of various labelling structures including fluorophores. PDE-resistant form of 8-AHA-cAMP (Cat. No. A 011, above). Detailed technical information available. Reference: Stokka et al., *Biochem. J.*, **400**, 493 - 499 (2006).

5 µmol / ~2.3 mg € 239.- (A 085 - 05)	5 x 5 µmol € 1,002.- (A 085 - 25)

A 071

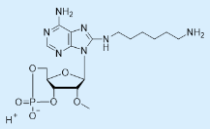


8- (6- Aminohexyl)aminoadenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-AHA-cAMPS)

[214272-03-4]; $C_{16}H_{26}N_7O_5PS$; MW 459.5; λ_{max} 273 nm; ε 17000; free acid; purity > 98% HPLC.
PDE-stable cyclic AMP analogue suitable for immobilization as affinity ligand (e.g. for purification of phosphodiesterases) or for coupling of various labelling structures including fluorophores. PDE-resistant form of 8-AHA-cAMP (Cat. No. A 011, above). Detailed technical information available. Reference: Moll et al., *J. Neural Transm.*, **113**, 1015 - 1032 (2006); Bertinetti et al., *BMC Chem. Biol.*, **9**: 3 (2009).

5 µmol / ~2.3 mg € 130.- (A 071 - 05)	5 x 5 µmol € 555.- (A 071 - 25)

A 099



8- (6- Aminohexylamino)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate (8-AHA-2'-O-Me-cAMP)

$C_{17}H_{28}N_7O_6P$; MW 457.4; λ_{max} 273 nm; ε 17000; free acid; purity > 98% HPLC.
8-AHA-2'-O-Me-cAMP has only poor affinity towards protein kinases A and G and is thus suitable as a ligand in affinity chromatography of cAMP binding proteins that do not require an intact 2'-OH group, such as the exchange protein activated by cyclic AMP (Epac) and certain phosphodiesterases. Detailed technical information available.

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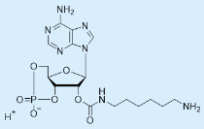
5 µmol / ~2.3 mg € 164.- (A 099 - 05)	5 x 5 µmol € 692.- (A 099 - 25)

A 046

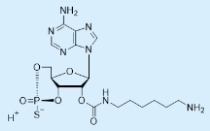


2'- O- (6- Aminohexylcarbamoyl)adenosine- 3', 5'- cyclic monophosphate (2'-AHC-cAMP)

$C_{17}H_{26}N_7O_7P$; MW 471.4; λ_{max} 259 nm; ε 15000; free acid; purity > 98% HPLC.
Cyclic AMP analogue suitable for immobilization as affinity ligand (e.g. for purification of phosphodiesterases) or for coupling of various labelling structures including fluorophores. This structure is also offered with a shorter spacer (2'-AEC-cAMP, Cat. No. A 098). For corresponding PDE-stable phosphorothioate (Sp-2'-AHC-cAMPS) please see below (Cat. No. A 066). Detailed technical information available. Compare: Corrie et al., *Prot. Expr. Purif.*, **3**, 417 - 420 (1992).

5 µmol / ~2.4 mg € 70.- (A 046 - 05)	5 x 5 µmol € 300.- (A 046 - 25)	**Inquiries for bulk quantities welcome!**

A 120

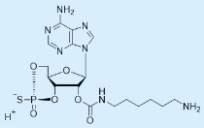


2'- O- (6- Aminohexylcarbamoyl)adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-2'-AHC-cAMPS)

$C_{17}H_{26}N_7O_6PS$; MW 487.5; λ_{max} 259 nm; ε 15200; free acid; purity > 98% HPLC. Analogue of the PKA inhibitor Rp-cAMPS (Cat. No. A 002), suitable for immobilization as affinity ligand (e.g. for purification of phosphodiesterases) or for coupling of various labelling structures including fluorophores. PDE-resistant form of 2'-AHC-cAMP (Cat. No. A 046, above). Detailed technical information available. Compare: Corrie et al., *Prot. Expr. Purif.*, **3**, 417 - 420 (1992).

5 µmol / ~2.4 mg € 196.- (A 120 - 05)	5 x 5 µmol € 831.- (A 120 - 25)

A 066

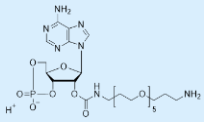


2'- O- (6- Aminohexylcarbamoyl)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-2'-AHC-cAMPS)

$C_{17}H_{26}N_7O_6PS$; MW 487.5; λ_{max} 259 nm; ε 15200; free acid; purity > 98% HPLC.
PDE-stable cyclic AMP analogue suitable for immobilization as affinity ligand (e.g. for purification of phosphodiesterases) or for coupling of various labelling structures including fluorophores. This structure is also offered with a shorter spacer (Sp-2'-AEC-cAMPS, Cat. No. A 095). Detailed technical information available. Compare: Corrie et al., *Prot. Expr. Purif.*, **3**, 417 - 420 (1992).

5 µmol / ~2.4 mg € 152.- (A 066 - 05)	5 x 5 µmol € 647.- (A 066 - 25)

A 145

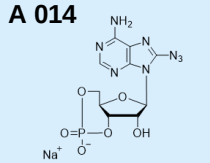


2'- O- (19- Amino- 4, 7, 10, 13, 16- pentaoxanonadecylcarbamoyl)adenosine- 3', 5'- cyclic monophosphate (2'-APNC-cAMP)

$C_{25}H_{42}N_7O_{12}P$; MW 663.6; λ_{max} 259 nm; ε 15000; free acid; purity > 98% HPLC.
cAMP analogue with a long hydrophilic spacer for improved solubility in water, suitable as a ligand in affinity chromatography and for modification with fluorophores or other markers. Detailed technical information available.

5 µmol / ~3.3 mg € 158.- (A 145 - 05)	5 x 5 µmol € 673.- (A 145 - 25)

A 014

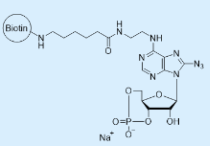


8- Azidoadenosine- 3', 5'- cyclic monophosphate (8-N_3-cAMP)

[31966-52-6]; $C_{10}H_{10}N_8O_6P{\cdot}Na$; MW 392.2; λ_{max} 281 nm; ε 13000 (pH 6); soluble sodium salt; purity > 95% HPLC. For other salt forms please inquire. Analogue for photoaffinity labelling of cAMP binding proteins. Detailed technical information available. Reference: Haley, *Methods Enzymol.*, **46**, 339 - 346 (1977).

10 µmol / ~3.9 mg € 63.- (A 014 - 10)	5 x 10 µmol € 269.- (A 014 - 50)

A 127

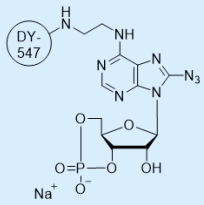


8- Azido- N^6- (2- [biotinyl]aminoethyl)adenosine- 3', 5'- cyclic monophosphate (8-N_3-6-[Biotin]-AE-cAMP)

$C_{28}H_{40}N_{12}O_9PS{\cdot}Na$; MW 774.7; λ_{max} 290 nm; ε 17000; sodium salt; purity > 98% HPLC.
For other salt forms please inquire. Analogue for photoaffinity labelling of cAMP binding proteins which can be immobilized by UV light. The biotin label is connected to position 6 of cyclic AMP via a 10 atom spacer. Detailed technical information available.

0.1 µmol / ~80 µg € 152.- (A 127 - 001)	5 x 0.1 µmol € 647.- (A 127 - 005)

A 100

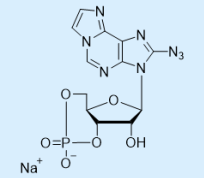


8- Azido- N^6- (2- [DY- 547]- aminoethyl)adenosine- 3', 5'- cyclic monophosphate (8-N$_3$-6-[DY-547]-AE-cAMP)

$C_{42}H_{48}N_{11}O_{13}PS_2 \cdot Na_2$; MW 1056.0; λ_{max} 559 nm; ε 150000 (EtOH); sodium salt; purity > 95% HPLC. For other salt forms please inquire. 8-N$_3$-6-[DY547]-AE-cAMP is a light sensitive analogue for photoaffinity labelling. It can be immobilized within a cyclic AMP binding site by illumination with UV light. The fluorescent reporter group connected to position 6 of the adenine nucleobase can be excitated at 557 nm and emits with 574 nm. Detailed technical information available. Reference: Park et al., *Cell*, **148**, 421 - 433 (2012).

0.1 µmol / ~0.1 mg € 217.- (A 100 - 001)	5 x 0.1 µmol € 924.- (A 100 - 005)

A 077

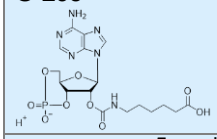


8- Azido- 1, N^6- ethenoadenosine- 3', 5'- cyclic monophosphate (8-N$_3$-ε-cAMP)

[60902-12-7]; $C_{12}H_{10}N_8O_6P \cdot Na$; MW 416.2; λ_{max} 290 nm; ε 10000; sodium salt; purity > 98% HPLC.
For other salt forms or metabolites please inquire. Nonfluorescent cAMP analogue, that can be used for labelling of cAMP receptors. Upon UV-light-induced immobilization the ethenoadenine moiety starts to fluoresce, providing a label for tracing the receptor protein. Detailed technical information available. References: Keeler & Campbell, *Biochem. Biophys. Res. Commun.*, **72**, 575 - 580 (1976); Dreyfuss et al., *Proc. Nat. Acad. Sci. USA*, **75**, 1199 - 1203(1978).

1 µmol / ~0.4 mg € 164.- (A 077 - 01)	5 x 1 µmol € 692.- (A 077 - 05)

C 109

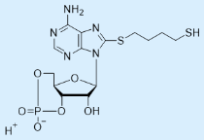


2'- (5- Carboxypentylcarbamoyl)adenosine-3', 5'-cyclic monophosphate (2'-CPC-cAMP)

$C_{17}H_{23}N_6O_9P$; MW 486.4; λ_{max} 259 nm; ε 15000; free acid; purity > 98% HPLC.
For other salt forms or metabolites please inquire. Functionalized cAMP analogue with a terminal carboxy group, that can be used for coupling of various labels, dyes or supports with free amino groups. Detailed technical information available.

5 µmol / ~2.4 mg € 124.- (C 109 - 05)	5 x 5 µmol € 528.- (C 109 - 25)

M 080

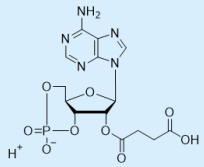


8- (4- Mercaptobutylthio)adenosine- 3', 5'- cyclic monophosphate (8-MBT-cAMP)

[1033893-75-2]; $C_{14}H_{20}N_5O_6PS_2$; MW 449.4; λ_{max} 282 nm; ε 19000; purity > 98% HPLC; triethylammonium salt.
For other salt forms or metabolites please inquire. Functionalized cAMP analogue, suitable for immobilization as affinity ligand (e.g. for purification of phosphodiesterases) or for coupling of various labelling structures including fluorophores. Detailed technical information available.

5 µmol / ~2.2 mg € 155.- (M 080 - 05)	5 x 5 µmol € 660.- (M 080 - 25)

M 011

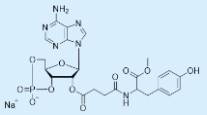


2'- O- Monosuccinyladenosine- 3', 5'- cyclic monophosphate (2'-O-MS-cAMP)

[36940-87-1]; $C_{14}H_{16}N_5O_9P$; MW 429.3; λ_{max} 259 nm; ε 15000; free acid; purity > 98% HPLC.
2'-O-MS-cAMP in this free acid form is soluble in organic solvents such as dimethylformamide (DMF). For other salt forms please inquire. Cyclic AMP analogue, suitable for coupling of various ligands including proteins for ELISA. For a structure with a hydrolytically and enzymatically much more stable linkage please compare 2'-AHC-cAMP (Cat. No. C 109). Detailed technical information available. Reference: Horton et al., *J. Immun. Methods*, **155**, 31 - 40 (1992).

25 µmol / ~11 mg € 124.- (M 011 - 25)	5 x 25 µmol € 528.- (M 011 - 125)	**Inquiries for bulk quantities welcome!**

M 022



2'- O- Monosuccinyladenosine- 3', 5'- cyclic monophosphate, tyrosylmethyl ester (2'-O-MS-TME-cAMP)

[60448-20-6]; $C_{24}H_{26}N_6O_{11}P \cdot Na$; MW 628.5; λ_{max} 258 nm; ε 15000; sodium salt; purity > 95% HPLC.
Cyclic AMP analogue, suitable for radio-iodination for use in cAMP immunoassays. Detailed technical information available. Reference: Steiner et al., *J. Biol. Chem.*, **247**, 1106 - 1113 (1972).

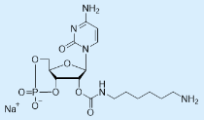
1 µmol / ~0.6 mg € 149.- (M 022 - 01)	5 x 1 µmol € 633.- (M 022 - 05)

Inquire

We are constantly synthesizing new cAMP-based precursors for labelling and immobilization! Please inquire regarding special structures not listed here, or check out our website (www.biolog.de). Nearly all ligands are available immobilized to agarose beads as well. Custom syntheses and purifications are offered.

Cyclic CMP-based Precursors for Labelling and Immobilization

A 156

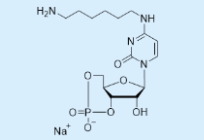


2'- O- (6- Aminohexylcarbamoyl)cytidine- 3', 5'- cyclic monophosphate (2'-AHC-cCMP)

$C_{16}H_{26}N_5O_8P$; MW 447.4; λ_{max} 270 nm; ε 9000; free acid; purity > 98% HPLC.
Analogue of cCMP (Cat. No. C 001), suitable as a ligand for affinity chromatography of cCMP binding proteins or for coupling of various labelling structures including fluorophores. Detailed technical information available.

5 µmol / ~2.2 mg € 138.- (A 156 - 05)	5 x 5 µmol € 585.- (A 156 - 25)

A 143



N^4- (6- Aminohexyl)cytidine- 3', 5'- cyclic monophosphate (4-AH-cCMP)

$C_{15}H_{25}N_4O_7P$; MW 404.4; λ_{max} 270 nm; ε 13300; free acid; purity > 98% HPLC.
Analogue of cCMP (Cat. No. C 001), suitable as a ligand for affinity chromatography of cCMP binding proteins or for coupling of various labelling structures including fluorophores. Detailed technical information available.

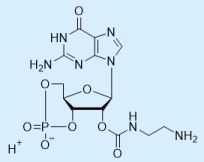
5 µmol / ~2 mg € 152.- (A 143 - 05)	5 x 5 µmol € 647.- (A 143 - 25)

Inquire

We are constantly synthesizing new cCMP-based precursors for labelling and immobilization! Please inquire regarding special structures not listed here, or check out our website (www.biolog.de). Nearly all ligands are available immobilized to agarose beads as well. Custom syntheses and purifications are offered.

