New Developments

from the chemists at **Berry & Associates**

Issue 11 | July 2015

In This Issue

Design.
Develop.
Deliver.

ICON Isotopes:

Stable Isotope labeling reagents

We at Berry & Associates are pleased to announce our expansion into the stable isotope arena. Through our acquisition of ICON Isotopes, we are now able to offer a diverse collection of heavy atom labeled compounds including ^{13}C, ^{15}N, ^{18}O, ^{34}S and deuterium labeled compounds. For almost 32 years, ICON Isotopes has provided researchers with quality labeled commodity compounds, labeled gases for molecular spectroscopy, and unique custom labeled products available only through ICON Isotopes. As the new owners of ICON Isotopes, Berry & Associates will fulfill orders made through ICON Isotopes as well as leverage our synthetic capabilities to maintain the inventory and expand the product list through additional custom offerings. Icon Isotopes specializes in labeled compounds containing one or more stable isotopes of the following elements: carbon, nitrogen, oxygen, hydrogen, sulfur, bromine and chlorine. The wide variety of available ICON compounds includes but is not limited to a range of specifically labeled amino acids including L-Histidine-1-^{13}C (IC 3629), L-Histidine-a-^{15}N (IN 5060), as well as multiple options for labeled tryptophan, lysine and tyrosine. Beyond amino acids, stable labels have been incorporated into many classes of compounds including alkanes, agricultural compounds, carbohydrates, chiral auxiliaries, fatty acids, nucleic acid bases (including Adenosine-amine-^{15}N, IN 5016 and Guanosine-amine-^{15}N, IN 5245), steroids (including the plant growth hormone (+)-2-*cis*-4-*trans*-Abscisic Acid d_6 ID 1001) as well as lasing gases, specialty gases and gas mixtures. See the table below for some of the more popular stable isotope compounds that we offer.

BERRY &ASSOCIATES

ICON ISOTOPES

You can explore the current ICON catalog at www.iconisotopes.com. If your research requires a labeled compound you don't see, feel free to contact us and let us help design, develop and deliver your custom research solution.

Compound Number	Compound Name
IO 6455	Sodium Perchlorate-$^{18}O_4$
IO 6325	Hydrogen Peroxide-$^{18}O_2$
ID 1130	Hydrogen Peroxide-d_2
IC 3540	DL-Glutamic Acid -1-^{13}C
IN 5062	Ammonium-^{15}N Nitrate-^{15}N
IN 5142	Dimethylamine-^{15}N Hydrochloride
ID 2084	Deuterium Oxide
ID 1001	(±)-2-cis-4-trans-Abscisic Acid-d_6
IR 8050	Helium-3
IN 5060	L-Histidine-α-^{15}N
IC 3629	L-Histidine-1-^{13}C
IO 6490	Water-^{18}O

New Blueberry Quenchers for Optical Nanosensor Applications

As a result of a valuable collaboration with the Clark group researchers at Northeastern University, we have developed a novel line of pH sensitive quenchers called Blueberry Quenchers. The ability to tune absorbance as a function of pH sets these quenchers apart from others on the market.

Imaging ions in a cellular environment is an ongoing challenge for advancing research in clinical diagnostics, biochemical research, and environmental science among other specialties. The field has expanded from the invention of florescent calcium imaging indicators[1] to include a variety of sensing tools one of which is nanoscale ion-selective optodes.[2] These nanoscale optodes are the equivalent of ion-selective electrodes and offer an advantage over traditional molecular indicators in that the recognition moiety and the optical reporter are separate components. This modular construction enables tuning the sensor for dynamic range, sensitivity, wavelength and selectivity.

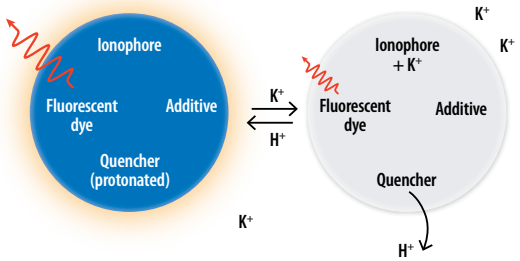
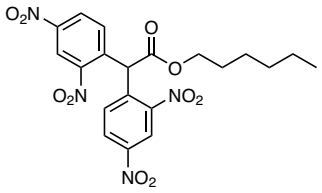


Figure 1. The pH-based mechanism of potassium nanosensors.