Cyclic GMP-based Precursors for Labelling and Immobilization

A 075

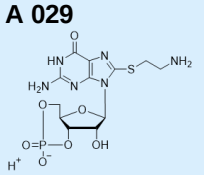


2'- O- (2- Aminoethylcarbamoyl)guanosine- 3', 5'- cyclic monophosphate (2'-AEC-cGMP / 2'-EDA-cGMP)

$C_{13}H_{18}N_7O_8P$; MW 431.3; λ_{max} 252 nm; ε 13500; free acid; purity > 98% HPLC.
Cyclic GMP analogue suitable for immobilization as affinity ligand (e.g. for purification of phosphodiesterases) or for coupling of various labelling structures including fluorophores. This ligand is also offered with a longer spacer (2'-AHC-cGMP, Cat. No. A 048, below). Detailed technical information available. Compare: Corrie et al., *Prot. Expr. Purif.*, **3**, 417 - 420 (1992).

5 µmol / ~2.2 mg € 87.- (A 075 - 05)	5 x 5 µmol € 369.- (A 075 - 25)	**Inquiries for bulk quantities welcome!**

A 029

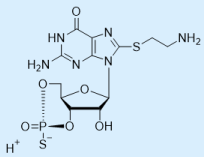


8- (2- Aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (8-AET-cGMP)

[115974-70-4]; $C_{12}H_{17}N_6O_7PS$; MW 420.4; λ_{max} 272 nm; ε 14000; free acid; purity > 98% HPLC.
Suitable as ligand in affinity chromatography (compare Cat. No. A 019) and for modification with fluorophores or other markers. Detailed technical information and references available. Reference: Dills et al., *Biochemistry*, **15**, 3724 - 3730 (1976); Jäger et al., *Br. J. Pharmacol.*, **161**, 1645 - 1660 (2010).

5 µmol / ~2.1 mg € 89.- (A 029 - 05)	5 x 5 µmol € 379.- (A 029 - 25)

A 154

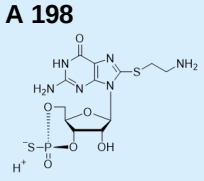


8- (2- Aminoethylthio)guanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-8-AET-cGMPS)

[221904-88-7]; $C_{12}H_{17}N_6O_6PS_2$; MW 436.4; λ_{max} 277 nm; ε 14000; free acid; purity > 98% HPLC.
Suitable as ligand in affinity chromatography (compare Cat. No. A 009) and for modification with fluorophores or other markers. Detailed technical information available.

5 µmol / ~2.2 mg € 241.- (A 154 - 05)	5 x 5 µmol € 1,010.- (A 154 - 25)

A 198

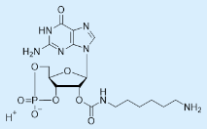


8- (2- Aminoethylthio)guanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-8-AET-cGMPS)

[221904-92-3]; $C_{12}H_{17}N_6O_6PS_2$; MW 436.4; λ_{max} 277 nm; ε 14000; free acid; purity > 98% HPLC.
Suitable as ligand in affinity chromatography (compare Cat. No. A 019) and for modification with fluorophores or other markers. Detailed technical information available.

5 µmol / ~2.2 mg € 160.- (A 198 - 05)	5 x 5 µmol € 682.- (A 198 - 25)

A 048

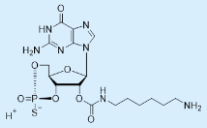


2'- O- (6- Aminohexylcarbamoyl)guanosine- 3', 5'- cyclic monophosphate (2'-AHC-cGMP)

[1262749-60-9]; $C_{17}H_{26}N_7O_8P$; MW 487.4; λ_{max} 252 nm; ε 13500; free acid; purity > 98% HPLC.
Cyclic GMP analogue suitable for immobilization as affinity ligand (e.g. for purification of phosphodiesterases) or for coupling of various labelling structures including fluorophores.This structure is also offered as a ligand immobilized to agarose (Cat. No. A 059) and with a shorter spacer (Cat. No. A 075, above). For a corresponding PDE-stable phosphorothioate please refer to Sp-2'-AHC-cGMPS (Cat. No. A 067, below). Detailed technical information available. Compare: Corrie et al., *Prot. Expr. Purif.*, **3**, 417 - 420 (1992).

5 µmol / ~2.4 mg € 87.- (A 048 - 05)	5 x 5 µmol € 369.- (A 048 - 25)	**Inquiries for bulk quantities welcome!**

A 123

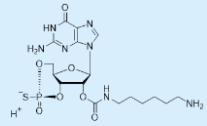


2'- O- (6- Aminohexylcarbamoyl)guanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer (Rp-2'-AHC-cGMPS)

[1262749-61-0]; $C_{17}H_{26}N_7O_7PS$; MW 503.5; λ_{max} 252 nm; ε 14300; free acid; purity > 98% HPLC.
PDE-stable cyclic GMP analogue suitable for immobilization as affinity ligand (e.g. for purification of phosphodiesterases) or for coupling of various labelling structures including fluorophores. Detailed technical information available. This structure is also offered as a ligand immobilized to agarose (Cat. No. A 051), and without sulfur modification (Cat. No. A 048, above). Compare: Corrie et al., *Prot. Expr. Purif.*, **3**, 417 - 420 (1992).

5 µmol / ~2.5 mg € 196.- (A 123 - 05)	5 x 5 µmol € 831.- (A 123 - 25)

A 067

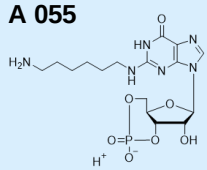


2'- O- (6- Aminohexylcarbamoyl)guanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer (Sp-2'-AHC-cGMPS)

[1262749-61-0]; $C_{17}H_{26}N_7O_7PS$; MW 503.5; λ_{max} 252 nm; ε 14300; free acid; purity > 98% HPLC.
PDE-stable cyclic GMP analogue suitable for immobilization as affinity ligand (e.g. for purification of phosphodiesterases) or for coupling of various labelling structures including fluorophores. This structure is also offered as a ligand immobilized to agarose (Cat. No. A 052), and without sulfur modification (Cat. No. A 048). Detailed technical information available. Compare: Corrie et al., *Prot. Expr. Purif.*, **3**, 417 - 420 (1992).

5 µmol / ~2.5 mg € 152.- (A 067 - 05)	5 x 5 µmol € 647.- (A 067 - 25)

A 055

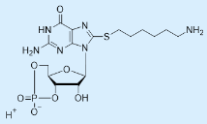


N^2- (6- Aminohexyl)guanosine- 3', 5'- cyclic monophosphate (2-AH-cGMP)

[205368-58-7]; $C_{16}H_{25}N_6O_7P$; MW 444.4; λ_{max} 254 nm; ε 15000; free acid; purity > 98% HPLC.
Suitable as ligand in affinity chromatography of cGMP-binding proteins and for modification with fluorophores. For the corresponding PDE-resistant phosphorothioates please inquire. Detailed technical information available. References: Dills et al., *Biochemistry*, **15**, 3724 - 3730 (1976); Hebert et al., *J. Biol. Chem.*, **273**, 5557 - 5565 (1998).

5 µmol / ~2.2 mg € 113.- (A 055 - 05)	5 x 5 µmol € 480.- (A 055 - 25)

A 167

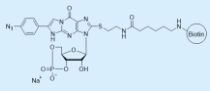


8- (6- Aminohexylthio)guanosine- 3', 5'- cyclic monophosphate (8-AHT-cGMP)

[144510-13-4]; $C_{16}H_{25}N_6O_7PS$; MW 476.5; λ_{max} 275 nm; ε 14000; purity > 98% HPLC.
Suitable as a ligand in affinity chromatography and for modification with fluorophores or other markers. Detailed technical information available. Reference: Sekhar et al., *Mol. Pharmacol.*, **42**, 103 - 108 (1992).

5 µmol / ~2.4 mg € 207.- (A 167 - 05)	5 x 5 µmol € 880.- (A 167 - 25)

A 186

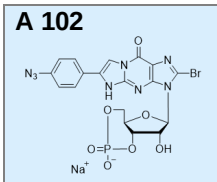


β- (4- Azidophenyl)- 1, N^2- etheno- 8- (2- [biotinyl]aminoethylthio)guanosine- 3', 5'- cyclic monophosphate (4-N_3-PET-8-[Biotin]-AET-cGMP)

$C_{36}H_{44}N_{12}O_{10}PS_2 \cdot Na$; MW 922.9; λ_{max} 287 nm; ε 40000; sodium salt; purity > 95% HPLC. For other salt forms or metabolites please inquire. Biotinylated cGMP analogue for photoaffinity labelling of cGMP-responsive receptors. Detailed technical information available.

0.1 µmol / ~92 µg € 124.- (A 186 - 001)	5 x 0.1 µmol € 528.- (A 186 - 005)

A 102



β- (4- Azidophenyl)- 1, N^2- etheno- 8- bromoguanosine- 3', 5'- cyclic monophosphate (4-N_3-PET-8-Br-cGMP)

$C_{18}H_{13}BrN_8O_7P \cdot Na$; MW 587.2; λ_{max} 278 nm; ε 40000; sodium salt; purity > 97% HPLC. For other salt forms or metabolites please inquire. Analogue for photoaffinity labelling of cGMP-responsive receptors, considered to be an isozyme-selective activator of cGMP-dependent protein kinase I α and β. Detailed technical information available.

1 µmol / ~0.6 mg € 152.- (A 102 - 01)	5 x 1 µmol € 647.- (A 102 - 05)

M 015	**2'- O- Monosuccinylguanosine- 3', 5'- cyclic monophosphate (2'-O-MS-cGMP)** [39118-26-8]; $C_{14}H_{16}N_5O_{10}P$; MW 445.3; λ_{max} 252 nm; ε 13500; free acid; purity > 98% HPLC. 2'-O-MS-cGMP in this free acid form is soluble in organic solvents such as dimethylformamide (DMF). For other salt forms please inquire. Cyclic GMP analogue, suitable for coupling of various ligands including proteins for ELISA. For a structure with a hydrolytically and enzymatically much more stable linkage please compare 2'-AHC-cGMP (Cat. No. A 048). Detailed technical information and references available. Reference: Dressendoerfer et al., *J. Immunoassay*, **16**, 37 - 53 (1995).
25 µmol / ~11 mg € 171.- (M 015 - 25)	5 x 25 µmol € 726.- (M 015 - 125)

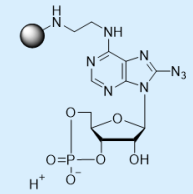
M 023	**2'- O- Monosuccinylguanosine- 3', 5'- cyclic monophosphate, tyrosylmethyl ester (2'-O-MS-TME-cGMP)** [104872-93-7]; $C_{24}H_{26}N_6O_{12}P{\cdot}Na$; MW 644.5; λ_{max} 252 nm; ε 13500; sodium salt; purity > 95% HPLC. Cyclic GMP analogue, suitable for radio-iodination for use in cGMP immunoassays. Reference: Horton & Baxendale, *Meth. Mol. Biol.*, **41**, 91 - 105 (1995).	
1 µmol / ~0.6 mg € 211.- (M 023 - 01)	5 x 1 µmol € 897.- (M 023 - 05)	**Inquiries for bulk quantities welcome!**

Inquire	We are constantly synthesizing new cGMP-based precursors for labelling and immobilization! Please inquire regarding special structures not listed here, or check out our website (www.biolog.de). Nearly all ligands are available immobilized to agarose beads. Custom syntheses and purifications are offered.

Immobilized cyclic AMP for Affinity Chromatography

All affinity gels are offered in small plastic columns of three different sizes. For free beads without a column or bulk amounts please inquire. The corresponding free ligands (analogues with spacer) of every gel listed are available as well ("Precursors for Labelling and Immobilization"). Also, a corresponding negative control gel without nucleotide modification can be ordered (Cat. No. E 010, end of this chapter).

A 111

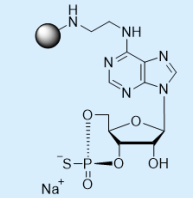


N^6- (2- Aminoethyl)adenosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (6-AE-cAMP-Agarose)

The second messenger cyclic AMP immobilized on agarose by an aminoethyl spacer attached to position 6 of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. This ligand is also offered with a longer spacer (6-AH-cAMP-Agarose, Cat. No. A 036) and as a PDE-resistant version (Sp-6-AE-cAMPS-Agarose, Cat. No. A 109, below). Detailed technical information available. Reference: Murashima et al., *Biochemistry*, **29**, 5285 - 5292 (1990).

Columns:	0.6 ml € 98.- (A 111 - 06)	2.5 ml € 306.- (A 111 - 25)	6 ml € 616.- (A 111 - 60)

A 109

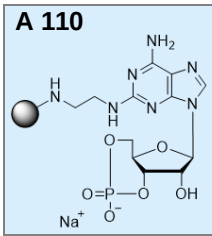


N^6- (2- Aminoethyl)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer; immobilized on agarose gel (Sp-6-AE-cAMPS-Agarose)

The protein kinase A activator Sp-cAMPS (Cat. No. A 003) immobilized on agarose by an aminoethyl spacer attached to position 6 of the ligand. Free Sp-cAMPS is only very slowly metabolized by corresponding phosphodiesterases and thus represents an extraordinary stable ligand. In addition, its reduced binding affinity towards protein kinase A compared to cAMP results in milder desorption conditions during affinity chromatography. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. This ligand is offered with a longer spacer (Sp-6-AH-cAMPS-Agarose, Cat. No. A 108) as well. Detailed technical information available.

Columns:	0.6 ml € 174.- (A 109 - 06)	2.5 ml € 543.- (A 109 - 25)	6 ml € 1,079.- (A 109 - 60)

A 110

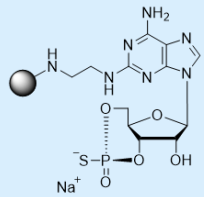


2- (2- Aminoethylamino)adenosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (2-AEA-cAMP-Agarose)

The second messenger cyclic AMP immobilized on agarose by an aminoethylamino spacer attached to position 2 of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. This ligand is also offered with a longer spacer (2-AHA-cAMP-Agarose, Cat. No. A 054) and as PDE-resistant version (Sp-2-AEA-cAMPS-Agarose, Cat. No. A 087). Detailed technical information available.

Columns:	0.6 ml € 164.- (A 110 - 06)	2.5 ml € 510.- (A 110 - 25)	6 ml € 1,012.- (A 110 - 60)

A 087

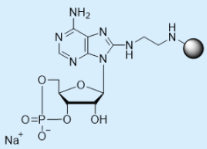


2- (2- Aminoethylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer; immobilized on agarose gel (Sp-2-AEA-cAMPS-Agarose)

The protein kinase A activator Sp-cAMPS (Cat. No. A 003) immobilized on agarose by an aminoethylamino spacer attached to position 2 of the ligand. Free Sp-cAMPS is only very slowly metabolized by corresponding phosphodiesterases and thus represents an extraordinary stable ligand. In addition, its reduced binding affinity towards protein kinase A compared to cAMP results in milder desorption conditions in affinity chromatography. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. This ligand is offered with a longer spacer (Sp-2-AHA-cAMPS-Agarose, Cat. No. A 069) as well. Detailed technical information available.

Columns:	0.6 ml € 207.- (A 087 - 06)	2.5 ml € 646.- (A 087 - 25)	6 ml € 1,257.- (A 087 - 60)

A 020



8- (2- Aminoethylamino)adenosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (8-AEA-cAMP-Agarose)

The second messenger cyclic AMP immobilized on agarose by an aminoethylamino spacer attached to position 8 of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. This ligand is also offered with a longer spacer (8-AHA-cAMP-Agarose, Cat. No. A 028) and as a PDE-resistant version (Sp-8-AEA-cAMPS-Agarose, Cat. No. A 008). Detailed technical information available. References: Dills et al., *Biochemistry*, **15**, 3724 - 3731 (1976); Scholten et al., *J. Proteome Res.*, **5**, 1435 - 1447 (2006).

Columns:	0.6 ml € 65.- (A 020 - 06)	2.5 ml € 204.- (A 020 - 25)	6 ml € 411.- (A 020 - 60)

A 007	**8- (2- Aminoethylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer; immobilized on agarose gel (Rp-8-AEA-cAMPS-Agarose)** The metabolically stable protein kinase A inhibitor Rp-cAMPS (Cat. No. A 002) immobilized on agarose by an aminoethylamino spacer attached to position 8 of the ligand. Free Rp-cAMPS binds to the protein kinase A holoenzyme, but prevents dissociation to free catalytic and regulatory subunits. In addition, it is not hydrolized by mammalian phosphodiesterases. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinase A (presumably as its holoenzyme), phosphodiesterases and others. This ligand is offered with a longer spacer (Rp-8-AHA-cAMPS-Agarose, Cat. No. A 012) as well. Detailed technical information available.		
Columns:	0.6 ml € 164.- (A 007 - 06)	2.5 ml € 510.- (A 007 - 25)	6 ml € 1,012.- (A 007 - 60)

A 008	**8- (2- Aminoethylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer; immobilized on agarose gel (Sp-8-AEA-cAMPS-Agarose)** The protein kinase A activator Sp-cAMPS (Cat. No. A 003) immobilized on agarose by an aminoethylamino spacer attached to position 8 of the ligand. Free Sp-cAMPS is only very slowly metabolized by mammalian phosphodiesterases and thus represents an extraordinary stable ligand. In addition, its reduced binding affinity towards protein kinase A compared to cAMP results in milder desorption conditions during affinity chromatography. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. This ligand is offered with a longer spacer (Sp-8-AHA-cAMPS-Agarose, Cat. No. A 013) as well. Detailed technical information available. Reference: Bertinetti et al., *BMC Chem Biol*, **9** (2009).		
Columns:	0.6 ml € 142.- (A 008 - 06)	2.5 ml € 442.- (A 008 - 25)	6 ml € 890.- (A 008 - 60)

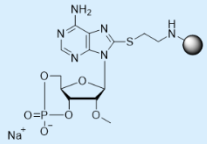
A 112	**2'- O- (2- Aminoethylcarbamoyl)adenosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (2'-AEC-cAMP-Agarose)** The protein kinase A activator cyclic AMP immobilized on agarose by an aminoethylcarbamoyl spacer attached to the ribose 2'-position of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins, especially those which tolerate modification of the 2'-ribose hydroxyl group such as some phosphodiesterases. This type of gel is also offered with a longer spacer (2'-AHC-cAMP-Agarose, Cat. No. A 058) and as a PDE-resistant version (Rp- & Sp-2'-AEC-cAMPS-Agarose, Cat. No. A 126 & A 122). Detailed technical information available.		
Columns:	0.6 ml € 55.- (A 112 - 06)	2.5 ml € 170.- (A 112 - 25)	6 ml € 343.- (A 112 - 60)

A 126	**2'- O- (2- Aminoethylcarbamoyl)adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer; immobilized on agarose gel (Rp-2'-AEC-cAMPS-Agarose)** The protein kinase A inhibitor Rp-cAMPS (Cat. No. A 002) immobilized on agarose by an aminoethylcarbamoyl spacer attached to the ribose 2'-position of the ligand. Free Rp-cAMPS is not metabolized by mammalian phosphodiesterases and thus represents an extraordinary stable ligand. In addition, its reduced binding affinity towards protein kinase A compared to cAMP results in milder desorption conditions during affinity chromatography. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins, especially those which tolerate modification of the 2'-ribose hydroxyl group such as some phosphodiesterases. This type of gel is offered with a longer spacer (Rp-2'-AHC-cAMPS-Agarose, Cat. No. A 049) as well. Detailed technical information available.		
Columns:	0.6 ml € 155.- (A 126 - 06)	2.5 ml € 485.- (A 126 - 25)	6 ml € 978.- (A 126 - 60)

A 122	**2'- O- (2- Aminoethylcarbamoyl)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer; immobilized on agarose gel (Sp-2'-AEC-cAMPS-Agarose)** The protein kinase A activator Sp-cAMPS (Cat. No. A 003) immobilized on agarose by an aminoethylcarbamoyl spacer attached to the ribose 2' position of the ligand. Free Sp-cAMPS is only very slowly metabolized by mammalian phosphodiesterases and thus represents an extraordinary stable ligand. In addition, its reduced binding affinity towards protein kinase A compared to cAMP results in milder desorption conditions during affinity chromatography. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins, especially those which tolerate modification of the 2'-ribose hydroxyl group such as some phosphodiesterases. This type of gel is offered with a longer spacer (Sp-2'-AHC-cAMPS-Agarose, Cat. No. A 050) as well. Detailed technical information available.		
Columns:	0.6 ml € 120.- (A 122 - 06)	2.5 ml € 374.- (A 122 - 25)	6 ml € 753.- (A 122 - 60)

A 193	**8- (2- Aminoethylthio)adenosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (8-AET-cAMP-Agarose)** The second messenger cyclic AMP immobilized on agarose by an aminoethylthio spacer attached to position 8 of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. Detailed technical information available. References: Dills et al., *Biochemistry*, **15**, 3724 - 3731 (1976); Scholten et al., *J. Proteome Res.*, **5**, 1435 - 1447 (2006).		
Columns:	0.6 ml € 72.- (A 193 - 06)	2.5 ml € 227.- (A 193 - 25)	6 ml € 456.- (A 193 - 60)

A 195



8- (2- Aminoethylthio)- 2'-O- methyladenosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (8-AET-2'-O-Me-cAMP-Agarose)

The second messenger cyclic AMP with a methylated ribose 2'-hydroxyl group immobilized on agarose by an aminoethylthio spacer attached to position 8 of the ligand. Considered to be suitable for affinity chromatography of various cAMP-responsive proteins, especially those which tolerate modification of the ribose 2'-hydroxyl group, such as the exchange protein activated by cyclic AMP (Epac) and certain phosphodiesterases. Detailed technical information available.

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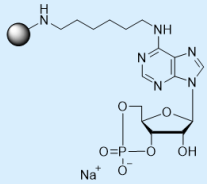
Columns:	0.6 ml € 186.- (A 195 - 06)	2.5 ml € 583.- (A 195 - 25)	6 ml € 1,134.- (A 195 - 60)

A 036

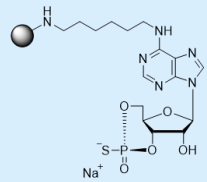


N^6- (6- Aminohexyl)adenosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (6-AH-cAMP-Agarose)

The second messenger cyclic AMP immobilized on agarose by an aminohexyl spacer attached to position 6 of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. This ligand is also offered with a shorter spacer (6-AE-cAMP-Agarose, Cat. No. A 111) and as a PDE-resistant version (Sp-6-AH-cAMPS-Agarose, Cat. No. A 108, below). Detailed technical information available. Reference: Poteet-Smith et al., *J. Biol. Chem.*, **272**, 379 - 388 (1997).

Columns:	0.6 ml € 98.- (A 036 - 06)	2.5 ml € 306.- (A 036 - 25)	6 ml € 616.- (A 036 - 60)

A 108

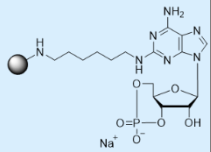


N^6- (6- Aminohexyl)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer; immobilized on agarose gel (Sp-6-AH-cAMPS-Agarose)

Sp-cAMPS (Cat. No. A 003) immobilized on agarose by an aminohexyl spacer attached to position 6 of the ligand. Free Sp-cAMPS is only very slowly metabolized by mammalian phosphodiesterases and thus represents an extraordinary stable ligand. In addition, its reduced binding affinity towards protein kinase A compared to cAMP results in milder desorption conditions during affinity chromatography. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. This type of gel is offered with a shorter spacer (Sp-6-AE-cAMPS-Agarose, Cat. No. A 109) as well. Detailed technical information available.

Columns:	0.6 ml € 174.- (A 108 - 06)	2.5 ml € 543.- (A 108 - 25)	6 ml € 1,079.- (A 108 - 60)

A 054

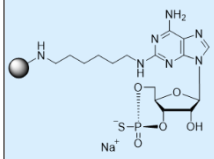


2- (6- Aminohexylamino)adenosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (2-AHA-cAMP-Agarose)

The second messenger cyclic AMP immobilized on agarose by an aminohexylamino spacer attached to position 2 of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. This ligand is also offered with a shorter spacer (2-AEA-cAMP-Agarose, Cat. No. A 110) and as PDE-resistant version (Sp-2-AHA-cAMPS-Agarose, Cat. No. A 069, below). Detailed technical information available. References: Scholten et al., *J. Proteome Res.*, **5**, 1435 - 1447 (2006); Margarucci et al., *Mol. BioSyst.*, **7**, 2311 - 2319 (2011); Hanke et al., *N. Biotechnol.*, **28**, 294 - 301 (2011).

Columns:	0.6 ml € 164.- (A 054 - 06)	2.5 ml € 510.- (A 054 - 25)	6 ml € 1,012.- (A 054 - 60)

A 069

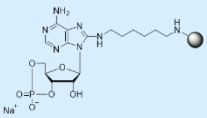


2- (6- Aminohexylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer; immobilized on agarose gel (Sp-2-AHA-cAMPS-Agarose)

The protein kinase A activator Sp-cAMPS (Cat. No. A 003) immobilized on agarose by an aminohexylamino spacer attached to position 2 of the ligand. Free Sp-cAMPS is only very slowly metabolized by mammalian phosphodiesterases and thus represents an extraordinary stable ligand. In addition, its reduced binding affinity towards protein kinase A compared to cAMP results in milder desorption conditions during affinity chromatography. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. This ligand is offered with a shorter spacer (Sp-2-AEA-cAMPS-Agarose, Cat. No. A 087) as well. Detailed technical information available. References: Bertinetti et al., *BMC Chem Biol*, **9** (2009); Hanke et al., *N. Biotechnol.*, **28**, 294 - 301 (2011).

Columns:	0.6 ml € 207.- (A 069 - 06)	2.5 ml € 646.- (A 069 - 25)	6 ml € 1,257.- (A 069 - 60)

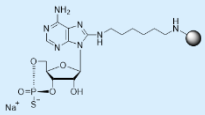
A 028

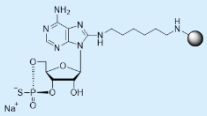


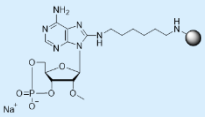
8- (6- Aminohexylamino)adenosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (8-AHA-cAMP-Agarose)

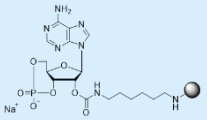
The second messenger cyclic AMP immobilized on agarose by an aminohexylamino spacer attached to position 8 of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. This ligand is also offered with a shorter spacer (8-AEA-cAMP-Agarose, Cat. No. A 020) and as PDE-resistant version (Sp-8-AHA-cAMPS-Agarose, Cat. No. A 013). Detailed technical information available. References: Dills et al., *Biochemistry*, **15**, 3724 - 3731 (1976); Margarucci et al., *Mol. BioSyst.*, **7**, 2311 - 2319 (2011).