Researchers from the Clark lab[3] have endeavored to overcome the optode limitations arising from the use of fluorescent indicators from the Nile red series. A key step in this work has been the successful use of the quencher dye Blueberry-C6-ester-652 (BLU 00652) in place of the more traditional chromoionophore III (CH III) in the potassium specific nanosensor formulation.[3] Figure 1 shows the sensor mechanism utilizing the pH sensitive Blueberry-C6-ester-652 along with a static fluorophore in ion-selective optodes. The change in FRET between quencher and fluorophore results from the change in absorbance of the quencher as a function of potassium ion extraction. Figure 2 shows both the extinction coefficient characterization (A) and the pH titration (B).

In addition to Blueberry-C6-ester-652 (BLU 00652), our collection of Blueberry Quenchers includes Blueberry pyridyl C6 ester (BLU 00675) with a λ_{max} of 556 nm, pKa of 5.6 and ε = 36,750 $M^{-1}cm^{-1}$, and Blueberry-cyano-C6-ester (BLU 00655) which has a λ_{max} of 623 nm, pKa of 8.0 and ε = 24,500 $M^{-1}cm^{-1}$. These quenchers exhibit broad absorption ranges from 450 nm–700 nm, and cover a wide range of physiologically relevant pKa's.



Blueberry-C6-ester-652 (BLU 00652)

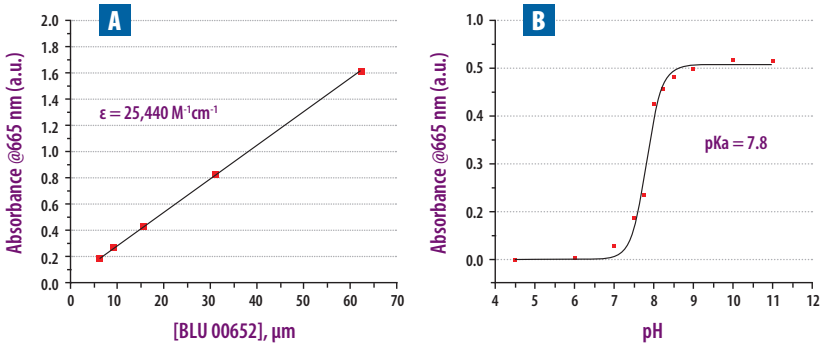
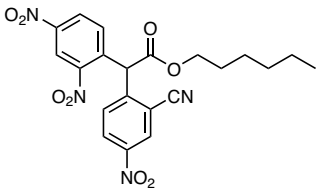
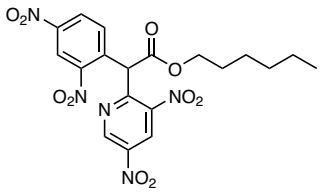


Figure 2 Blueberry-C6-ester-652 quencher dye: (A) extinction coefficient characterization, and (B) pH titration in CH_3CN/Buffer (1:1).



Blueberry-cyano-C6-ester (BLU 00655)



Blueberry pyridyl-C6-ester (BLU 00675)

References:

1. Grynkiewicz, G.; Poenie, M.; Tsien, R.Y. *J. Biol. Chem.* **1985**, *260*, 3440-3450.

2. a) Harjes, D.I.; Dubach, J.M.; Rosenzweig, A.; Das, S.; Clark, H.A. *Macromolecular Rapid Commun.* **2010**, *31*, 217-221. b) Dubach, J.M.; Das, S.; Rosenzweig, A.; Clark, H.A. *Proc. Nat. Academy of Sci.* **2009**, *106*, 16145-16150. c) Dubach, J.M.; *Integrative Biol.* **2011**, *3*, 142-148. d) Xie, X.; Bakker, E. *Anal. Bioanal. Chem.* **2015**, *407*, 3899-3910.

3. a) Sahari, A.; Ruckh, T.; Hutchings, R.; Clark, H. submitted to *Anal. Chem.* **2015**.

b) Sahari, A.; Ruckh, T.; Hutchings, R.; Clark, H. Gordon Research Seminars, Waterville NH, **2015**.

Ordering Information—Blueberry Quenchers

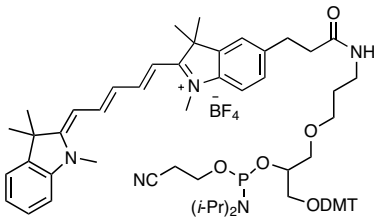
Catalog Number	Name	Size	Price
BLU 00655	Blueberry-cyano-C6-ester		
		5 mg	$250.00
		10 mg	$370.00
BLU 00652	Blueberry-C6-ester-652		
		5 mg	$250.00
		10 mg	$370.00
BLU 00675	Blueberry pyridyl-C6-ester		
		5 mg	$250.00
		10 mg	$370.00

New Frameworks for Cyanine Dye Phosphoramidites and CPGs

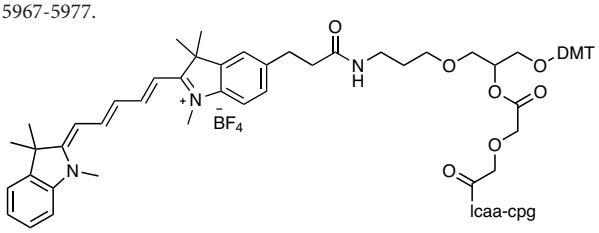
Since the early 1990's, cyanine dyes have been a valuable labeling tool for nucleic acids. Cyanine dyes were originally introduced by Waggoner[1] and co-workers and commercialized by Molecular Probes, and today, there are many cyanine dyes available. In general, cyanine dyes have high extinction coefficients with longer dyes having higher absorbance and emission wavelengths. These dyes are easy to use as they tend to have high fluorescence and low non-specific binding to biomolecules.[2]

B&A is pleased to introduce Cyanine-3 and Cyanine-5 fluorophores in phosphoramidite forms (X,5'-Cyanine 3 CEP, BA 0407 and X,5'-Cyanine 5 CEP, BA 0404) and CPG forms (3'-Cyanine 3 CPG BA 0408 and 3'-Cyanine 5 CPG, BA 0406) for use in oligonucleotide synthesis. These new products feature the traditional aminopropylglycerol linker construct that has been used successfully with other oligo tags such as fluorescein (BA 0253 and BA 0147), TAMRA (BA 0130), dabsyl (BA 0149), and dabcyl (BA 0081). These new products allow the introduction of Cyanine-3 and Cyanine-5 at any oligo sequence location.

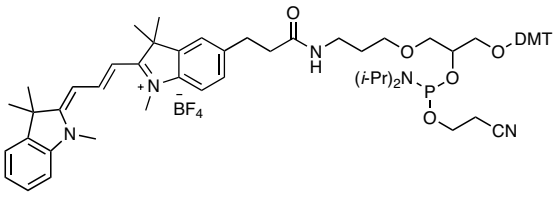
Soon, we also hope to provide TEG-azide modifications for Cyanine-3 and Cyanine-5 to allow their use in click reactions. Please send us suggestions for other Cyanine dye products that would be desirable for your research endeavors.



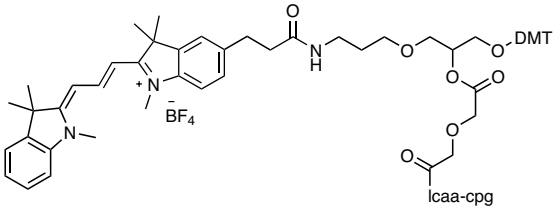
X,5'-Cyanine 5 CEP (BA 0404)



3'-Cyanine 5 CPG (BA 0406)



X,5'-Cyanine 3 CEP (BA 0407)



3'-Cyanine 3 CPG (BA 0408)

References

1. a) Ernst, L.A.; Gupta, R.K.; Mujumdar, R.B., Waggoner, A.S. *Cytometry* **1989**, *10 (1)*, 3–10. b) Mujumdar, B.; Ernst, A. Mujumdar, S.R., Lewis, C.J.; Waggoner, A.S. *Bioconjugate Chemistry*,**1993**, *4(2)*, 105-111.

2. Lee, W.; von Hippel, P.H.; Marcus, A.H. *Nucleic Acids Res.* **2014**, *42*, 5967-5977.

Ordering Information—Cyanine Dye Phosphoramidites and CPGs

Catalog Number	Name	Size	Price
BA 0407	X,5'-Cyanine 3 CEP		
		50 umol	$260.00
		100 umol	$490.00
BA 0404	X,5'-Cyanine 5 CEP		
		50 umol	$260.00
		100 umol	$490.00
BA 0408	3'-Cyanine 3 CPG		
	100 mg		$160.00
	1 umol column pk of 4		$250.00
		1 g	$1250
BA 0406	3'-Cyanine 5 CPG		
	100 mg		$160.00
	1 umol column pk of 4		$250.00
	1 g		$1250