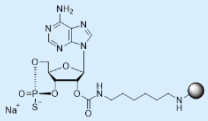
Columns:	0.6 ml € 65.- (A 028 - 06)	2.5 ml € 204.- (A 028 - 25)	6 ml € 411.- (A 028 - 60)

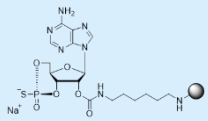
A 012 	**8- (6- Aminohexylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer; immobilized on agarose gel (Rp-8-AHA-cAMPS-Agarose)** The metabolically stable protein kinase A inhibitor Rp-cAMPS (Cat. No. A 002) immobilized on agarose by an aminohexylamino spacer attached to position 8 of the ligand. Free Rp-cAMPS binds to the protein kinase A holoenzyme but prevents dissociation of catalytic and regulatory subunits. In addition it is not hydrolyzed by mammalian phosphodiesterases. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinase A (presumably as its holoenzyme), phosphodiesterases and others. This ligand is offered with a shorter spacer (Rp-8-AEA-cAMPS-Agarose, Cat. No. A 007) as well. Detailed technical information available. References: Margarucci et al., *Mol. BioSyst.*, **7**, 2311 - 2319 (2011); Bertinetti et al., *BMC Chem Biol*, **9** (2009).		
Columns:	0.6 ml € 164.- (A 012 - 06)	2.5 ml € 510.- (A 012 - 25)	6 ml € 1,012.- (A 012 - 60)

A 013 	**8- (6- Aminohexylamino)adenosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer; immobilized on agarose gel (Sp-8-AHA-cAMPS-Agarose)** The protein kinase A activator Sp-cAMPS (Cat. No. A 003) immobilized on agarose by an aminohexylamino spacer attached to position 8 of the ligand. Free Sp-cAMPS is only very slowly metabolized by mammalian phosphodiesterases and thus represents an extraordinary stable ligand. In addition, its reduced binding affinity towards protein kinase A compared to cAMP results in milder desorption conditions during affinity chromatography. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. This ligand is offered with a shorter spacer (Sp-8-AEA-cAMPS-Agarose, Cat. No. A 008) as well. Detailed technical information available. Reference: Bertinetti et al., *BMC Chem Biol*, **9** (2009).		
Columns:	0.6 ml € 142.- (A 013 - 06)	2.5 ml € 442.- (A 013 - 25)	6 ml € 890.- (A 013 - 60)

A 057 	**8- (6- Aminohexylamino)- 2'- O- methyladenosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (8-AHA-2'-O-Me-cAMP-Agarose)** The second messenger cyclic AMP with a methylated ribose 2'-hydroxyl group immobilized on agarose by an aminohexylamino spacer attached to position 8 of the ligand. Suitable for affinity chromatography of various cAMP-responsive proteins, especially those which tolerate modification of the ribose 2'-hydroxyl group, such as the exchange protein activated by cyclic AMP (Epac) and certain phosphodiesterases. Detailed technical information available. Reference: Borland et al., *Mol. Pharmacol.*, **69**, 374 - 384 (2006). Protected by patent n° EP 02077219.0 and foreign equivalents, exclusively licensed to BIOLOG LSI for research purposes only		
Columns:	0.6 ml € 180.- (A 057 - 06)	2.5 ml € 563.- (A 057 - 25)	6 ml € 1,134.- (A 057 - 60)

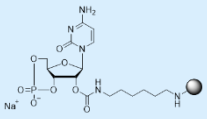
A 058 	**2'- O- (6- Aminohexylcarbamoyl)adenosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (2'-AHC-cAMP-Agarose)** The protein kinase A activator cyclic AMP immobilized on agarose by an aminohexylcarbamoyl spacer attached to the ribose 2'-position of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins, especially those which tolerate modification of the 2'-ribose hydroxyl group such as some phosphodiesterases. This type of gel is also offered with a shorter spacer (2'-AEC-cAMP-Agarose, Cat. No. A 112) and as PDE-resistant version (Sp-2'-AHC-cAMPS-Agarose, Cat. No. A 050, below). Detailed technical information available.		
Columns:	0.6 ml € 65.- (A 058 - 06)	2.5 ml € 204.- (A 058 - 25)	6 ml € 411.- (A 058 - 60)

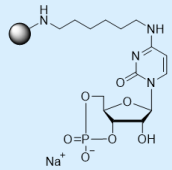
A 049 	**2'- O- (6- Aminohexylcarbamoyl)adenosine- 3', 5'- cyclic monophosporothioate, Rp-isomer; immobilized on agarose gel (Rp-2'-AHC-cAMPS-Agarose)** The PDE-resistant protein kinase A inhibitor Rp-cAMPS (Cat. No. A 002) immobilized on agarose by an aminohexylcarbamoyl spacer attached to the ribose 2'-position of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins, especially those which tolerate modification of the 2'-ribose hydroxyl group such as some phosphodiesterases. This type of gel is offered with a shorter spacer (Rp-2'-AEC-cAMPS-Agarose, Cat. No. A 126) as well. Detailed technical information available.		
Columns:	0.6 ml € 155.- (A 049 - 06)	2.5 ml € 485.- (A 049 - 25)	6 ml € 978.- (A 049 - 60)

A 050 	**2'- O- (6- Aminohexylcarbamoyl)adenosine- 3', 5'- cyclic monophosporothioate, Sp-isomer; immobilized on agarose gel (Sp-2'-AHC-cAMPS-Agarose)** The PDE-resistant protein kinase A activator Sp-cAMPS (Cat. No. A 003) immobilized on agarose by an aminohexylcarbamoyl spacer attached to the ribose 2'-position of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins, especially those which tolerate modification of the 2'-ribose hydroxyl group such as some phosphodiesterases. This type of gel is offered with a shorter spacer (Sp-2'-AEC-cAMPS-Agarose, Cat. No. A 122) as well. Detailed technical information available.		
Columns:	0.6 ml € 120.- (A 050 - 06)	2.5 ml € 374.- (A 050 - 25)	6 ml € 753.- (A 050 - 60)

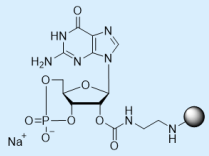
Inquire	We are constantly synthesizing affinity gels with new cAMP ligands. Please inquire regarding special structures, different matrices not listed here or visit our website (www.biolog.de). Custom syntheses of special gels are offered.

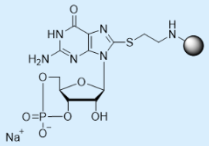
Immobilized cyclic CMP for Affinity Chromatography

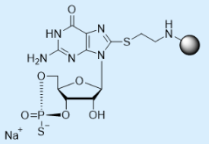
A 158 	**2'- O- (2- Aminoethylcarbamoyl)cytidine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (2'-AHC-cCMP-Agarose)** The putative second messenger cyclic CMP immobilized on agarose by an aminoethylcarbamoyl spacer attached to the ribose 2'-position of the ligand. The gel can be used for affinity chromatography of cCMP-responsive proteins, such as protein kinases, phosphodiesterases and others. Detailed technical information available. Reference: Hammerschmidt et al., *PLoS One* **7**(7): e39848 (2012).		
Columns:	0.6 ml € 114.- (A 158 - 06)	2.5 ml € 356.- (A 158 - 25)	6 ml € 717.- (A 158 - 60)

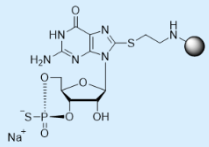
A 147 *New !* 	**N^4- (6- Aminohexyl)cytidine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (4-AH-cCMP-Agarose)** The putative second messenger cyclic CMP immobilized on agarose by an aminohexyl spacer attached to position 4 of the ligand. The gel can be used for affinity chromatography of cCMP-responsive proteins, such as protein kinases, phosphodiesterases and others. Detailed technical information available. Reference: Hammerschmidt et al., *PLoS One* **7**(7): e39848 (2012).		
Columns:	0.6 ml € 186.- (A 147 - 06)	2.5 ml € 583.- (A 147 - 25)	6 ml € 1,134.- (A 147 - 60)

Immobilized cyclic GMP for Affinity Chromatography

A 196 	**2'- O- (2- Aminoethylcarbamoyl)guanosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (2'-AEC-cGMP-Agarose)** The protein kinase G activator cyclic GMP immobilized on agarose by an aminoethylcarbamoyl spacer attached to the ribose 2'-position of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins, especially those which tolerate modification of the 2'-ribose hydroxyl group such as some phosphodiesterases. This type of gel is also offered with a longer spacer (2'-AHC-cGMP-Agarose, Cat. No. A 059) and corresponding PDE-resistant versions (Rp- and Sp-2'-AHC-cGMPS-Agarose, Cat. No's. A 051 & A 052). Detailed technical information available.		
Columns:	0.6 ml € 72.- (A 196 - 06)	2.5 ml € 228.- (A 196 - 25)	6 ml € 459.- (A 196 - 60)

A 019 	**8- (2- Aminoethylthio)guanosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (8-AET-cGMP-Agarose)** The second messenger cyclic GMP immobilized on agarose by an aminoethylthio spacer attached to position 8 of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. This type of gel is offered as PDE-resistant version (Sp-8-AET-cGMPS-Agarose, Cat. No. A 010, below) as well. Detailed technical information available. References: Schlossmann et al., *Nature,* **404**, 197 - 201 (2000); Scholten et al., *J. Proteome Res.*, **5**, 1435 - 1447 (2006); Antl et al., *Blood*, **109**, 552 - 559 (2007); Margarucci et al., *Mol. BioSyst.*, **7**, 2311 - 2319 (2011).		
Columns:	0.6 ml € 107.- (A 019 - 06)	2.5 ml € 333.- (A 019 - 25)	6 ml € 671.- (A 019 - 60)

A 009 	**8- (2- Aminoethylthio)guanosine- 3', 5'- cyclic monophosphorothioate, Rp- isomer; immobilized on agarose gel (Rp-8-AET-cGMPS-Agarose)** The metabolically stable protein kinase G inhibitor Rp-cGMPS (Cat. No. G 016) immobilized on agarose by an aminoethylthio spacer attached to position 8 of the ligand. In addition, its reduced binding affinity towards protein kinase G compared to cGMP should result in potentially milder desorption conditions in affinity chromatography. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. Detailed technical information available. Protected under US Patent 5,625,056 issued to BIOLOG LSI		
Columns:	0.6 ml € 169.- (A 009 - 06)	2.5 ml € 527.- (A 009 - 25)	6 ml € 1,046.- (A 009 - 60)

A 010 	**8- (2- Aminoethylthio)guanosine- 3', 5'- cyclic monophosphorothioate, Sp- isomer; immobilized on agarose gel (Sp-8-AET-cGMPS-Agarose)** The protein kinase G activator Sp-cGMPS (Cat. No. G 017) immobilized on agarose by an aminoethylthio spacer attached to position 8 of the ligand. Free Sp-cGMPS is only very slowly metabolized and thus represents an extraordinary stable ligand. In addition, its reduced binding affinity towards protein kinase G compared to cGMP should result in potentially milder desorption conditions in affinity chromatography. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. Detailed technical information available. Protected under US Patent 5,625,056 issued to BIOLOG LSI		
Columns:	0.6 ml € 147.- (A 010 - 06)	2.5 ml € 459.- (A 010 - 25)	6 ml € 924.- (A 010 - 60)

A 059	**2'- O- (6- Aminohexylcarbamoyl)guanosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (2'-AHC-cGMP-Agarose)** The protein kinase G activator cyclic GMP immobilized on agarose by an aminohexylcarbamoyl spacer attached to the ribose 2' position of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins, especially those which tolerate modification of the 2'- ribose hydroxyl group, such as some phosphodiesterases. This type of gel is offered as PDE-resistant version (Sp-2'-AHC-cGMPS-Agarose, Cat. No. A 052, below) as well. Detailed technical information available. References: Kim & Park, *J. Biochem. Mol. Biol*., **36**, 299 - 304 (2003); Scholten et al., *J. Proteome Res*., **5**, 1435 - 1447 (2006).		
Columns:	0.6 ml € 72.- (A 059 - 06)	2.5 ml € 228.- (A 059 - 25)	6 ml € 459.- (A 059 - 60)

A 051	**2'- O- (6- Aminohexylcarbamoyl)guanosine- 3', 5'- cyclic monophosporothioate, Rp-Isomer; immobilized on agarose gel (Rp-2'-AHC-cGMPS-Agarose)** The PDE-resistant PKG inhibitor Rp-cGMPS (Cat. No. G 016) immobilized on agarose by an aminohexylcarba-moyl spacer attached to the ribose 2'-position of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins, especially those which tolerate modification of the 2'-ribose hydroxyl group such as some phosphodiesterases. This type of gel is offered with normal cGMP (2'-AHC-cGMP-Agarose, Cat. No. A 059, above) as well. Detailed technical information available. Compare: Corrie et al., *Prot. Expr. Purif*., **3**, 417 - 420 (1992).		
Columns:	0.6 ml € 155.- (A 051 - 06)	2.5 ml € 486.- (A 051 - 25)	6 ml € 979.- (A 051 - 60)

A 052	**2'- O- (6- Aminohexylcarbamoyl)guanosine- 3', 5'- cyclic monophosporothioate, Sp-Isomer; immobilized on agarose gel (Sp-2'-AHC-cGMPS-Agarose)** The PDE-resistant PKG activator Sp-cGMPS (Cat. No. G 017) immobilized on agarose by an aminohexylcarba-moyl spacer attached to the ribose 2' position of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins, especially those which tolerate modification of the 2'- ribose hydroxyl group such as some phosphodiesterases. This type of gel is also offered with normal cGMP (2'-AHC-cGMP-Agarose, Cat. No. A 059, above). Detailed technical information available. Compare: Corrie et al., *Prot. Expr. Purif*., **3**, 417 - 420 (1992).		
Columns:	0.6 ml € 135.- (A 052 - 06)	2.5 ml € 421.- (A 052 - 25)	6 ml € 849.- (A 052 - 60)

A 056	**N^2- (6- Aminohexyl)guanosine- 3', 5'- cyclic monophosphate; immobilized on agarose gel (2-AH-cGMP-Agarose)** The second messenger cyclic GMP immobilized on agarose by an aminohexyl spacer attached to the 2-amino group of the ligand. The gel can be used for affinity chromatography of various cyclic nucleotide-responsive proteins such as protein kinases, phosphodiesterases and others. Detailed technical information available. References: Kim & Park, *J. Biochem. Mol. Biol*., **36**, 299 - 304 (2003); Scholten et al., *J. Proteome Res*., **5**, 1435 - 1447 (2006); Margarucci et al., *Mol. BioSyst*., **7**, 2311 - 2319 (2011).		
Columns:	0.6 ml € 164.- (A 056 - 06)	2.5 ml € 510.- (A 056 - 25)	6 ml € 1,012.- (A 056 - 60)

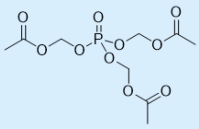
Inquire	We are constantly synthesizing affinity gels with new cGMP ligands. Please inquire regarding special structures, different matrices not listed here or visit our website (www.biolog.de). Custom syntheses of special gels are offered.

Control for Affinity Chromatography Gels

E 010	**Ethanolamine; immobilized on agarose gel (EtOH-NH-Agarose)** Agarose gel without nucleotide ligands, as negative control in affinity chromatography experiments. This agarose matrix is identical to the material used for the synthesis of the affinity gels listed above. The reactive groups on the bead surface normally used to immobilize the functionalized nucleotide, have been deactivated with ethanolamine. References: Antl et al., *Blood*, **109**, 552 - 559 (2007); Hammerschmidt et al., *PLoS One* **7**(7): e39848 (2012).		
Columns:	0.6 ml € 82.- (E 010 - 06)	2.5 ml € 255.- (E 010 - 25)	6 ml € 513.- (E 010 - 60)

Miscellaneous

P 030	**Phosphate tris(acetoxymethyl)ester (PO_4-AM_3)** $C_9H_{15}O_{10}P$; MW 314.2; purity > 95% MS. Membrane-permeant prodrug of inorganic phosphate. PO_4-AM_3 is recommended as control reagent in nucleotide-AM ester applications to test for side effects of acetic acid and formaldehyde. After cell permeation and intracellular metabolic activation by endogenous esterases the highly polar inorganic phosphate (PO_4^{3-}) is released. In addition, the AM ester groups liberate acetic acid and formaldehyde, two metabolites with potential biological functions. Please note: 0.33 µmol of PO_4-AM_3 is stoichiometrically equivalent to 1 µmol of a cyclic nucleotide AM ester. References: Schultz et al., *J. Biol. Chem.*, **268**, 6316 - 6322 (1993); Chepurny et al., *J. Biol. Chem.*, **284**, 10728 - 10736 (2009).
0.33 µmol / ~0.1 mg € 43.- (P 030 - 003)	5 x 0.33 µmol € 185.- (P 030 - 015)



D 052	**RQIKIWFQNRRMKWKK-LRK$_5$H-amide (DT-3)** MW 3293.1 for free peptide; TFA salt; purity > 95% HPLC. Peptide-based inhibitor of protein kinase G type I α and I β. Detailed technical information available. Reference: Dostmann et al., *Proc. Natl. Acad. Sci. USA,* **97**, 14772 - 14777 (2000).
0.5 mg / ~0.15 µmol € 113.- (D 052-005)	5 x 0.5 mg € 480.- (D 052-025)

D 051	**YGRKKRRQRRRPP-LRK$_5$H-amide (DT-2)** MW 2800.5 for free peptide; TFA salt; purity > 95% HPLC. Peptide-based, membrane permeant inhibitor of protein kinase G type I α and I β. Detailed technical information available. Reference: Dostmann et al., *Proc. Natl. Acad. Sci. USA,* **97**, 14772 - 14777 (2000).
0.5 mg / ~0.18 µmol € 113.- (D 051-005)	5 x 0.5 mg € 480.- (D 051-025)

D 110	**ygrkkrrqrrrpp-lr$_5$h-amide ((D)-DT-2)** MW 2800.5 for free peptide; TFA salt; purity > 95% HPLC. Proteolytically resistant, membrane permeant and highly potent peptide-based inhibitor of protein kinase G type I α and I β. Detailed technical information available. Reference: Nickl et al., *Biochim. Biophys. Acta,* **1804**, 524 - 532 (2010).
0.5 mg / ~0.18 µmol € 164.- (D 110-005)	5 x 0.5 mg € 692.- (D 110-025)

W 001	**LRKKKKKH-amide (W45)** MW 1064.4 for free peptide; TFA salt; purity > 95% HPLC. Potent peptide-based inhibitor of protein kinase G type I α and I β, which is not membrane permeant. Can be used for studies with DT-2, (D)-DT-2 and DT-3 as a control. Detailed technical information available. Dostmann et al., *Proc. Natl. Acad. Sci. USA,* **97**, 14772 - 14777 (2000).
0.5 mg / ~0.47 µmol € 93.- (W 001-005)	5 x 0.5 mg € 396.- (W 001-025)

Inquire	**Custom Syntheses and Bulk Supply** BIOLOG offers custom syntheses for many nucleosides, nucleotides and nucleobases not listed in this catalogue. If a certain basic structure is offered, e.g. as a cyclic nucleotide, we can most probably prepare related structures as well. Please inquire concerning prices and delivery schedules. If you need one of our products or a different structure in bulk, please request a corresponding offer.

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K 002

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Ko-*Libri* Library of Cyclic Nucleotides

10 mM solution of cyclic nucleotides dissolved in 250 µl DMSO in 1.4 ml polypropylene vials in 96 (8 x 12) well polypropylene racks. Purity of compounds: typically > 98% HPLC. Supporting datasheet and electronic datafiles (ISIS™/BASE and MSExcel) on CD.

Cyclic AMP Analogues	Cat. No.
1,N^6-ε-2-aza-cAMP	A 015
1-NO-cAMP	A 023
2-AHA-cAMP	A 053
2-Cl-8-MA-cAMP	C 080
2-Cl-cAMP	C 020
2'-dcAMP	D 015
2'-F-cAMP	D 073
2'-NH2-cAMP	A 088
2'-O-Bn-cAMP	B 061
2'-O-MB-cAMP	M 007
2'-O-Me-cAMP	M 050
2'-O-MS-cAMP	M 011
6-Bn-cAMP	B 008
6-Bnz-cAMP	B 009
6-MB-cAMP	M 003
6-MBC-cAMP	M 012
6-Phe-cAMP	P 006
7-CH-cAMP	D 021
8-AET-2'-O-Me-cAMP	A 142
8-Br-2'-O-Me-cAMP	B 022
8-Br-cAMP	B 007
8-Cl-cAMP	C 007
8-CPT-2'-O-Me-cAMP	C 041
8-CPT-cAMP	C 010
8-HA-cAMP	H 006
8-MA-cAMP	M 001
8-PIP-cAMP	P 002
ara-cAMP	A 076
cAMP	A 001
DB-cAMP	D 009
ε-cAMP	E 001
MANT-cAMP	M 008
Rp-2-Cl-cAMPS	C 073
Rp-5,6-DCl-cBIMPS	D 013
Rp-8-Br-cAMPS	B 001
Rp-8-Cl-cAMPS	C 003
Rp-8-CPT-cAMPS	C 011
Rp-8-PIP-cAMPS	P 004
Rp-cAMPS	A 002
Rp-2',3'-cAMPS	A 006
Sp-2-Cl-cAMPS	C 074
Sp-5,6-DCl-cBIMPS	D 014
Sp-6-Bnz-cAMPS	B 040
Sp-8-Br-cAMPS	B 002
Sp-8-Cl-cAMPS	C 004
Sp-8-CPT-cAMPS	C 012
Sp-8-PIP-cAMPS	P 005
Sp-cAMPS	A 003

Cyclic GMP Analogues	Cat. No.
2'-dcGMP	D 020
2'-O-MB-cGMP	M 006
7-CH-cGMP	D 099
8-AET-cGMP	A 029
8-Br-cGMP	B 004
8-Br-PET-cGMP	P 003
8-pCPT-2'-O-Me-cGMP	C 048
8-pCPT-cGMP	C 009
cGMP	G 001
DB-cGMP	D 010
MANT-cGMP	M 009
PET-cGMP	P 001
Rp-8-Br-cGMPS	B 005
Rp-8-Br-PET-cGMPS	P 007
Rp-8-pCPT-cGMPS	C 013
Rp-cGMPS	G 016
Sp-8-Br-cGMPS	B 006
Sp-8-Br-PET-cGMPS	P 008
Sp-8-pCPT-cGMPS	C 014
Sp-cGMPS	G 017

Other Cyclic Nucleotides	
2',3'-cUMP	U 004
cUMP	U 001
2-NH_2-cPuMP	A 027
5,6-DM-cBIMP	D 001
6-Cl-cPuMP	C 002
cCMP	C 001
cIMP	I 001
cPuMP	P 010
cTMP	T 005
cXMP	X 001
Sp-6-Cl-cPuMPS	C 083

2.5 µmol each € 4,148.- (K 002 - 79)

❄ Shipment on dry ice is recommended to maintain original quality

Inquire

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All library compounds are available as single compounds as well.

Alphabetical listing of products and abbreviations

Product Name	Page
A	
8-ABA-cAMP	54
Acetoxymethyl ester of cyclic AMP	27
Acetoxymethyl ester of cyclic GMP	40
Acetoxymethyl ester of cyclic CMP	42
Adenosine-	
- 1-N-oxide-3',5'-phosphate (1-NO-cAMP)	27
- 2',3'-phosphate (2',3'-cAMP)	49
- 2',3'-phosphorothioate, endo isomer (Rp-2',3'-cAMPS)	49
- 2',3'-phosphorothioate, exo isomer (Sp-2',3'-cAMPS)	49
- 3',5'-phosphate, free acid (cAMP)	27
- 3',5'-phosphate, sodium salt (cAMP)	27
- 3',5'-phosphate, acetoxymethyl ester (cAMP-AM)	27
- 3',5'-phosphate, benzyl ester (cAMP-Bn)	27
- 3',5'-phosphorothioate, Rp-isomer (Rp-cAMPS)	16
- 3',5'-phosphorothioate, Sp-isomer (Sp-cAMPS)	18
- 3',5'-phosphorothioate, Sp-isomer, acetoxymethyl ester	18
2-ADOA-cAMP	54
8-ADOA-cAMP	55
2'-ADOC-cAMP	54
6-AE-cAMP	55
6-AE-cAMP-Agarose	62
2-AEA-cAMP	55
2-AEA-cAMP-Agarose	62
8-AEA-cAMP	55
8-AEA-cAMP-Agarose	62
2'-AEC-cAMP	56
2'-AEC-cAMP-Agarose	63
2'-AEC-cGMP	60
2'-AEC-cGMP-Agarose	66
6-AE-8-N_3-cAMP	56
8-AET-cAMP	56
8-AET-cAMP-Agarose	63
8-AET-cGMP	60, 69
8-AET-cGMP-Agarose	66
8-AET-2'-O-Me-cAMP	21, 56
8-AET-2'-O-Me-cAMP-Agarose	25, 64
Affinity chromatography gels	61
Agarose gels	61
2-AHA-cAMP	57, 69
2-AHA-cAMP-Agarose	64
8-AHA-cAMP	57
8-AHA-cAMP-Agarose	64
8-AHA-2-Cl-cAMP	27
8-AHA-2'-O-Me-cAMP	21, 57
8-AHA-2'-O-Me-cAMP-Agarose	26, 65
6-AH-cAMP	57
6-AH-cAMP-Agarose	64
2'-AHC-cAMP	58
2'-AHC-cAMP-Agarose	65
2'-AHC-cCMP	42, 60
2'-AHC-cCMP-Agarose	66
2'-AHC-cGMP	60
2'-AHC-cGMP-Agarose	67
4-AH-cCMP	42, 60
4-AH-cCMP-Agarose	66
2-AH-cGMP	61
2-AH-cGMP-Agarose	67
8-AHT-cGMP	61
8-(4-Aminobutyl)aminoadenosine-3',5'-phosphate (8-ABA-cAMP)	54
2'-Amino-2'-deoxyadenosine-3',5'-phosphate (2'-NH_2-cAMP)	53
2-(8-Amino-3,6-dioxaoctylamino)adenosine-3',5'-phosphate	54
8-(8-Amino-3,6-dioxaoctylamino)adenosine-3',5'-phosphate	55

Product Name	Page
A *- continued*	
2'-O-(8-Amino- 3, 6- dioxaoctylcarbamoyl)adenosine- 3', 5'-phosphate	54
N^6-(2-Aminoethyl)-8-azidoadenosine-3',5'-phosphate (6-AE-8-N_3-cAMP)	56
N^6-(2-Aminoethyl)adenosine-	
- 3',5'-phosphate (6-AE-cAMP)	55
- 3',5'-phosphate immobilized on agarose (6-AE-cAMP-Agarose)	62
- 3',5'-phosphorothioate, Sp-isomer (Sp-6-AE-cAMPS)	55
- 3',5'-phosphorothioate, Sp on agarose (Sp-6-AE-cAMPS-Agarose)	62
2-(2-Aminoethylamino)adenosine-	
- 3',5'-phosphate (2-AEA-cAMP)	55
- 3',5'-phosphate on agarose (2-AEA-cAMP-Agarose)	62
- 3',5'-phosphorothioate, Sp-isomer (Sp-2-AEA-cAMPS)	55
- 3',5'-phosphorothioate, Sp, on agarose (Sp-2-AEA-cAMPS-Agarose)	62
8-(2-Aminoethylamino)adenosine-	
- 3',5'-phosphate (8-AEA-cAMP)	55
- 3',5'-phosphate, immobilized on agarose (8-AEA-cAMP-Agarose)	62
- 3',5'-phosphorothioate, Rp-isomer (Rp-8-AEA-cAMPS)	55
- 3',5'-phosphorothioate, Rp-isomer, immobilized on agarose	63
- 3',5'-phosphorothioate, Sp-isomer (Sp-8-AEA-cAMPS)	56
- 3',5'-phosphorothioate, Sp-isomer, immobilized on agarose	63
2'-O-(2-Aminoethylcarbamoyl)adenosine-	
- 3',5'-phosphate (2'-AEC-cAMP)	56
- 3',5'-phosphate immobilized on agarose (2'-AEC-cAMP-Agarose)	63
- 3',5'-phosphorothioate, Rp-isomer (Rp-2'-AEC-cAMPS)	56
- 3',5'-phosphorothioate, Rp-isomer, immobilized on agarose	63
- 3',5'-phosphorothioate, Sp-isomer (Sp-2'-AEC-cAMPS)	56
- 3',5'-phosphorothioate, Sp-isomer, immobilized on agarose	63
2'-O-(2-Aminoethylcarbamoyl)guanosine-3',5'-phosphate (2'-AEC-cGMP)	60
2'-O-(2-Aminoethylcarbamoyl)guanosine-3',5'-phosphate on agarose	66
8-(2-Aminoethylthio)-	
- adenosine-3',5'-phosphate (8-AET-cAMP)	56
- adenosine-3',5'-phosphate on agarose (8-AET-cAMP-Agarose)	63
- guanosine-3',5'-phosphate (8-AET-cGMP)	60, 69
- guanosine-3',5'-phosphate, immobilized on agarose	66
- guanosine-3',5'-phosphorothioate, Rp-isomer (Rp-8-AET-cGMPS)	60
- guanosine-3',5'-phosphorothioate, Rp, immobilized on agarose	66
- guanosine-3',5'-phosphorothioate, Sp-isomer (Sp-8-AET-cGMPS)	60
- guanosine-3',5'-phosphorothioate, Sp, immobilized on agarose	66
- 2'-O-methyladenosine-3',5'-phosphate (8-AET-2'-O-Me-cAMP)	21, 56
- 2'-O-methyladenosine-3',5'-phosphate, immobilized on agarose	25, 64
N^1-Aminoguanosine-3',5'-phosphate (1-NH_2-cGMP)	37
N^6-(6-Aminohexyl)adenosine-	
- 3',5'-phosphate (6-AH-cAMP)	57
- 3',5'-phosphate, immobilized on agarose (6-AH-cAMP-Agarose)	64
- 3',5'-phosphorothioate, Sp-isomer (Sp-6-AH-cAMPS)	57
- 3',5'-phosphorothioate, Sp on agarose (Sp-6-AH-cAMPS-Agarose)	64
2-(6-Aminohexylamino)adenosine-	
- 3',5'-phosphate (2-AHA-cAMP)	57, 69
- 3',5'-phosphate on agarose (2-AHA-cAMP-Agarose)	64
- 3',5'-phosphorothioate, Sp-isomer (Sp-2-AHA-cAMPS)	57
- 3',5'-phosphorothioate, Sp on agarose (Sp-2-AHA-cAMPS-Agarose)	64
8-(6-Aminohexylamino)-	
- adenosine-3',5'-phosphate (8-AHA-cAMP)	57
- adenosine-3',5'-phosphate, immobilized on agarose	64
- adenosine-3',5'-phosphorothioate, Rp-isomer (Rp-8-AHA-cAMPS)	57
- adenosine-3',5'-phosphorothioate, Rp-isomer immobilized on agarose	65
- adenosine-3',5'-phosphorothioate, Sp-isomer (Sp-8-AHA-cAMPS)	57
- adenosine-3',5'-phosphorothioate, Sp-isomer, immobilized on agarose	65
- 2-chloroadenosine-3',5'-phosphate (8-AHA-2-Cl-cAMP)	27
- 2'-O-methyladenosine-3',5'-phosphate (8-AHA-2'-O-Me-cAMP)	21, 57
- 2'-O-methyladenosine-3',5'-phosphate, immobilized on agarose	26, 65
- adenosine-3',5'-phosphate (2'-AHC-cAMP)	57
- adenosine-3',5'-phosphate, immobilized on agarose	65