Catalog Number	Name	Size	Price
BA 0253	Fluorescein II CEP		
		100 umol	$255.00
		0.25 g	$495.00
BA 0147	3'-Fluorescein CPG		
	Available in Bulk	Call for quote	
BA 0130	3'-TAMRA CPG		
	Available in Bulk	Call for quote	
BA 0149	3'-Dabsyl CPG		
	Available in Bulk	Call for quote	
BA 0081	3'-Dabcyl CPG		
	Available in Bulk	Call for quote	

Exocyclic DNA Adduct Investigational Tools: Etheno Bridged Products

Nucleobases that contain an additional two carbon bridge between heteroatoms are referred to as ethenobases. The etheno bridged ring system results from the reaction of a vinyl halide or other vinyl monomer electrophiles with dG, dC or dA nucleotides in DNA through the action of the cytochrome P450 system.[1] This type of DNA damage is proposed to be an initiating step in carcinogenesis. Research has shown, for example, that the 1,N^2-etheno bridged deoxy guanosine moiety is mutagenic in both *E. coli* and mammalian cells.[1b] The structure of duplex DNA containing 1,N^2-etheno dG has been studied and shown to hinder canonical Watson-Crick H-bonding.[1-3] Our 1, N^2-etheno dG CEP (BA 0403) allows incorporation of an etheno bridged dG moiety internally or at the 5' end of an oligonucleotide. The resulting oligonucleotides can then be used as site specifically damaged DNA fragments for structure and function investigations.

3, N^4-Etheno-dC CEP (BA 0391), enables incorporation of a fluorescent pyrimidine nucleoside analog into oligonucleotides for the investigation of nucleic acid interactions. Due to the similarity in structure between dC and 3, N^4-Etheno-dC,

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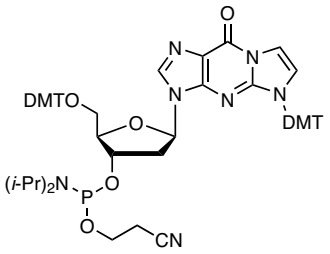
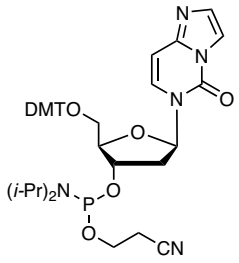


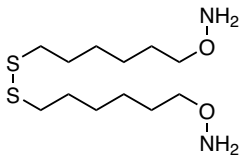
1,N^2-Etheno-dG CEP (BA 0403)



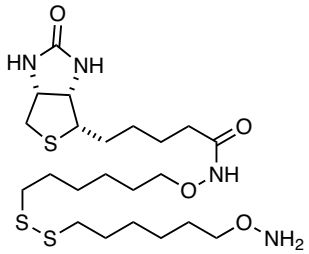
3,N^4-Etheno-dC CEP (BA 0391)

Expanding our Aminooxy Tool Collection

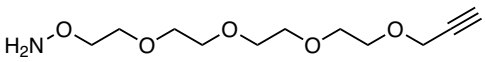
The use of oxime formation in ligation reactions of oligonucleotides has been widely established in the literature for over a decade.[1] 5'-Aminooxy-modifiers have been used in oxime ligation for peptideoligonucleotide conjugates,[2] for attachment of nucleosides to solid supports,[3] and for head to tail cyclization of oligonucleotides.[4] We offer a variety of aminooxy moieties to facilitate your research.[5] Previously, we introduced the aminooxy containing phosphoramidites BA 0350 (5'-Aminooxy-modifier-11 CEP) and BA 0374 (Aminooxy-modifier CEP) as well as 7-O-Amino-4-methylumbelliferone (HC 9070) for aldehyde detection, bis-(6-Aminooxyhexyl)disulfide (LK 4275) and the versatile, multipurpose Aminooxy TEG-azide (LK 4270). Our latest additions to this collection are our Thiol Cleavable Biotin (BT 1095) and the clickable Aminooxy-TEG-Propyne (LK 4280). If your research requires a different aminooxy tool, feel free to contact us and we would be happy to see how we can help.



Bis-(6-Aminooxyhexyl)disulfide (LK 4275)



Thiol cleaveable biotin (BT 1095)



Aminooxy-TEG-Propyne (LK 4280)

Ordering information for the Aminooxy collection is on the back cover

References

1. For recent reviews see: a) Zatsepin, T.S.; Stetsenko, D.A.; Gait, M.J.; Oretskaya, T.S. *Bioconjugate Chem.,* **2005**, *16(3)*, 471-89. b) Singh, Y.; Edupuganti, O.P.; Villen, M.; Defrancq, E.; Dumy, P. *Comptes RendusChim.,* **2005**, *8(5),* 789-96.

2. a) Cebon, B.; Lambert, J.N.; Leung, D.; Mackie, K.; McCluskey, K.L.; Nguyen, H.; Tassone, C. Aust *J. Chem.,* **2000**, *53,* 3333-40. b) Prater, C.E.; Miller, P.S. *Bioconjugate Chem.,* **2003**, *14(2),* 320-30. c) Prater, C.E.; Miller, P.S. *Bioconjugate Chem.,* **2004**, *15(2)*, 498-507.

3. a) Salo, H.; Virta, P.; Hakala, H.; Prakash, T.P.; Kawasaki, A.M.; Manoharan, M.; Lönnberg, H. *Bioconjugate Chem.,* **1999**, *10(5)*, 815-23. b) Defrancq, E.; Hoang, a.; Vinet, F.; Dumy, P. *Bioorg. Med. Chem. Lett.,* **2003**, *13*, 2683-6. c) Bincheva, M.; Scheibler, L.; Lincoln, P.; Vogel, H.; Akerman, B. *Langmuir,* **1999**, *15*, 4317-20.

4. Edupuganti, O.P.; Defrancq, E.; Dumy, P. J. *Org. Chem,* **2003**, *68*, 8708-10.

5. Chemistry From Berry & Associates, Issue 9, May 2013.

the modified nucleoside can be incorporated into DNA with retention of DNA structure and nucleobase recognition.[4] 3, N^4-Ethenocytosine is reported to be a highly mutagenic DNA adduct that is recognized and excised by the double-stranded uracil DNA glycolase in *E. Coli*, and by human thymine-DNA glycolase proteins *in vitro*.[5] The miscoding potential in reactions catalyzed by mammalian DNA polymerases for 3, N^4-etheno2'-deoxycytidine has also been reported.[6] Both BA 0403 and BA 0391 can be efficiently incorporated into oligonucleotides using standard conditions and taking care to avoid prolonged exposure to ammonium hydroxide.

References

1. a) Barbin, A. *Mutat. Res.* **2008**, *462*, 55-69. b) Shanmugam, G.; Kozekov, I. D.; Guengerich, F. P.; Rizzo, C. J.; Stone, M. P. *Chem. Res. Toxicol.* **2008**, *21*, 1795-1805.

2. Shanmugam, G.; Goodeneough, A.K.; Kozekov, I. D.; Guengerich, F. P.; Rizzo, C. J.; Stone, M. P. *Chem. Res. Toxicol.*, **2007**, *20(11)*, 1601-1611.

3. Stone, M. P.; Huang, H.; Brown, K. L.; Shanmigam, G.*Chemistry & Biodiversity*, **2011**, *8*, 1571-1615.

4. Ming, X.; Seela, F. *Chem. Eur. J.* **2012**, *18*, 9590-9600 and references therein.

5. Saparbaev, M.; Laval, J. *Proc. Natl. Acad. Sci. USA*, **1998**, 95, 8508-8513.

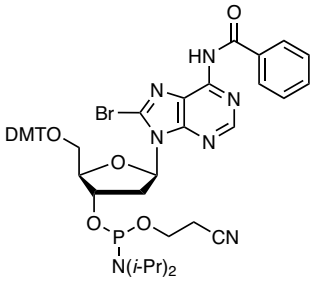
6. a) Zhang, W. Johnson, F.; Grollman, A.P.; Shibutani, S. *Chem. Res. Toxicol.* **1995**, *8*, 157-163. b) Shibutani, S.; Suzuki, N.; Matsumoto, Y.; Grollman, A.P. *Biochemistry*, **1996**, *35*, 14992-14998.

Ordering Information—Etheno Bridged Products

Catalog Number	Name	Size	Price
BA 0403	1,N^2-Etheno-dG CEP		
		100 umol	$805.00
		0.25 g	$1415.00
BA 0391	3,N^4-Etheno-dC CEP		
		100 umol	$330.00
		0.25 g	$845.00

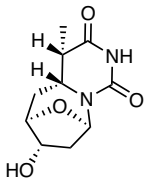
Miscellaneous Tools For Advancing Your Research

Based on a variety of customer requests, we have recently added a number of additional research tools to our product lineup. One of these new offerings is 8-Bromo-N^6-benzoyl dA CEP (BA 0389), which couples efficiently with extended coupling times and can be used for the incorporation of a halogenated nucleosides into oligonucleotides for crystallographic studies and cross-linking studies of protein-DNA and RNA-DNA complexes.