Product Name	Page
A - *continued*	
2'-O-(6-Aminohexylcarbamoyl)-	
- adenosine-3',5'-phosphorothioate, Rp-isomer (Rp-2'-AHC-cAMPS)	58
- adenosine-3',5'-phosphorothioate, Rp-isomer, immobilized on agarose	65
- adenosine-3',5'-phosphorothioate, Sp-isomer (Sp-2'-AHC-cAMPS)	58
- adenosine-3',5'-phosphorothioate, Sp-isomer, immobilized on agarose	65
- cytidine-3',5'-phosphate (2'-AHC-cCMP)	42, 60
- cytidine-3',5'-phosphate on agarose (2'-AHC-cCMP-Agarose)	66
- guanosine-3',5'-phosphate (2'-AHC-cGMP)	60
- guanosine-3',5'-phosphate, immobilized on agarose	67
- guanosine-3',5'-phosphorothioate, Rp-isomer (Rp-2'-AHC-cGMPS)	60
- guanosine-3',5'-phosphorothioate, Rp-isomer, immobilized on agarose	67
- guanosine-3',5'-phosphorothioate, Sp-isomer (Sp-2'-AHC-cGMPS)	60
- guanosine-3',5'-phosphorothioate, Sp-isomer, immobilized on agarose	67
N^4-(6-Aminohexyl)cytidine-3',5'-phosphate (4-AH-cCMP)	42, 60
N^4-(6-Aminohexyl)cytidine-3',5'-phosphate on agarose	66
N^2-(6-Aminohexyl)guanosine-3',5'-phosphate (2-AH-cGMP)	61
N^2-(6-Aminohexyl)guanosine-3',5'-phosphate on agarose	67
8-(6-Aminohexylthio)guanosine-3',5'-phosphate (8-AHT-cGMP)	61
2'-O-(19-Aminopentaoxanonadecylcarbamoyl)adenosine-3',5'-phosphate	58
8-(2-Aminophenylthio)guanosine-3',5'-phosphate (8-APT-cGMP)	37
2-Aminopurine riboside-3',5'-phosphate (2-NH_2-cPuMP)	44, 49
8-APT-cGMP	37
2'-APNC-cAMP	58
Arabinoadenosine-3',5'-phosphate (*ara*-cAMP)	49, 69
2-Aza-1,N^6-ethenoadenosine-3',5'-phosphate (2-Aza-ε-cAMP)	28, 44
8-Azido-	
- adenosine-3',5'-phosphate (8-N_3-cAMP)	28, 58
- N^6-(6-[biotinyl]aminoethyl)adenosine-3',5'-phosphate	28, 49
- N^6-(2-[DY-547]-aminoethyl)adenosine-3',5'-phosphate	28, 49
- 1,N^6-ethenoadenosine-3',5'- phosphate (8-N_3-ε-cAMP)	28, 44
β-(4-Azidophenyl)-1,N^2-etheno-8-(2-[biotinyl]aminoethylthio)-cGMP	37, 50
β-(4-Azidophenyl)-1,N^2-etheno-8-bromoguanosine-3',5'-phosphate	37, 49
B	
BCMCM-caged 8-Br-cAMP	29
BCMCM-caged 8-Br-cGMP	38
BCMCM-caged cAMP	29
BCMCM-caged cGMP	38
N^6-Benzoyl-	
- adenosine-3',5'-phosphate (6-Bnz-cAMP)	23, 28
- adenosine-3', 5'-phosphate, acetoxymethyl ester (6-Bnz-cAMP-AM)	24, 28
- adenosine-3',5'-phosphorothioate, Sp-isomer (Sp-6-Bnz-cAMPS)	18, 24
- 8-piperidinoadenosine-3',5'-phosphate (6-Bnz-8-PIP-cAMP)	29
N^6-Benzyladenosine- 3',5'-phosphate (6-Bn-cAMP)	24, 29
8-Benzylthioadenosine-3',5'-phosphate (8-BT-cAMP)	29
8-[Biotin]-AET-cAMP	29, 50
8-[Biotin]-AET-cGMP	37, 50
2-[Biotin]-AHA-cAMP	29, 50
2-[Biotin]-AH-cGMP	37, 50
8-(2-[Biotinyl]aminoethylthio)adenosine-3',5'-phosphate	29, 50
8-(2-[Biotinyl]aminoethylthio)guanosine-3',5'-phosphate	37, 50
2-(6-[Biotinyl]aminohexylamino)adenosine-3',5'-phosphate	29, 50
N^2-(6-[Biotinyl]aminohexyl)guanosine-3',5'-phosphate	37, 50
[6,7-Bis(carboxymethoxy)coumarin-4-yl]methyl-	
- adenosine-3',5'-phosphate (BCMCM-caged cAMP)	29
- 8-bromoadenosine-3',5'-phosphate (BCMCM-caged 8-Br-cAMP)	29
- 8-bromoguanosine-3',5'-phosphate (BCMCM-caged 8-Br-cGMP)	38
- guanosine-3',5'-phosphate (BCMCM-caged cGMP)	38
6-Bn-cAMP	24, 29
6-Bnz-cAMP	23, 28
6-Bnz-cAMP-AM	24, 28
6-Bnz-8-PIP-cAMP	29
8-Br-cAMP	30
8-Br-cAMP-AM	30
8-Br-cAMPS, Rp-isomer	16
8-Br-cAMPS, Sp-isomer	18

Product Name	Page
B - *continued*	
8-Br-cAMPS, Sp-isomer, AM ester	19
8-Br-cGMP	38
8-Br-cGMP-AM	38
8-Br-2'-O-Me-cAMP	21
8-Br-2'-O-Me-cAMP-AM	22
8-Br-2'-O-Me-cGMP	24, 50
8-Br-2',3'-cAMP	51
8-Bromo-	
- adenosine- 2', 3'- cyclic monophosphate (8-Br-2',3'-cAMP)	51
- adenosine-3',5'-phosphate (8-Br-cAMP)	30
- adenosine-3',5'-phosphate, acetoxymethyl ester (8-Br-cAMP-AM)	30
- adenosine-3',5'-phosphorothioate, Rp-isomer (Rp-8-Br-cAMPS)	16
- adenosine-3',5'-phosphorothioate, Sp-isomer (Sp-8-Br-cAMPS)	18
- adenosine-3',5'-phosphorothioate, Sp-isomer, acetoxymethyl ester	19
- cyclic AMP (8-Br-cAMP)	30
- cyclic GMP (8-Br-cGMP)	38
- guanosine-3',5'-phosphate, acetoxymethyl ester (8-Br-cGMP-AM)	38
- guanosine-3',5'-phosphate (8-Br-cGMP)	38
- guanosine-3',5'-phosphorothioate, Rp-isomer	35, 69
- guanosine-3',5'-phosphorothioate, Sp-isomer	36, 69
- 2'-O-methyladenosine-3',5'-phosphate (8-Br-2'-O-Me-cAMP)	21
- 2'-O-methyladenosine-3',5'-phosphate, acetoxymethyl ester	22
- 2'-O-methyladenosine-3',5'-phosphorothioate, Sp-isomer	22
- 2'-O-methylguanosine-3',5'-phosphate (8-Br-2'-O-Me-cGMP)	24, 50
- 2'-O-monobutyryladenosine-3',5'-phosphorothioate, Rp-isomer	16
8-Br-PET-cGMP	41, 69
8-BT-cAMP	29
Bucladesine (Db-cAMP)	30, 69
3-[5-(t.-But.)isoxazol-3-yl]-2-[2-(3-chlorophenyl)hydrazono]-3-oxopropanenitrile	25
C	
cAMP, H	27
cAMP, Na	27
cAMP-AM	27
cAMP-Bn	27
2',3'-cAMP	49
2',3'-cAMPS, Rp-isomer	49, 69
2',3'-cAMPS, Sp-isomer	49
ε-cAMP	31, 44
2'-(5-Carboxypentylcarbamoyl)adenosine-3',5'-phosphate (2'-CPC-cAMP)	59
cCMP	42, 69
cCMP-AM	41
2',3'-cGMP	52
3',5'-cGMP	40, 69
3',5'-cGMP-AM	40
7-CH-cAMP	31
7-CH-cGMP	39
2-Chloro-	
- adenosine-3',5'-phosphate (2-Cl-cAMP)	30, 69
- adenosine-3',5'-phosphorothioate, Rp- isomer (Rp-2-Cl-cAMPS)	16, 69
- adenosine-3',5'-phosphorothioate, Sp- isomer (Sp-2-Cl-cAMPS)	19, 69
- 8-n-hexylaminoadenosine-3',5'-phosphate (2-Cl-8-HA-cAMP)	30
- inosine-3',5'-phosphate (2-Cl-cIMP)	50
- 8-methylaminoadenosine-3',5'-phosphate (2-Cl-8-MA-cAMP)	30, 69
8-Chloro-	
- adenosine-3',5'-phosphate (8-Cl-cAMP)	30, 69
- adenosine-3',5'-phosphate, acetoxymethyl ester	30
- adenosine-3',5'-phosphorothioate, Rp-isomer (Rp-8-Cl-cAMPS)	17, 69
- adenosine-3',5'-phosphorothioate, Sp-isomer (Sp-8-Cl-cAMPS)	19, 69
8-(4-Chlorophenylthio)-	
- adenosine-3',5'-phosphate (8-CPT-cAMP)	31, 69
- adenosine-3',5'-phosphate, acetoxymethyl ester (8-CPT-cAMP-AM)	31
- adenosine-3',5'-phosphorothioate, Rp-isomer (Rp-8-CPT-cAMPS)	17, 69
- adenosine-3',5'-phosphorothioate, Sp-isomer (Sp-8-CPT-cAMPS)	19, 69
- guanosine-3',5'-phosphate (8-pCPT-cGMP)	38, 69
- guanosine-3',5'-phosphate, acetoxymethyl ester (8-pCPT-cGMP-AM)	38

Product Name	Page
C - *continued*	
8-(4-Chlorophenylthio)-	
- guanosine-3',5'-phosphorothioate, Rp-isomer (Rp-8-pCPT-cGMPS)	35, 69
- guanosine-3',5'-phosphorothioate, Sp-isomer (Sp-8-pCPT-cGMPS)	36, 69
- 2'-O-methyladenosine-3',5'-phosphate (8-CPT-2'-O-Me-cAMP)	22
- 2'-O-methyladenosine-3',5'-phosphate, acetoxymethyl ester	22
- 2'-O-methyladenosine-3',5'-phosphorothioate, Sp-isomer	22
- 2'-O-methylguanosine-3',5'-phosphate (8-pCPT-2'-O-Me-cGMP)	24, 69
- N^6-phenyladenosine-3',5'-phosphate (8-CPT-6-Phe-cAMP)	31
- β-phenyl-1,N^2-ethenoguanosine-3',5'-phosphate (8-pCPT-PET-cGMP)	38
- β-phenyl-1,N^2-ethenoguanosine-3',5'-phosphorothioate, Rp-isomer	35
- β-phenyl-1,N^2-ethenoguanosine-3',5'-phosphorothioate, Sp-isomer	36
6-Chloropurine riboside-	
- 3',5'-phosphate (6-Cl-cPuMP)	51, 69
- 3',5'-phosphorothioate, Rp-isomer (Rp-6-Cl-cPuMPS)	50
- 3',5'-phosphorothioate, Sp-isomer (Sp-6-Cl-cPuMPS)	19, 51
cIMP	52, 69
2-Cl-cAMP	30, 69
8-Cl-cAMP	30, 69
8-Cl-cAMP-AM	30
2-Cl-cIMP	50
6-Cl-cPuMP	51, 69
2-Cl-8-HA-cAMP	30
2-Cl-8-MA-cAMP	30, 69
2'-CPC-cAMP	59
8-CPT-cAMP	31, 69
8-CPT-cAMP-AM	31
8-CPT-cGMP	38, 69
8-CPT-cGMP-AM	38
8-CPT-2'-O-Me-cAMP	22
8-CPT-2'-O-Me-cAMP-AM	22
8-CPT-6-Phe-cAMP	31
cPuMP	53, 69
cTMP	43, 69
cTuMP	31, 69
2',3'-cUMP	43, 53
cUMP	43, 54
cUMP-AM	43
cXMP	53, 69
cyclic AMP	27
cyclic AMPS, immobilized on agarose via ribose 2'-O	63
cyclic CMP	42, 69
cyclic 2',3'-GMP	51
cyclic GMP	40, 69
cyclic GMP, acetoxymethylester (cGMP-AM)	40
cyclic GMPS, immobilized on agarose via ribose 2'-O	67
cyclic guanosine-3',5'-phosphate, acetoxymethyl ester (cGMP-AM)	40
cyclic IMP	52, 69
cyclic PuMP	53, 69
cyclic TMP	43, 69
cyclic UMP	43, 54
cyclic UMP, acetoxymethylester (cUMP-AM)	43
cyclic XMP	54, 69
4-Cyclopentyl-dimethylbenzylsulfanyl-oxo-dihydropyrimidine carbonitrile	25
Cytidine-	
- 3',5'-phosphate	42, 69
- 3',5'-phosphate, acetoxymethyl ester (cCMP-AM)	42
- 3',5'-phosphorothioate, Rp-isomer (Rp-cCMPS)	42
- 3',5'-phosphorothioate, Sp-isomer (Sp-cCMPS)	42
D	
DB-cAMP	31, 69
DB-cAMP-AM	31
DB-cCMP	42
DB-cGMP	39
2'-dcAMP	51