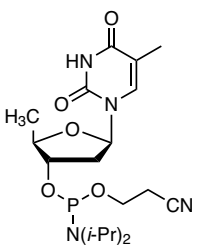


8-Bromo-N^6-benzoyl-dA CEP (BA 0389)

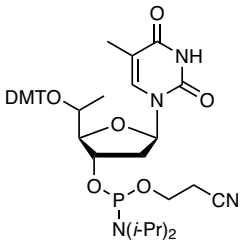
Looking for a novel nucleoside to take your research in a new direction? Perhaps (5*S*,6*R*)-5',6Cyclo-5'deoxy-5,6-dihydrothymidine (PY 7345) is just what you need. This interesting nucleoside is a novel nucleoside that was discovered as a result of the preparation of 5'-Deoxythymidine CEP (BA 0405). In addition, we also now offer 5'-Methyl dT CEP (BA 0409).



(5*S*, 6*R*)-5',6-Cyclo-5'-deoxy-5,6-dihydrothymidine (PY 7345)



5'-Deoxythymidine CEP (BA 0405)



5'-Methyl dT CEP (BA 0409)

Our biotin tools include D-(+)-Biotin-tyramine amide (BT 1015, also called biotinphenol) which was prepared by customer request based on a literature report of its use as a labeling probe for intracellular proteins in the proteomic mapping of the mitochondria matrix.[1] The tyramide functionality enables high density biotin labeling of nucleic acid sequences or proteins through the catalytic activity of horseradish peroxidase, and this approach can provide increased sensitivity compared to traditional avidin-biotinylated enzyme complex approaches.[2]

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Miscellaneous Tools

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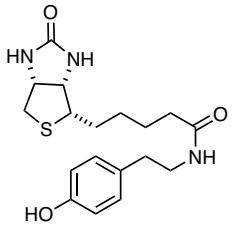
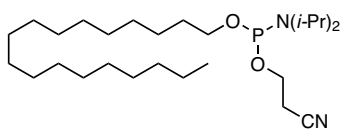
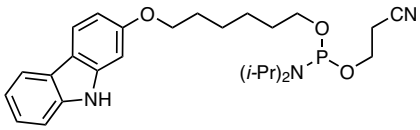
If you are in need of alternative labeling options *via* the tyramide pathway, we would be happy to discuss your research needs with you.



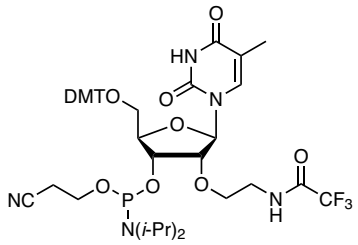
D-(+)-Biotin-tyramine amide (BT 1015)



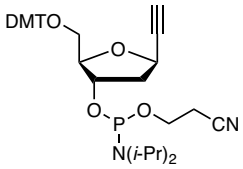
1-Octadecanol CEP (BA 0390)



Carbazole Alkyl CEP (BA 0187)



2'-*O*-Aminolinker-5-methyl-U CEP (BA 0191)



Clickable dSpacer CEP (BA 0410)

Four additional phosphoramidites are now available for your research needs. These are 1-Octadecanol CEP (BA 0390) a lipophilic primary phosphoramidite, Carbazole Alkyl CEP (BA 0187) 2'-*O*-Aminolinker-5-methyl-U CEP (BA 0191), and our new Clickable dSpacer CEP (BA 0410) onto which we have appended a click-friendly alkyne to our popular dSpacer CEP (BA 0033). This Clickable dspacer has been shown to be easily incorporated into oligonucleotides and efficiently converted postsynthetically to a triazole containing nucleobase by Hari et al, and that use of benzyl azide in the click reaction resulting triazole can behave as a universal base.[3]

References:

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Ordering Information—Miscellaneous Tools

Catalog Number	Name	Size	Price
BA 0389	8-Bromo-N^6-benzoyl-dA CEP		
		100 umol	$105.00
		0.25 mg	$245.00
BT 1015	D-(+)-Biotin-tyramine amide		
		50 mg	$200.00
		100 mg	$350.00
PY 7345	(5S, 6R)-5',6-Cyclo-5'-deoxy-5,6-dihydrothymidine		
		10 mg	$215.00
		25 mg	$490.00
BA 0390	1-Octadecanol CEP		
		0.25 g	$150.00
		1 g	$485.00
BA 0405	5'-Deoxythymidine CEP		
		100 umol	$475.00
		0.25 g	$2100.00
BA 0409	5'-Methyl dT CEP		
		100 umol	$475.00
		0.25 g	$2100.00

Catalog Number	Name	Size	Price
BA 0187	Carbazole Alkyl CEP		
		100 umol	$195.00
		250 umol	$490.00
BA 0191	2'-*O*-Aminolinker-5-methyl-U CEP		
		100 umol	$460.00
		0.25 g	$975.00
BA 0410	Clickable dSpacer CEP		
		100 umol	$275.00
		0.25 g	$820.00

The purchase of these products for use in applications relating to copper catalyzed azide-alkyne cycloaddition chemistry ("Click Chemistry") includes a limited, nontransferable license to intellectual property owned by TSRI to use this product solely for internal non-commercial research activities and specifically excludes clinical, therapeutic, or diagnostic use in humans or animals. Information regarding a license for commercial use in Click Chemistry may be obtained directly from The Scripps Research Institute, 10550 N. Torrey Pines Rd., La Jolla, CA 92037, or by contacting 858-784-8140 or click@scripps.edu.

Pseudouridine Family

Pseudouridine (Ψ) is one of the most common modified nucleosides found in RNA, e.g., in tRNAs and snRNAs.[1] The uracil nucleobase is identical to that found in uridine except that it is attached to the ribose ring via C5 rather than N1, i.e., it is a C-nucleoside (Figure 3). Thus, in addition to the ability to form Watson-Crick base pairs with adenosine in the normal manner, Ψ has an additional hydrogen bond donor at N1. This difference can strongly influence the overall structure of an RNA oligonucleotide.[2] The availability of totally synthetic Ψ-containing oligoribonucleotides has led to the synthesis of modified ribozymes and key portions of natural tRNAs and snRNAs and has generated numerous observations about the role of Ψ in RNA.[2-5] For example,[3a] in double-stranded RNA, the N1 hydrogen projects into the deep and narrow major groove, and 1 H-NMR studies on synthetic duplex A-form RNA show that the uniquely visible[2,3a,5] N1 hydrogen is normally nonbonded, but may be accessed with metal ions, spermidine, and charged peptide side chains. Replacement or addition of pseudouridine residues in synthetic anticodon domains of tRNALys (human and *E. coli*) had a dramatic effect on its structure.[5a] In studies on synthetic fragments of 23S rRNA, altering the number and position of Ψ residues showed a range of effects, both stabilizing and destabilizing.[4] It was proposed that Ψ may be stabilizing relative to U because of greater hydrophilicity, presumably due to additional hydrogen bonding *via* the N1 hydrogen.[5] More recently, research has shown that pseudouridinylation has a significant impact on decoding by ribosomes in diverse organisms.[6] Carlile *et. al* have also shown through the application of pseudouridine profiling in both yeast and human cells that mRNAs are pseudouridinylated in a highly regulated manner.[7]

To assist in the research of the role of pseudouridinylation in RNA function, we offer a variety of pseudouridine tools. We can provide totally synthetic Pseudouridine (PYA 11080) as well as from fermentation (reduced pricing). The closely related nucleoside analogs N^1-Methylpseudouridine (PYA 11050), 1,3-Dimethylpseudouridine (PYA 11050), 2'-Deoxypseudouridine (PYA 11010) and 1,3-Dimethyl-2'-deoxypseudouridine (PYA 11040) are also available. For use in the incorporation of pseudouridine into