Product Name	Page
D - *continued*	
2'-dcGMP	51
5,6-DCl-cBIMP	32
DEACM-caged cAMP	32
DEACM-caged cGMP	39
7-Deaza-	
- adenosine-3',5'-phosphate (7-CH-cAMP / cTuMP)	31, 69
- guanosine-3',5'-phosphate (7-CH-cGMP)	39
2'-Deoxy-	
- adenosine-3',5'-phosphate (2'-dcAMP)	51
- 2'-fluoroadenosine-3',5'-phosphate (2'-F-dcAMP)	51
- guanosine-3',5'-phosphate (2'-dcGMP)	51
N^6,2'-O-Dibutyryladenosine-3',5'-phosphate (DB-cAMP)	31, 69
N^6,2'-O-Dibutyryladenosine-3',5'-phosphate, AM ester (DB-cAMP-AM)	31
N^4,2'-O-Dibutyrylcytidine-3',5'-phosphate (DB-cCMP)	42
N^2,2'-O-Dibutyrylguanosine-3',5'-phosphate (DB-cGMP)	39
5,6-Dichloro-1-β-D-ribofuranosylbenzimidazole-3',5'-phosphate	32
5,6-Dichloro-1-β-D-ribofuranosylbenzimidazole-3',5'-phosphorothioate,Rp	52
5,6-Dichloro-1-β-D-ribofuranosylbenzimidazole-3',5'-phosphorothioate,Sp	19
(7-Diethylaminocoumarin-4-yl)methyladenosine-3',5'-phosphate	32
(7-Diethylaminocoumarin-4-yl)methylguanosine-3',5'-phosphate	39
5,6-Dimethylbenzimidazole riboside-3',5'-phosphate (5,6-DM-cBIMP)	52
5,6-DM-cBIMP	52
8-[DY-547]-AET-cAMP	32, 44
8-[DY-547]-AET-cGMP	39, 45
8-[DY-647]-AET-cGMP	39, 45
8-[DY-547]-AET-2'-O-Me-cAMP	22, 45
2'-[DY-505-05]-AHC-cGMP	44
8-(2-[DY-547]-aminoethylthio)adenosine-3',5'-phosphate	32, 44
8-(2-[DY-547]-aminoethylthio)guanosine-3',5'-phosphate	39, 45
8-(2-[DY-647]-aminoethylthio)guanosine-3',5'-phosphate	39, 45
8-(2-[DY-547]-aminoethylthio)-2'-O-methyladenosine-3',5'-phosphate	22, 45
2'-O-(6-[DY-505-05]-aminohexylcarbamoyl))guanosine-3',5'-phosphate	44
E	
ε-cAMP	32, 45
2'-EDA-cAMP	56
2'-EDA-cGMP	60
EPAC activators	21
EPAC inhibitors	25
ESI-05 (Epac inhibitor)	25
ESI-09 (Epac inhibitor)	25
Ethanolamine, immobilized on agarose (EtOHNH-Agarose)	25, 67
1,N^6-Ethenoadenosine-3',5'-phosphate (ε-cAMP)	32, 45
EtOHNH-Agarose	25, 67
F	
FAM-cAMP	45, 51
FAM-cGMP	46, 52
f-cAMP	32, 44
2'-F-dcAMP	51
f-cGMP	39, 45
8-[Fluo]-AET-cAMP	32, 45
8-[Fluo]-AET-cGMP	39, 45
2'-Fluo-AHC-cAMP	45, 51
2'-Fluo-AHC-cGMP	46, 52
8-[Fluo]-AHT-PET-cGMP	39, 46
8-[Fluo]-cAMP	32, 45
8-[Fluo]-cGMP	39, 45
8-(2-[Fluoresceinyl]aminoethylthio)adenosine-3',5'-phosphate	32, 45
8-(6-[Fluoresceinyl]aminohexylthio)-β-PET-guanosine-3',5'-phosphate	39, 46
8-(2-[Fluoresceinyl]aminoethylthio)guanosine-3',5'-phosphate	39, 45
2'-(6-[Fluoresceinyl]aminohexylcarbamoyl)-3',5'-cAMP	45, 51
2'-(6-[Fluoresceinyl]aminohexylcarbamoyl)-3',5'-cGMP	46, 52

Product Name	Page
G	
Guanosine-	
- 2',3'-phosphate (2',3'-cGMP)	52
- 3',5'-phosphate (cGMP)	40, 69
- 3',5'-phosphate, acetoxymethyl ester (cGMP-AM)	40
- 3',5'-phosphorothioate, Rp-isomer (Rp-cGMPS)	35, 69
- 3',5'-phosphorothioate, Sp-isomer (Sp-cGMPS)	36, 69
H	
8-Hexylaminoadenosine-3',5'-phosphate (8-HA-cAMP)	32
8-HA-cAMP	32
HJC0197 (Epac inhibitor)	25
8-Hydroxyadenosine-3',5'-phosphate (8-OH-cAMP)	32
8-Hydroxyadenosine-3',5'-phosphorothioate, Rp (Rp-8-OH-cAMPS)	17
8-Hydroxyadenosine-3',5'-phosphorothioate, Sp (Sp-8-OH-cAMPS)	20
8-Hydroxy-2'-O-methyladenosine-3',5'-phosphate (8-OH-2'-O-Me-cAMP)	23
8-(4-Hydroxyphenylthio)-2'-O-methyladenosine-3',5'-phosphate	23
I	
Inhibitors of Epac	25
Inhibitors of protein kinase A	16
Inhibitors of protein kinase G	35
Inosine-3',5'-phosphate (cIMP)	52, 69
K	
Ko-*Libri* library of cyclic nucleotides	69
L	
LRKKKKKH-amide (W45)	67
M	
8-MA-cAMP	33
8-MABA-cAMP	33, 46
6-MAH-cAMP	33, 46
MANT-cAMP	46, 53
MANT-cCMP	43, 46
MANT-cGMP	46, 53
2'-O-MB-cAMP	33
6-MB-cAMP	25, 33
6-MBC-cAMP	24, 33
2'-O-MB-cGMP	40
8-MBT-cAMP	59
2'-O-Me-cAMP	23, 52
2-Me-cGMP	40
2'-O-Me-cGMP	24, 52
8-(4-Mercaptobutylthio)adenosine-3',5'-phosphate (8-MBT-cAMP)	59
8-(4-Methoxyphenylthio)-2'-O-methyladenosine-3',5'-phosphate	23
2'-O-Methyladenosine-3',5'-phosphate (2'-O-Me-cAMP)	23, 52
8-Methylaminoadenosine-3',5'-phosphate (8-MA-cAMP)	33
2'-O-(N'-Methylanthraniloyl)adenosine-3',5'-phosphate (MANT-cAMP)	46, 53
2'-O-(N'-Methylanthraniloyl)cytidine-3',5'-phosphate (MANT-cCMP)	43, 46
2'-O-(N'-Methylanthraniloyl)guanosine-3',5'-phosphate (MANT-cGMP)	46, 53
N^6-(6-[N'-Methylanthraniloyl]aminohexyl)adenosine-3',5'-phosphate	33, 46
8-(4-[N'-Methylanthraniloyl]aminobutylamino)adenosine-3',5'-phosphate	33, 46
N^2-Methylguanosine-3',5'-phosphate (2-Me-cGMP)	40
2'-O-Methylguanosine-3',5'-phosphate (2'-O-Me-cGMP)	24, 52
4-Methylphenyl-2,4,6-trimethylphenylsulfone (ESI-05)	25
N^6-Mono-t.-butylcarbamoyladenosine-3',5'-phosphate (6-MBC-cAMP)	24, 33
2'-O-Monobutyryladenosine-3',5'-phosphate (2'-O-MB-cAMP)	33
2'-O-Monobutyryladenosine-3',5'-phosphorothioate, Rp-isomer	17
2'-O-Monobutyryladenosine-3',5'-phosphorothioate, Sp-isomer	20
N^6-Monobutyryladenosine-3',5'-phosphate (6-MB-cAMP)	25, 33
2'-O-Monobutyryguanosine-3',5'-phosphate (2'-O-MB-cGMP)	40
2'-O-Monosuccinyladenosine-3',5'-phosphate (2'-O-MS-cAMP)	59
2'-O-Monosuccinyladenosine-3',5'-phosphate, tyrosylmethyl ester	59
2'-O-Monosuccinylguanosine-3',5'-phosphate (2'-O-MS-cGMP)	61

Product Name	Page
M - *continued*	
2'-O-Monosuccinylguanosine-3',5'-phosphate, tyrosylmethyl ester	61
2'-O-MS-cAMP	59
2'-MS-TME-cAMP	59
2'-O-MS-cGMP	61
2'-MS-TME-cGMP	61
N	
8-N_3-cAMP	28, 58
8-N_3-6-[Biotin]-AE-cAMP	28, 49
8-N_3-6-[DY-547]-AE-cAMP	28, 49
8-N_3-ε-cAMP	28, 44
4-N_3-PET-8-[Biotin]-AET-cGMP	37, 50
4-N_3-PET-8-Br-cGMP	37, 49
8-NBD-cAMP	33, 47
8-NBD-cGMP	40, 47
2'-NH_2-cAMP	53
1-NH_2-cGMP	37
2-NH_2-cPuMP	44, 49
8-(2-[7-Nitro-4-benzofurazanyl]aminoethylthio)-3',5'-cGMP	40, 47
4-Nitrobenzimidazole riboside-3',5'-phosphate (4-NO_2 -cBIMP)	53
8-(2-[7-Nitro-4-benzofurazanyl]aminoethylthio)-3',5'-cAMP	33, 47
1-NO-cAMP	27
4-NO_2-cBIMP	53
O	
8-OH-cAMP	32
8-OH-2'-O-Me-cAMP	23
P	
8-[φ-450]-cAMP	34, 47
8-[φ-575]-cAMP	34, 47
8-[φ-575]-2'-O-Me-cAMP	23, 47
8-[φ-450]-cGMP	40, 47
8-[φ-575]-cGMP	40, 47
8-pCPT-cAMP (8-CPT-cAMP)	31, 69
8-pCPT-cAMP-AM (8-CPT-cAMP-AM)	31
8-pCPT-cGMP	38, 69
8-pCPT-cGMP-AM	38
8-pCPT-2'-O-Me-cAMP	22
8-pCPT-2'-O-Me-cAMP-AM	22
8-pCPT-2'-O-Me-cGMP	24, 69
8-pCPT-PET-cGMP	38
8-pCPT-6-Phe-cAMP	31
PET-cGMP	41, 69
8-[Pharos-450]-adenosine-3',5'-phosphate (8-[φ-450]-cAMP)	34, 47
8-[Pharos-575]-adenosine-3',5'-phosphate (8-[φ-575]-cAMP)	34, 47
8-[Pharos-575]-2'-O-methyladenosine-3',5'-phosphate	23, 47
8-[Pharos-450]-guanosine-3',5'-phosphate (8-[φ-450]-cGMP)	40, 47
8-[Pharos-575]-guanosine-3',5'-phosphate (8-[φ-575]-cGMP)	40, 47
6-Phe-cAMP	25, 34
N^6-Phenyladenosine-3',5'-phosphate (6-Phe-cAMP)	25, 34
N^6-Phenyladenosine-3',5'-phosphorothioate, Sp-isomer	20, 25
β-Phenyl-1,N^2-ethenoguanosine-3',5'-phosphate (PET-cGMP)	41, 69
β-Phenyl-1,N^2-etheno-8-bromoguanosine-3',5'-phosphate	41, 69
β-Phenyl-1,N^2-etheno-8-bromoguanosine-3',5'-phosphorothioate, Rp-	35
β-Phenyl-1,N^2-etheno-8-bromoguanosine-3',5'-phosphorothioate, Sp-	36
8-pHPT-2'-O-Me-cAMP	23
8-PIP-cAMP	34, 69
8-Piperidinoadenosine-3',5'-phosphate (8-PIP-cAMP)	34, 69
8-Piperidinoadenosine-3',5'-phosphorothioate, Rp-isomer	17, 69
8-Piperidinoadenosine-3',5'-phosphorothioate, Sp-isomer	20, 69
Phosphate tris(acetoxymethyl)ester (PO_4-AM_3)	67
PKA inhibitors	16
PKG inhibitors	35
8-pMeOPT-2'-O-Me-cAMP	23

Product Name	Page
P - *continued*	
Protein kinase A activators	18, 27
Protein kinase A inhibitors	16
Protein kinase G activators	36, 37
Protein kinase G inhibitors	35
Purine riboside-3',5'-phosphate (cPuMP)	53, 69
R	
Rp-8-AEA-cAMPS	55
Rp-8-AEA-cAMPS-Agarose	63
Rp-2'-AEC-cAMPS	58
Rp-2'-AEC-cAMPS-Agarose	63
Rp-8-AET-cGMPS	60
Rp-8-AET-cGMPS-Agarose	66
Rp-8-AHA-cAMPS	57
Rp-8-AHA-cAMPS-Agarose	65
Rp-2'-AHC-cAMPS	57
Rp-2'-AHC-cAMPS-Agarose	65
Rp-2'-AHC-cGMPS	60
Rp-2'-AHC-cGMPS-Agarose	67
Rp-8-Br-cAMPS	16
Rp-8-Br-cGMPS	35, 69
Rp-8-Br-2'-O-MB-cAMPS	16
Rp-8-Br-PET-cGMPS	35
Rp-cAMPS	16
Rp-2',3'-cAMPS	49, 69
Rp-cCMPS	42
Rp-cGMPS	35, 69
Rp-2-Cl-cAMPS	16, 69
Rp-8-Cl-cAMPS	17, 69
Rp-6-Cl-cPuMPS	50
Rp-8-CPT-cAMPS	17, 69
Rp-5,6-DCl-cBIMPS	52
Rp-2'-EDA-cAMPS	56
Rp-2'-O-MB-cAMPS	17
Rp-8-OH-cAMPS	17
Rp-8-pCPT-cAMPS	17, 69
Rp-8-pCPT-cGMPS	35, 69
Rp-8-pCPT-PET-cGMPS	35
Rp-8-PIP-cAMPS	17, 69
RQIKIWFQNRRMKWKK-LRK$_5$H-amide (DT-3)	68
S	
Sp-2-AEA-cAMPS	56
Sp-2-AEA-cAMPS-Agarose	62
Sp-8-AEA-cAMPS	55
Sp-8-AEA-cAMPS-Agarose	63
Sp-6-AE-cAMPS	55
Sp-6-AE-cAMPS-Agarose	62
Sp-2'-AEC-cAMPS	56
Sp-2'-AEC-cAMPS-Agarose	63
Sp-8-AET-cGMPS	60
Sp-8-AET-cGMPS-Agarose	66
Sp-6-AH-cAMPS	57
Sp-6-AH-cAMPS-Agarose	64
Sp-2-AHA-cAMPS	57
Sp-2-AHA-cAMPS-Agarose	64