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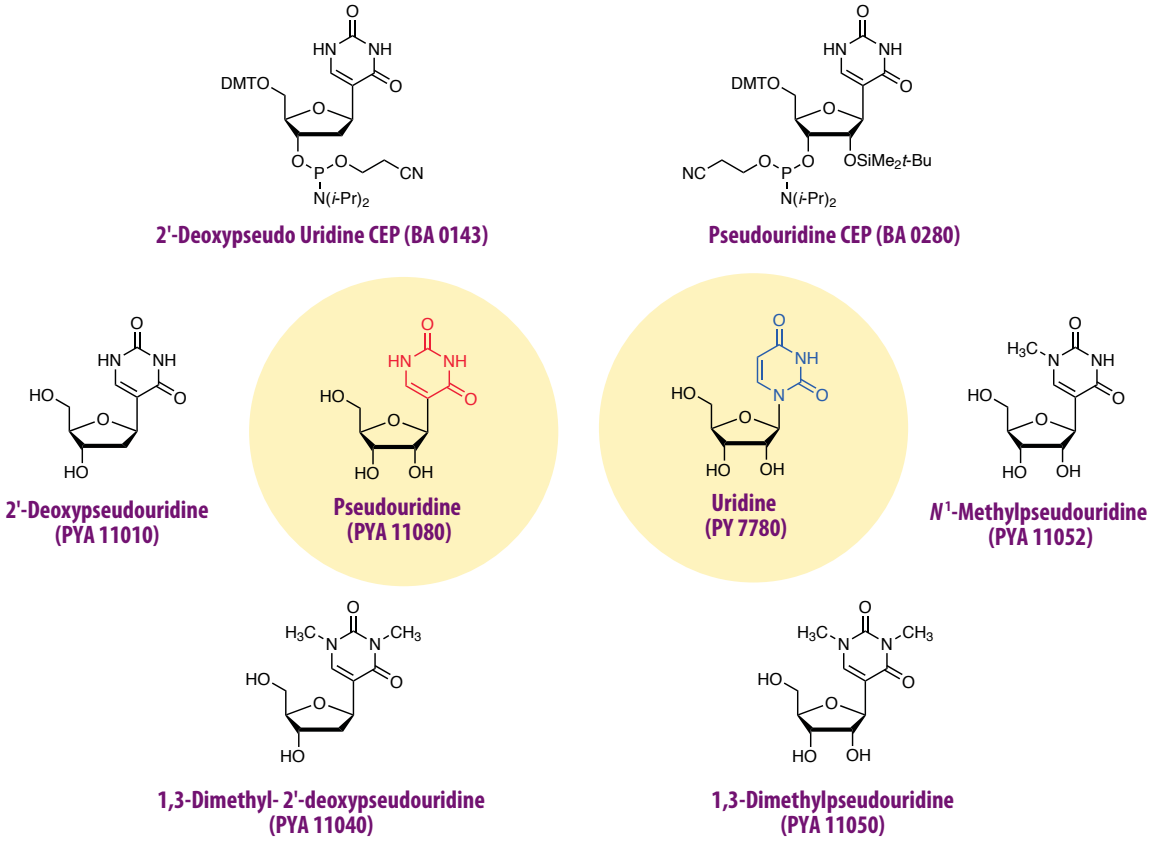

Figure 3. Pseudouridine and related products.

Pseudouridine Family

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synthetic oligonucleotides, we have Pseudouridine CEP (BA 0280) which relies on standard cyanoethyl phosphoramidite coupling chemistry, 2'-O-TBDMS protection, without nucleobase protecting groups. We also offer the 2'-Deoxypseudouridine CEP (BA 0143).

References

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Ordering Information—Pseudouridine Family

Catalog Number	Name	Size	Price
BA 0143	2'-Deoxypseudouridine CEP		
	Available in Bulk	Call for quote	
BA 0280	Pseudouridine CEP		
		100 umol	$290.00
		0.25 g	$645.00
PY 7780	Uridine		
		25 g	$45.00
		100 g	$160.00
		500 g	$760.00
PYA 11010	2'-Deoxypseudouridine		
		5 mg	$46.50
		25 mg	$179.00
PYA 11040	1,3-Dimethyl-2'-deoxypseudouridine		
		10 mg	$216.00
		100 mg	$843.00
		250 mg	$1580.00
PYA 11050	1,3-Dimethylpseudouridine		
		10 mg	$142.50
		50 mg	$255.00
		250 mg	$1125.00
		1 g	$2375.00
PYA 11052	N^1-Methylpseudouridine		
		10 mg	$295.00
		50 mg	$895.00
PYA 11080	Pseudouridine (fermentation)		
		10 mg	$75.00
		50 mg	$100.00
		100 mg	$175.00
		500 mg	$395.00
		1 g	$595.00
PYA 11080	Pseudouridine (synthetic)		
		1 g	$1,550.00

Aminooxy Tool Collection

Continued from page 4

Ordering Information—Aminooxy Tool Collection

Catalog Number	Name	Size	Price
LK 4280	Aminooxy-TEG-propyne		
		100 mg	$325.00
		1 g	$2600.00
LK 4275	bis-(6-Aminooxyhexyl)disulfide		
		100 mg	$325.00
		500 mg	$1080.00
		1 g	$1800.00

Catalog Number	Name	Size	Price
BT 1095	Thiol cleavable biotin		
		10 mg	$175.00
		50 mg	$595.00
HC 9070	7-O-Amino-4-methylumbelliferone		
		5 mg	$100.00
		25 mg	$305.00

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