Product Name	Page
S - *continued*	
Sp-8-AHA-cAMPS	57
Sp-8-AHA-cAMPS-Agarose	65
Sp-2'-AHC-cAMPS	58
Sp-2'-AHC-cAMPS-Agarose	65
Sp-2'-AHC-cGMPS	60
Sp-2'-AHC-cGMPS-Agarose	67
Sp-6-Bnz-cAMPS	18, 24
Sp-8-Br-cAMPS	18
Sp-8-Br-cAMPS, AM ester	19
Sp-8-Br-cGMPS	36, 69
Sp-8-Br-2'-O-Me-cAMPS	22
Sp-8-Br-PET-cGMPS	36
Sp-cAMPS	18
Sp-cAMPS-AM	18
Sp-2',3'-cAMPS	49
Sp-cAMPS, immobilized on agarose via ribose 2'-O	63, 65
Sp-cCMPS	42
Sp-cGMPS, immobilized on agarose via ribose 2'-O	67
Sp-cGMPS	36, 69
Sp-2-Cl-cAMPS	19, 69
Sp-8-Cl-cAMPS	19, 69
Sp-6-Cl-cPuMPS	19, 51
Sp-8-CPT-cAMPS	19, 69
Sp-8-CPT-2'-O-Me-cAMPS	22
Sp-5,6-DCl-cBIMPS	19
Sp-2'-EDA-cAMPS	56
Sp-2'-O-MB-cAMPS	20
Sp-8-OH-cAMPS	20
Sp-8-pCPT-cAMPS	19, 69
Sp-8-pCPT-cGMPS	36, 69
Sp-8-pCPT-2'-O-Me-cAMPS	22
Sp-8-pCPT-PET-cGMPS	36
Sp-6-Phe-cAMPS	20, 25
Sp-8-PIP-cAMPS	20, 69
Synergistic pairs of cAMP analogues	14
T	
2'-O-(2-[TAMRA]-aminoethylcarbamoyl)guanosine-3',5'-phosphate	48
2'-O-(6-[TAMRA]-aminohexylcarbamoyl)guanosine-3',5'-phosphate	48
Thymidine-3',5'-phosphate (cTMP)	43, 69
Tubercidin-3',5'-phosphate (cTuMP / 7-CH-cAMP)	31, 69
U	
Uridine-2',3'-phosphate (2',3'-cUMP)	43, 54
Uridine-3',5'-phosphate (cUMP)	43, 53
Uridine-3',5'-phosphate, acetoxymethylester (cUMP-AM)	43
W	
LRKKKKKH-amide (W45)	68
X	
Xanthosine-3',5'-phosphate (cXMP)	54, 69
Y	
ygrkkrrqrrrpp-lr$_5$h-amide ((D)-DT-2)	68
YGRKKRRQRRRPP-LRK$_5$H-amide (DT-2)	68

We appreciate your interest in our product line. Please take a moment to review the following notes:

- **Orders** can be placed at our online shop, but are welcome by phone, e-mail, fax or regular mail as well, of course. Customers from EC countries are requested to submit the European tax registration number of their institution along with their order.

- **Shipping** of your order will be prepared as soon as possible. Unless otherwise instructed, items requiring refrigeration may not be shipped on Thursday or Friday to avoid weekend storage under unsuitable conditions.

- **Prices** are shown in Euro and do not include taxes or foreign duties (if applicable). There are no packing or transport costs for air mail delivery, however, courier service and dry ice shipments (recommended for e.g. all triphosphates & diphosphates) will be extra charged. We reserve the right to change prices without prior written notice, however, products will not be shipped at an increased price without authorization from the customer.

- **Courier** costs depend on destination: approx. € 35.- for customers in Germany, € 50.- – € 150.- within Europe, and € 100.- – € 350.- for the rest of the world. Please check every arriving parcel for any obvious damage before signing the receipt, otherwise compensation for broken vials is not possible.

- **Invoices** are payable net 30 days by bank transfer; no deductions accepted. European customers are urged to use the SEPA payment system. Corresponding bank details (BIC and IBAN) are shown on all our paper work.

- **Bulk:** Many of our products can be supplied in larger sizes. Favourable quotations for bulk quantities or discounts on purchase of multiple vials are available upon request.

- **Discounts** can be granted for amounts exceeding catalogue sizes, and for customers identified as permanent buyers. Standing orders with favourable conditions are possible upon request.

- **Support** for our products is provided in form of corresponding technical information that accompanies every product. Additional and updated data can be found on our website (www.biolog.de), especially regarding published references, lipophilicity and specificity. We try hard to support you with all background knowledge available to us, so please contact us by e-mail (service@biolog.de) in case you have special questions, or if you would like to suggest a new product.

- **Feed-back** on performance of our products is very much appreciated, be it positive or negative. It encourages us, helps us to improve, and leads to better and more qualified service for our customers. Also, we would like to hear about your new papers with our products, in order to have the citation included in the corresponding technical information.

- **Custom syntheses** of many structures not listed in this catalogue are offered. Please contact us with your research needs, and be sure to specify purity, salt form and amounts necessary.

- **Quality:** If you are not satisfied with our product, please contact us. Products may not be returned or an invoice annulled without prior written approval from BIOLOG. We cannot be held responsible for damage to material because of improper storage or handling after receipt.

- **Safety:** All products in this catalogue are sold for research purposes only and are **not** intended for human, drug, food additive, clinical, or household use. Only qualified professionals and trained laboratory staff familiar with their potential hazards and trained in good laboratory practices should handle them. Some of the products could be toxic or hazardous compounds. When available, information pertaining to the potential hazards is provided. However, the absence of a warning must **not** be interpreted as an indicator of safety. Material Safety Data Sheets (MSDS) are available upon request.

Terms and Conditions of Sale and Synthesis

Last updated: May 20, 2017

I. Conclusion of Contract

1. The following conditions apply and become an integral part of all purchase or other orders for synthesis of products confirmed by us, Biolog Life Science Institute, and apply to all our quotations. They are deemed accepted and acknowledged by our clients in placing an order with us or in taking possession of the delivery. Divergent conditions of our clients whose application is not explicitly confirmed in writing by us are not binding even if there was no expressed contradiction.
2. All our quotations are subject to change. The conclusion of the contract can be regarded final only after the client has received our order confirmation. Oral agreements, amendments or additions to the contract are binding only if confirmed by us in writing.
3. We retain ownership, copyright and inventor's rights in all quotations, cost estimates, compound lists, structures and other documents. Quotations and connected documentation must not be disclosed to third parties unless our prior authorization has been obtained.
4. The client accepts that personal data are recorded by us within the scope of the provisions of the BDSG (German Federal Data Protection Law).

II. Prices and Payment

1. Prices shown on the web and in the printed catalogue are in Euro. For price information and our acceptance of other currencies such as US Dollar, please inquire.
2. Prices shall be understood without value added tax. Shipping costs are extra charged (approx. Euro 30.00 within Germany; approx. Euro 40.00 - 100.00 within Europe, and for the rest of the world according to destination). Please note, that some products, e.g. all triphosphates, require courier transport with blue or dry ice in order to maintain their original high quality and purity. This will lead to extra costs, please inquire for details. Airmail postal service may be available for some destinations without any additional costs.
3. We are entitled to charge our clients additionally to the contract price all increases in expenses accrued in connection with the supply or service provided such increases become effective after conclusion of the contract. This right is independent from the cause of increase as there are legal regulations or other regulations or factual reasons. Expenses which we debit to our clients are especially export and import charges as custom duties, price-adjustment levies and taxes, storage charges, insurance premiums and similar costs which are out of the scope of our direct influence.
4. Along with the products ordered you will receive our invoice which is due net 30 days. Payment becomes overdue on the 31st day after invoice date. Invoices should be paid by bank transfer free of expenses for us. Bank details are given on the invoice.
5. Without prejudice to any more extensive rights we are entitled in case of default of payment to demand interest on arrears of 8 % above the current discount rate published by the Deutsche Bundesbank.
6. A set-off or other retention of payment in view of counter claims of the client is admissible only if the counter-claims have been acknowledged by us or the claims have been finally determined by court order.
7. We are entitled to demand, in our choice, the provision of security through letter of credit or other securities such as prepayment. Should the client not comply with this demand within ten days, we have the rights, after expiry of an additional term of 5 days to repudiate the contract.

III. Terms of Delivery

1. We are not obliged to comply with the agreed delivery term until the client has fulfilled his contractual obligations or duties imposed on him in particular the stipulated financial commitments. The term of delivery shall be complied with if the products to be delivered have left our premises or readiness for despatch has been announced.
2. The term of delivery shall be adequately extended if the completion or delivery of the products is delayed by strikes, lockouts or other obstacles beyond our control (force majeure). We shall notify the client about such circumstances without undue delay.
3. Delivery of products which are not produced by us is subject to obtaining punctual and complete supply ourselves.
4. Goods may not be returned to us except with our prior permission. Goods can only be accepted for return if they are unopened and in good condition. Transport costs for returned goods are for the purchaser's account. Any returned items may be subject to a processing fee.

IV. Transition of Risk

1. We despatch products on account and risk of our clients. The risk shall pass to the client, even with freight prepaid shipments, at the time the products are handed over to the carrier or with commencement of transit by ourselves or by acceptance by the persons instructed by the client. We undertake to assign existing rights and remedies against the carrier on first simple demand and unconditional payment of the contract price by the client.
2. By unconditional acceptance of the products by the carrier or by the person instructed by the client all subsequent claims regarding the external condition (packing, leakage etc.) are precluded.
3. Even if the delivered products show considerable faults, they have to be accepted by the client, however, without prejudice for subsequent guaranty claims concerning the product. The client must, however, examine the delivery in every respect for any lack of conformity with the contract and shall give notice of any lack of conformity with the contract or will be excluded with all subsequent claims.
4. In the event the client defaults in the acceptance of the products or providing security, we are entitled, without prejudice to our rights for repudiation of the contract, to demand a lump sum indemnity of 5 % of the total delivery value. We as well as the client are not precluded from claiming and proving a higher or lower damage.

V. Retention of Title

1. We retain the right of property in the products delivered until all our present or accessory claims against the client, irrespective of their cause, are settled. In acceptance of drafts or of bills of exchange or in assuming the liability under a bill of exchange by acceptance or issue of a bill of exchange the title in the products does not pass to the client before the draft or bill of exchange has been finally honoured and it has been ascertained that no claims can be lodged against us based upon the documentary credits. Inserting claims in a current account as well as acknowledgment of a balance does not affect the retention of title.
2. The client is authorized to use the products supplied for research purposes only if not otherwise confirmed in writing. He is also entitled to mix or synthesize with the products at his own risk. The title in our products is extended to new products synthesized by our client. In case our title in the products is extinguished by combination, mixture up or incorporation of other products the client herewith transfers title in the new synthesized products to us which is held as security for all claims as per para. 1 above. The products we obtained title in are stored free of charge by the client without giving any cause of action against us in view of the mixing up, the synthesis or the storage of the products.
3. In any case, the client agrees that any and all intellectual property or other rights, know-how, and methods relating to the synthesis or purchase contract remain our sole property.

VI. Guaranty and Liability

1. We do not assume liability for oral advices of any kind - which are non-binding in any event - to the client. Any advice, oral or written, regarding the area of application of our products does not dispense the client from a self-responsible examination regarding the qualification of the products for the intended purposes or methods as well as of any infringement with issued or pending intellectual property rights belonging to third parties.
2. Our products are for laboratory research use only if not otherwise confirmed in writing. They must not be used with human subjects or for clinical diagnosis or therapeutic use in humans or animals, including, but not limited to, commercial purposes, *in vitro* diagnostic purposes, ex vivo or in vivo therapeutic purposes, investigational use, in foods, drugs, devices or cosmetics of any kind, or for consumption by or use in connection with or administration or application to humans or animals.
3. Our products are not sterile and are not regularly checked for endotoxins. Products carrying a charge are essentially desalted by common standard techniques for nucleotides. Please be aware, that efficacy of all known desalting methods is limited and dependent on properties of the particular product. Final preparations of products may therefore contain a minor residual salt content.
4. The product descriptions on our web site and in our catalogue are accurate to the best of our knowledge. Since research applications are subjected to variable influences beyond our control, the products are offered without performance warranty, expressed or implied. In any case we reserve the right, from time to time, to modify composition and purity, in response to changes in the market conditions, raw material supply or other factors. Many products are new and experimental and have not been tested for toxicity. PLEASE NOTE THAT THE ABSENCE OF A WARNING STATEMENT DOES NOT IMPLY THAT THE PRODUCT IS NOT HAZARDOUS. Research products should be used only by qualified investigators or by technically trained personnel working under the direct supervision of such investigators. It is the investigator's responsibility to ensure the safe handling of all products.
5. If any research product fails to meet the physical criteria ascribed to it on the catalogue, our web site or by any other analysis or description issued by us in writing, we will, after validating the deficiency, at the option of the client, either replace the deficient product in kind or will issue a Euro credit equivalent to the purchase price of the deficient product.
6. We will not be liable under any legal theory (including but not limited to contract, negligence, strict liability in tort or warranty of any kind) for any indirect, special, incidental, consequential or exemplary damages (including but not limited to lost profits), even if we had notice of the possibility of such damages. We shall not be liable for any loss, damage or penalty as a result of any delay in or failure to deliver or otherwise perform hereunder. In any event the extent of our liability is restricted to the damage to the product itself.
7. If the fault or omission of the ascribed quality is caused by the delivery or performance of a sub-supplier our liability is restricted to an assignment of our rights and remedies we have against the sub-supplier. We undertake to assign these rights and remedies on first simple demand. If the client is not able to recover from the sub-supplier, he is entitled to keep us liable according para. VI. 4. in a subsidiary way.
8. Refund, replacement or any other claims is conditioned on client giving written notice to us within thirty (30) days after arrival of the products at its destination. Failure of client to give said notice within said thirty (30) days shall constitute a waiver by the client of all claims hereunder with respect to said material. Our liability under VI. 9. below remains unaffected.
9. In any event, any claim of the client against us for, but not limited to refund, replacement, remuneration for consequential damages or otherwise is excluded under the statute of limitations after one year after arrival of the products at its destination. Our liability under VI. 9. below remains unaffected.
10. Our liability for intention or gross negligence, for an expressed warranty, for the violation of an obligation which was of absolute material importance for the intended purpose of the contract, under the statute for the liability for defect products, and for personal injury or death remains unaffected. In cases of gross negligence and in cases of our failure to fulfil an obligation which was of absolute material importance for the intended purpose of the contract we are liable only for the immediate and foreseeable damage.
11. As our products are delivered to the clients for research purposes only, the client shall indemnify us, without prejudice to our continuing legal rights and waiving any defence of limitation, without limit against any and all claims of third parties which are brought against us on the grounds of product liability, to the extent the claim is based on circumstances which were caused after risk passed to the client.

VII. Legal Clauses

1. The sole and exclusive place of performance for all contractual or other obligations under the contract as well as the sole and exclusive place of jurisdiction shall be Bremen for both parties.
2. Any dispute between the parties shall be governed by German law.
3. In case one of the above stipulations has been proved invalid the validity of the remaining provisions remain unaffected.

BIOLOG

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